

**CONTRACT DOCUMENTS  
AND  
SPECIFICATIONS  
FOR**

**VOLUME 2**

**VILLAGE OF WATKINS GLEN AND  
VILLAGE OF MONTOUR FALLS  
REGIONAL WASTEWATER TREATMENT FACILITY**

**CONTRACT NO. 2A – GENERAL CONSTRUCTION  
CONTRACT NO. 2B – ELECTRICAL CONSTRUCTION  
CONTRACT 2C – HVAC CONSTRUCTION  
CONTRACT 2D – PLUMBING CONSTRUCTION**

**VILLAGE OF WATKINS GLEN AND VILLAGE OF MONTOUR FALLS  
SCHUYLER COUNTY, NEW YORK**

**WATKINS GLEN  
SAM SCHIMIZZI, MAYOR**

**MONTOUR FALLS  
JOHN KING, MAYOR**

**VILLAGE BOARD OF TRUSTEES**

**VILLAGE BOARD OF TRUSTEES**

**GARY SCHMIDT  
KEVIN THORNTON  
LAURIE DENARDO  
ANTHONY FRABONI**

**PHILLIP SMITH  
JAMES RYAN  
STEVEN LAWTON  
VINCENT CHICONE**

**DONNA BEARDSLEY,  
VILLAGE CLERK/TREASURER**

**ALYSSA HAMMOND,  
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VILLAGE ATTORNEY**

**DECEMBER 2017**

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VILLAGE OF MONTOUR FALLS  
SCHUYLER COUNTY, NEW YORK

REGIONAL WASTEWATER TREATMENT FACILITY  
CWSRF PROJECT No. C8-6423-03-00  
CONTRACT No. 2

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## SECTION 01 10 00

### SUMMARY OF WORK

#### PART 1 – GENERAL

##### 1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The following summary of Work is a general summary of the salient features of the Work to be performed by the General and Trades construction contractors. It does not supersede the requirements of the detailed technical specifications.
  
- B. Watkins-Montour Regional Wastewater Treatment Facility (WMRWWTF):
  - 1. Site Address: 449 South Clute Park Road, Watkins Glen, NY.
  - 2. Modification of an existing embankment, and construction of new WWTF Access Road.
  - 3. Construction of SBR Complex.
  - 4. Erection of process buildings, Administration building, and allied facilities, as shown and specified.
  - 5. Control system integration of two (2) Contract 1 pump stations into the WMRWWTF SCADA system.
  - 6. Start-up, commissioning, and training of Village staff.

##### 1.02 NUMBER OF CONTRACTS

- A. Work will be performed under four (4) Prime Contracts, each Contract is identified in the following and on Drawings:
  - 1. Contract No. 2A – General Construction.
  - 2. Contract No. 2B – Electrical Construction.
  - 3. Contract No. 2C – HVAC Construction.
  - 4. Contract No. 2D – Plumbing Construction.
  
- B. Refer to Section 01 29 00, Payment Procedures, for detailed Pay Item descriptions.

##### 1.03 WORK BY OWNER OR OTHERS

- A. Contract 3, Site Preparation:
  - 1. The Owner has awarded a separate contract for clearing, preliminary access road work, and importing structural fill and performing a site surcharge program to improve on-site soils and increase site elevation.
  - 2. This work will be completed prior to the start of Contract 2 work.

3. Anticipated improved site conditions are presented as existing conditions within the Contract 2 bid documents.
- B. Contract 1, Force Mains and Pump Stations:
1. Owner will award contracts for supply and installation of two sewage pump stations and force mains that will connect to the WMRWWTF.
  2. Contractors shall coordinate Work with utilities of Owner and public or private utilities as required to establish, water service, electric service and gas service, as specified herein.

#### 1.04 PRE-SELECTED PROCESS EQUIPMENT

- A. The Owner has pre-selected the following equipment manufacturers to provide the following equipment:
1. Sequencing Batch Reactor Package: Fluidyne Corporation. Reference specification: Section 11322.
  2. Tertiary Filter Package: Aqua Aerobic Systems, Inc. Reference specification: Section 11343.
- B. The General Contractor shall contract with the listed manufacturers to provide the equipment and services as specified in the attached pre-selection specifications.
- C. The Electrical Contractor's responsibilities related to the pre-selected equipment are as shown on the Electrical Drawings and as specified in the attached pre-selection specifications.
- D. All scope items not specifically included in the respective equipment manufacturer's scope of supply shall be furnished by the General Contractor.
- E. The General Contractor shall provide all incidental and ancillary work and coordination to furnish and install the pre-selected equipment, meeting all the performance and detail requirements of these Contract Documents.

#### 1.05 CONTRACTOR'S USE OF SITE AND PREMISES

- A. The Project Site is located in an environmentally-sensitive area, as specified in Section 01 31 13, Project Coordination.
- B. Utility outages and shutdown:
1. Coordinate and schedule electrical and other utility outages with Owner.
  2. At least one week before scheduled outage, submit Outage Request to RPE itemizing the date, time, and duration for each requested outage.

## 1.06 WORK SEQUENCE

- A. Seasonal constraints affecting the sequence of the Work are as specified in Section 01 31 13, Project Coordination.
- B. Contractors' Progress Schedule: Comply with Section 01 32 16, Construction Progress Documentation.

## 1.07 PERMITS

- A. The Owner has secured the following permits for this project:
  - 1. As issued by the New York State Department of Environmental Conservation (NYSDEC):
    - a. Article 17, SPDES Discharge Permit.
    - b. Article 15, Excavation and Fill in Navigable Waters.
    - c. Section 401, Water Quality Certification.
    - d. Article 24, Freshwater Wetlands Permit.
    - e. Part 182, Incidental Take of Endangered or Threatened Species.
    - f. Permit GP-0-15-002, General Permit for Stormwater Discharges from Construction Activity.
  - 2. As issued by the U.S. Army Corps of Engineers:
    - a. Section 404 Clean Water Act Nationwide Permit 12.
    - b. Section 10, Rivers and Harbors Act, Nationwide Permit 12.
    - c. Nationwide Permit No. 7, 12, and 39.
  - 3. As issued by the U.S. Fish and Wildlife Service: Non-Purposeful Take Permit.
- B. All special conditions and special provisions included in these permits are incorporated into these Contract Documents by reference. Comply with Section 00 31 46, Permits.
- C. Contractor shall secure all building permits, coordinate all inspections, pay all fees, to authorities having jurisdiction, and secure certificates of occupancy for all buildings and facilities constructed under this Contract.

## PART 2 – PRODUCTS

(Not Used)

## PART 3 – EXECUTION

(Not Used)

++ END OF SECTION ++

## SECTION 01 26 00

### CONTRACT MODIFICATION PROCEDURES

#### PART 1 – GENERAL

##### 1.01 PROPOSAL REQUESTS

- A. The Owner may, in anticipation of ordering an addition, deletion, or revision to the Work, request the Contractor prepare a detailed proposal of cost and times to perform contemplated change.
- B. Proposal requests will include reference number for tracking purposes and detailed description of and reason for proposed change, and such additional information as appropriate and as may be required for Contractor to accurately estimate cost and time impact on the Project.
- C. Proposal request is for information only; Contractor is neither authorized to execute proposed change nor stop Work in progress as a result of such request.
- D. Contractor's written proposal shall be transmitted to the RPE promptly, but not later than 14 days after Contractor's receipt of Owner's written request. Proposal shall remain firm for a maximum period of 45 days after receipt.
- E. Owner's request for proposal or Contractor's failure to submit such proposal within the required time period will not justify a Claim for an adjustment in Contract Price or Contract Times (or Milestones).

##### 1.02 CLAIMS

- A. Include at a minimum:
  - 1. Specific reference including:
    - a. Drawing numbers.
    - b. Specification section and article/paragraph number.
    - c. Submittal type.
    - d. Submittal number.
    - e. Date reviewed.
    - f. RPE's comment, as applicable with appropriate attachments.
  - 2. Stipulated facts and pertinent documents, including photographs and statements.
  - 3. Interpretations relied upon.
  - 4. Description of:
    - a. Nature and extend of Claim.

- b. Who or what caused the situation.
  - c. Impact to the Work and work of others.
  - d. Discussion of claimant's justification for requesting a change to price, time, or both.
5. Estimated adjustment in price claimant believes it is entitled to with full documentation and justification.
  6. Requested Change in Contract Times: Include at least:
    - a. Progress Schedule documentation showing logic diagram for request.
    - b. Documentation that float times available for Work have been used.
    - c. Revised activity logic with durations including subnetwork logic revisions, duration changes and other interrelated schedule impacts, as appropriate.
  7. Documentation as may be necessary as set forth below for Work Change Directive, and as RPE may otherwise require.

### 1.03 WORK CHANGE DIRECTIVES

#### A. Procedures:

1. RPE will:
  - a. Initiate, including a description of the Work involved and any attachments.
  - b. Affix signature, demonstrating RPE's recommendation.
  - c. Transmit five (5) copies to the Owner.
2. Owner will:
  - a. Affix signature, demonstrating approval of the changes involved.
  - b. Return four (4) copies to the RPE, who will retain one copy, send one copy to construction observation staff and forward two copies to the Contractor.
3. Upon completion of the Work covered by the Work Change Directive or when final Contract Times and Contract Price are determined, Contractor shall submit documentation for inclusion in a Change Order.
4. Contractor's documentation shall include but not be limited to:
  - a. Appropriately detailed records of Work performed to enable determination of value of the Work.
  - b. Full information required to substantiate resulting change in Contract Times and Contract Price for Work. On request of RPE, provide additional data necessary to support documentation.
  - c. Support data for Work performed on a unit price or Cost of the Work basis with additional information such as:
    - 1) Dates Work was performed and by whom.
    - 2) Time records, wage rates paid, and equipment rental rates.
    - 3) Invoices and receipts for materials, equipment, and subcontracts, are similarly documented.

- B. Effective Date of Work Change Directive: Date of signature by Owner, unless otherwise indicated thereon.

#### 1.04 CHANGE ORDERS

- A. Procedure:
  - 1. RPE will prepare four (4) copies of Change Order and transmit such attached therewith agreed-upon scopes of work and cost proposal for same. RPE's signature on the Change Order form is evidence of the RPE's recommendation that the cost of the Work (increase or decrease) is reasonable and in accordance with the Contract Documents.
  - 2. Contractor shall, upon receipt, review the Change Order and attached scope and cost back-up. If the Change Order and back-up is consistent with the Contractor's understanding of the change in Contract scope, then the Contractor shall sign and forward four (4) copies of the change order back to the RPE.
  - 3. RPE will, upon receipt of Contractor-signed copies, promptly forward the four (4) copies of the Change Order to the Owner for execution.
  - 4. Upon receipt of the Contractor-signed copies, the Owner will promptly either:
    - a. Execute the Change Order, retaining one (1) copy for its file and returning (3) copies to the RPE for distribution.
    - b. Return to RPE unsigned copies with written justification for not executing Change Order.
  - 5. Upon receipt of Owner-executed Change Order, Contractor shall:
    - a. Perform Work covered by Change Order.
    - b. Revise Schedule of Values to adjust Contract Price and submit with the next Application for Payment.
    - c. Revise the Progress Schedule to reflect changes in Contract Times, if any, and to adjust times for other items of Work affected by the change.
- B. In signing a Change Order, the Owner and Contractor acknowledge and agree that:
  - 1. Stipulated compensation (Contract Price, Contract Time or both) set forth includes payment for:
    - a. the Cost of the Work covered by the Change Order.
    - b. The Contractor's fee for overhead and profit.
    - c. Interruption of Progress Schedule.
    - d. Delay and impact, including cumulative impact, on other Work under the Contract Documents.
    - e. Extended overhead.
  - 2. Change Order constitutes full mutual accord and satisfaction for the change to the Work.

3. Unless otherwise stated in the Change Order, all requirements of the original Contract Documents apply to the Work covered by the Change Order.

#### 1.05 COST OF THE WORK

- A. In determining the supplemental costs allowed in Paragraph 13.01 of the General Conditions for rental equipment and machinery, the following will apply.
- B. Rental of construction equipment and machinery and the parts thereof having a replacement value in excess of \$1,000, whether owned by the Contractor or rented or leased from others, shall meet the following requirements.
  1. Full rental costs for leased equipment shall not exceed rates listed in the Rental Rate Blue Book published by Equipment Watch, Atlanta, GA, as adjusted to the regional area of the Project. Owned equipment costs shall not exceed the single shift rates established in the Cost Reference Guide (CRG), also published by Equipment Watch. The most recent published edition in effect at commencement of actual equipment use shall be used.
  2. Rates shall apply to equipment in good working condition. Equipment not in good condition, or larger than required, may be rejected by the RPE or accepted at reduced rates.
  3. Leased equipment: For equipment leased or rented in arm's length transactions from outside vendors, maximum rates shall be determined by the following actual usage/Blue Book Payment Category:
    - a. Less than 8 hours: Hourly Rate.
    - b. Eight (8) or more hours, but less than 7 days: Daily Rate.
    - c. Seven (7) or more days, but less than 30 days: Weekly Rate.
    - d. Thirty (30) days or more: Monthly Rate.
  4. "Arm's-length" rental and lease transactions are those in which the firm involved in the rental or lease of equipment is not associated with, owned by, have common management, directorship, facilities and/or stockholders with the firm renting the equipment.
  5. Leased Equipment in Use: Actual equipment use time documented by RPE shall be the basis that equipment was on and utilized at the Project Site. In addition to the leasing rate above, equipment operation costs shall be paid at the estimated hourly operating cost rate set forth in the Blue Book if not already included in the lease rate. Hours of operation shall be based upon actual equipment usage to the nearest quarter hour, as recorded by the RPE.

6. Leased Equipment, When Idle (Standby): Idle or standby equipment is equipment onsite or in transit to and from the Work Site and necessary to perform the Work under the modification, but not in actual use. Idle equipment time, as documented by the RPE, shall be paid at the leasing rate determined above, excluding operational costs.
7. Owned and Other Equipment in Use: Equipment rates for owner equipment or equipment provided in other than an arm's-length transaction shall not exceed the single shift total hourly costs rate developed in accordance with the CRG and as modified herein for multiple shifts. This total hourly rate will be paid for each hour the equipment actually performs work. Hours of operation shall be based on actual equipment usage as recorded by the RPE. This rate shall represent payment in full for Contractor's direct costs.
8. Owned and Other Equipment, When Idle (Standby): Equipment necessary to be onsite to perform the Work on single shift operations, but not utilized, shall be paid for at the ownership hourly expense rate developed in accordance with the CRG, provided its presence and necessity onsite has been documented by the RPE. Payment for idle time of portions of a normal workday, in conjunction with original contract Work, will not be allowed. In no even shall idle time claimed in a day for a particular piece of equipment exceed the normal Work or shift schedule established for the Project. It is agreed that this rate shall represent payment in full for Contractor's direct costs. When the RPE determines that the equipment is not needed to continuously remain at the Work Site, payment will be limited to actual hours in use.
9. Owned and Other Equipment, Multiple Shifts: For multiple-shift operations, the CRG single shift total hourly costs rate shall apply to the operating equipment during the first shift. For subsequent shifts, up to 2 in a 24-hour day, operating rate shall be the sum of the total hourly CRG operating cost and 60 percent of the CRG ownership and overhaul expense. Payment for idle or standby time for second and third shifts shall be 20 percent of the CRG ownership and overhaul expense.
10. When necessary to obtain owned equipment from sources beyond the Project limits, the actual cost to transfer equipment to the Work Site and return it to its original location will be allowed as an addition item of expense. Move-in and move-out allowances will not be made for equipment brought to the Project if the equipment is also used on original Contract or related Work.
11. If the move-out destination is not to the original location, payment for move-out will not exceed payment for move-in.
12. If move is made by common carrier, the allowance will be the amount paid for the freight. If equipment is hauled with Contractor's own forces, rental will be allowed for the hauling unit plus the hauling unit operator's



wage. If equipment is transferred under its own power, the rental will be 75 percent of the appropriate total hourly costs for the equipment, without attachments, plus the equipment operator's wage.

13. Charges for time utilized in services equipment to ready it for use prior to moving and similar charges will not be allowed.
14. When a breakdown occurs on any piece of owned equipment, payment shall cease for that equipment and any other owned equipment idled by the breakdown.
15. If any part of the Work is shut down by the Owner, standby time will be paid during non-operating hours if diversion of equipment to other Work is not practicable. RPE reserves the right to cease standby time payment when an extended shutdown is anticipated.
16. If a rate has not been established in the CRG for owned equipment, Contractor may choose one of the following courses of action:
  - a. If approved by the RPE, use the rate of the most similar model found, considering such characteristics as manufacturer, capacity, horsepower, age, and fuel type.
  - b. Request Equipment Watch to furnish a written response for a rate on the equipment, which shall be presented to the RPE for approval.
  - c. Request RPE to establish a rate.

#### 1.06 FIELD ORDER

- A. RPE will issue Field Orders, with three copies to the Contractor.
- B. Effective date of the Field Order shall be the date of signature by RPE, unless otherwise indicated thereon.
- C. Contractor shall acknowledge receipt by signing and returning one copy to the Engineer.
- D. Field Orders will be incorporated into subsequent Change Orders, as a no-cost change to the Contract.

#### PART 2 – PRODUCTS

(Not used)

#### PART 3 – EXECUTION

(Not used)

++ END OF SECTION ++

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SUBMITTALS

- A. Informational Submittals:
  - 1. Schedule of Values: Submit on Form EJCDC C-620.
  - 2. Application for Payment.
  - 3. Final Application for Payment

1.02 CASH ALLOWANCES

- A. Cash allowances will be administered in accordance with Paragraph 13.02 of the General Conditions.
- B. Submit, with application for payment, invoice showing date of purchase, from whom the purchase was made, the date of delivery of the product or service, and the price, including delivery to the Site and applicable taxes.
- C. Cash allowances are further described as:
  - 1. Pay Item 2A.5: SBR Equipment.
  - 2. Pay Item 2A.6: Tertiary Filter Equipment.
  - 3. Pay Item 2A.7: Facility Equipment and Furnishing.
  - 4. Pay Item 2B.2: Electrical Service Furnishing.
  - 5. Pay Item 2D.3: Gas Service Furnishing.

1.03 SCHEDULE OF VALUES

- A. Prepare a separate Schedule of Values for each schedule of the Work under the Agreement.
- B. Upon request of the RPE, provide documentation to support the accuracy of the Schedule of Values.
- C. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.
- D. Lump Sum Work:
  - 1. Reflect specified cash allowances and alternates, as applicable.

2. List bonds and insurance premiums, mobilization, demobilization, progress schedule preparation, equipment testing, facility start-up, and contract closeout separately.
- E. An unbalanced or front-loaded schedule will not be accepted.
- F. Summation of the complete Schedule of Values representing all the Work shall equal the Contract Price.

#### 1.04 SCHEDULE OF ESTIMATED PROGRESS PAYMENTS

- A. Show estimated payment requests throughout Contract Times aggregating initial Contract Price.
- B. Base estimated progress payments on initially acceptable progress schedule. Adjust to reflect subsequent adjustments in progress schedule and Contract Price as reflected by modifications to the contract Documents.

#### 1.05 APPLICATION FOR PAYMENT

- A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment On-Hand, as applicable. Execute certification by authorized officer of Contractor.
- B. Use detailed Application for Payment EJCDC C-620.
- C. Prepare separate form for each schedule, as applicable.
- D. Include accepted Schedule of Values for each schedule or portion of lump sum Work and the unit price breakdown for the Work to be paid on a unit price basis.
- E. Include separate line item for each Change Order and Work Change Directive executed prior to date of submission. Provide further breakdown of such, as requested by the RPE.

#### 1.06 PAY ITEMS

- A. Schedule 2A – General Construction:
1. Pay Item 2A.1: General Mobilization:
    - a. Measurement: Lump sum.
    - b. Payment: Payment shall be full compensation for all preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project site for the establishment of all field offices, buildings and other facilities necessary

for work on the project; for all other work and operations that must be performed or costs incurred before beginning the Work on the other contract items and for demobilization.

- 1) Fifty percent (50%) of the lump sum price bid for mobilization or \$200,000, whichever is less, will be paid upon application for payment, but no sooner than 15 days after start of the Work at the project site.
  - 2) Forty percent (40%) of the lump sum price bid for mobilization or \$160,000, whichever is less, will be paid with the first regular pay application after ten percent (10%) of the original total contract amount, including payments for delivered materials but excluding mobilization, is earned.
  - 3) The balance of the lump sum price for mobilization will be paid upon completion of all work on the project, including final cleanup, including but not limited to demobilization and restoration activities. Specifically excluded from this item is remobilization associated with punch list or warranty work.
2. Pay Item 2A.2: General Construction:
- a. Measurement: Lump sum.
  - b. Payment: Payment shall be full compensation for all general construction work shown on the Drawings and specified herein, including coordination with the Owner and other contractors, general requirements, sequencing, and other related items, as shown and specified herein, or as may be required.
  - c. Related Work:
    - 1) Drawings:
      - a) General Drawings.
      - b) Civil Drawings, excluding C-121 through C-126.
      - c) Landscaping Drawings, related to seeding and site restoration.
      - d) Architectural Drawings.
      - e) Structural Drawings.
      - f) Process Drawings
      - g) Coordination with other contracts, as shown or called on these drawings.
    - 2) Specifications:
      - a) Division 00.
      - b) Division 01
      - c) Division 03, excluding Section 03 48 00, Pre-Cast Post-Tensioned Concrete Tanks.
      - d) Division 04.
      - e) Division 05.
      - f) Division 06.
      - g) Division 07.
      - h) Division 08.

- i) Division 09
  - j) Division 10.
  - k) Section 11 53 00, Laboratory Equipment.
  - l) Division 12.
  - m) Division 13.
  - n) Division 31.
  - o) Division 32:
    - i) Section 32 11 16, Aggregate Base and Aggregate Paving.
    - ii) Section 32 16 23, Sidewalks.
    - iii) Section 32 17 26, Tactile Warning Surfacing.
    - iv) Section 32 31 13, Chain Link Fences and Gates.
    - v) Section, 32 91 13, Soil Preparation.
    - vi) Section 32 92 00, Turf and Grass.
  - p) Division 33.
  - q) Division 40.
  - r) Division 41.
  - s) Division 43.
  - t) Division 44.
  - u) Division 46.
3. Pay Item 2A.3: Access Road Construction:
- a. Measurement: Lump sum.
  - b. Payment: Payment shall be full compensation for the differential costs added the base bid amount in connection with constructing the WMRWWTF Access Road from STA AR17+ to STA AR 26+40 with all appurtenances, guide rails, and culverts as shown on the Drawings and as specified herein.
  - c. Related Work:
    - 1) Drawings:
      - a) C-123 through C-126.
    - 2) Specifications:
      - a) Section 31 05 13, Soils for Earthwork.
      - b) Section 31 05 16, Aggregates for Earthwork.
      - c) Section 31 23 01, Excavation, Backfill, and Compaction.
      - d) Section 32 11 16, Aggregate Base and Aggregate Paving.
      - e) Section 32 32 23, Segmental Retaining Walls
      - f) Section 33 46 00, Subdrainage.
4. Pay Item 2A.4: Pre-Cast Post-Tensioned Concrete Tanks:
- a. Measurement: Lump sum.
  - b. Payment: Payment shall be full compensation for the differential costs added to or deducted from the amount bid under Pay Item 2A.2 in connection with constructing a pre-cast, post-tensioned concrete SBR Complex in lieu of a cast-in-place concrete SBR Complex.

- c. Related Work:
  - 1) Drawings:
    - a) Process Drawings.
    - b) Structural Drawings.
  - 2) Specifications:
    - a) Section 03 48 00, Rectangular Pre-cast Post-Tensioned Concrete Tanks.
- 5. Pay Item 2A.5: SBR Equipment:
  - a. Measurement: Allowance.
  - b. Payment: Payment shall be full compensation for all direct costs associated with furnishing Pre-Selected SBR Equipment up to the allowance amount. All costs associated with ordering, coordinating, installation, finishing, startup, etc shall be paid under Pay Item 2A.2.
  - c. Related Work:
    - 1) Drawings:
      - a) Process Drawings.
    - 2) Specifications:
      - a) Division 00.
      - b) Division 01.
      - c) Section 11322, Sequential Batch Reactor, Sludge Digester, and Post-SBR Equalization Basin Equipment Pre-Selection.
      - d) Related Sections of Division 40.
- 6. Pay Item 2A.6: Tertiary Filter Equipment:
  - a. Measurement: Allowance.
  - b. Payment: Payment shall be full compensation for all direct costs associated with furnishing Pre-Selected Tertiary Filter Equipment up to the allowance amount. All costs associated with ordering, coordinating, installing, finishing, startup, etc shall be paid under Pay Item 2A.2.
  - c. Related Work:
    - 1) Drawings:
      - a) Process Drawings.
    - 2) Specifications:
      - a) Division 00.
      - b) Division 01.
      - c) Section 11343, Tertiary Disk Filter Equipment Pre-Selection.
      - d) Related Sections of Division 40.
- 7. Pay Item 2A.7: Facility Equipment and Furnishing:
  - a. Measurement: Allowance.
  - b. Payment: Payment shall be full compensation for all direct costs associated with purchase, delivery, installation and set-up of shop furnishings, shop tools, plant office furniture, and appurtenant equipment, and furnishings, and mark-up for same, as directed by the Owner up to the allowance amount.
  - c. Related Work: Not specified. Purchases will be as directed by the Owner.

8. Pay Item 2A.8: Asphalt Paving:
  - a. Measurement: Unit price, square yard.
  - b. Payment: Payment shall be full compensation for all labor, equipment, and material associated with furnishing and installing asphalt pavement and striping on drives and parking lots, built to the typical section shown on the Drawings, as directed by the RPE. Compacted granular subbase will be paid under Item 2A.2.
  - c. Related Work:
    - 1) Drawings:
      - a) Civil Drawings.
    - 2) Specifications:
      - a) Section 32 12 16, Asphalt Paving.
      - b) Section 32 17 23, Pavement Markings.
9. Pay Item 2A.9: Evergreen Tree Planting:
  - a. Measurement: Unit price, each.
  - b. Payment: Payment shall be full compensation for all labor, equipment, and material associated with planting Evergreen Tree species shown on the Drawings at locations as directed by the RPE.
  - c. Related Work:
    - 1) Drawings:
      - a) Landscape Drawings.
    - 2) Specifications:
      - a) Section 32 93 00, Plants.
10. Pay Item 2A.10: Deciduous Tree Plant:
  - a. Measurement: Unit price, each.
  - b. Payment: Payment shall be full compensation for all labor, equipment, and material associated with planting Deciduous Tree species shown on the Drawings at locations as directed by the RPE.
  - c. Related Work:
    - 1) Drawings:
      - a) Landscape Drawings.
    - 2) Specifications:
      - a) Section 32 93 00, Plants.
11. Pay Item 2A.11: Silt Fence:
  - a. Measurement: Unit price, linear foot.
  - b. Payment: Payment shall be full compensation for all labor, equipment, and material associated with installing silt fence, as directed by the RPE.
  - c. Related Work:
    - 1) Drawings:
      - a. C-116, C-127, C-128, C-501, C-502.
    - 2) Specifications:
      - a. Section 01 57 13, Temporary Erosion and Sediment Control.

- B. Schedule 2B – Electrical Construction:
1. Pay Item 2B.1: Electrical Mobilization:
    - a. Measurement: Lump sum.
    - b. Payment:
      - 1) Payment shall be full compensation for all preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project site for the establishment of all field offices, buildings and other facilities necessary for work on the project; for all other work and operations that must be performed or costs incurred before beginning the Work on the other contract items and for demobilization.
      - 2) Fifty percent (50%) of the lump sum price bid for mobilization or \$50,000, whichever is less, will be paid upon application for payment, but no sooner than 15 days after start of the Work at the project site.
      - 3) Forty percent (40%) of the lump sum price bid for mobilization or \$40,000, whichever is less, will be paid with the first regular pay application after ten percent (10%) of the original total contract amount, including payments for delivered materials but excluding mobilization, is earned.
      - 4) The balance of the lump sum price for mobilization will be paid upon completion of all work on the project, including final cleanup, including but not limited to demobilization and restoration activities. Specifically excluded from this item is remobilization associated with punch list or warranty work.
  2. Pay Item 2B.2: Electrical Construction:
    - a. Measurement: Lump sum.
    - b. Payment: Payment shall be full compensation for all electrical construction work shown and specified in the Related Work, including coordination with the Owner and other contractors, general requirements, sequencing, and other related items as shown and specified herein.
    - c. Related Work:
      - 1) Drawings:
        - a) General Drawings.
        - b) Civil Drawings, as it relates to coordination of duct bank construction.
        - c) Electrical Drawings.
        - d) Process Drawings as it relates to coordination of electrical feeders and control wiring to process equipment and devices.
        - e) Coordination with other contracts, as shown or called on these Drawings.
      - 2) Specifications:
        - a) Division 00.
        - b) Division 01.



- c) Division 26.
  - d) Division 27.
  - e) Division 28.
  - f) Division 40.
  - g) Division 41.
  - h) Division 43.
  - i) Division 46.
3. Pay Item 2B.3: Electrical Service Furnishing:
- a. Measurement: Allowance.
  - b. Payment:
    - 1) Payment shall be full compensation for all direct costs associated up to the allowance amount with the Contractor's coordination and installation of electric service at the WMRWWTF with the Electric Utility.
    - 2) Work and costs shall include but not be limited to all direct costs to be borne by the "Customer", as defined by the Electric Utility.
    - 3) Work and costs shall include but not be limited to trenching, primary duct bank construction, conduit installation up to and including the meter base, placement of transformer foundation pads and secondary containment, and will conform to all technical, administrative, coordination, and scheduling requirements of the respective Electric Utility.

C. Schedule 2C – HVAC Construction:

1. Pay Item 2C.1: HVAC Construction:
- a. Measurement: Lump sum.
  - b. Payment: Payment shall be full compensation for HVAC construction work shown and specified in the Related Work, including coordination with the Owner and other contractors, general requirements, sequencing and other related items, as shown and specified herein.
  - c. Related Work:
    - 1) Drawings:
      - a) General Drawings.
      - b) HVAC Drawings.
      - c) Coordination with other contracts, as shown or called out on these drawings.
    - 2) Specifications:
      - a) Division 00.
      - b) Division 01.
      - c) Applicable sections of Division 22.
      - d) Division 23.
      - e) Applicable sections of Division 26.

- D. Schedule 2D – Plumbing Construction:
1. Pay Item 2D.1: Plumbing Construction:
    - a. Measurement: Lump sum.
    - b. Payment: Payment shall be full compensation for all plumbing construction work, including fire protection work shown and specified in the Biosolids Room (Room 301) and as further shown and specified in the Related Work, including coordination with the Owner and other contractors, general requirements, sequencing, and other related items, as shown and specified herein.
    - c. Related Work:
      - 1) Drawings:
        - a) General drawings.
        - b) Plumbing drawings.
        - c) Applicable Fire Protection drawings.
        - d) Coordination with other contracts, as shown or called on these Drawings.
      - 2) Specifications:
        - a) Division 00.
        - b) Division 01.
        - c) Division 09.
        - d) Section 21 13 13, Wet Pipe Sprinkler System.
        - e) Division 22.
        - f) Applicable Sections of Division 40, as may be called in Division 22.
  2. Pay Item 2D.2: Sprinkler System Construction:
    - a. Measurement: Lump sum.
    - b. Payment: Payment shall be full compensation for the incremental cost added to or deducted from the amount bid under Pay Item 2D.1 in connection with constructing building sprinkler systems for rooms and buildings not included in Pay Item 2D.1, as shown and specified in the Related Work, including coordination with the Owner and other contractors, general requirements sequencing, and other related items, as shown and specified herein.
    - c. Related Work:
      - 1) Drawings:
        - a) Fire Protection Drawings.
        - b) Applicable sections of the Plumbing Drawings.
      - 2) Specifications:
        - a) Section 21 13 13, Wet Pipe Sprinkler System.
        - b) Applicable sections of Division 22.
        - c) Applicable sections of Division 26.
  3. Pay Item 2D.3: Gas Service Furnishing:
    - a. Measurement: Allowance.

- b. Payment:
  - 1) Payment shall be full compensation for all direct costs associated with the Contractor's coordination and installation of gas service at the WMRWWTF with Gas Utility up to the allowance amount.
  - 2) Work and costs shall include but not be limited to all direct costs to be borne by the "Customer", as defined by the Gas Utility.
  - 3) Work and costs shall include but not be limited to trenching, gas branch main (approximately 750 LF) and service installation up to and including the meter, support, stanchions, and regulators, as well as complying with all technical, administrative, coordination, and scheduling requirements of the Gas Utility.

#### 1.07 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

- A. Payment will not be made for the following:
  - 1. Loading, haling, and disposing of rejected material.
  - 2. Quantities of material wasted or disposed in a manner not called for in the Contract Documents.
  - 3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provision of Contract Documents.
  - 4. Material not unloaded from transporting vehicle.
  - 5. Defective Work not accepted by the Owner.
  - 6. Material remaining on hand after completion of the Work.

#### 1.08 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

- A. Partial Payment: No partial payments will be made for materials and equipment delivered or stored unless shop drawings and preliminary operation and maintenance data has been accepted by the RPE.
- B. Final Payment:
  - 1. Will be made only for products incorporated into the Work.
  - 2. Remaining products, for which partial payments have been made shall revert to Contractor unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

#### 1.09 PARTIAL PAYMENT FOR UNDELIVERED, PROJECT-SPECIFIC MANUFACTURED OR FABRICATED EQUIPMENT

- A. Notwithstanding the above provisions, partial payments for undelivered (not yet delivered to Site or not stored in the vicinity of the Site) products specifically manufactured for this Project, excluding off-the-shelf or catalog items, will be made for products listed below when all following conditions exist:

1. Partial payment request is supported by written acknowledgement from Suppliers that invoice requirements have been met.
  2. Equipment is adequately insured, maintained, stored, and protected by appropriate security measures.
  3. Each equipment items is clearly marked and segregated from other items to permit inventory and accountability.
  4. Authorization has been provided for access to storage Site for RPE and Owner.
  5. Equipment meets applicable Specifications of these Contract Documents.
- B. Failure of Contractor to continue compliance with above requirements shall give cause for Owner to withhold payments made for such equipment from future partial payments.

## PART 2 - PRODUCTS

(Not Used)

## PART 3 - EXECUTION

(Not Used)

++ END OF SECTION ++

SECTION 01 29 00

SUPPLEMENT  
LIEN WAIVER AND RELEASE

WHEREAS, \_\_\_\_\_, hereafter called the "Undersigned," having entered into a written contract or purchase order with the Village of Watkins Glen and the Village of Montour Falls, hereafter call the "Owner", for the supplying of materials and/or the furnishing of labor and materials, or the furnishing of labor only for the project known as the Watkins-Montour Regional WWTF.

WHEREAS, Undersigned has requisitioned a PARTIAL/FINAL payment from the Owner pursuant to such contract or purchase order.

NOW, THEREFORE, for good and valuable consideration including the PARTIAL/FINAL payment of \$\_\_\_\_\_ provided for herein, Undersigned agrees as follows:

- 1) Upon receiving payment from the Owner, the payment to which this instrument refers, Undersigned agrees not in any way to claim or file a mechanic's lien or other lien against said project, premises or any part thereof, or on the monies or other consideration due to become due for the Owner for any of the materials heretofore furnished or work or labor performed or furnished by the Undersigned. Further, the Undersigned hereby formally and irrevocably releases and waives in writing every and any lien, charges or claim of any nature whatsoever that it has, or as to which it may at any time have been entitled, up to and including the date hereof in connection with the said project, except for any unpaid retained monies unless the payment herein is payment of retainage, which lien waiver shall be for the benefit of the Owner of the Project.
- 2) The Undersigned further says that all monies due for this work which includes all labor, material, fuel, transportation and equipment, fringe benefits, pension funds, apprentice training programs, employee vacations, welfare funds, and similar funds and payments as well as all applicable sales and used taxes, royalties, commissions, permits, bonds, guarantees, insurances, licenses, or patent fees have been paid in full except as noted below. (If none write "NONE").

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

And that there are no persons in a position to have or file a lien against the above mentioned work and/or the premises on which the same is located on account of any labor or materials furnished to Undersigned or any of the Undersigned's subcontractors or suppliers.

- 3) Undersigned agrees that the lien waiver appearing in Paragraph "1" hereof shall be deemed to be in compliance with the Lien Law of the State of New York.
- 4) Undersigned agrees that any of its subcontractors or suppliers being entitled to any of the proceeds of the within payments have been paid except as noted below. (If none write "NONE").

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- 5) Furthermore, Undersigned hereby formally and irrevocably releases and waives any rights to make a claim upon any labor and material payment bond issued to the Owner, for this project on account of the labor, services, materials, fixtures or supplies heretofore furnished to this date by the Undersigned for the said project.
- 6) Furthermore, Undersigned hereby formally and irrevocably releases the Owner from all claims of liability, loss or damage to the Undersigned except as noted otherwise herein for anything furnished or performed in connection with, relating to or arising out of the contract or out of the work covered by said contract, including, but not limited to, all claims for extra work, labor or materials, delays or increased costs due to changed conditions, loss of efficiency or productivity, nonsequential work operations, delays, acceleration, suspension of work, and for any prior act, neglect or default on the part of the Owner, or any of its officers, agents or employees in connection therewith, up to and including the date of this waiver, except for any unpaid retained monies.
- 7) The Undersigned further acknowledges that neither the aforesaid payment nor acceptances by the Owner, of the work covered by the aforementioned contract and/or purchase order shall in any way or manner operate as, or constitute a release or waiver of the Undersigned's obligations, undertaking or liabilities under said contract or purchase order or in any way affect or limit the same.

This Agreement shall run to the benefit of the Owner, its successors and assigns; signed and dated this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

AMOUNT OF THIS

PARTIAL/FINAL PAYMENT:

\$ \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Office/Authorized Signature

\_\_\_\_\_  
Printed Name and Title

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_.

\_\_\_\_\_

Notary Public

## SECTION 01 31 13

### PROJECT COORDINATION

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION

- A. The Village of Watkins Glen and Village of Montour Falls will maintain control over their respective wastewater conveyance and treatment systems for the duration of the Contract.
- B. No work shall be undertaken which would jeopardize the minimum required conveyance or capacity of the existing conveyance and treatment systems.
- C. All outages, cut-overs and connections of new Work to the existing conveyance system shall be coordinated with the respective Village personnel.
- D. The Project Site is located within an environmentally-sensitive area and is located within or adjacent to:
  - 1. The Catharine Creek Wildlife Management Area.
  - 2. An active Bald Eagle nest, a State protected and threatened species and Federally-protected species.
  - 3. Habitat suitable for the northern long-eared bat, a species listed as Threatened by the U.S. Fish and Wildlife Service.
  - 4. The Seneca Canal, a Class C stream with C(T) standards.

##### 1.02 RELATED WORK AT THE SITE

- A. General:
  - 1. Other work that is either directly or indirectly related to schedule performance of the Work under these Contract Documents, listed henceforth, is anticipated to be performed at the Site by others.
  - 2. Coordinate the Work of the Contract Documents with work of others as specified in the General Conditions.
  - 3. Include sequencing constraints specified herein as a part of Progress Schedule.

##### 1.03 FACILITY OPERATIONS

- A. Continuous operation of Owner's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.



- B. Perform Work continuously during critical connections and change-overs, and as required to prevent interruption of the Owner's operation.
- C. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to maintain continuous operations of the Owner's facilities.
- D. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by Owner and RPE. Such authorization will be considered within 48 hours after receipt of Contractor's written request.
- E. Perform Work continuously during critical connections and change-overs, and as required to prevent interruption of the Owner's operation.

#### 1.04 SEASONAL CONSTRAINTS ON THE PROJECT SITE

- A. Tree-clearing: Tree felling and clearing activities shall be scheduled to occur between October 1 and March 31.
- B. In-stream Work: In-stream Work shall be scheduled to occur between June 1 and September 30.
- C. Site access constraints:
  - 1. Substantial Completion for Contract 3, Site Preparation is scheduled for June 2, 2018. Contract 2 contractors shall not have access to the site until after this date.
  - 2. Site Work within the 660-foot buffer zone of the bald eagle nest shall begin no later than December 31.
  - 3. No activity shall occur within the 330-foot buffer zone of the bald eagle nest.
- D. Temporary visual screen: Visual screen shall only be removed after Substantial Completion of the Contract 2A work and only between the months of September and December.

#### 1.05 PROJECT MILESTONES

- A. General: Include Milestones specified herein as part of the Progress Schedule required under Section 01 32 16, Construction Progress Documentation.

- B. Project Milestones:
1. Schedule A – General:
    - a. Plant Construction:
      - 1) Plant Construction shall include all shallow foundations, superstructures, concrete, yard piping, exposed piping, labeling, complete access road construction, commissioning, and manufacturer’s initial operations training.
      - 2) This Milestone will also include submittal of draft O&M manuals, all individual equipment commissioning reports, and successful completion of a process operational demonstration.
      - 3) Operational demonstration shall be completed by September 15, 2019.
    - b. Successful completion of the Plant Construction work shall constitute Substantial Completion of the Schedule A work and shall set the date of warranty period commencement for all labor, equipment, and material furnished by the Contractor.
  2. Schedule B – Electrical:
    - a. All building electrical services, lights, panels, terminations, third-party acceptance tests, conduit and wire labeling, submittal and acceptance of all O&M manuals shall be completed and ready for the Owner’s use by July 27, 2019.
    - b. Successful completion of this work shall constitute Substantial Completion of the Schedule B work and shall set the date of warranty period commencement for all labor, equipment, and material furnished by the Contractor.
  3. Schedule C – HVAC:
    - a. All building HVAC services, duct work, air handlers, and exhaust fans, shall be installed, tested, and balanced, submittal and acceptance of all O&M manuals, per the Contract Documents and ready for the Owner’s use by August 18, 2019.
    - b. Successful completion of this work shall constitute Substantial Completion of the Schedule C work and shall set the date of warranty period commencement for all labor, equipment, and material furnished by the Contractor.
  4. Schedule D – Plumbing:
    - a. All building services, including potable water, non-potable work, gas, and hot water systems, drain, waste, and vent piping, fixtures, and appurtenances shall be installed tested and ready and submittal and acceptance of O&M manuals per the Contract Documents and ready for the Owner’s use by August 18, 2019.

- b. Successful completion of this work shall constitute Substantial Completion of the Schedule D work and shall set the date of warranty period commencement for all labor, equipment, and material furnished by the Contractor.
- C. Final completion: All punch list work, submittal of approved O&M manuals, spare parts, and final operator training shall be complete and ready for final inspection by October 15, 2019.

PART 2 – PRODUCTS

(Not used)

PART 3 – EXECUTION

(Not used)

++ END OF SECTION ++

SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 GENERAL

- A. RPE will schedule physical arrangements for meetings throughout the progress of the Work on a monthly basis, prepare meeting agenda with regular participant input and will distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes following each meeting to participants and parties affected.

1.02 PRE-CONSTRUCTION CONFERENCE

- A. Contractor shall be prepared to discuss the following subjects, as a minimum:
  - 1. Required schedules.
  - 2. Status of bonds and insurance.
  - 3. Sequencing of critical path work items.
  - 4. Progress payment procedures.
  - 5. Project changes and clarifications.
  - 6. Use of Site, access, office and storage areas, security and temporary facilities.
  - 7. Major product delivery and priorities.
  - 8. Contractor's safety plan.
- B. Attendees will include:
  - 1. Owner's representative.
  - 2. Contractor's office representative.
  - 3. Contractor's resident superintendent.
  - 4. Contractor's quality control representative.
  - 5. Subcontractors' representatives whom the Contractor may wish or RPE may request to attend.
  - 6. RPE's representatives.
  - 7. Others, as appropriate.

1.03 PRELIMINARY SCHEDULE REVIEW MEETING

- A. As set forth in the General Conditions and Section 01 32 16, Construction Progress Documentation.

#### 1.04 PROGRESS MEETINGS

- A. RPE will schedule regular progress meetings at Site, conducted monthly to review the Work progress, Progress Schedule, Schedule of Submittals, Application for Payment, contract modifications, and other matters needing discussion and resolution. Additional coordination meetings may be called by the Owner, as required to adequately coordinate major tie-ins.
- B. Attendees will include:
  - 1. Owner's representative(s), as appropriate.
  - 2. Contractor, Subcontractor, and Suppliers, as appropriate.
  - 3. RPE's representative(s).
  - 4. Others, as appropriate.
- C. Update and submit interim Schedules 3 days before project meetings.

#### 1.05 QUALITY CONTROL MEETINGS

- A. Scheduled by the RPE on a regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of the Work and work of other Contractors.
- B. Attendees will include:
  - 1. Contractor.
  - 2. Contractor's designated quality control representative.
  - 3. Subcontractors and Suppliers, as necessary.
  - 4. RPE's representatives.

#### 1.06 PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS) COORDINATION MEETINGS

- A. RPE will schedule meetings at Site, conducted monthly to review specific requirements of the PICS work.
- B. Attendees will include:
  - 1. Contractor.
  - 2. Owner.
  - 3. PICS Subcontractor/Integrator.
  - 4. RPE's representative.

#### 1.07 PRE-INSTALLATION MEETINGS

- A. When required in individual specification sections, convene at Site prior to commencing the Work of that Section.

- B. Require attendance of entities directly affecting, or affected by the Work of that Section.
- C. Notify the RPE 7 days in advance of the meeting date.
- D. Provide suggested agenda to RPE to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

#### 1.08 FACILITY START-UP MEETINGS

- A. Schedule and attend a minimum of two facility startup meetings. The first of such meetings shall be held prior to submitting Facility Startup Plan, as specified in Section 01 91 14, Equipment Testing and Facility Startup, and shall include preliminary discussions regarding such plan.
- B. Agenda items shall include, but not be limited to, content of Facility Startup Plan, coordination needed between various parties in attendance, and potential problems associated with startup.
- C. Attendees will include:
  - 1. Contractor.
  - 2. Contractor's designated quality control representative.
  - 3. Subcontractors and equipment manufacturer's representatives whom Contractor deems to be directly involved in facility startup.
  - 4. RPE's representatives.
  - 5. Owner's operations personnel.
  - 6. Others as required by the Contract Documents or as deemed necessary by the Contractor.

#### 1.09 OTHER MEETINGS

- A. In accordance with Contract Documents and as may be required by Owner and RPE.

#### PART 2 – PRODUCTS

(Not used)

#### PART 3 – EXECUTION

(Not used)

++ END OF SECTION ++

## SECTION 01 32 16

### CONSTRUCTION PROGRESS DOCUMENTATION

#### PART 1 – GENERAL

##### 1.01 SUBMITTALS

- A. Informational Submittals:
  - 1. Preliminary Progress Schedule: Submit within time specified in the General Conditions.
  - 2. Detailed Progress Schedule:
    - a. Submit initial Detailed Progress Schedule within 30 days after Effective Date of the Agreement.
    - b. Submit an Updated Progress Schedule at each update, as specified herein.
  - 3. Submit with each Progress Schedule submittal:
    - a. Contractor's certification that Progress Schedule submittal is actual schedule being utilized for execution of the Work.
    - b. Project shall be scheduled using P6 by Primavera, or approved equal software capable of critical path activity analysis.
    - c. Progress schedule: Six (6) legible color copies.
    - d. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
  - 4. Prior to final payment, submit a final Updated Progress Schedule.

##### 1.02 SCHEDULE COORDINATION

- A. Where Contractor is referred to in the singular, it shall refer to each of separate contractors as applicable.
- B. General Contractor shall incorporate detailed schedules prepared by other contractors into the overall Progress Schedule, and shall maintain throughout the duration of the Project.
- C. Coordinate preparation and process of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- D. Coordinate Contractor's construction schedule with the schedule of values, list of subcontractors, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- E. The General Contractor shall update the work schedule on a monthly basis throughout construction. A copy of the updated work schedule shall be submitted to the RPE along with each payment application, along with copies of certified payrolls and required M/WBE documentation. Payment applications will not be reviewed by the RPE until an acceptable updated schedule has been received. The General Contractor shall update the work schedule on a monthly basis throughout the construction period.

### 1.03 DETAILED PROGRESS SCHEDULE

- A. In addition to the requirements of the General Conditions, submit a Detailed Progress Schedule beginning with Notice to Proceed and continuing through Final Completion.
- B. Show the duration and sequence of activities required for complete performance of the Work reflecting means and methods chosen by the Contractor.
- C. When accepted by the RPE, the Detailed Progress Schedule will be the Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.
- D. Format: In accordance with requirements specified herein.
- E. Updated monthly through the 15th of each month along with each pay application to reflect actual progress and occurrences to date, including weather delays.

### 1.04 PROGRESS SCHEDULE – CRITICAL PATH NETWORK

- A. General: Comprehensive computer-generated schedule using the critical path method (CPM), generally as outlined in the “Construction Planning & Scheduling Manual”, as published by the Associated of General Contractors of America (AGC). If a conflict occurs between the AGC publication and this Specification, then this Specification shall govern.
- B. Contents:
  1. Schedule shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
  2. Identify Work calendar basis using days as a unit of measure.
  3. Show complete interdependence and sequence of construction and Project-related activities reasonably required to complete the Work.
  4. Identify the Work of separate stages and other logically grouped activities.



5. Reflect sequences of the Work, constraints, delivery windows, review times Contract Times and Project Milestones set forth in the Agreement and Section 01 31 13, Project Coordination.
6. Include as applicable, at a minimum:
  - a. Obtaining permits, submittals for early product procurement, and long-lead items.
  - b. Mobilization and other preliminary activities.
  - c. Submittal review and approval.
  - d. Initial Site work.
  - e. Specified Work sequences, constraints, and Milestones, including Substantial Completion date.
  - f. Major equipment fabrication, factory-testing, and delivery dates.
  - g. Concrete work.
  - h. Structural steel work.
  - i. Architectural features work.
  - j. Conveying systems work.
  - k. Equipment work.
  - l. Mechanical work.
  - m. Electrical work.
  - n. Instrumentation and control work.
  - o. Other important work for each facility.
  - p. Equipment and system startup and testing activities.
  - q. Project closeout and site restoration.
  - r. Demobilization.
7. No activity duration, exclusive of those for Submittals review and product fabrication/delivery, shall be less than 1 day or more than 14 days, unless otherwise approved.
8. Activity duration for Submittal review shall not be less than review time specified unless clearly identified and prior written acceptance has been obtained from the RPE.

C. Network Graphical Display:

1. Plot or print on paper 11" x 17".
2. Title block: Show name of Project, Owner, date submitted, revision or update number, and the name of the scheduler. Updated schedules shall indicate data date.
3. Identify horizontally across top of schedule the time frame by year, month, and day.
4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
5. Indicated critical path.
6. Show, at a minimum, the controlling relationships between activities.
7. Plot activities on a time-scaled basis, with the length of each activity proportional to the current estimate of the duration.

8. Plot activities on an early start basis unless otherwise request by RPE.
9. Provide a legend to describe standard and special symbols used.

#### 1.05 PROGRESS OF THE WORK

- A. Comply with Section 01 31 19.
- B. Updated Progress Schedule shall reflect:
  1. Progress of Work through 15th of each month, tied to pay application submittal.
  2. Approved changes in Work scope and activities modified since submittal.
  3. Delays in Submittals or resubmittals, deliveries, or Work.
  4. Adjusted or modified sequences of the Work.
  5. Other identifiable changes.
  6. Revised projections of progress and completion.
  7. Report of changed logic.
- C. Produce detailed sub-schedules during Project, upon request of Owner or RPE, to further define critical portions of the Work, such as a planned facility shutdown.
- D. If Contractor fails to complete activity by its latest scheduled completion date and this failure impacts the critical path, the Contractor shall, within 7 days of such failure, submit a recovery schedule, detailing how the Contractor intends to correct nonperformance and return to acceptable current Progress Schedule. Actions by the Contractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.
- E. Owner may order Contractor to increase plant, equipment, labor force or working hours if Contractor fails to:
  1. Complete a Milestone activity by its completion date.
  2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to the Owner.

#### 1.06 NARRATIVE PROGRESS REPORT

- A. Format:
  1. Organize same as Progress Schedule.
  2. Identify on a cover letter, reporting period, date submitted, and name of author of report.

- B. Contents:
1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles).
  2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
  3. Contractor's plan for management of Site (e.g., laydown and staging areas, construction traffic), utilization of construction equipment, buildup of trade labor, and identification of potential Contract changes.
  4. Identification of new activities and sequences as a result of executed Contract changes.
  5. Documentation of weather over the reporting period, and any resulting impacts to the Work.
  6. Description of actual or potential delays, including related causes, and the steps taken to anticipated to mitigate their impact.
  7. Changes to activity logic.
  8. Changes to the critical path.
  9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
  10. Steps taken to recover the schedule from Contractor-caused delays.

#### 1.07 SCHEDULE ACCEPTANCE

- A. RPE's acceptance will demonstrate agreement that:
1. Proposed schedule is accepted with respect to:
    - a. Contract Times, including Final Completion and all intermediate Milestones are within the specified times.
    - b. Specified Work sequences and constraints are shown as specified.
    - c. Access restrictions are accurately reflected.
    - d. Startup and testing times are as specified.
    - e. Submittal review times are as specified.
    - f. Startup testing duration is as specified and timing is acceptable.
  2. In all other respects, RPE's acceptance of the Contractor's schedule indicates that, in the RPE's judgement, schedule represents a reasonable plan for constructing the project in accordance with the Contract Documents. The RPE's review will not make any change in Contract requirements. Lack of comment on any aspect of the schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of the change, unless Contractor has explicitly called the non-conformance to the RPE's attention in submittal. Schedule remains the Contractor's responsibility and the Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct the Project in accordance with the Contract Documents.

## 1.08 ADJUSTMENT OF CONTRACT TIMES

- A. Reference General Conditions and Section 01 26 00, Contract Modification Procedures.
- B. Evaluation and reconciliation of Adjustments of Contract Times shall be based on the Updated Progress Schedule at the time of proposed adjustment or claimed delay.
- C. Float:
  - 1. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
  - 2. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic constraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be to the benefit of the Owner and Contractor.
  - 3. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which:
    - a. Impacts the Project's critical path.
    - b. Consumes available float or contingency time.
    - c. Extends Work beyond the contract completion date.
- D. Claims Based on Contract Times:
  - 1. Where RPE has not yet rendered a formal decision on Contractor's Claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in Progress Schedule, Contractor shall reflect an interim adjustment in the Progress Schedule as acceptable to the RPE.
  - 2. It is understood and agreed that such interim acceptance will not be binding on either the Contractor or the Owner, and will be made only for the purpose of continuing to schedule Work until such time as formal decision has been rendered as to an adjustment, if any, of the Contract Times.
  - 3. Contractor shall revise Progress Schedule prepared thereafter in accordance with the RPE's formal decision.

## PART 2 – PRODUCTS

(Not Used)

## PART 3 – EXECUTION

(Not Used)

++ END OF SECTION ++

## SECTION 01 33 00

### SUBMITTAL PROCEDURES

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- B. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- C. Related Requirements:
  1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  2. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  3. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  4. Section 01 77 00 "Closeout Procedures" for submitting record Drawings, record Specifications, and record Product Data.
  5. Section 00 91 14 "Equipment Testing and Facility Start-up" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

##### 1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Sharefile: Communications protocol that enables transfer of files to and from another computer over a network.

- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### 1.04 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
  - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
  - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
  - 4. Format: Arrange the following information in a tabular format:
    - a. Scheduled date for first submittal.
    - b. Specification Section number and title.
    - c. Submittal category: Action; informational.
    - d. Name of subcontractor.
    - e. Description of the Work covered.
    - f. Scheduled date for Engineer's final release or approval.

#### 1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
  - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
  
- B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
  5. Consultant Review: Where portions of the Contract Documents were prepared by Engineer's consultants, allow an additional 15 days for review of each submittal. Submittal will be returned to Engineer, before being returned to Contractor.
  
- C. Identification and Information: Attach completed Certification Sheet to the front of each submittal with all the appropriate information included. Certification Sheet can be found at the end of this Section.
  1. Failure to attach a completed Certification Sheet to the Submittal will result in rejection of the Submittal.
  
- D. Steel Certifications: Attach to each Submittal a completed Contractor's Steel Certification Form. A copy of the form is attached to this Section.
  1. Failure to attach a completed Contractor's Steel Certification Form to the Submittal will result in rejection of the Submittal.
  
- E. Deviations: Identify deviations from the Contract Documents on submittals.
  
- F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
  1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section.
  2. Submit electronically in PDF format (or DWF format as applicable) via the Project specific Projectwise Construction Management (PWCM) site.

3. Name file with submittal number or other unique identifier, including revision identifier.
  - a. File name shall include the specification section number, paragraph number, number indicating the version of the submittal (001 for initial submittal, 002 for first resubmittal, etc.), and a description of the submittal.
    - 1) Example: 333400 2.2 001 PVC Pipe.pdf
- G. Paper Submittals: No paper submittals will be accepted as part of this Project unless specifically required as part of the Contract Documents or requested by Engineer or Engineer's consultants.
- H. Options: Identify options requiring selection by Engineer.
- I. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal. Resubmittals shall be as a standalone submittal, including all applicable information from the previous submittals. Resubmittals that only include information on revised items will be returned without review.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- L. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

## PART 2 – PRODUCTS

### 2.01 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections and as identified on the Submittal Schedule. Types of submittals are indicated in individual Specification Sections.



1. Post electronic submittals as PDF electronic files directly to the Project Sharefile site established for Project.
    - a. Engineer will return annotated file. Annotate and retain one copy of the file as an electronic Project record document file within the Project Sharefile site.
  2. Action Submittals: Submit electronic copy of each submittal, unless otherwise indicated. Engineer will return submittal electronically.
  3. Informational Submittals: Submit electronic copy of each submittal, unless otherwise indicated. Engineer will not return electronic copies unless submittal is rejected.
  4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
    - e. Manufacturer's list of recommended spare parts.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file, unless otherwise requested by Engineer or Engineer's consultants.

- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 22 by 34 inches.
  3. Submit Shop Drawings in the following format:
    - a. PDF electronic file (or DWF format as applicable).
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
  3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a. Number of Samples: Submit two full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a. Number of Samples: Submit three sets of samples. Engineer will retain two Sample sets; remainder will be returned.
    - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  - 2. Manufacturer and product name, and model number if applicable.
  - 3. Number and name of room or space.
  - 4. Location within room or space.
  - 5. Submit product schedule in the following format:
    - a. PDF electronic file.
- F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."
- G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 45 33 "Special Inspections and Structural Testing."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

- J. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."
- K. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
  2. Number and title of related Specification Section(s) covered by subcontract.
  3. Drawing number and detail references, as appropriate, covered by subcontract.
  4. Submit subcontract list in the following format:
    - a. Electronic copy of subcontractor list, unless otherwise indicated. Engineer will return electronically.
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Steel Certificates: Attach to each Submittal a completed Contractor's Steel Certification Form.

- S. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- T. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- U. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- V. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- W. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- X. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.02 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
  
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## PART 3 – EXECUTION

### 3.01 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.02 ENGINEER'S ACTION

- A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
  - 1. NO EXCEPTIONS TAKEN: Engineer will return submittal electronically. Contractor to make additional copies and distribute as specified.
  - 2. AMEND AND RESUBMIT: Engineer will return submittal electronically. Contractor to resubmit with amendments directed by the Engineer.

3. REJECTED: Engineer will return submittal electronically. Contractor to prepare a new submittal based on the objections given by the Engineer.
  4. REVIEWED ONLY FOR LOADS IMPOSED ON THE STRUCTURE:  
Engineer will return submittal electronically. Contractor to make additional copies and distribute as specified above.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Engineer without action.

++ END OF SECTION ++

## SECTION 01 40 00

### CONTRACTOR QUALITY CONTROL

#### PART 1 – GENERAL

##### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
  - 1. ASTM International (ASTM):
    - a. D3740, Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
    - b. E329, Use in the Evaluation of Testing and Inspection Agencies as Used in Construction.

##### 1.02 DEFINITIONS

- A. Contractor Quality Control (CQC): The means by which the Contractor ensures that the construction, to include that performed by subcontractors and suppliers, complies with the requirements of the Contract.

##### 1.03 SUBMITTALS

- A. Informational submittals:
  - 1. CQC Plan: Submit, not later than 30 days after receipt of Notice to Proceed.
  - 2. CQC Report: Submit, weekly, an original and one copy in report form.

##### 1.04 OWNER'S QUALITY ASSURANCE

- A. All Work is subject to the Owner's quality assurance inspection and testing at all locations and at all reasonable times before acceptance to ensure strict compliance with the requirements of the Contract Documents.
- B. Owner's quality assurance inspections and tests are for the sole benefit the Owner and do not:
  - 1. Relieve the Contractor of responsibility for providing adequate quality control measures.
  - 2. Relieve the Contractor of responsibility for damage to or loss of the material before acceptance.
  - 3. Constitute or imply acceptance.



4. Affect the continuing rights of the Owner after acceptance of the completed Work.
- C. The presence or absence of a quality assurance inspector does not relieve the Contractor from any Contract requirements.
- D. Promptly furnish all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the RPE.
- E. Owner may charge Contractor for any additional cost of inspection or test when Work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Quality assurance inspections and tests will be performed in a manner that will not unnecessarily delay the Work.

## PART 2 – PRODUCTS

(Not used)

## PART 3 –EXECUTION

### 3.01 GENERAL

- A. Maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the requirements of the Contract Documents.
- B. Maintain complete inspection records and make them available at all times to the Owner and RPE.
- C. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the Contract Documents. The system shall cover all construction and demolition operations, both onsite and offsite, including Work by subcontractors, fabricators, suppliers, and purchasing agents, and shall be keyed to the proposed construction sequence.

### 3.02 COORDINATION MEETING

- A. After the Preconstruction Conference, but before start of construction, and prior to acceptance of the CQC Plan, schedule a meeting with the RPE and Owner to discuss the quality control system.

- B. Develop a mutual understand of the system details, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite Work, and the interrelationship of the Contractor's management and control with the Owner's Quality Assurance.
- C. There may be occasions when subsequent conferences may be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by the Contractor.

### 3.03 QUALITY CONTROL ORGANIZATION

- A. CQC System Manager:
  - 1. Designate an individual within the Contractor's organization who will be responsible for overall management of the CQC and have the authority to act in CQC matters for the Contractor.
  - 2. The CQC System Manager may perform other duties on the Project.
  - 3. The CQC System Manager shall be an experienced construction professional, with a minimum of three years' construction experience on similar type Work.
  - 4. The CQC System Manager shall report to the Contractor's project manager or someone higher in the organization. The project manager in this context shall mean the individual with responsibility for the overall quality and production management of the Project.
  - 5. The CQC System Manager shall be onsite during construction; periods of absence may not exceed 2 weeks at any one time.
- B. CQC Staff:
  - 1. Designate a CQC staff, available at the Site at all times during progress, with complete authority to take any action necessary to ensure compliance with the Contract. CQC staff members shall be subject to acceptance by the RPE.
  - 2. CQC staff shall take direction from CQC System Manager in matters pertaining to QC.
  - 3. CQC staff must be of sufficient size to ensure adequate QC coverage of Work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities.
  - 4. The actual strength of the CQC staff may vary during any specific Work period to cover the needs of the Project. Add additional staff when necessary for a proper CQC organization.

- C. Organizational changes: Obtain the RPE's acceptance before replacing any member of the CQC staff. Requests for changes shall include name, qualifications, duties, and responsibilities of the proposed replacement.

### 3.04 QUALITY CONTROL PHASING

- A. CQC shall include at least three phases of control to be conducted by the CQC System Manager for all definable features of the Work, as follows:
  - 1. Preparatory Phase:
    - a. Notify Owner at least 48 hours in advance of beginning any of the required action of the preparatory phase.
    - b. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The CQC System Manager shall instruct applicable CQC staff as to the acceptable level of workmanship required in order to meet Contract requirements.
    - c. Document the results of the preparatory phase meeting by separate minutes prepared by the CQC System Manager and attached to the QC report.
    - d. Perform prior to beginning Work on each definable feature of the Work:
      - 1) Review applicable Contract Specifications.
      - 2) Review applicable Contract Drawings.
      - 3) Verify that all materials and/or equipment have been tested, submitted, and approved.
      - 4) Verify that provisions have been made to provide required control inspection and testing.
      - 5) Examine the Work area to verify that all required preliminary Work has been completed and is in compliance with the Contract.
      - 6) Perform a physical examination of required materials, equipment, and sample Work to verify that they are on hand, conform to approved Shop Drawings or submitted data, and are properly stored.
      - 7) Review the appropriate activity hazard analysis to verify safety requirements are met.
      - 8) Review procedures for constructing the Work, including repetitive deficiencies.
      - 9) Document construction tolerances and workmanship standards for that phase of the Work.
      - 10) Check to verify that the plan for the Work to be performed, if so required, has been accepted by the RPE.

2. Initial phase:
  - a. Accomplish at the beginning of a definable feature of Work:
    - 1) Notify the Owner at least 48 hours in advance of beginning initial phase.
    - 2) Perform prior to beginning Work on each definable feature of Work:
      - a) Review minutes of the preparatory meeting.
      - b) Check preliminary Work to verify compliance with Contract requirements.
      - c) Verify required control inspection and testing.
      - d) Establish level of workmanship and verify that it meets minimum acceptable workmanship standards.
      - e) Resolve all differences.
      - f) Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
    - 3) Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the QC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
    - 4) The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
3. Follow-up phase:
  - a. Perform daily checks to verify continuing compliance with Contract requirements, including control testing, until completion of the particular feature of Work.
  - b. Daily checks shall be made a matter of record in the CQC documentation and shall document specific results of inspections for all features of the Work for the day or shift.
  - c. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of Work that will be affected by the deficient Work. Constructing upon or concealing nonconforming Work will not be allowed.
4. Additional Preparatory and Initial phases: Additional preparatory and initial phases may be conducted on the same definable features of Work as determined by the Owner if the quality of ongoing Work is unacceptable or if there are changes in the applicable QC staff or in the onsite production supervision or work crew, or if Work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

### 3.05 CONTRACTOR QUALITY CONTROL PLAN

#### A. General:

1. Plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used.
2. An interim plan for the first 30 days of operation will be considered.
3. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of Work to be started.
4. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of Work to be started.

#### B. Content:

1. Plan shall cover the intended CQC organization for the entire Contract and shall include the following, as a minimum:
  - a. Organization: Description of the quality control organization, including a chart showing lines of authority and acknowledgement that the CQC staff will implement the three-phase control system for all aspects of the Work specified.
  - b. CQC Staff: The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function.
  - c. Letters of authority: A copy of a letter to the CQC System Manager signed by an authorized official of the firm, describing the responsibilities and delegating sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop Work which is not in compliance with the Contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives, outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Owner.
  - d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents.
  - e. Testing: Control, verification, and acceptance testing procedures for each specific test to include the test name frequency, specification paragraph containing the test name, frequency, personnel and laboratory responsible for each type of test, as estimate of number of tests required.
  - f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests, including documentation.

- g. Procedures for tracking deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
  - h. Reporting procedures, including proposed reporting formats; include a copy of the CQC report form.
- C. Acceptance of Plans: Acceptance of the Contractor's basis and addendum CQC plans is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Owner reserves the right to require the Contractor to make changes in the CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.
- D. Notification of changes: After acceptance of the CQC plan, the Contractor shall notify the RPE, in writing, a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to the RPE's acceptance.

### 3.06 CONTRACTO QUALITY CONTROL REPORT

- A. As a minimum, prepare a CQC report for every 7 calendar days. Account for all days throughout the life of the Contract. Reports shall be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by QC staff.
- B. Maintain current records of quality control operations, activities, and tests performed, including the Work of subcontractors and suppliers.
- C. Records shall be on an acceptable form and shall be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including but not limited to the following:
1. Contractor/subcontractor area of responsibility.
  2. Operation plant/equipment with hours worked, idle, or down for repair.
  3. Work performed today, giving location, description, and by whom. When a network schedule is used, identify each phase of Work performed each day by activity number.
  4. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
  5. Material received with statement as to its acceptability and storage.
  6. Identify submittals reviewed, with Contract reference, by whom, and action taken.
  7. Offsite surveillance activities, including actions taken.

8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
9. List instructions given/received and conflicts in Drawings and/or Specifications.
10. Contractor's verification statement.
11. Indicate a description of trades working on the Project, the number of personnel working, weather conditions encountered, and any delay encountered.
12. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in field work and workmanship comply with the Contract.

### 3.07 SUBMITTAL QUALITY CONTROL

- A. Comply with Section 01 33 00, Submittal Procedures.
- B. The CQC organization shall be responsible for certifying that all submittals are in compliance with the Contract requirements.
- C. The Owner will furnish copies of test report forms upon request by the Contractor.
- D. Contractor may use other forms, as approved.

### 3.08 TESTING QUALITY CONTROL

- A. Testing procedure:
  1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to the Contract requirements.
  2. Perform the following activities and record the following data:
    - a. Verify testing procedures comply with Contract requirements.
    - b. Verify facilities and testing equipment are available and comply with testing standards.
    - c. Check test instrument calibration data against certified standards.
    - d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
    - e. Documentation:
      - 1) Record results of all tests taken, both passing and failing, on the CQC report for the date taken.

- 2) Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test.
- 3) Actual test reports may be submitted later, if approved by the RPE, with a reference to the test number and date taken.
- 4) Provide directly to the RPE an informational copy of tests performed by an offsite or commercial test facility. Test results shall be signed by an engineer registered in the state where tests are performed.
- 5) Failure to submit timely test reports, as stated, may result in nonpayment for related Work performed and disapproval of the test facility in the Contract.

B. Testing laboratories:

1. Laboratory facilities, including personnel and equipment utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D3740 and ASTM E329, and shall be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority.
2. Personnel performing concrete testing shall be certified by the American Concrete Institute (ACI) and National Institute for Certification in Engineering Technologies (NICET).

### 3.09 COMPLETION INSPECTION

A. The CQC System Manager shall conduct an inspection of the Work at the completion of all Work or any milestone established by a completion time stated in the Contract.

B. Punch list:

1. The CQC System Manager shall develop a punch list of items which do not conform to the Contract requirements.
2. Include punch list in the CQC report, indicating the estimated date by which the deficiencies will be corrected.
3. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Owner.
4. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire Work or any particular increment thereof if the Project is divided into increments by separate completion dates.

+ + END OF SECTION + +



## SECTION 01 43 33

### MANUFACTURER'S FIELD SERVICES

#### PART 1 – GENERAL

##### 1.01 DEFINITIONS

- A. Person-day: One person for 8 hours within regular working hours.

##### 1.02 SUBMITTALS

- A. Informational Submittals:
  - 1. Training Schedule: Submit in accordance with the requirements of this Specification, not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.
  - 2. Lesson Plan: Submit, in accordance with requirements of this Specification, proposed lesson plan not less than 21 days prior to scheduled training and revise as necessary for acceptance.

##### 1.03 QUALIFICATIONS OF MANUFACTURER'S REPRESENTATIVE

- A. Authorized representative of the manufacturer, factory-trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystems, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual specification sections.
- B. Representative subject to acceptance by Owner and Engineer. No substitute representative will be allowed unless prior written approval by such has been given.

#### PART 2 – PRODUCTS

(Not used)

#### PART 3 – EXECUTION

##### 3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

- A. Furnish manufacturer's services, when required by an individual specification section, to meet the requirements of this section.

- B. Where time is necessary in excess of that stated in the Specifications for manufacturer's services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.
- C. Schedule manufacturer's services to avoid conflict with other onsite testing or other manufacturer's onsite services.
- D. Determine, before scheduling services, that conditions necessary to successful testing have been met.
- E. Only those days of service approved by the RPE will be credited to fulfill specified minimum services.
- F. When specified in individual specification sections, manufacturer's services shall include:
  - 1. Assistance during product (system, subsystem, or component) installation or application procedures.
  - 2. Inspection, checking, and adjustment as required for product to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
  - 3. Revisiting the Site as required to correct problems and until installation and operation are acceptable to the RPE.
  - 4. Assistance during function and performance testing, and facility startup and evaluation.
  - 5. Training of the Owner's personnel in the operation and maintenance of the respective equipment, as required.

### 3.03 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

- A. A Manufacturer's Certificate of Proper Installation form shall be completed and signed by the equipment manufacturer's authorized representative.
- B. Such form shall certify the installation is properly installed and consistent with the manufacturer's intended use of the equipment and that the equipment is ready for commissioning and performance testing.

### 3.04 TRAINING

- A. General:
  - 1. Furnish manufacturer's representatives for detailed classroom and hands-on training to Owner's personnel on operation and maintenance of specified equipment, and as may be required in the applicable specifications.

2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with the Owner, and familiar with operation and maintenance manual information specified in Section 01 78 23, Operation and Maintenance Data.
  3. Manufacturer's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
  4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.
- B. Training Schedule:
1. List specified equipment and systems that require training services and show:
    - a. Respective manufacturer.
    - b. Estimated dates for installation completion.
    - c. Estimated training dates.
  2. Allow for multiple sessions when several shifts are involved.
  3. Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.
  4. Coordinate with Section 01 91 14, Equipment Testing and Facility Startup.
- C. Lesson Plan: When manufacturer or vendor training of Owner personnel is specified, prepare a lesson plan for each required course containing the following minimum information:
1. Title and objectives.
  2. Recommended attendees (such as managers, engineers, operators, maintenance).
  3. Course description, outline of course content, and estimated class duration.
  4. Format (such as lecture, self-study, and demonstration, hands-on, etc.).
  5. Instruction materials and equipment requirements.
  6. Resumes of instructors providing training.
- D. Pre-startup Training:
1. Coordinate training sessions with Owner's operating personnel, manufacturer's representatives, and with submission of operation and maintenance manuals in accordance with Section 01 78 23, Operation and Maintenance Data.
  2. Complete at least 14 days prior to beginning of facility startup.
- D. Post-startup Training: If required in the specifications furnish and coordinate training of the Owner's operating personnel by respective manufacturer's representatives.

+ + END OF SECTION + +

## SECTION 01 45 33

### SPECIAL INSPECTIONS AND STRUCTURAL TESTING

#### PART 1 - GENERAL

##### 1.01 GENERAL REQUIREMENTS

- A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the *New York State Uniform Code* (NYSUC).

##### 1.02 DEFINITIONS

- A. Registered Design Professional (RDP) for Structures: Licensed Professional Engineer or Registered Architect whose seal appears in the Construction Drawings. The Registered Design Professionals for Structures refers to the Structural Engineers for building design.
- B. Registered Design Professional (RDP) for Construction Phase: Licensed Professional Engineer or Registered Architect who is responsible for performing professional services during the Construction Phase of the project. These services included, but are not limited to, reviewing submittals, responding to RFIs and questions during construction, and performing field visits.
- C. RDP for Geotechnical Engineering: Licensed Professional Engineer whose seal appears on the Geotechnical Investigation. The RDP for Geotechnical Engineering shall perform or oversee Agent 2 services as indicated in the Schedule of Special Inspections. If a Geotechnical Investigation was not performed or if the RDP for Geotechnical Engineering is not retained to perform Agent 2 services, a licensed Geotechnical Engineer shall be retained to perform these duties.
- D. Code Enforcement Official: Officer or other designated authority charged with administration and enforcement of the NYSUC.
- E. Special Inspector (SI): Professional Engineer licensed in the State of New York, acting on behalf of the Owner, that implements the Special Inspection Program for the project.
- F. Testing/Inspecting Agency: Agent retained by Special Inspector or Owner and coordinated by Special Inspector to perform some inspection services on behalf of Special Inspector.

- G. Testing/Inspecting Agency (Agent 1): Professional Engineer licensed in the State of New York that is qualified to perform structural inspections. The Special Inspector shall have a minimum of three years of experience performing inspections for similar projects.
- H. Testing/Inspecting Agency (Agent 2): Professional Geotechnical Engineer licensed in the state of New York that is qualified to perform inspections for preparation of building subgrades and foundations.
- I. Testing/Inspecting Agency (Agents 3 or 4): Agency or firm qualified to inspect certain structural elements and perform field and laboratory tests to determine the characteristics and quality of building materials and workmanship.
- J. Statement of Special Inspections: Documents prepared by the Registered Design Professionals for structures and filed with and approved by the Code Enforcement Official as a condition of obtaining a building permit. These documents include this specification and the Schedule of Special Inspections.
- J. Schedule of Special Inspections: An itemized list of inspections, verifications, and tests (including frequency) required for the project and individuals, agencies, or firms who will be retained to perform these services. The Schedule of Special Inspections is located in Drawing S-002.
- K. Seismic/Wind-Force-Resisting System: Components of the structural system that provide resistance to seismic/wind forces. These components are identified in the Schedule of Special Inspections.
- L. Inspect and Inspection: Visual observation of materials, equipment, or construction work as defined in the Statement of Special Inspections, to determine that the work is in substantial conformance with the requirements of the Contract Documents.
- M. Continuous Special Inspection: Full-time observation of work by the Special Inspector or Testing Agency while the work is being performed.
- N. Periodic Special Inspections: Part-time or intermittent observation of work by the Special Inspector or Testing Agency for work that has been or is being performed and at completion of work.

### 1.03 QUALIFICATIONS

- A. Special Inspector and Testing/Inspecting Agency shall be accepted by the RDP for the Construction Phase and the Code Enforcement Official.

- B. Special Inspections shall be performed by agents who have relevant experience for each category of inspections indicated in the drawings.
- C. Minimum qualifications of inspection agents are indicated in the drawings.

#### 1.04 SUBMITTALS

- A. Special Inspector and Testing/Inspecting Agency shall submit to the RDP for the Construction Phase and Code Enforcement Official for review, a copy of their qualifications including names and qualifications of each inspector and technician who will be performing inspections or tests.
- B. Special Inspector and Testing/Inspecting Agency shall disclose past or current business relationship or potential conflict of interest with Contractor or Subcontractors whose work will be inspected or tested.

#### 1.05 PAYMENT

- A. Owner will engage and pay for services of Special Inspector and Testing/Inspecting Agency.
- B. If materials requiring Special Inspections are fabricated in a plant not within 200 miles of project site, Contractor shall be responsible for travel expenses of Special Inspector or Testing/Inspecting Agency.
- C. Contractor shall be responsible for cost of retesting or reinspection of work failing to comply with requirements of Contract Documents.

#### 1.06 OWNER RESPONSIBILITIES

- A. Owner will provide Special Inspector with complete set of Contract Documents sealed by the RDP for Structures and approved by the Code Enforcement Official.

#### 1.07 CONTRACTOR RESPONSIBILITIES

- A. Each Contractor responsible for construction of a seismic/wind-force-resisting system listed in the Schedule of Special Inspections and indicated in drawings shall submit a written Contractor's Statement of Responsibility to the Code Enforcement Official, Special Inspector, and RDP for the Construction Phase prior to commencement of work on system or component. Use form provided at end of this section or other similar form.
- B. Contractor shall cooperate with Special Inspector and his agents so Special Inspections and testing may be performed without hindrance.

- C. As indicated in the Schedule of Special Inspections, Contractor shall notify Special Inspector or Testing/Inspecting Agency at least 48 hours in advance of a required inspection or test.
- D. Contractor shall provide incidental labor and facilities to provide access to work to be inspected or tested, to obtain and handle samples at site or at source of products to be tested, to facilitate tests and inspections, and for storing and curing of test samples.
- E. If Special Inspections or testing require the use of Contractor's scaffolding to access work areas, Contractor shall provide competent person to perform daily evaluation of scaffolding to verify it is safe to use. Contractor shall notify Special Inspector and Testing Agent of this review before each use. Contractor is responsible for safe assembly and stability of scaffolding.
- F. Contractor shall keep latest set of Construction Drawings, field sketches, accepted shop drawings, and specifications at project site for field use by Inspectors and Testing Technicians.
- G. Contractor shall perform remedial work if required and sign nonconformance reports stating remedial work has been completed. Contractor shall submit signed reports to Special Inspector as work proceeds.
- H. The Special Inspection program shall not relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents or from implementing an effective Quality Control program.
- I. Contractor shall be solely responsible for construction site safety.

#### 1.08 SPECIAL INSPECTOR RESPONSIBILITIES

- A. Special Inspector shall hold a Special Inspections preconstruction meeting at least 7 days prior to initial planned date for start of construction. Attendees shall include Contractors, Owner's Representative, Testing Agency, Special Inspector, and RDP for the Construction Phase. Discussions shall include the following:
  - 1. Review of specifications and Schedule of Special Inspections for work requiring Special Inspections.
  - 2. Responsibilities of Contractors, Owner, Testing Agency, Special Inspector, and RDP for the Construction Phase.
  - 3. Notification and reporting procedures.
- B. Special Inspector shall record and distribute minutes from the Special Inspection Preconstruction meeting.

- C. Special Inspector shall review inspection and material testing reports and coordinate the services of the Testing/Inspecting Agencies as follows:
  - 1. Verify inspections have been performed in accordance with the Schedule of Special Inspections.
  - 2. Verify reports are being distributed to the Contractor, Owner, Architect, Code Enforcement Official, and RDP for the Construction Phase.
  - 3. Verify discrepancies have been recorded and are being tracked.
- D. Special Inspector shall make site visits to inspect work as designated in the Statement of Special Inspections. Discrepancies will be brought to the attention of the Contractor and RDP for the Construction Phase.
- E. Special Inspector shall keep records of inspections and tests.
- F. Special Inspector shall review Certificates of Compliance for conformance with the standards specified in the Contract Documents. Discrepancies will be brought to the attention of the Contractor and RDP for the Construction Phase.
- G. Special Inspector shall submit a final report of Special Inspections in accordance with Section 3.04 of this specification.

#### 1.09 LIMITS ON AUTHORITY

- A. Special Inspector or Testing/Inspecting Agency shall not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Special Inspector or Testing/Inspecting Agency shall not have control over Contractor's means and methods of construction.
- C. Special Inspector or Testing/Inspecting Agency shall not be responsible for construction site safety.
- D. Special Inspector or Testing/Inspecting Agency shall not have authority to stop work.

#### PART 2 - INSPECTIONS AND TESTING

##### 2.01 EXCAVATION, BACKFILL, COMPACTION, AND DEEP FOUNDATIONS (TANK AND BUILDING AREAS)

- A. Special Inspector shall perform inspections and verifications or coordinate the RDP for Geotechnical Engineering to perform inspections and verifications including the following:



1. Identify soils requiring undercutting and replacing while observing proof rolling and when subgrade is exposed.
  2. Verify footing bearing strata.
  3. Review and accept materials proposed by Contractor for use as compacted fill based on test data and information submitted by Testing Agency. Material approval shall be based on requirements and recommendations stated in Project Geotechnical and Subsurface Investigation.
  4. Observe and accept filling and compaction procedures.
  5. Observe and accept preparation of slab-on-grade subgrade and subbase.
- B. Testing Agency shall perform field density tests for building and tank subgrades and for fill materials including slab subbase within building and tank area in accordance with ASTM D 6938 as follows:
1. Footing subgrade and each stratum of soil on which footings will be placed.
  2. Building subgrade including slab subbase and each lift of compacted material.
  3. Inspect each subgrade and fill layer before further backfill or construction work is performed. Approval shall be based on satisfactory achievement of compaction criteria.
  4. Verify use of fill material and lift thicknesses in field.
- C. Testing Agency shall perform moisture content testing of slab subbase in accordance with ASTM D 6938.

## 2.02 CAST-IN-PLACE CONCRETE

- A. Special Inspector shall perform the following:
1. Inspect reinforcing steel and placement.
  2. Inspect embedded bolts and anchor rods prior to concrete placement.
  3. Shop inspection of precast, pre-tensioned concrete:
    - a. Verify Fabricator maintains detailed fabrication and Quality Control procedures:
    - b. Review procedures for completeness and adequacy relative to code requirements.
    - c. If Fabricator is designated as PCI-Certified Fabricator, Special Inspection for shop-fabricated members and assemblies is not required.
    - d. If Fabricator is not designated as PCI-Certified Fabricator, Contractor shall reimburse Owner via execution of credit change order for cost of Special Inspections and testing in Fabricator's shop. Shop inspections include:
      - I. Placement of prestressing tendons.
      - II. Application of prestressing forces.
  4. Inspect erected precast concrete members.
    - b. Connections and bearing of precast concrete members for conformance with shop and erection details including wall panels.
  5. Inspect post-tensioned concrete.

- a. Placement of tendons prior to jacking.
  - b. Application of jacking load.
  - c. Tendon anchorage.
  - d. Grouting of bonded prestressing tendons.
- B. Testing Agency shall perform the following:
1. Verify use of required design mix.
  2. Sample and test concrete during placement as follows. Test shall be taken at point of discharge into structure:
    - a. Record specific locations where concrete was placed. Refer to column lines where possible.
    - b. For each truck, record time concrete is batched as shown in truck ticket, time placement begins/sample time, and time truck is emptied.
    - c. For each truck, sample fresh concrete in accordance with ASTM C 172, except modified for slump to comply with ASTM C 94.
    - d. For each truck, perform slump test in accordance with ASTM C 143. Perform two slump tests for pumped concrete; one at truck and one at point of discharge.
    - e. For each truck for self-consolidating concrete, measure slump flow and record visibility stability index in accordance with ASTM C 1611/C 1611M. Slump cone may be in the upright or inverted position. Use same cone position for the entire project for consistency.
    - f. For normal-weight concrete, measure air content in accordance with ASTM C 231, pressure method. Perform one test for each truck for air-entrained and non-air-entrained concrete.
    - g. Record temperature of concrete for each truck. Test in-place concrete temperature hourly when ambient temperature is 40 degrees F and below and when 80 degrees F and above.
    - h. Record air temperature and general weather conditions (cloudy, windy, sunny, etc.).
    - i. Record unit weight of fresh normal-weight concrete in accordance with ASTM C 138. Perform one test for each 50 cubic yard of concrete.
    - j. Perform concrete compressive tests as follows:
      - I. Prepare compressive test specimens in accordance with ASTM C 31. Take a set of six 6 x 12 cylinders or nine 4 x 8 cylinders for each 50 cubic yards of concrete or each 5,000 square feet of slab area for each type of concrete. Store undisturbed in insulated box during cold weather. Deliver to laboratory between 16 and 32 hours after making. Perform compressive tests in accordance with ASTM C 39: two 6 x 12 specimens (three 4 x 8 specimens) tested at 7 days, two 6 x 12 specimens (three 4 x 8 specimens) tested at 28 days, and two 6 x 12 specimens (three 4 x 8 specimens) retained for later testing if required.

- II. In cold weather or whenever steel erection is scheduled to commence less than 14 days after placement of supporting foundation concrete, cast additional set of four 6 x 12 specimens (six 4 x 8 specimens) for each 50 cubic yards or fraction thereof of supporting foundation concrete. Field-cure cylinders, and test two 6 x 12 specimens (three 4 x 8 specimens) at 7 days, retaining two 6 x 12 specimens (three 4 x 8 specimens) for later testing if required. Steel erection may not begin until supporting concrete obtains 75 percent of its design strength.
    - III. If concrete will be placed in separate buildings on a given project, make individual compressive strength test cylinders for each building.
  - k. Perform additional testing as follows if required:
    - I. Take additional set of cylinders for compressive strength testing for each truck in which total time period between batching and completing placement has exceeded ACI-recommended, 90-minute-maximum time limit. Take additional cylinders within 10 minutes of placement completion.
    - II. Make additional tests of in-place concrete when test results indicate specified concrete strengths or other characteristics have not been attained in structure.
    - III. Perform tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods acceptable to Architect.
    - IV. Contractor shall reimburse Owner for cost of additional tests.
- 3. Inspect concrete placement for proper application techniques.
- 4. Inspect for maintenance of specified curing temperature and techniques.
- 5. Perform floor flatness ( $F_F$ ) and levelness ( $F_L$ ) testing of slabs receiving a trowel finish no later than 48 hours after slab placement in accordance with ASTM E 1155.
  - a. Each floor/level shall be divided into test section areas.  $F_F$  and  $F_L$  numbers for each test section area are local values.
  - b. Test section areas shall be minimum of 320 square feet with minimum boundary length of 8 feet for any side. Testing is not to be performed for smaller slab areas.
  - c. Test section areas shall be maximum of 2,000 square feet.
  - d. Test section areas shall not cross slab construction joints.
  - e. Locate test lines orthogonally or at 45 degrees to slab edges in accordance with ASTM E 1155 and no closer than 2 feet to any edge or opening.
  - f. Overall  $F_F$  and  $F_L$  numbers are for entire floor/level and shall be determined by considering measurements from all of test section areas on that floor/level.
  - g. ( $F_L$ ) testing is not required for slabs on metal deck.
- 6. Perform moisture vapor emission and alkalinity testing in accordance with ASTM F 1869 and ASTM F 710, respectively, as follows:
  - a. Perform testing after building is enclosed, prior to installation of adhered floor finishes, and once HVAC systems are operational.
  - b. Test results must be reviewed and accepted by floor finish installer.

7. Verify in-situ concrete strength prior to removing of shores/forms from structural slabs.
8. Inspect welding of connections for erected precast members if applicable.
9. Inspect welding of reinforcing bars.

## 2.03 UNIT MASONRY

- A. Special Inspector shall perform the following:
  1. As masonry construction begins, the following shall be verified to ensure compliance:
    - a. Construction of mortar joints.
    - b. Location of joint reinforcement and connectors.
  2. Verify:
    - a. Size and location of structural elements.
    - b. Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.
    - c. Specified size, grade, and type of reinforcement.
    - d. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).
  3. Prior to grouting, verify:
    - a. Grout space is clean.
    - b. Placement of reinforcement and connectors.
    - c. Construction of mortar joints.
  4. Verify grout placement to ensure compliance with code and Construction Document provisions.
    - a. Grouting of CMU cells.
- B. Testing Agency shall perform the following:
  1. Verify for compliance with approved submittals:
    - a. Proportions of site-prepared mortar.
    - b. Proportions of site-prepared grout.
    - c. Slump flow and visual stability index (VSI) of self-consolidating grout as delivered to the site in accordance with ASTM C 1611.
  2. Observe preparation of required mortar specimens, grout specimens, or prisms in accordance with ASTM C 780, ASTM C 1019, and ASTM C 1314 Rev B.
  3. Field Quality Control Testing: Perform tests and evaluations listed below during construction for each 5,000 square feet of wall area or portion thereof.
    - a. Sample and evaluate mortar composition and properties in accordance with ASTM C 780.
    - b. Sample and test grout compressive strength in accordance with ASTM C 1019.
    - c. For each type of wall construction indicated, test masonry prisms in accordance with ASTM C 1314 and as follows:

- I. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

## 2.04 STRUCTURAL STEEL (INCLUDING STEEL JOISTS AND METAL DECK)

- A. Special Inspector shall perform the following:
  1. Verify Fabricator maintains detailed fabrication and Quality Control procedures:
    - a. Review procedures for completeness and adequacy relative to code requirements.
    - b. If Fabricator is designated as AISC-Certified Fabricator, Special Inspection for shop-fabricated members and assemblies is not required.
    - c. If Fabricator is not designated as AISC-Certified Fabricator, Contractor shall reimburse Owner via execution of credit change order for cost of Special Inspections and testing in Fabricator's shop.
  2. Review manufacturer's Certificates of Compliance for high-strength bolts and weld filler material.
  3. Review certified mill test reports.
  4. Inspect steel frame joint details for compliance with approved Construction Documents.
  5. Inspect end connections and bridging of open-web steel joists.
- B. Testing Agency shall perform the following:
  1. Material verification of high-strength bolts, nuts, and washers, including review of identification markings and manufacturer's Certificate of Compliance.
    - a. Test high-strength bolt assemblies in a tension measuring device to verify material conformance prior to installation. Assemble bolt, nut, and washer on a loose plate and tension by tightening nut to develop required tension in Table 4 of "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  2. Verification that copies of accepted field welding procedure specifications are available on site for reference by erector's welders.
  3. Verification that erector's welder's qualifications are current and appropriate for joint type, welding position, and welding process to be used.
  4. Verification that joint fit-up for partial and complete penetration groove welds are in compliance with AWS tolerances as follows:
    - a. Visually inspect 50 percent of joints scheduled for partial and complete penetration groove welds.
    - b. Visually inspect 100 percent of tension member splices and moment connections that are part of the lateral force resisting system.
  5. Inspect high-strength bolting.
    - a. Joints designated as snug tight require only visual inspection.
    - b. Joints designated as fully tensioned or slip critical require visual inspection during installation.

- I. Checking after installation using calibrated wrenches will not be permitted.
- 6. Material verification of structural steel and metal deck, including review of identification markings.
- 7. Perform pull-out tests on adhesive, expansion, and sleeve anchors.
- 8. Material verification of weld filler materials, including review of identification markings.
- 9. Inspect welding of structural steel and metal deck.
  - a. Visually inspect welds according to AWS.
  - b. Schedule inspection of field welding in timely manner utilizing vertical access means and methods utilized by Contractor to perform the welding.
  - c. Ultrasonic inspection (UT) according to ASTM E 587 is required for partial and complete penetration field groove welds as follows:
    - I. UT inspect 50 percent of joints scheduled for partial and complete penetration groove welds.
    - II. UT inspect 100 percent of tension member splices and moment connections that are part of lateral force resisting system.
    - III. UT inspect 50 percent or minimum of six of the joints scheduled for partial or complete penetration groove welds completed by each welder. Increase inspection percentage to 100 percent for each welder with more than one rejected weld.
  - d. Magnetic particle inspection according to ASTM E 709 is required for Fabricators not certified by AISC Quality Certification Program for 10 percent of shop fillet welds.
  - e. Magnetic particle inspection according to ASTM E 709 is required for 10 percent of field fillet welds.
  - f. UT inspect according to ASTM E 587 is required for 10 percent of shop partial or complete penetration welds and 100 percent of shop partial or complete penetration groove welds in tension members.
- 10. Inspect welding of reinforcing steel.
- 11. Inspect condition of erected materials.
  - a. Visually inspect erected steel for damage.
  - b. Visually inspect connections and framing to verify compliance with Contract Documents and accepted shop drawings.
- 12. Inspect column plumbness:
  - a. Inspect erected columns for plumbness within tolerances specified in Section 051200, Part 3: Execution.
  - b. Inspect columns for fit up within tolerances specified in AISC *Manual of Steel Construction*, Specification Section M4.
- 13. Inspect mechanical fasteners for metal deck, including connections to supporting structure and side-lap fastening.
  - a. Visually inspect 100 percent of mechanical deck fasteners and 50 percent using depth gauge tool provided by fastener manufacturer.

14. Additional testing shall be performed as follows if required.
  - a. Testing Agency shall perform additional tests of connections and framing members field modified by Contractor to correct errors in shop drawings, fabrication, or erection.
  - b. Anchor rods and embedded structural supports incorrectly located or damaged after installation shall be field modified by Contractor as indicated in Section 033000, Paragraph 3.05 and tested by Testing Agency.
  - c. Testing and reporting of field modifications shall be in accordance with this section, Special Inspections, and have the following additional requirements:
    - I. Magnetic particle inspection according to ASTM E 709 is required for 100 percent of fillet welds.
    - II. Ultrasonic inspection according to ASTM E 587 is required for 100 percent of full-penetration welds.
    - III. Perform pull-out tests on 100 percent of each type of adhesive, expansion, or sleeve anchor used by applying a load equal to 125 percent of allowable pull-out strength listed in manufacturer's literature.
  - d. Contractor shall reimburse Owner for cost of additional tests performed.
- C. The requirements of this section apply to pre-engineered structural components including framing members, welded and bolted connections, anchor rods, bracing, etc.

## 2.05 COLD-FORMED METAL FRAMING

- A. Special Inspector shall perform the following:
  1. Verify Fabricator maintains detailed fabrication and Quality Control procedures:
    - a. For Fabricators not previously registered and approved to perform such work without Special Inspection, review Quality Control procedures for completeness and adequacy relative to code requirements for Fabricator's scope of work.
  2. Visually inspect installation of clips, hangers, hurricane ties, and miscellaneous connectors.
  3. Visually inspect framing and details.
  4. Visually inspect installation of temporary and permanent truss bracing.
- B. Testing Agent shall perform the following:
  1. Verify member size and thickness.
  2. Verify weight of galvanized coating according to ASTM A 90.
  3. Visually inspect framing for damage, including bracing.
  4. Visually inspect welds according to AWS.
  5. Perform pull-out tests on adhesive, expansion, and sleeve anchors.
- C. The requirements of this section apply to pre-engineered structural components including joists, purlins, girts, etc.

## PART 3 - DOCUMENTATION

### 3.01 RECORDS AND REPORTS

- A. Prepare detailed reports of each test or inspection. Include the following general information:
1. Project name and number.
  2. Date of test or inspection.
  3. Name of Testing Agency or Inspecting Agency.
  4. Name of technician or inspector.
  5. Weather conditions.
  6. Locations and elevations of specific areas tested or inspected referenced to grid lines.
  7. Description of test or inspection.
  8. Reference to applicable ASTM standard.
  9. Summary of observations, results, and recommendations.
  10. Description of areas or materials requiring retesting or reinspection.
- B. Concrete compressive strength test reports shall contain the following information:
1. Name of Contractor and concrete supplier.
  2. Name of concrete testing service.
  3. Name of technician making and testing specimens.
  4. Truck number and delivery ticket number.
  5. Date and location within structure of concrete placement.
  6. Concrete type, class, mix proportions of materials, and design compressive strength at 28 days.
  7. Slump, air content, unit weight, and concrete temperature.
  8. Total time period between batching and completing placement for each truck.
  9. Compressive strength and type of break for tests.
- C. Field reports for concrete inspection shall contain general information noted above plus ambient temperature and cylinder numbers.
- D. Test reports for masonry materials shall include proportions, composition, and compressive strength.

### 3.02 COMMUNICATION

- A. Testing/Inspecting Agency shall immediately notify Contractor, Special Inspector, and RDP for the Construction Phase by telephone, fax, or e-mail of test results failing to comply with requirements of Contract Documents.



- B. Special Inspector shall immediately notify Contractor of work found to be in nonconformance with Contract Documents during inspections. If nonconforming work is not corrected while Special Inspector is on-site, Special Inspector shall notify RDP for the Construction Phase within 24 hours (one business day) and issue an inspection report noting the non-conformance.
- C. Special Inspector and each Testing/Inspecting Agent shall use a log to record and track non-conforming work during construction. Non-Conformance log shall include the following information:
  - 1. Description of non-conformance.
  - 2. Date of non-conformance.
  - 3. Description of response by the RDP for the Construction Phase if received.
  - 4. Status of nonconformance: 'Open' or 'Closed.'

Updated log shall be attached to each inspection report. Special Inspector or Testing/Inspecting Agent may use Non-Conformance Log form provided at end of this section or other similar form.

- D. If non-conforming work is not corrected at time of substantial completion of structure or other appropriate time, Special Inspector shall notify Code Enforcement Official.

### 3.03 DISTRIBUTION OF REPORTS

- A. Testing/Inspecting Agency shall submit reports to Special Inspector and RDP for the Construction Phase within 7 days of inspection or test. Legible handwritten reports may be submitted if final typed copies are not available.
- B. Special Inspector shall distribute reports to the Contractor, Owner, Architect, Code Enforcement Official, and RDP for the Construction Phase within 7 days of inspections. Legible handwritten reports may be submitted if final typed copies are not available.
- C. If requested by the Code Enforcement Official, Special Inspector shall submit interim reports that include inspections and tests performed since beginning of construction or since previous interim report. Interim reports shall be addressed to the Code Enforcement Official with copies sent to the RDP for the Construction Phase and Contractor. Interim reports shall be signed by Agent performing inspections.

### 3.04 FINAL REPORT OF SPECIAL INSPECTIONS

- A. At completion of work, each Testing/Inspecting Agency shall submit Agent's Final Report of Special Inspections to Special Inspector stating work was completed in substantial conformance with Contract Documents and appropriate inspections and tests were performed. Testing/Inspecting Agency may use Agent's Final Report of Special Inspections form provided at end of this section or other similar form.
- B. At completion of work, Special Inspector shall compile a Final Report of Special Inspections including each Agent's Final Report of Special Inspections. The Final Report of Special Inspections shall state required inspections have been performed and itemize nonconforming work not corrected or resolved as required by the NYSUC. Interim reports from all Agents will not be included unless specifically requested by the Owner or Code Enforcement Official. The Final Report shall be stamped by a New York State Professional Engineer.
- C. Special Inspector may use Final Report of Special Inspections form provided at end of this section or other similar form based on CASE Form 102-2001.
- D. Special Inspector shall submit Final Report of Special Inspections to RDP for the Construction Phase and Code Enforcement Official prior to issuance of a Certificate of Use and Occupancy.

# AGENT X NON-CONFORMANCE LOG

PROJECT:

PROJECT NUMBER:

Non-Conformance Item No.  (See Note 1)	Special Inspection Report No. Reference/Date	Summary of Non-Conformance	Date of RDP Response Received	SI Reinspection Required	Date Contractor Verification Received  (See Note 1)	Status  (See Note 2)
NC 1						
NC 2						
NC 3						
NC 4						
NC 5						
<b>NC 6</b>						

1. New items are in **bold**. For each non-conformance item above, the General Contractor or Subcontractor must sign and submit the Contractor Verification statement located in the RDP Response Report.

2. Non-conformance items remain "OPEN" until the Contractor Verification have been received. When the signed verifications have been received by the RDP, the item will be "CLOSED".

# Testing/Inspection Agent's Final Report of Special Inspections

Project Name: Waste Water Treatment Facility Inspection Agent: \_\_\_\_\_  
Location: Watkins Glen/Montour Falls Inspection Agent Project No.: \_\_\_\_\_  
Owner: Village of Watkins Glen Special Inspector: \_\_\_\_\_  
Owner Address: \_\_\_\_\_ CA Phase RDP: \_\_\_\_\_

To the best of my information, knowledge, and belief, the Special Inspections and testing required for this project and designated for this Agent in the Statement of Special Inspections (which includes Specification Section 014533 and the Schedule of Special Inspections) have been performed and discovered discrepancies have been reported and resolved except for the following:

Comments:

**[Attach continuation sheets if required to complete description of uncorrected discrepancies.]**

Respectfully submitted,  
Agent of the Special Inspector  
[TITLE]

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Address

\_\_\_\_\_  
City, State, Zip



# Final Report of Special Inspections

Project Name: Waste Water Treatment Facility Inspection Agent: \_\_\_\_\_  
Location: Watkins Glen/Montour Falls Inspection Agent Project No.: \_\_\_\_\_  
Owner: Village of Watkins Glen Special Inspector: \_\_\_\_\_  
Owner Address: \_\_\_\_\_ CA Phase RDP: \_\_\_\_\_

To the best of my information, knowledge, and belief, Special Inspections required for this project, as indicated in the Statement of Special Inspections, (which includes Specification Section 014533 and the Schedule of Special Inspections) have been performed and discovered discrepancies have been reported and resolved except for the following:

Comments:

**[Attach continuation sheets if required to complete description of uncorrected discrepancies.]**

Interim reports submitted prior to this Final Report form a basis for and are to be considered an integral part of this Final Report. Upon request, the interim Testing and Special Inspection reports can be provided. Agent's Final Reports of Special Inspections are attached and are also a part of this Final Report.

Respectfully submitted,  
Special Inspector  
[TITLE]

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Professional Seal

# Contractor's Statement of Responsibility

Project Name: Waste Water Treatment Facility Contractor: \_\_\_\_\_  
Location: Watkins Glen/Montour Falls Contractor Project No.: \_\_\_\_\_  
Owner: Village of Watkins Glen Architect of Record: \_\_\_\_\_  
Owner Address: \_\_\_\_\_ CA Phase RDP: \_\_\_\_\_

As the Contractor responsible for the construction of \_\_\_\_\_, I reviewed and understand the special requirements for the seismic/wind-force-resisting systems listed in the Statement of Special Inspections (which includes Specification Section 014533 and the Schedule of Special Inspections). I verify the following:

1. Procedures for exercising control within my organization, the method and frequency of reporting, and the distribution of reports have been reviewed and are understood.
2. Control will be exercised to obtain conformance with the Construction Documents approved by the Code Enforcement Official.
3. Each person exercising such control and his position in the organization have been identified. Their qualifications have been reviewed and accepted by the RDP for the Construction Phase.

Comments [**Attach continuation sheets if required**]:

Respectfully submitted,

\_\_\_\_\_  
(Type or print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Address

\_\_\_\_\_  
City, State, Zip

END OF SECTION

## SECTION 01 50 00

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 – GENERAL

##### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section
  - 1. American Nursery and Landscape Association (ANLA): American Standards for Nursery Stock.
  - 2. Federal Emergency Management Agency (FEMA).
  - 3. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
  - 4. Telecommunications Industry Association (TIA): 568-C, Commercial Building Telecommunications Cabling Standard.
  - 5. U.S. Department of Agriculture (USDA): Urban Hydrology for Small Watersheds.
  - 6. U.S. Weather Bureau: Rainfall-Frequency Atlas of the U.S. for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 years.

##### 1.02 SUBMITTALS

- A. Informational Submittals:
  - 1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
  - 2. Temporary Utility submittals:
    - a. Electric power supply and distribution plans.
    - b. Dewatering well locations.
  - 3. Site Utilization Plan:
    - a. Access Roads: Routes, cross-sections, and drainage facilities.
    - b. Parking area plans.
    - c. Contractor's field office, storage yard, and storage building plans, including gravel surfaced areas.
    - d. Fencing and protective barrier locations and details.
    - e. RPE's field office plans.
    - f. Staging area location plan.
    - g. Traffic and pedestrian control and routing plans: As specified herein, and proposed revisions thereto.
    - h. Plan for maintenance of existing operations.
  - 4. Temporary Control Submittals:
    - a. Noise control plan.
    - b. Dust control plan.

- c. Plan for disposal of waste materials and intended haul routes.
- 5. Project Sign and Construction Traffic Signs:
  - a. Submit layouts for approval prior to fabrication and delivery.
  - b. Design all signs and supports to withstand 75 mph wind load.

### 1.03 MOBILIZATION

- A. Mobilization shall include, but not be limited to, these principle items:
  - 1. Obtaining required permits.
  - 2. Moving Contractor's field office and equipment required for first month.
  - 3. Installing temporary construction power, wiring and lighting facilities.
  - 4. Providing onsite communication facilities, including telephones.
  - 5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations.
  - 6. Arrange for and erection of, Contractor's work and storage yard.
  - 7. Posting OSHA required notices and establishing safety programs and procedures.
  - 8. Having Contractor's superintendent at the Site full-time.
- B. Use area designated for Contractor's temporary facilities as shown on the Drawings or as directed by the Owner.

### 1.04 PROTECTION OF WORK AND PROPERTY

- A. Comply with Owner's safety rules while on Owner's property.
- B. Keep Owner informed of series onsite accidents and related claims.
- C. Use of explosives: No blasting or use of explosives will be allowed onsite.

### 1.05 VEHICULAR TRAFFIC

- A. Traffic Control Plan:
  - 1. Adhere to traffic control plan reviewed and accepted by RPE.
  - 2. Changes to this plan shall be made only by written approval of appropriate public authority.
  - 3. Secure approvals for necessary changes so as not to delay progress of the Work.
- B. Traffic Routing Plan: Show sequences of construction affecting use of roadways, time required for each phase of the Work, provisions for decking over excavations and phasing of operations to provide necessary access, and plans for signing, barricading, and striping to provide passages for pedestrians and vehicles.



## PART 2 – PRODUCTS

### 2.01 RPE'S FIELD OFFICE

- A. General Contractor shall furnish equipment specified for exclusive use of RPE and its representatives.
- B. Ownership of equipment furnished under this article will remain, unless otherwise specified, that of the Contractor.
- C. Equipment furnished shall be new or like new in appearance and function.
- D. Minimum features:
  - 1. 120-volt lighting and wall receptacles.
  - 2. Fluorescent ceiling lights.
  - 3. electric heating and self-contained air conditioning unit, properly sized for Project location and conditions. Provide ample electric power to operate installed system.
  - 4. Railed stairways and landings at entrance.
  - 5. Sign on entrance door reading “RESIDENT PROJECT ENGINEER”, letter height 4 inches, minimum.
  - 6. Exterior doors:
    - a. Quantity: 2.
    - b. Type: solid core.
    - c. Locks: cylindrical keyed alike.
  - 7. Minimum quantity of windows: 2.
  - 8. Minimum interior height: 8’-0”.
- E. Floor space: minimum 300 square feet, based on 12-foot by 25 foot trailer.
- F. Plan table, plan rack, two double desks with desk surface located 29 inches from floor, two 2-drawer, steel file cabinets, and overhead shelf.
- G. Office Equipment – General:
  - 1. Bottled water service: one, with cooler capable of producing both hot and cold water.
  - 2. Paper cup dispenser with full supply of cups: 1
  - 3. Paper towel dispenser quantity: 1.
  - 4. Desk chair: Two with the following characteristics:
    - a. Five-castor base.
    - b. Adjustable height.
    - c. Swivels.
    - d. Locking back.
    - e. Adjustable seat back for height and angle.

- f. Adjustable arms.
- 5. Folding Table: 36 inches by 72 inches.
- 6. Steel folding chairs: Six.
- 7. Drafting table: one, 3 feet by 6 feet.
- 8. Four drawer steel file with lock: one, legal width.
- 9. Drawing rack with drawing hangers: one.
- 10. Wastepaper basket: two.
- 11. First Aid kit: one.
- 12. ABC fire extinguisher: one 10-lb unit, wall hung.

H. Contractor shall provide weekly office cleaning and trash service.

## PART 3 – EXECUTION

### 3.01 RPE'S FIELD OFFICE

- A. Make available for RPE's use prior to start of the Work at the Site and to remain onsite for minimum of 30 days after final acceptance of the Work.
- B. Locate where directed by RPE; level, block, tie down skirt, provide stairways, and relocated when necessary and approved. Construct on proper foundations and provide proper surface drainage and connections for utility services.
- A. Provide minimum 100 square feet of gravel or crushed rock base, minimum depth of 4 inches, at each entrance.
- B. Raise grade under field office, as necessary, to elevation adequate to avoid flooding.
- C. Provide sanitary facilities in compliance with State and local health authorities.
- D. Exterior door keys: Furnish two set(s) of keys.
- E. Local area network (LAN):
  - 1. Provide Ethernet network prewired in compliance with TIA-568-C.
  - 2. Ethernet wireless router shall be capable of a minimum of four connections.
  - 3. LAN shall be designed and installed by personnel experienced in similar LAN systems.

### 3.02 TEMPORARY UTILITIES

- A. Power:
  - 1. No electric power is available at the Site. Make arrangements to obtain and pay for electrical power used until final payment and acceptance by the Owner, unless otherwise recommended by the RPE at Substantial Completion.
  - 2. Cost of electric power shall be borne by the Contractor. No separate payment will be made.
- B. Lighting: provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work.
- C. Heating, Cooling, and Ventilating:
  - 1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for installation of materials, and to protect materials, equipment, and finishes from damage because of temperature or humidity. Costs for temporary heat shall be borne by the Contractor.
  - 2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.
  - 3. Pay costs of installation, maintenance, operation, removal, and fuel consumed.
  - 4. Provide portable unit heaters, complete with controls, oil- or gas-fired, and suitably vented to outside as required for protection of health and property.
  - 5. If permanent natural gas piping is used for temporary heating units, do not modify or re-route gas piping without approval of Gas Utility. Provide separate gas metering, as required by the Gas Utility.
- D. Water: No construction or potable water is available at the Site. Make arrangements for and bear the cost of providing water required for construction purposes and drinking by construction personnel during construction.
- E. Sanitary and Personnel Facilities: Provide and maintain facilities for Contractor's employees, Subcontractors, and other onsite employers' employees. Service, clean and maintain facilities and enclosures.
- F. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.

### 3.03 PROTECTION OF WORK AND PROPERTY

#### A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic for a period exceeding 4 hours, unless special arrangements have been made.
3. Maintain in continuous service existing oil and gas pipelines, underground power, telephone and communication cable, water mains, irrigation lines, sewers, poles and overhead power and other utilities encountered along the line of the Work, unless other arrangements satisfactory to the utility owners of have been made.
4. When completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate activities with utility owner and perform work to their satisfaction.
5. Protect, shore, brace, support, and maintain underground utility construction uncovered or otherwise affected by construction operations.
6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
7. In areas where Contractor's operations are adjacent to or near a utility such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by the Contractor.
8. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's activity, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
9. Do not impair operation of existing sewer system. Prevent construction material and pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, and other utility structures.
10. Maintain original site drainage wherever possible.

#### B. Barricades and Lights:

1. Provide as required by the NYS DOT Manual of Uniform Traffic Control Devices and in sufficient quantity to safeguard public and the Work.
2. Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alley ways, inside and outside of fenced area, and as required to ensure public safety and the safety of the Contractor's employees, other employers' employees, and others who may be affected by the Work.

3. Provide to protect existing facilities and adjacent properties from potential damage.
4. Locate to enable access by facility operators and property owners.
5. Protect streets, roads, highways, and other public thoroughfares that are closed to traffic by effective barricades with acceptable warning signs.
6. Locate barricades at the nearest intersecting public thoroughfare on each side of the blocked section.
7. Illuminate barricades and obstructions with warning lights from sunset to sunrise.

C. Trees and Plantings:

1. Protect from damage and reserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on Drawings to remain undisturbed.
  - a. Where practical, tunnel beneath trees when on or near line of trench.
  - b. Employ hand excavation as necessary to prevent tree injury.
  - c. Do not stockpile materials or permit traffic within drip lines of trees.
  - d. Provide and maintain temporary barricades around trees.
  - e. Water vegetation as necessary to maintain health.
  - f. Cover temporarily exposed roots with wet burlap and keep burlap moist until soil is replaced around roots.
  - g. No trees, except those specifically shown on Drawings to be removed shall be removed without written approval of the RPE.
  - h. Dispose of removed trees in a legal manner offsite.
2. Balling and burlapping of trees indicated for replacement shall conform to recommended specifications set forth in the American Standards for Nursery Stock, published by the American Nursery and Landscape Association. Balls shall be firm and intact and made-balls will not be accepted. Handle ball and burlap trees by ball and not by top.
3. In the event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices.
4. Replace each plant that dies as a result of construction activities.

D. Existing Structures:

1. Where Contractor contemplates removal of small structures such as mailboxes, signposts, and culverts that interfere with the Contractor's operations, obtain approval of property owner and RPE.
2. Move mailboxes to temporary locations accessible to postal service.
3. Replace items removed in their original location and a condition equal to or better than original.

- E. Finished Construction: Protect finished floors and concrete floors exposed as well as those covered with tile or other finish.
- F. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.
- G. Dewatering:
  - 1. Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works.
  - 2. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.
- H. Archeological Finds:
  - 1. General: should finds of an archaeological or paleontological nature be made within the Site limits, immediately notify the Owner and RPE and proceed in accordance with the General Conditions.
  - 2. Archaeological Finds: Evidence of human occupation or use of an area within Contract limits. Evidence may consist of skeletons, stone, or other utensils, or evidence of habitations or structures.
  - 3. Paleontological Finds: Evidence of prehistoric plant or animal life, such as skeletons, bones, fossils, or casts and other indications of such as pictographs.
  - 4. Owner may order the Work stopped in other areas if, in the Owner's opinion, find is more extensive than may appear from uncovered material.
  - 5. Protection of Finds:
    - a. Cover, fence, or otherwise protect finds until notice to resume the Work is given.
    - b. Cover finds with plastic film held in place by earth, rocks, or other weights placed outside the find. Should additional backfilling be necessary for safety or to prevent caving, place backfill material loosely over plastic film.
    - c. Sheet or shore as necessary to protect excavations underway. Place temporary fence to prevent unauthorized access.
    - d. Dewater finds made below water table as necessary to protect construction Work underway. Divert groundwater or surface runoff away from find by ditching or other acceptable means.
  - 6. Removal of Finds:
    - a. Finds are property of the Owner. Do not remove or disturb finds without Owner's written authorization.

- b. Should Owner elect to have a find removed, provide equipment, labor, and material to permit safe removal of find without damage. Provide transportation for delivery to individuals, institutions, or other places as Owner may find desirable, expedient, or required by law.

I. Threatened and Endangered Species:

1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna.
2. Notify the RPE of construction activities that may threaten threatened and endangered species or their habitats.
3. RPE will mark areas known as habitats of threatened and endangered species prior to commencement of the Work.
4. Additional areas will be marked by RPE as other habitats of threatened and endangered species become known during construction.

### 3.04 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be allowed onsite.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detour, or haul roads used in construction area a dust-preventative treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

B. Noise Control:

1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
2. Noise Control Plan: Propose plan to mitigate construction noise and comply with noise control ordinances, including method of construction, equipment to be used, and acoustical treatments.

- C. Water Pollution Control:
  - 1. Divert sanitary sewage and non-storm waste flow interfering with construction and requiring diversion to sanitary sewers. No not cause or permit action to occur which would cause an overflow to existing waterway.
  - 2. Prior to commencing excavation and construction, obtain Owner's agreement with detailed plans showing procedures intended to manage and dispose of sewage, groundwater, and dewatering pump discharges.
  - 3. Comply with Section 01 57 13, Temporary Erosion and Sediment Control, for storm water flow and surface runoff.
  - 4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.
  
- D. Erosion, Sediment, and Flood Control: Provide, maintain, and operate temporary facilities as specified in Section 01 57 13, Temporary Erosion and Sediment Control, to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.
  
- D. Project Signage:
  - 1. Location of signs shall be as shown or as directed by the RPE.
  - 2. Maintain signs so they are clean, legible, and upright. Keep grass and weeds cut away from signs.
  - 3. Repair and repaint damaged signs. Relocate signs as required by progress of Work.
  - 4. Remove signs when Project is completed or when directed by the RPE.
  - 5. Signs to be relocated shall be removed, cleaned, and stored if not immediately reinstalled.

### 3.05 STORAGE YARDS AND BUILDINGS

- A. Coordinate requirements with Section 01 61 00, Common Product Requirements.
  
- B. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.
  
- C. Temporary Storage Buildings:
  - 1. Provide environmental control systems that meet recommendations of manufacturers of equipment and material stored.
  - 2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
  - 3. Store combustible materials (paints, solvents, fuels) in well-ventilated and remote building meeting safety standards.



### 3.06 ACCESS ROADS

- A. Construct access roads as shown and within easements, rights-of-way, or Project limits. Alignments for new routes shall be approved by the RPE.
- B. Maintain drainage ways. Install and maintain culverts to allow water to flow beneath access roads. Provide corrosion-resistant culvert pipe of adequate strength to resist construction loads.
- C. Provide gravel, crushed rock, or other stabilization material to permit access by all motor vehicles at all times.
- D. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.
- E. Coordinate with RPE detours and other operations affecting traffic and access. Provide at least 72 hours' notice to RPE of operations that will alter site access.
- F. Where access road crosses existing fences, install and maintain gates. Gates and gate posts shall comply with Section 32 31 13, Chain Link Fences and Gates.
- G. Upon completion of construction, restore ground surface disturbed by access road construction to grades as shown on the Drawings.

### 3.07 PARKING AREAS

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.
- B. Provide parking facilities for personnel working on the Project. No employee or equipment parking will be permitted on Owner's existing paved areas, except as specifically designated for Contractor's use.
- C. Use area designated on Drawings or area as designated by the Owner for parking of Contractor's and Contractor's employees' vehicles.

### 3.08 VEHICULAR TRAFFIC

- A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Ensure the least possible obstruction to traffic and normal commercial pursuits.

- B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.
- C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients from accommodation of public and private travel.
- D. Road Closures: Maintain satisfactory means of exit for persons residing or having occasion to transact business along route of the Work. If it is necessary to close off roadway or alley providing sole vehicular access to property for periods greater than 2 hours, provide written notice to each owner so affected 3 days prior to such closure. In such cases, closing of up to 4 hours may be allowed. Closures of up to 10 hours may be allowed if a week's written notice is given and undue hardship does not result.
- E. Maintenance of Traffic is not required if Contractor obtains written permission from Owner and tenant of private property, or from authority having jurisdiction over public property involved, to obstruct traffic at designated point.
- E. In making street crossing, do not block more than one-half of the street at a time. Whenever possible, widen shoulder on opposite side to facilitate traffic flow. Provide temporary surfacing on shoulders as necessary.
- F. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.
- G. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.
- H. Provide snow removal to facilitate normal vehicular traffic on public or private roads affected by construction. Perform snow removal promptly and efficiently by means of suitable equipment whenever necessary for safety, and as may be directed by proper authority.
- I. Notify fire department and police department before closing streets or portions thereof. Notify said departments when streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from the fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. Furnish Contractor's night emergency telephone numbers to police department.

- J. Temporary Bridges:
1. Construct temporary bridges at points where maintenance of traffic across pipeline construction is necessary.
  2. Make bridges over public streets, roads, and highways acceptable to authority having jurisdiction.
  3. Bridges erected over private roads and driveways shall be adequate for service to which they are subjected.
  4. Provide substantial guide rails and suitably protected approaches.
  5. Provide footbridges not less than 4 feet wide with handrails and uprights of dressed lumber.
  6. Maintain bridges in place as long as conditions of the Work require their use for safety of public, except that when necessary for proper prosecution of the Work in immediate vicinity of the bridge. Bridge may be relocated or temporarily removed for such periods as RPE may permit.

### 3.09 CLEANING DURING CONSTRUCTION

- A. In accordance with the General Conditions, as may be specified in other specification sections, and as required herein.
- B. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up and dispose of debris.
- C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish off-site.
- D. At least weekly, brush sweep entry drive, roadways and other streets and walkways affected by the Work and where adjacent to the Work.

+ + END OF SECTION + +

## SECTION 01 57 13

### TEMPORARY EROSION AND SEDIMENT CONTROL

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. This section covers work necessary for stabilization of soil to prevent erosion during and after construction and land-disturbing activities. The Work shall include the furnishing of all labor, material, tools, and equipment to perform the Work and services necessary as herein specified and as indicated on the Drawings. This shall include installation, maintenance, and final removal of all temporary soil erosion and sediment control measures.
- B. The minimum areas requiring soil erosion and sediment control measures are indicated on the Drawings. The Owner or RPE reserves the right to modify the use, location, and quantities of soil erosion and sediment control, based on the Contractor's activities.
- C. See additional information noted on the Drawings.

##### 1.02 GENERAL

- A. Refer to General Conditions and Division 01, General Requirements, which contain information and requirements that apply to the Work specified herein and are mandatory requirements of for this Project.
- B. All activities shall conform to the latest edition of the New York State Storm Water Management Design Manual, the site-specific Storm Water Pollution Prevention Plan (SWPPP), the SPDES General Permit GP-0-15-002, and the Drawings. In the event of conflicting requirements, the more stringent requirements shall apply.
- C. Soil erosion stabilization and sedimentation control consist of the following elements:
  - 1. Maintenance of existing permanent or temporary storm drainage piping and channel systems, as necessary.
  - 2. Construction of new permanent and temporary storm drainage piping and channel systems, as necessary.
  - 3. Construction of temporary erosion control facilities such as silt fences, check dams, etc.

4. Topsoil and seeding:
    - a. Placement and maintenance of Temporary Seeding on all areas disturbed by construction.
    - b. Placement of permanent topsoil, fertilizer, and seed, etc. in all areas not occupied by structures or pavement, unless shown otherwise.
  5. Soil Stabilization Seeding: Placement of fertilizer, seed, etc. in areas as specified hereinafter.
- D. The Contractors shall be responsible for phasing and coordinating Work in areas allocated for respective use including proposed stockpile areas to restrict sediment transport. This will include installation of all temporary erosion and sediment control devices, ditches, or other facilities.
- E. The areas set aside for the Contractor's use during the Project may be temporarily developed to provide satisfactory working, staging, and administrative areas for its exclusive use. Preparation of these areas shall be in accordance with other requirements contained within these Specifications and shall be done in a manner to control all sediment transport away from the area.
- F. Sediment transport and erosion from working stockpiles shall be controlled and restricted from moving beyond the immediate stockpile area by installation of silt fence or fiber rolls and construction of temporary toe-of-slope ditches, as necessary. The Contractor shall keep these temporary facilities in operational condition by regular cleaning, regrading, and maintenance. Stockpiles remaining in place longer than 14 calendar days shall be considered permanent stockpiles for purposes of erosion and sediment control.
- G. All permanent stockpiles shall be seeded with soil stabilization seed and protected by permanent 2-foot-minimum ditches, completely surrounding stockpiles and located within 10 feet of the toes of stockpile slopes.
- H. The Contractor shall maintain all elements of the soil erosion and sediment control systems and facilities to be constructed during this Project for the duration of activity on the Project. Formal inspections made jointly by the Contractor and the RPE shall be conducted every 2 weeks to evaluate the Contractor's conformance. These inspections shall be in addition to the daily inspections performed by the Contractor and the weekly inspections performed by the RPE.
- I. All silt traps shall be cleaned of collected sediment after every storm or as determined from weekly inspections. Cleaning shall be done in a manner that will not direct the sediment into the storm drain piping system. Removed sediment

shall be taken to an area selected by the RPE where it can be cleaned of sticks and debris, then allowed to dry. Final sediment and debris disposal shall be on-site, as directed by the RPE.

- J. Replacement or repair of failed or overloaded silt fences, check dams, or other temporary erosion control devices shall be accomplished by the Contractor within 2 days after receiving written notice from the RPE.
- K. Unpaved earth drainage ditches shall be re-graded as needed to maintain original grade and remove sediment buildup. If a ditch becomes difficult to maintain, the Contractor shall cooperate with the Engineer and install additional erosion control devices such as check dams, rolled erosion control product, or silt fences, as directed by the RPE.
- L. If the Contractor has not complied with any of the above maintenance efforts to the satisfaction of the RPE within 2 working days after receiving written notification, the Owner shall have sufficient cause to engage others to perform any needed maintenance or cleanup, including removal of accumulated sediment at constructed erosion control facilities, and deduct from the Contractor's monthly partial payment the costs for such efforts, plus a \$500 administrative fee.

### 1.03 SUBMITTALS

- A. Comply with Section 01 33 00, Submittal Procedures.
- B. In addition, the Contractor shall provide the following specific information:
  - 1. Certificates of inspection of seed by State or Federal authorities and copies of delivery invoices or other proof of quantities of fertilizer.
  - 2. Manufacturer's certificate of compliance attesting that the geotextile meets the requirements of these Specifications.

## PART 2 – PRODUCTS

### 2.01 PERMANENT SEED

- A. Seed for those areas where topsoil is to be applied shall be 20 lbs per acre Creeping Red Fescue, 20 lbs per acre Chewings Fescue, 10 lbs per acre Red Clover, and 5 lbs per acre Perennial Ryegrass.

### 2.02 SOIL STABILIZATION AND TEMPORARY SEED

- A. Summer seed mix shall be Annual or Perennial Ryegrass.

- B. Winter seed mix shall be Certified Aroostook Winter Rye (cereal rye).

#### 2.03 TOPSOIL

- A. Topsoil shall be as specified under Section 31 23 23, Fill and Backfill.

#### 2.04 FERTILIZER

- A. Fertilizer shall be commercial, chemical type, uniform in composition, free-flowing, conforming to State and Federal laws, and suitable for application with equipment designed for that purpose.
- B. State law prohibits the application of fertilizer between December 1 and April 1, and application within 20 feet of a surface water is restricted.
- C. Fertilizers shall have a minimum percentage of plant food by weight for the following: Permanent fertilizer mix shall be 10 percent nitrogen, 10 percent phosphoric acid, and 10 percent potash.
- D. Fertilizer with phosphate composition greater than 0.67 percent by weight may only be used if new lawn is being established or a soil test indicates that it is necessary. Projects located within watersheds with Enhanced Phosphorus Removal Standards may only use fertilizer with more than 0.67 phosphate with a valid soil test demonstrating need.

#### 2.05 LIME

- A. Ground dolomitic limestone not less than 85 percent total carbonates and magnesium, ground so that 50 percent passes through a 100-mesh sieve and 90 percent passes a 20-mes sieve. Coarser material will be acceptable provided the specified application rates are increased proportionately on the basis of quantities passing a 100-sieve.
- B. Quantity of lime needed varies by soil pH. Apply in accordance with current edition of the New York State Standards and Specifications for Erosion and Sediment Control.

#### 2.06 STRAW MULCH

- A. Threshed straw of oats, wheat, barley, or rye, free from seed of noxious weeds, or clean salt hay applied at 2 tons per acre.

## PART 3 – EXECUTION

### 3.01 GENERAL

- A. Install erosion and sediment control measures and maintain in accordance with the Drawings, General Permit, and the SWPPP.
- E. Provide and maintain Temporary Seeding at all times.

### 3.02 SEEDING

- A. General:
  - 1. The Contractor shall give at least 3 days' notice to the RPE prior to seeding to allow the Owner to inspect the prepared areas. The Contractor shall rework all areas not approved for seeding to the Owner's satisfaction.
  - 2. The Contractor shall keep the Engineer advised of schedule of operations.
  - 3. Seed shall be clean, delivered in original, unopened packages and bearing an analysis of the contents, guaranteed 95 percent pure with minimum germination rate of 85 percent.
- B. Schedules:
  - 1. Seeding shall be performed in accordance with the following schedule:
    - a. Summer Seeding: From March 15 to June 15, and September 1 to October 15.
    - b. Winter Seeding: All other times of year, except when weather conditions prohibit further construction operations as determined by the RPE.
- C. Soil Stabilization and Temporary Seeding:
  - 1. Soil stabilization seeding shall consist of the application of the following materials in quantities as further described herein for stockpiles and disturbed areas left inactive for more than 14 days:
    - a. Lime.
    - b. Fertilizer.
    - c. Temporary seed mix at 30 pounds per acre for summer seed mix or 100 pounds per acre for winter seed mix.
    - d. Mulch.
    - e. Maintenance.
  - 2. Hydroseeding will be permitted as an alternative method of applying seed and associated soil conditioning agents described above. Submit hydroseeding application plan and methods prior to commencing work.



3. Temporary Seeding shall be placed and maintained over all disturbed areas prior to Permanent Seeding. Maintain Temporary Seeding until such time as areas are approved for Permanent Seeding. As a minimum, maintenance shall include:
  - a. Repair and re-seeding bare areas or re-disturbed areas.
  - b. Mowing for stands of grass or weeds exceeding 6 inches in height.
  
- D. Topsoil and Permanent Seeding:
  1. Topsoil and Permanent Seeding shall consist of the application of the following materials in quantities as further described herein:
    - a. 4-inch depth of topsoil.
    - b. Lime.
    - c. Fertilizer.
    - d. Permanent seed mix.
    - e. Mulch.
  2. Topsoil shall be placed over all disturbed areas that are not surfaced with concrete, asphalt, or pavers.
  3. Preparation:
    - a. After rough grading is completed and reviewed by the RPE, Contractor shall spread topsoil as specified herein over all areas to receive Permanent Seeding to a minimum compacted depth of 6 inches with surface elevations as shown. Loosen the finished surface to a depth of 2 inches and leave in smooth condition, free from depressions or humps, ready for seeding.
    - b. Finish Grading:
      - 1) Contractor shall rake the topsoiled area to a uniform grade such that all areas drain as indicated on the Contract Drawings.
      - 2) Contractor shall remove all trash and all stones exceeding 1-inch in diameter from area to a depth of 2 inches.
  4. Permanent Seed:
    - a. After soil has been scarified, apply seed and other products at the rate and proportion specified below:
      - 1) Seed Mix: 55 pounds per acre.
      - 2) Fertilizer: In accordance with manufacturer's recommendations.
      - 3) Lime: Varies by soil pH. Apply in accordance with New York Standards and Specifications for Erosion and Sediment Control
      - 4) Water: as necessary.
  5. Maintenance:
    - a. Maintenance Period: Contractor shall begin maintenance immediately after each portion of permanent grass is planted and continue for 8 weeks after all planting is completed.

- b. Maintenance Operations: Contractor shall water to keep surface oil moist. Repair washed out areas by filling with topsoil, liming, fertilizing, and seeding. Replace mulch on banks when washed or blown away. Mow to 2 inches after grass reaches 3 inches in height, and mow frequently enough to keep grade from exceeding 3-1/2 inches. Weed by local spot application of selective herbicide only after first planting season when grass is established.
6. Guarantee:
- a. If, at the end of the 8-week maintenance period, a satisfactory stand of grass has not been produced, the Contractor shall renovate and re-seed the grass or unsatisfactory portions thereof immediately, or, if after October 15, during the next planting season. If a satisfactory stand of grass develops by July 1 or the following year, it will be accepted. If it is not accepted, a complete replanting will be required during the planting season meeting all of the requirements specified under paragraph Permanent Seed.
  - b. A satisfactory stand of grass is defined as grass or section of grass that has a substantial establishment of new grass, strongly rooted, and uniformly green in appearance from a distance of 50 feet, with no noticeable thin or bare areas as determined by the RPE

### 3.03 SUPPLEMENT

- A. The supplements listed below and attached following “End of Section” are part of this specification:
  - 1. Stormwater Pollution Prevention Plan for the Watkins-Montour Regional Wastewater Treatment Plant.

++ END OF SECTION ++

**Project Seneca Regional WWTF  
Village of Watkins Glen  
Village of Montour Falls**

# **Stormwater Pollution Prevention Plan**

**February 2017**

Project Seneca Regional WWTF  
Village of Watkins Glen  
Village of Montour Falls

Stormwater Pollution Prevention Plan

February 2017

Prepared For:

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## 1.0 Site Evaluation, Assessment, and Planning

### 1.1 Project/Site Information

Project/Site Name: Project Seneca Regional WWTF

Project Location: Boat Launch Road

City/State/Zip Code: Watkins Glen, New York 14891

County: Schuyler

Latitude/Longitude      Latitude: 42° 22' 25.08" N  
Longitude: 76° 51' 30.98" W

Method for determining latitude/longitude:

- USGS topographic map (specify scale: \_\_\_\_\_)  
 NYSDEC Web Site  
 GPS  
 Other (please specify): Google Earth

Is the project located in Indian country?  Yes  No

If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable." N/A

Is this project considered a federal facility?  Yes  No

SPDES permit number: \_\_\_\_\_ (fill in number upon receipt of NYSDEC Acknowledgement letter)

### 1.2 Contact Information/ Responsible Parties

Owner: Village of Watkins Glen  
Sam Schimizzi, Mayor  
303 N. Franklin Street  
Watkins Glen, New York 14891  
Phone: (607) 535-2736  
Email: mayorschimizzi@watkinglen.us



Village of Montour Falls  
John King, Mayor  
408 West Main Street  
PO Box 812  
Montour Falls, New York 14865  
Phone: (607) 535-7367  
Email: mvillagehall@stny.rr.com

Project Manager: Greg Mosure, P.E.  
Barton & Loguidice, D.P.C.  
443 Electronics Parkway  
Syracuse, New York 13088  
Phone: (315) 457-5200  
Fax: (315) 451-0052  
Email: gmosure@bartonandloguidice.com

Stormwater Manager  
and SWPPP Contact: Lindsay R. Reichlein, P.E., CPESC  
Barton & Loguidice, D.P.C.  
443 Electronics Parkway  
Syracuse, New York 13088  
Phone: (315) 457-5200  
Fax: (315) 451-0052  
Email: lreichlein@bartonandloguidice.com

The project is subject to the NYSDEC's SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002). All provisions of the permit (attached as Appendix A) must be followed for duration of the construction activities until the permit is terminated. The permit application, Notice of Intent, attached as Appendix B should be posted in a publicly accessible location along with the NYSDEC's acknowledgement letter.

### 1.3 Nature and Sequence of Construction Activity

The project includes construction of a new wastewater treatment facility (WWTF), pumping stations, and associated sewer piping for the Villages of Watkins Glen and Montour Falls. The permanent disturbance includes the new WWTF building, two small pumping stations, and paved driveway and parking. The Watkins Glen Pump Station will be located on a Village-owned parcel just

south of the existing Watkins Glen WWTP; the Montour Falls Pump Station will be located at the existing Montour Falls WWTP, which will be decommissioned prior to construction of the pump station. The Watkins Glen Pump Station construction is mainly comprised of utility work with the addition of a small 19'x9' control building. By decommissioning the Montour Falls WWTP, approximately 0.5 acres of impervious area will be removed and a small 10'x10' control building and asphalt driveway will be added for a net reduction in impervious cover of 0.35 acres. Approximately 15,360 linear feet of new sewer forcemain will be installed in the Villages of Watkins Glen and Montour Falls.

A map of the project area is included as Figure 1.

The Contractor's construction sequence for the project shall be submitted for review prior to the pre-construction meeting. The following list is an example (subject to change) of the sequence of construction operations anticipated, for which the pace is dependent upon multiple factors (weather, material deliveries, etc.).

Suggested Sequence of Construction:

1. Obtain plan approval and other applicable permits.
2. Let the work through competitive bidding and secure a qualified contractor to complete the work.
3. Hold a preconstruction meeting at least one (1) week prior to starting construction.
4. Mobilize to site and layout established limits of work and buffer areas prior to starting construction.
5. Install erosion and sediment control measures in preparation of the construction. All erosion and sediment control structures shall be in place prior to upgradient land disturbance.

6. Protect trees marked on drawings. Complete clearing of any additional trees as required.
7. Surcharge site. Surcharge areas must be temporarily stabilized within 24 hours of soil disturbance. Ensure all dewatering operations do not cause a water quality violation.
8. Maintain existing erosion and sediment controls and install additional measures as necessary following surcharging.
9. Complete construction of the wastewater treatment facility building, driveways, parking lots, and final grading. Complete installation of sewer forcemain. Complete demolition of existing facilities and construction of the pump stations.
10. Complete restoration of all disturbed areas including paving, landscape planting, and turf establishment.
11. Install bioretention area at wastewater treatment facility.
12. Once turf establishment is complete, remove temporary erosion and sediment control measures. See notes below for further information.

Notes:

- All erosion and sediment control practices will be installed and maintained in accordance with the New York State Standards and Specifications for Erosion and Sediment Control. If full implementation of the approved plan does not provide for effective erosion control, additional erosion and sediment control measures shall be implemented to control or treat the sediment source. This shall be the responsibility of the Contractor.
- All erosion and sediment control practices will be enforced daily through the utilization of full-time construction inspection and

administration. Needed repairs will be addressed immediately and repaired before daily work shutdown.

- The contractor and any subcontractors shall have, onsite at all times during any disturbance activity, a NYSDEC 4-hr trained contractor representative to oversee disturbance activities and coordinate erosion and sediment control activities.
- Permanent vegetation will be established on all disturbed areas. Site stabilization will be defined as 80% vegetative cover over the entire site. Following site stabilization, all temporary erosion and sediment control practices will be removed.
- No more than five (5) acres of soil will be disturbed at a given time without prior written approval from the NYSDEC.
- To help ensure permit compliance through timely remedying of identified site deficiencies, Contractor's payment applications will not be processed until SWPPP (and documents inherently incorporated) deficiencies older than seven (7) days are corrected to the satisfaction of the Owner's Qualified Inspector.

What is the function of the construction activity?

- Residential  Commercial  Industrial  Road Construction  
 Linear Utility  Other (please specify): Municipal WWTF

Estimated Project Start Date: March 2017

Estimated Project Completion Date: April 2019

#### 1.4 Soils, Slopes, Vegetation, and Current Drainage Patterns

The attached Figure 2 illustrates the existing WWTF site, along with some of its physical characteristics and drainage area. The following provides a description of soils, slopes, vegetation, and current drainage patterns on the site.

### 1.4.1 Soil Type(s)

The WWTF site, located on the east side of the Barge Canal that exits the south end of Seneca Lake, on the west side of the Seneca Lake Inlet, and immediately north of the Catherine Creek Wildlife Management Area:

- Wy (99.9% of site): This soil is defined as Wayland soils complex, non-calcareous substratum, 0-3% slopes, frequent flooding. The soil complex belongs to hydrologic soil group B/D and is very poorly drained. Depth to restrictive features is more than 80 inches. Depth to water table is approximately 0-6 inches and the  $K_{sat}$  is approximately 0.6-2 in/hr.
- Wk (0.1% of site): This soil is defined as Walkill silt loam. It belongs to hydrologic soil group B/D and is very poorly drained. Depth to restrictive features is more than 80 inches. Depth to water table is approximately 0 inches and the  $K_{sat}$  is approximately 0.57-1.98 in/hr.

The NRCS soils map is included in Appendix C.

### 1.4.2 Slopes

The 8.6-acre WWTF site is nearly flat and generally slopes to the east and southeast towards the wetlands and to the west towards the Barge Canal. Following construction, the WWTF site will be relatively flat, with a closed drainage system discharging to the bioretention area that overflows into the Barge Canal. The eastern and southern ends of the site will continue to drain towards the wetlands.

### 1.4.3 Drainage Patterns

#### Existing Conditions:

Stormwater at the site generally runs off the site via sheet flow to the west, east, and southeast as described above.

#### Future Conditions:

Following construction, overall drainage patterns will be similar to existing drainage patterns, with stormwater generally flowing to the west. Runoff from the building rooftop and parking lots will be captured and directed to the bioretention area for water quality treatment. The bioretention area will overflow into the Barge Canal.

### 1.4.4 Vegetation

The pre-developed cover type at the site is forest in fair condition. The addition of the wastewater treatment facility buildings, driveways, and parking will convert approximately 2.39 acres to impervious area.

Clearing of trees solely for staging of equipment is not acceptable unless replaced in-kind as ordered by the Engineer or Owner. The limits of clearing are clearly defined. Disturbance should be limited to only what is necessary for equipment passage and the construction (including materials staging) of permanent structures. Excessive staging areas should be avoided. Given the proximity to wetlands and critical habitats, tree clearing must be limited to the boundaries shown on the contract drawings.

## 1.5 Construction Site Estimates

### *WWTF site:*

Proposed area to be disturbed:	6.4 acres
Total drainage area:	7.0 acres
Percentage impervious area before construction:	0%
Percentage impervious area after construction:	47%

### *Watkins Glen Pump Station site:*

Proposed area to be disturbed:	0.086 acres
Total drainage area:	0.67 acres
Percentage impervious area before construction:	7%
Percentage impervious area after construction:	20%

### *Montour Falls Pump Station site:*

Proposed area to be disturbed:	0.70 acres
Total drainage area:	1.24 acres
Percentage impervious area before construction:	33%
Percentage impervious area after construction:	5%

### *Total project area, including above sites and sewer main:*

Proposed area to be disturbed:	10 acres
Total drainage area:	12 acres
Percentage impervious area before construction:	14%
Percentage impervious area after construction:	39%

## 1.6 Receiving Waters

The WWTF site discharges to the Barge Canal to the west, with minor discharge to the wetlands to the east and southeast. The remainder of the project discharges to L'Hommedieu Diversion Channel, Seneca Lake Inlet, Glen

Creek, and additional wetlands. The project is not located in a Total Maximum Daily Load (TMDL) watershed. The project is not located within a regulated Municipal Separate Storm Sewer System (MS4).

### 1.7 Site Features and Sensitive Areas to Be Protected

- Surface Waters: Several surface waters are located near the site. The south end of Seneca Lake lies approximately 1 mile to the north of the site. The Seneca Barge Canal adjoins the site to the west. Seneca Lake Inlet adjoins along the southeast boundary of the proposed project site. The Catharine Creek Wildlife Management Area, consisting mostly of wetlands, adjoins the property to the north and east. During construction, appropriate stormwater management controls will be installed to prevent sediment laden runoff from leaving the project site.
- Vegetation: The majority of the project site is vegetated. Disturbance of existing vegetation should be limited only to what is necessary for construction.
- Slopes: In any areas with slopes greater than 15%, it is recommended that clearing activities be limited to less than the 1-acre limit and that stabilization with seed and turf reinforcement matting/mulch occur on the same day as the disturbance and at least prior to any wind or rain event.
- Wetlands: Wetland field delineations were conducted, and it is anticipated that temporary and permanent disturbance to wetlands will occur. The following appropriate measures shall be taken:
  - If trenching is to be performed through delineated wetlands, trench blocks shall be used to prevent degradation of wetland hydrology and hydraulics. These will be installed



- upstream of proposed construction prior to the start of construction within a wetland;
- If state wetlands are located, the appropriate setbacks will be recognized;
  - If more than 1/10 of an acre of federal wetland disturbance is anticipated, the appropriate permits will be sought and the appropriate mitigation measures will be provided;
  - Prior to the start of any construction, the Contractor shall field identify wetlands by installing orange construction fencing around the perimeter of each known wetland;
  - Appropriate measures shall be taken to prevent the transport of sediment into identified wetlands. A double row of sediment logs/straw wattles will be installed upgradient of the wetland;
  - If a temporary wetland disturbance is proposed, native wetland material shall be reserved and re-installed;
  - Materials shall not be stockpiled adjacent to a wetland; and
  - Wetland buffers shall not be disturbed unless necessary. If disturbed, they shall be immediately replaced in-kind.
- **Soils:** The project site is comprised of Wayland soils complex and Wallkill silt loam. Both soils groups belong to hydrologic soil group B/D and are poorly drained. Depth to restrictive features is more than 80 inches, and depth to water table is approximately 0-6 inches. Every effort shall be made to avoid unnecessary compaction of these soils during construction. It is recommended that the limits of disturbance be **further** limited for heavy equipment to ensure that the quality of these beneficial soils be maintained. Soil restoration is **required** based on Section 5.1.6 of Chapter 5 in the New York State Stormwater Management Design Manual

(NYSSMDM), January 2015. The Contractor is responsible for ensuring these methodologies are followed based on the table below (From Table 5.3 of the NYSSMDM, 2015):

Soil Restoration Requirements		
Type of Soil Disturbance	Soil Restoration Requirement	
No soil disturbance	Restoration not permitted.	
Minimal soil disturbance	Restoration not required.	
Areas where topsoil is stripped only - no change in grade	HSG A & B	HSG C & D
	apply 6 inches of topsoil	Aerate* and apply 6 inches of topsoil
Areas of cut or fill	HSG A & B	HSG C & D
	Aerate* and apply 6 inches of topsoil	Apply full soil restoration**
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (de-compaction and compost enhancement).	
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.	
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.	
<p><u>Notes:</u></p> <p>*Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.</p> <p>** Per "Deep Ripping and De-compaction, DEC 2008."</p>		

### 1.8 Potential Sources of Pollution

Potential sources of sediment to stormwater runoff include:

- Surcharging of the WWTF site (soil disturbance and stockpiling, dust, equipment tracking);
- Installation of site structures (soil disturbance and stockpiling, dust, equipment tracking);
- Construction of the driveway and parking areas (dust, equipment tracking);

- Open trench installation of utilities (soil disturbance and stockpiling, dust, equipment tracking);
- Installation of green infrastructure practices (excavation, soil disturbance and stockpiling, dust, equipment tracking);
- Soil decompaction activities (equipment tracking and dust);
- Equipment staging (tracking of sediment); and
- Soil stockpiles (dust, sediment).

All construction plans will receive adequate attention to erosion and sediment control measures as discussed herein.

Potential pollutants and sources, other than sediment, to stormwater runoff include:

- The introduction of fluids from equipment and construction vehicles to the site. Tools and equipment requiring washing shall be washed in a designated washout location that is appropriately constructed to prevent pollutants from exiting the site or entering the stormwater system. All debris resulting from washouts shall be removed and properly disposed of. Potential wastes and products that may be stored on-site include grubbing wastes, packaging materials, building materials, paints and thinners, cleaning solvents, pesticides, petroleum products, and fertilizers. Fluids shall be stored within a lined, bermed location per prevailing federal, state, and local regulations.
- The introduction of concrete and asphalt to the site. Proper precautions (installation of designated concrete wash-out areas) will be taken to prevent transfer of these pollutants offsite. The best management practices outlined in Section 2 should be sufficient to

prevent typical construction wastes from impacting stormwater quality.

- Fertilizers utilized in planting medium may introduce other pollutant sources.

### 1.9 Endangered Species Certification

**Are endangered or threatened species and critical habitats on or near the project area?**

**Yes**                       **No**

B&L conducted a review of the U.S. Fish and Wildlife Service's Information, Planning, and Conservation System and the NYSDEC Division of Fish, Wildlife, and Marina Resources database regarding the existence of threatened and endangered species within or adjacent to the project area. Two federally-listed threatened species (Leedy's roseroot and the northern long-eared bat) and one state-listed threatened species (bald eagle) were identified in the vicinity of the proposed WWTF site and associated conveyance systems. Various mitigation actions have been proposed as part of this project, and the necessary permits have been sought. These assessments are included in Appendix I.

### 1.10 Historic Preservation

**Are there any historic sites on or near the construction site?**

**Yes**                       **No**

According to the New York State Historic Preservation Office (SHPO) letter from March 19, 2015, SHPO has determined that the project site is located within an archeologically sensitive area. Additionally, four historic sites are listed on the National Register within the Village of Watkins Glen, and two sites within Montour Falls. A Phase 1B Cultural Resource Reconnaissance Survey was completed in June 2015 and concluded that no negative impacts to cultural or archaeological resources are anticipated for this project. Documentation is provided in Appendix I.

## **2.0 Erosion and Sediment Control Practices**

All Best Management Practices (BMPs) will be in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control and the most current version of the New York State Stormwater Management Design Manual.

### **2.1 Stabilized Construction Entrance**

A stabilized construction entrance may be installed at the point of ingress to the WWTF site, and at the points of ingress and egress from the construction staging area. The entrance will consist of stabilized pads of aggregate underlain by filter cloth. The Contractor will be required to construct the entrances and temporary access routes in accordance with the details included in the most current version of the New York State Standards and Specifications for Erosion and Sediment Control. The stabilized construction entrance and access routes are temporary erosion and sediment control devices, and require removal following site stabilization.

### **2.2 Silt Fence**

Silt fence will be installed throughout the jobsite where sensitive areas are downslope of construction. The silt fence will reduce runoff velocity and enable the deposition of sediment. All construction specifications will be in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control. Silt fence is a temporary practice.

### **2.3 Fiber Roll**

Fiber roll may be installed along swales to reduce runoff velocity and enable the localized deposition of sediment. The fiber roll will reduce runoff

velocity and enable the deposition of sediment. All construction specifications will be in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control. Fiber rolls are a temporary practice.

#### 2.4 Protecting Vegetation During Construction

Protection of vegetation during construction will include protection of existing trees, shrubs, ground cover and other vegetation from damage by construction equipment. This will be by way of installing orange warning fence to caution against encroachment. Warning fence is a temporary measure and will require removal following site stabilization.

#### 2.5 Catch Basin Inlet Protection

Catch basin inlet protection will be installed around any catch basins located within or immediately adjacent to the limit of work. This is a temporary installation and will be installed prior to any construction taking place upgradient or immediately adjacent to existing or proposed catch basins. Catch basin inlet protection is to prevent sediment laden water from entering a catch basin inlet and will be constructed in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control.

#### 2.6 Land Grading and Surface Roughening

Land grading and surface roughening shall be conducted in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment. All disturbed areas shall be stabilized structurally or vegetatively in compliance with the SPDES permit requirements. All graded areas shall be permanently stabilized immediately following finished grading. Surface roughening shall be conducted on all slopes steeper than 3:1. Approved methods include tracking, grooving and stair-stepping.

## 2.7 Topsoil

Topsoil from excavated areas will be reapplied to graded areas to provide acceptable plant growing conditions, reducing erosion, irrigation needs, and the need for nitrogen fertilizer. Subsoil is to be scarified, and all compacted areas decompact to a minimum depth of 12-inches prior to topsoiling. Debris, woody plant parts, and stones over 3 inches in diameter are to be removed prior to application. Topsoil shall be distributed to a uniform depth and shall not be placed when frozen or saturated or on top of ice, snow, frozen subsoil, or standing water. Topsoil placed on slopes greater than five percent (5%) shall be promptly stabilized by “tracking” and seeded and mulched. Topsoiling standards and specifications will be in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control.

## 2.8 Temporary and Permanent Seeding

All areas that are left bare or in which work has suspended for more than one week (7 days) will be seeded and mulched in accordance with standards and specifications of the most current version of the New York State Standards and Specifications for Erosion and Sediment Control.

- Site preparation will include:
  - Scarify, if compacted
  - Maintain a pH of 6.0 to 7.0
  - Fertilize with phosphorus-free fertilizer per manufacturer's recommended application rates
- For temporary seeding, use Ryegrass (annual or perennial) at 30 lbs. per acre or Winter Rye at 100 lbs. per acre (October/November).
- For permanent seeding the above site preparation will be conducted and the site will be seeded in accordance with the



project specifications. If no specifications are provided, seed with a mixture of 45% by weight Kentucky Bluegrass, 40% Red Fescue, 15% Red Top at 220 lbs per acre.

- Irrigation of temporary and permanent seeding shall be conducted as necessary to encourage the required vegetative stand.
- Final site stabilization will be defined as permanent cover of at least 80% of the entire project site. **Note that at the conclusion of construction activities, a vegetative cover density of less than 80% of the vegetated area will require the continuation of regular weekly inspections and that a Notice of Termination cannot be submitted if the vegetative stand is less than 80%.**

## 2.9 Mulching

Mulching will be used on soils subject to erosion and on areas of new seeding. Mulch is to be applied after site preparation, soil amendments and planting is accomplished. Cereal grain straw mulch is to be applied at 90 lbs. per 1,000 sq. ft. (two (2) tons per acre) and anchored with wood fiber hydromulch at 11 to 17 lbs. per sq. ft. (500-750 lbs. per acre). Mulching standards and specifications will be in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control.

## 2.10 Soil Restoration

Soil restoration shall be conducted on all areas of the site where soils have been disturbed, including equipment and stockpile areas; however, soil restoration is not required along the water main installation portion of this project. Soil restoration is applied in the cleanup, restoration, and landscaping phase of construction and is followed by permanent establishment of vegetation. After the disturbed soils are rough graded, the subsoils must be tilled, layered with topsoil,

and vegetated in accordance with the New York State Stormwater Design Manual, January 2015 and the contract drawings.

#### 2.11 Dust Control (As Needed)

Dust control will be conducted via spraying water on an as-needed basis, as determined by the Engineer, Inspector, and Trained Contractor. Dust control standards and specifications will be in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control.

#### 2.12 Equipment and Laydown Areas

Designated staging areas shall be utilized for storage of all equipment on-site throughout the course of construction. These areas shall be located away from waterways and sensitive areas. Foam berms will be utilized around the equipment lay down areas. These berms will be adhered to impervious surfaces or pinned into pervious surfaces to create a containment area for spills.

Berms will be resistant to oils, coolants, and most chemicals. Upon discovery, all contained spills or leaks from the equipment lay down area must be cleaned up and reported to both the Owner and the NYSDEC, if required, in accordance with applicable State and Federal regulations.

#### 2.13 Temporary Stockpile Areas

Temporary stockpile areas shall be surrounded with a layer of fiber roll as necessary to prevent sedimentation of material onto adjacent property. Stockpiles shall not be located adjacent to a waterway and shall not remain exposed for greater than 7 days unless they are to be utilized or moved within 14 days of last exposure or use. Sideslopes of 1:4 shall be constructed.

## 2.14 Check Dams

Check dams shall be used in existing or constructed swales until upgradient land is stabilized. These may be rock check dams or prefabricated logs. Check dams standards and specifications will be in accordance with the most current version of the New York State Standards and Specifications for Erosion and Sediment Control.

## 2.15 Concrete Washout

Concrete washouts shall be used to wash any concrete, asphalt, or other pollutant off of vehicles and equipment. This area shall be designed per EPA standards and should not be placed within 50 feet of storm drains, open ditches, or waterbodies. The washout shall be constructed in a location that allows convenient access for concrete trucks, preferably near where the concrete is to be poured. Appropriate gravel or rock should cover paths to concrete washout facilities if the facilities are located on undeveloped property. These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.

## 2.16 Rolled Erosion Control Product (RECP)

A biodegradable erosion control product that is designed for short term to intermediate term erosion protection and vegetation establishment on steep slopes, medium- to high-flow channels, and shorelines will be utilized. **Areas within 50 feet of a surface water feature, areas corresponding to constructed stormwater channels, and areas corresponding to a slope of 15% or greater, must receive RECP.** After the blankets degrade, soil erosion is controlled by the mature vegetation's root, stem, and leaf structures. Rolled erosion control product shall be installed in accordance with manufacturer's recommendations and specifications and to the satisfaction of the Engineer and SWPPP Inspector.

## 2.17 Erosion and Sediment Control Implementation and Maintenance

The following table provides a summary of erosion and sediment control implementation:

<b>Table 1: Erosion and Sediment Control Implementation Plan</b>			
<b>Practice</b>	<b>Duration</b>	<b>Time of Implementation</b>	<b>Time of Removal</b>
Stabilized Construction Entrance	Temporary	Prior to construction.	Upon completion of construction and after final site stabilization.
Silt Fence/Fiber Roll	Temporary	After installing construction entrance; prior to earth disturbing activities.	Upon upgradient site stabilization.
Temporary Seeding	Temporary	Prior to any exposed earth being left for a period of 14 days or more.	Upon reconvening site work in location of temporary seeding.
Catch Basin Inlet Protection	Temporary	Prior to construction.	Upon upgradient site stabilization.
Dust Control	Temporary	As needed.	Upon construction completion.
Equipment Laydown Areas	Temporary	Prior to commencement of construction.	Upon completion of construction and just before final stabilization.
Temporary Stockpiles	Temporary	Upon commencement of earthmoving activity.	Upon completion of final grading.
Check Dams	Permanent	Prior to construction upgradient of existing or proposed swales.	To be removed upon final stabilization of upgradient contributing areas.
Concrete Washout	Temporary	Prior to commencement of construction.	Upon completion of construction and just before final stabilization.
Permanent Seeding	Permanent	Immediately upon final grading of areas to be vegetated	Not to be removed

The following table provides a summary of erosion and sediment control maintenance:

<b>Table 2: Erosion and Sediment Control Maintenance Plan-Maintenance Measures</b>				
<b>Practice</b>	<b>Duration</b>	<b>Maintenance Required</b>	<b>Maintenance Frequency</b>	<b>Responsible Party</b>
Stabilized Construction Entrance	Temporary	Replacement of gravel when voids are full.	As sediment fills the voids of the aggregate or every two weeks (whichever occurs first).	Contractor
Silt Fence/Fiber Roll	Temporary	Replace upon identification of damaged materials and when sediment reaches half the height of the fiber roll.	Inspect daily and after each runoff event.	Contractor
Temporary Seeding	Temporary	Reseed bare spots, water to establish growth, keep free of vehicular travel.	Weekly until stabilization occurs.	Contractor
Catch Basin Inlet Protection	Temporary	Replace upon identification of damaged materials and when sediment reaches half the height of the inlet barrier.	Inspect daily and after each runoff event.	Contractor
Dust Control	Temporary	N/A	Throughout dry weather periods until site is stabilized.	Contractor
Equipment Laydown Areas	Temporary	Repair or replacement of barrier.	Inspect daily and after each runoff event. If torn or leaking, replace immediately.	Contractor
Temporary Stockpiles	Temporary	Ensure appropriate side slopes and functioning perimeter barriers.	Weekly	Contractor
Check Dams	Permanent	Removal of sediment or replacement of check dam when 50% capacity is reached or voids are full.	Weekly during construction/yearly or when 50% capacity is reached (whichever occurs first)	Contractor/Owner
Concrete Washout	Temporary	Remove hardened concrete and clean area when 75% capacity is reached.	Weekly	Contractor
Permanent Seeding	Permanent	Reseed bare spots, water to establish growth, keep free of vehicular travel.	Weekly until growth is established.	Contractor/Owner

<b>Table 2: Erosion and Sediment Control Maintenance Plan-Maintenance Measures</b>				
<b>Practice</b>	<b>Duration</b>	<b>Maintenance Required</b>	<b>Maintenance Frequency</b>	<b>Responsible Party</b>
Notes:				
1) All erosion and sediment control practices will be installed and operation prior to start of work upgradient of the practice.				
2) Temporary practices will remain in place and operational until vegetative site stabilization, as directed by the Engineer.				
3) Practices will be inspected weekly in accordance with GP-0-15-002.				
4) The Contractor is responsible for installation and maintenance until submittal of Notice of Termination.				

<b>Table 3: Best Management Practice Category</b>		
<b>Practice</b>	<b>Duration</b>	<b>Category</b>
Stabilized Construction Entrance	Temporary	Establish stabilized construction exits.
Silt Fence/Fiber Roll	Temporary	Protect Slopes, Minimize disturbed area and protect natural features and soil. Establish perimeter controls and sediment barriers. Retain sediment on-site.
Temporary Seeding	Temporary	Protect slopes, stabilize soils, and retain sediment onsite.
Catch Basin Inlet Protection	Temporary	Retain sediment on-site.
Dust Control	Temporary	Retain sediment on-site.
Equipment Laydown Areas	Temporary	Retain sediment onsite. Establish perimeter controls.
Temporary Stockpiles	Temporary	Retain sediment onsite
Check Dams	Temporary	Retain sediment onsite. Protect storm drain inlets.
Concrete Washout	Temporary	Retain sediment onsite.
Permanent Seeding and Site Stabilization	Permanent	Protect slopes, stabilize soils, and retain sediment onsite.

### **3.0 Post-Construction Stormwater Management**

In accordance with the New York State Stormwater Management Design Manual, the hydrologic and hydraulic analyses were conducted to meet the following criteria:

1. Water Quality Volume - The water quality treatment volume is designed to improve water quality by capturing and treating 90 percent of the average annual stormwater runoff volume.
2. Channel Protection - The channel protection volume is based upon the 1-year, 24-hour storm event and is defined as the difference between the center of mass of the inflow hydrograph as compared to the center of mass of the outflow hydrograph leaving the stormwater management practice.
3. Overbank Flood Protection - This criterion must be met by controlling the peak discharge from the 10-year post-development storm event to the 10-year.
4. Extreme Storm Protection - This criterion must be met by controlling the peak discharge from the 100-year post-development storm event to the 100-year pre-development rates.
5. Runoff Reduction Volume – The runoff reduction volume is designed to reduce the amount of runoff leaving a site by capturing and infiltrating, onsite, the water quality volume.

The WWTF site was the only portion of the project evaluated for post-construction stormwater management, as the remainder of the project is linear utility. Channel protection volume, overbank flood protection, and extreme storm protection are not required for this project as the WWTF site discharges to the Barge Canal, which is considered by NYSDEC to be a fifth order stream.

### 3.1 Water Quality Volume

The water quality volume (WQ<sub>v</sub>) is designed to improve the water quality exiting the site by capturing and treating 90% of the average annual stormwater runoff volume. The WQ<sub>v</sub> requirement (in acre-feet) for the WWTF was calculated as follows, shown in Table 4 (see Appendix D for calculations):

$$WQ_v = [(P) (R_v) (A)]/12 \text{ where,}$$

$$R_v = 0.05 + [(0.009) (I)] \text{ where,}$$

I = Percent Impervious Cover  
P = 90% Rainfall Event  
A = Contributing Area (acres)

P	I	R <sub>v</sub>	A	Required WQ <sub>v</sub>	
				Acre-Feet	Feet <sup>3</sup>
1	47	0.47	5.102	0.201	8,734

### 3.2 Water Quantity

Currently, there is no stormwater conveyance system onsite. In future conditions, drainage patterns will be modified as flow will be directed to the bioretention area on the western side of the WWTF property, which will discharge to the Barge Canal via the outlet control device. The Barge Canal is considered by NYSDEC to be a fifth order stream; therefore, channel protection volume, overbank flood protection, and extreme flood protection are not required for this project.

### 3.3 Runoff Reduction Volume

The runoff reduction volume (RR<sub>v</sub>) is designed to reduce the stormwater volume leaving the site by capturing an amount equal to the computed water quality volume and infiltrating it onsite. It is equal to the Water Quality Volume. However, for sites that cannot reduce runoff in the amount equal to the water



quality volume, a minimum RRv is allowed. The minimum RRv requirement (in acre-feet) was calculated as follows, shown in Table 8 (see Appendix D for calculations):

$$RRv = [(P)(Rv)(S)(Aic)]/12 \text{ where,}$$

$$Rv = 0.05 + [(0.009)(I)] \text{ (Min Rv not to be less than 0.2)}$$

I = Percent impervious cover (must be 100%)  
P = 90% rainfall event  
S = Hydrologic Soil Group reduction factor  
Aic = Total area of new impervious cover (acres)

P	I	Rv	S	Aic	Required RRv	
					Acre-Feet	Feet <sup>3</sup>
1	100	0.950	0.2	2.39	0.038	1,648

Runoff reduction volume is based on the area of impervious cover at the site. This must be managed by use of Green Infrastructure Planning and Design techniques and, if needed, standard management practices with runoff reduction volume capacity.

### 3.4 Selected Permanent Stormwater Management Practices

The techniques listed in this section are permanent stormwater management practices that address all required stormwater sizing requirements. These are not only standard management or proprietary practices, but also green infrastructure planning and design methods. All practices identified herein as addressing sizing requirements for this project are illustrated on the site plan. Due to the requirements of GP-0-15-002, which references the New York State Stormwater Management Design Manual (January 2015), all practices identified herein will be equipped with a stormwater management sign meeting the following criteria:

- Not less than 18" x 24" (or 10" x 12" for footprints smaller than 400 sf)

- Must bear the following information:
  - ◆ STORMWATER MANAGEMENT PRACTICE - (name of the practice)
  - ◆ Project Identification - (SPDES Construction Permit #, other)
  - ◆ Must Be Maintained In Accordance With O&M Plan
  - ◆ DO NOT REMOVE OR ALTER

Signage is part of the construction contract, and shall be provided by the contractor as identified on the site plan, and for each practice identified for use herein.

#### *3.4.1 Water Quality Volume*

A Type F-5 bioretention area will be constructed in conformance with Section 6 of the 2015 Stormwater Management Design Manual. The bioretention area on the western side of the site will treat runoff from the WWTF buildings and asphalt driveways. The bioretention area is approximately 490 feet long by 16.5 feet wide, providing a surface area of 8,085 square feet. The depth of soil media is 2.5 feet, providing a total RRV benefit of 3,881 cubic feet and meeting the full WQv requirement of 8,734 cubic feet. WQv and RRV calculations are provided in Appendix D.

#### *3.4.2 Runoff Reduction Volume - Green Infrastructure*

Runoff reduction planning practices, including reduction of clearing and grading by limiting the site footprint to the extent possible and parking and sidewalk reductions, were incorporated into the project design process. The bioretention practice will exceed the minimum runoff reduction requirement.

Soil restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. Healthy soil is vital to a sustainable environment and landscape. A deep, well drained soil, rich in organic matter, absorbs rainwater, helps prevent flooding and soil erosion, filters out water pollutants, and promotes vigorous plant growth that requires less irrigation, pesticides, and fertilizer. Soil restoration will be conducted as outlined in Section 1.7.

### *3.4.3 RRv Exception – Hydrologic Soil Group Factor*

Every attempt to meet a RRv greater than the minimum has been made. However, this site is not amenable to infiltrating 100% of the WQv. The HSG D soils and lack of infiltration capacity in the site soils prevent this site from reducing 100% of the WQv; however, treatment of more than the minimum RRv will be met through the bioretention practice.

#### **4.0 Good Housekeeping BMPs**

The following best management practices should be implemented to ensure the proper storage and disposal of construction site wastes:

- Designate waste collection areas that do not receive significant runoff from upland areas and that are not adjacent to water bodies.
- Waste containers should be covered.
- Waste collection should be scheduled at appropriate intervals to prevent overflowing of containers.
- All maintenance and washing of vehicles shall be conducted off-site.
- Any spills should be cleaned up immediately and disposed of in accordance with applicable state and local laws.
- Contractor should have adequate spill prevention materials (i.e., absorbent pads, booms, etc.) on-site.
- Any petroleum products stored on-site should be placed in curbed/diked areas.
- In the event of a spill occurrence, the actions outlined in the NYSDEC's May 1, 1996 Technical Field Guidance for Spill Reporting and Initial Notification Requirements shall be adhered to (see Appendix J).
- Disposal of hazardous waste (non-petroleum) should be conducted as follows:
  - a. In accordance with local hazardous waste management authorities, and State and Federal regulations.
  - b. Containers should be emptied prior to disposal.
  - c. Product labels from containers should not be removed.
  - d. All hazardous waste containers should be stored in a dry, curbed/diked area per environmental regulations.

- All sanitary waste generated on-site should be disposed of in accordance with local and State regulations.
- Pesticides and fertilizers should be stored in a dry, curbed/diked area.
- Manufacturer's application rates should be adhered to, and pesticides shall be applied by licensed or certified personnel where applicable.
- All storage areas and waste containers should be included in the regular inspection program of the site.

Potential wastes and products that may be stored on-site include grubbing wastes, packaging materials, building materials, paints and thinners, cleaning solvents, pesticides, petroleum products, and fertilizers. The Contractor is responsible for implementation of additional best management practices necessary to protect water quality.

## 5.0 Inspections and Maintenance

### 5.1 Site Inspections

Inspections are required to be performed by a Qualified Inspector, which is a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), licensed Landscape Architect, or other Department-endorsed individual(s). The qualified inspector must also be working under the direct supervision of the licensed Professional Engineer or licensed Landscape Architect, provided that person has received at least four (4) hours of Department-endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department-endorsed entity as outlined in the General Permit in Appendix A.

Unless otherwise notified by the NYSDEC, the qualified inspector shall conduct site inspections in accordance with the following schedule:

- At least once every seven calendar days.
- For construction sites where soil disturbance activities are ongoing and have NYSDEC approval to disturb greater than five acres of soil at any one time, the qualified inspector shall conduct at least two site inspections every seven calendar days. When performing just two inspections every seven calendar days, the inspections shall be separated by a minimum of two full calendar days.
- For construction sites where soil disturbance activities have been temporarily suspended (e.g., winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the qualified inspector shall conduct a site inspection at least once every 30 calendar days.

For construction sites where soil disturbance activities have been shut down with partial project completion, the qualified inspector can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved final stabilization and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

At a minimum, the qualified inspector shall inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved final stabilization, all points of discharge to natural surface water bodies located within or adjacent to the construction site, and all points of discharge from the construction site.

The qualified inspector shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

- a. Date and time of inspection;
- b. Name and title of person(s) performing inspection;
- c. A description of the weather and soil conditions (e.g., dry, wet, saturated) at the time of the inspection;
- d. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems (i.e., pipes, culverts, ditches, etc.) and overland flow;
- e. A description of the condition of all natural surface water bodies located within or immediately adjacent to the construction site

which receive runoff from disturbed areas, including identification of any discharges of sediment to the surface water body;

- f. Identification of all erosion and sediment control practices that need repair or maintenance;
- g. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;
- h. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;
- i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;
- j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and
- k. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective action. Color copies of the digital photographs shall be attached to the inspection report maintained on-site within seven calendar days of the date of inspection. The qualified inspector shall also take digital photographs, with date stamp, that clearly show the condition of the practices after the corrective action has been completed, and color copies of the photos shall be attached to the inspection report that documents the completion of the corrective action work within seven calendar days of the date of that inspection.



Within one business day of the completion of an inspection, the qualified inspector shall notify the Owner, appropriate Contractor (or Subcontractor) of any corrective actions that need to be taken. The Contractor (or subcontractor) shall begin implementing the corrective actions within one (1) business day of this notification and shall complete the corrective actions within seven (7) calendar days from initial notification.

All inspection reports shall be signed by the qualified inspector. Sample inspection reports are included as Appendix E.

## 5.2 Maintenance of Stormwater Controls

Following termination of the SPDES permit, the Villages of Watkins Glen and Montour Falls will be responsible for the maintenance of the permanent post-construction practice, the bioretention area at the Regional WWTF. The logs provided in Appendix M shall be utilized to document post-construction inspection and maintenance.

## 5.3 Corrective Action Log

The corrective action log is attached as Appendix F of the SWPPP.

## 6.0 Recordkeeping and Training

### 6.1 Recordkeeping

The following is a list of records to keep onsite, available for inspectors to review:

- Dates of grading, construction activity, and stabilization.
- A copy of the construction general permit (attached).
- The signed and certified NOI form or permit application form (attached).
- A copy of the letter from the NYSDEC notifying you of their receipt of your complete NOI/application (to be attached upon receipt).
- Inspection reports (attached – keep all completed reports onsite).
- Records relating to endangered species and historic preservation (attached).
- Owner Certification (attached)
- Contractor/Subcontractor Certification (including NYSDEC trained Contractor Certification – to be attached upon receipt)
- Verification of 4-hr Contractor Training for on-site Contractor stormwater pollution control representative (to be attached upon receipt)

### 6.2 Log of Changes to the SWPPP

The SWPPP change/update log is attached as Appendix G of the SWPPP.

## **7.0 Notice of Termination**

Following the final inspection, a Notice of Termination (NOT) shall be filed with the NYSDEC in accordance with the SPDES Permit GP-0-15-002. The NOT will include a certification that the permanent stormwater management facilities have been constructed in accordance with the SWPPP. Prior to submittal of the NOT, an Operation and Maintenance Manual is required to be prepared for the permanent stormwater management facilities. The NOT form is included as Appendix K.

**8.0 Contractor Certification**

Each contractor and subcontractor responsible for implementing the SWPPP, as presented herein, must sign the following:

"I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings. "

Contractor is responsible for installing additional control measures as needed to prevent water quality violations and to maintain compliance with all applicable permits. Contractor is responsible for any penalties and violations associated with water quality violations or non-compliance with SPDES Permits.

_____	_____
Name	
_____	_____
Title*	Address
_____	_____
Date	Telephone Number

Specific Elements of the SWPPP that Contractor is Responsible for:

\_\_\_\_\_

Name and Title of Contractor's *Trained Individual(s)* Responsible for SWPPP Implementation:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**9.0 Subcontractor Certification**

Each contractor and subcontractor responsible for implementing the SWPPP, as presented herein, must sign the following:

"I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings. "

Contractor is responsible for installing additional control measures as needed to prevent water quality violations and to maintain compliance with all applicable permits. Contractor is responsible for any penalties and violations associated with water quality violations or non-compliance with SPDES Permits.

_____	_____
Name	
_____	_____
Title*	Address
_____	_____
Date	Telephone Number

Specific Elements of the SWPPP that Contractor is Responsible for:

\_\_\_\_\_

Name and Title of Contractor's *Trained Individual(s)* Responsible for SWPPP Implementation:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## **10.0 Owner Certification**

Refer to Appendix B for the Owner Certification within the Notice of Intent form.

## **11.0 References**

New York Standards and Specifications for Erosion and Sediment Control, NYSDEC, February 2016

New York State Stormwater Management Design Manual, Center for Watershed Protection, January 2015

NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-15-002), NYSDEC, January 2015

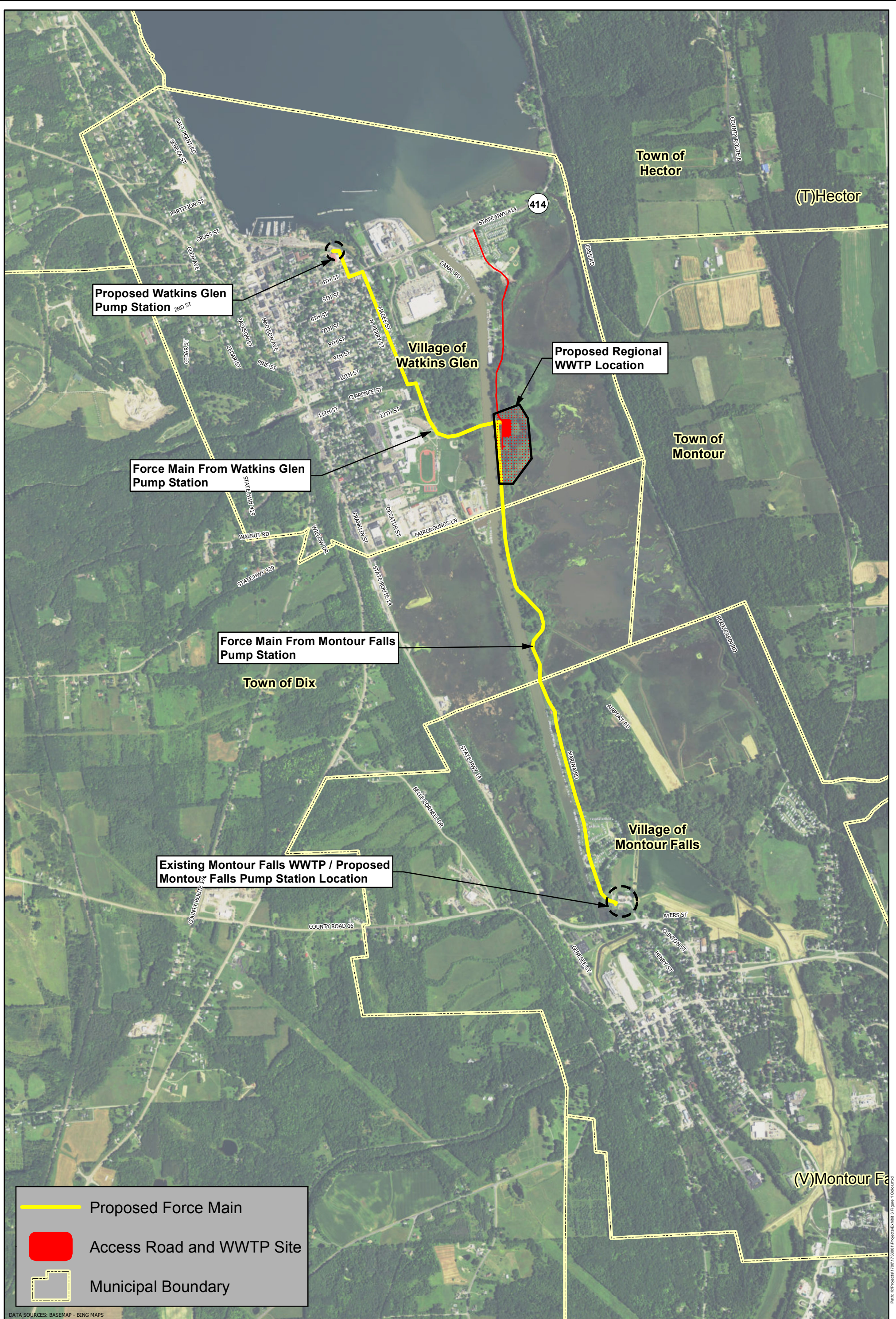
Developing Your Stormwater Pollution Prevention Plan, USEPA, January 2007

Stormwater Menu of BMPs, USEPA, June 1, 2006

Web Soil Survey, USDA NRCS

**Figure 1**  
**Project Location Map**





DATA SOURCES: BASEMAP - BING MAPS



1 inch = 1,500 feet

Path: K:\Projects\1700\1733003\Project\GCH\3 - Figure 1 - Contour.dwg

**Figure 2**  
**Pre-Development Site Plan**

Plotted: Dec 07, 2016 - 7:21PM  
 Z:\BL-Vault\02\18217A02-1C71-4823-8927-9905C604147\0769000-769999\769423\1\1733003 C111 WMT Existing Site Plan (D 769423).dwg

Checked by: INITIALS  
 Drawn by: GRR  
 Designed by: GDM  
 In charge of: EAP



**EXISTING SITE PLAN**  
 SCALE: 1" = 50'-0"

NO ALTERATION PERMITTED  
 HEREON EXCEPT AS PROVIDED  
 UNDER SECTION 7209  
 SUBDIVISION 2 OF THE NEW  
 YORK STATE EDUCATION LAW.

90% DESIGN DRAWINGS

Significant Construction  
 Changes Are Shown

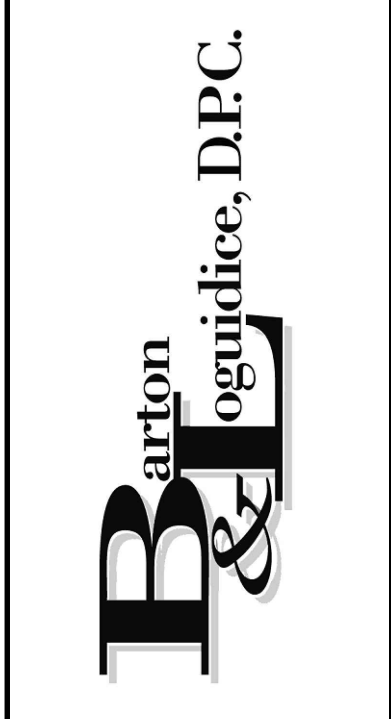
By \_\_\_\_\_ Date \_\_\_\_\_  
 Ck'd \_\_\_\_\_ Date \_\_\_\_\_

REVISIONS


VILLAGE OF WATKINS GLEN AND VILLAGE OF MONTAUR FALLS  
 REGIONAL WASTE WATER TREATMENT FACILITY  
 CONTRACT NO. 2A - GENERAL CONSTRUCTION

**PRE-DEVELOPMENT SITE PLAN**  
**PLAN**

VILLAGE OF WATKINS GLEN  
 SCHUYLER COUNTY, NEW YORK



Date  
 DECEMBER, 2016

Scale  
 AS SHOWN

Sheet Number  
**FIG 2**

Project Number  
 1733.003

**Figure 3**  
**Post-Development Site Plan**

NO ALTERATION PERMITTED  
HEREON EXCEPT AS PROVIDED  
UNDER SECTION 7209  
SUBDIVISION 2 OF THE NEW  
YORK STATE EDUCATION LAW.

90% DESIGN DRAWINGS

Significant Construction  
Changes Are Shown

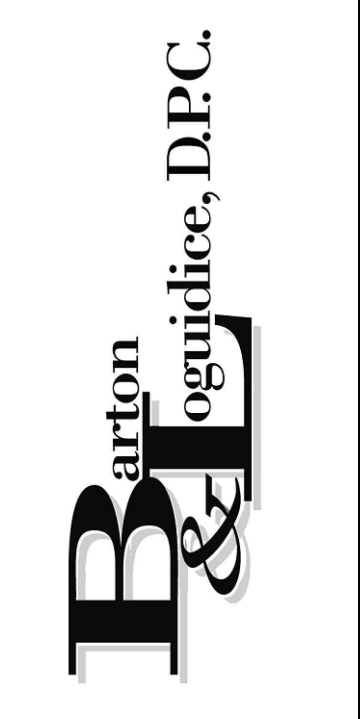
By \_\_\_\_\_ Date \_\_\_\_\_  
Ck'd \_\_\_\_\_ Date \_\_\_\_\_

REVISIONS	

VILLAGE OF WATKINS GLEN AND VILLAGE OF MONTAUR FALLS  
REGIONAL WASTE WATER TREATMENT FACILITY  
CONTRACT NO. 2A - GENERAL CONSTRUCTION  
**POST-DEVELOPMENT SITE PLAN**

SCHUYLER COUNTY, NEW YORK

VILLAGE OF WATKINS GLEN



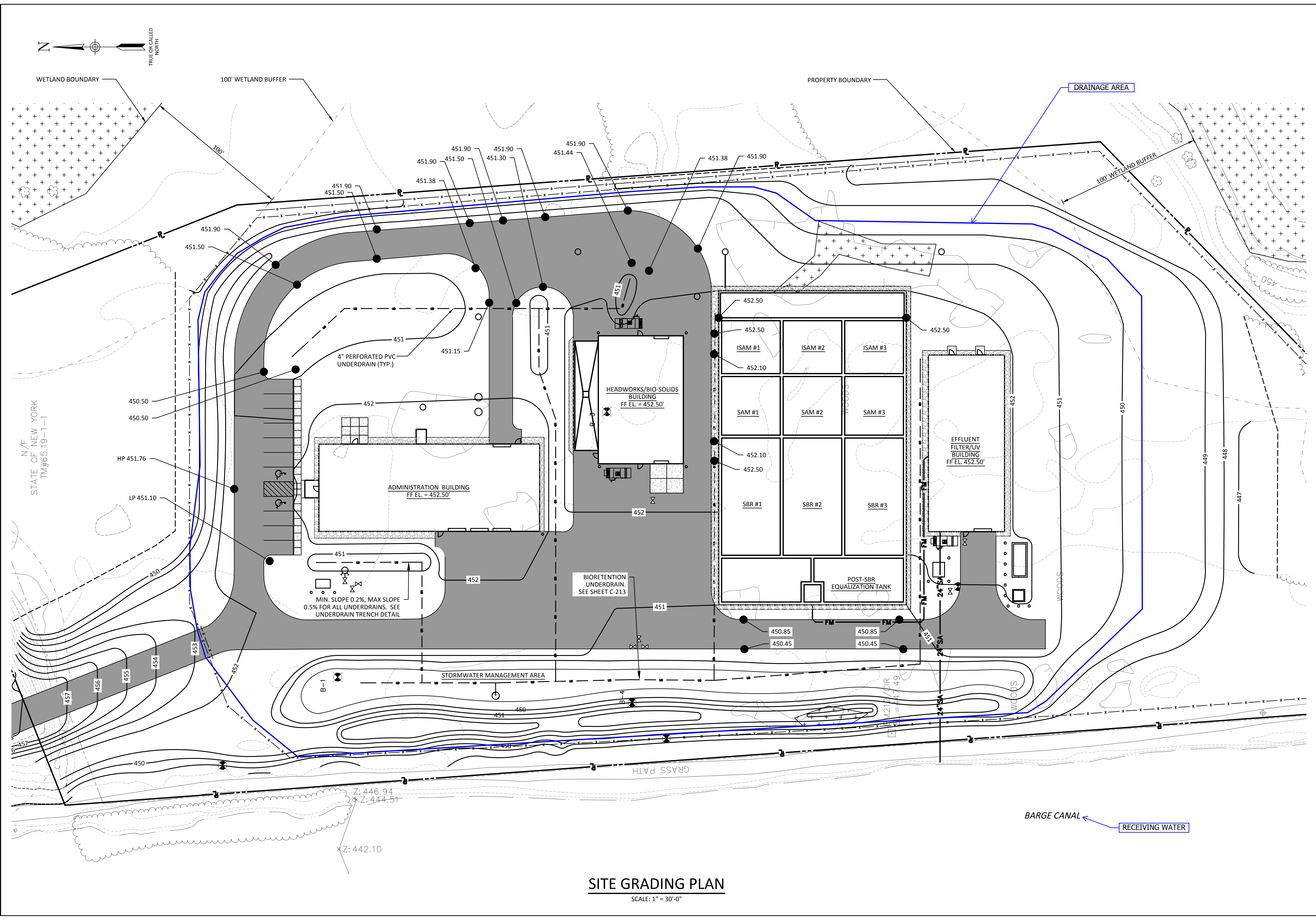
Date  
DECEMBER, 2016

Scale  
AS SHOWN

Sheet Number  
**FIG 3**

Project Number

1733.003



**SITE GRADING PLAN**

SCALE: 1" = 30'-0"

Plotted: Dec 09, 2016 - 12:41PM  
 Z:\BL-Vault\DD2\18217A02-1C71-4823-8927-9905C6054147\1014000-1014999\1014656\1\1733003\_C114\_WWTF\_Site Grading Plan (1014656).dwg  
 Checked by \_\_\_\_\_ INITIALS  
 Drawn by \_\_\_\_\_ GRR  
 Designed by \_\_\_\_\_ GDM  
 In charge of \_\_\_\_\_ EAP

N/F  
STATE OF NEW YORK  
TM #65,19-1-1

## **Appendix A**

### **SPDES General Permit GP-0-15-002**



Department of  
Environmental  
Conservation

NEW YORK STATE  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
SPDES GENERAL PERMIT  
FOR STORMWATER DISCHARGES

From

**CONSTRUCTION ACTIVITY**

Permit No. GP-0-15-002

Issued Pursuant to Article 17, Titles 7, 8 and Article 70  
of the Environmental Conservation Law

Effective Date: January 29, 2015

Expiration Date: January 28, 2020

John J. Ferguson  
Chief Permit Administrator

  
Authorized Signature

1 / 12 / 15

Date

Address: NYS DEC  
Division of Environmental Permits  
625 Broadway, 4th Floor  
Albany, N.Y. 12233-1750

## PREFACE

Pursuant to Section 402 of the Clean Water Act (“CWA”), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System (“NPDES”)* permit or by a state permit program. New York’s *State Pollutant Discharge Elimination System (“SPDES”)* is a NPDES-approved program with permits issued in accordance with the *Environmental Conservation Law (“ECL”)*.

This general permit (“permit”) is issued pursuant to Article 17, Titles 7, 8 and Article 70 of the ECL. An *owner or operator* may obtain coverage under this permit by submitting a Notice of Intent (“NOI”) to the Department. Copies of this permit and the NOI for New York are available by calling (518) 402-8109 or at any New York State Department of Environmental Conservation (“the Department”) regional office (see Appendix G). They are also available on the Department’s website at:

<http://www.dec.ny.gov/>

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of “*construction activity*”, as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a point source and therefore, pursuant to Article 17-0505 of the ECL, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. They cannot wait until there is an actual *discharge* from the construction site to obtain permit coverage.

**\*Note: The italicized words/phrases within this permit are defined in Appendix A.**



**NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES  
FROM CONSTRUCTION ACTIVITIES**

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(Part I)

I.

## Part I. PERMIT COVERAGE AND LIMITATIONS

### A. Permit Application

This permit authorizes stormwater *discharges to surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;
2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State*.
3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

### B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharges* authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge of pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the Stormwater Pollution Prevention Plan (“SWPPP”) the reason(s) for the deviation or alternative design and provide information

(Part I.B.1)

which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

- (i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharges*;
- (ii) Control stormwater *discharges* to *minimize* channel and streambank erosion and scour in the immediate vicinity of the *discharge* points;
- (iii) *Minimize* the amount of soil exposed during *construction activity*;
- (iv) *Minimize* the disturbance of *steep slopes*;
- (v) *Minimize* sediment *discharges* from the site;
- (vi) Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharges*, unless *infeasible*;
- (vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted; and
- (viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover.

b. **Soil Stabilization.** In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering.** *Discharges* from dewatering activities, including *discharges*

(Part I.B.1.c)

from dewatering of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures.** Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

- (i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;
- (ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and
- (iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited Discharges.** The following *discharges* are prohibited:

- (i) Wastewater from washout of concrete;
- (ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
- (iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;
- (iv) Soaps or solvents used in vehicle and equipment washing; and
- (v) Toxic or hazardous substances from a spill or other release.

f. **Surface Outlets.** When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion

(Part I.B.1.f)

at or below the outlet does not occur.

### **C. Post-construction Stormwater Management Practice Requirements**

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices (“SMPs”) are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.
2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

#### **a. Sizing Criteria for New Development**

- (i) Runoff Reduction Volume (“RRv”): Reduce the total Water Quality Volume (“WQv”) by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.
- (ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible*.

**In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual.** The remaining portion of the total WQv

(Part I.C.2.a.ii)

that cannot be reduced shall be treated by application of standard SMPs.

- (iii) Channel Protection Volume (“Cpv”): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
  - (1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
  - (2) The site *discharges* directly to tidal waters, or fifth order or larger streams.
- (iv) Overbank Flood Control Criteria (“Qp”): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
  - (1) the site *discharges* directly to tidal waters or fifth order or larger streams, or
  - (2) A downstream analysis reveals that overbank control is not required.
- (v) Extreme Flood Control Criteria (“Qf”): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
  - (1) the site *discharges* directly to tidal waters or fifth order or larger streams, or
  - (2) A downstream analysis reveals that overbank control is not required.

**b. Sizing Criteria for New Development in Enhanced Phosphorus Removal Watershed**

- (i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.
- (ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or

(Part I.C.2.b.ii)

standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible*.

**In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual.** The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

- (iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
  - (1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
  - (2) The site *discharges* directly to tidal waters, or fifth order or larger streams.
- (iv) Overbank Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
  - (1) the site *discharges* directly to tidal waters or fifth order or larger streams, or
  - (2) A downstream analysis reveals that overbank control is not required.
- (v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
  - (1) the site *discharges* directly to tidal waters or fifth order or larger streams, or
  - (2) A downstream analysis reveals that overbank control is not required.

**c. Sizing Criteria for Redevelopment Activity**



(Part I.C.2.c.i)

- (i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.
- (1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or
  - (2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or
  - (3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or
  - (4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

- (ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.
- (iii) Overbank Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(Part I.C.2.c.iv)

- (iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

**d. Sizing Criteria for Combination of Redevelopment Activity and New Development**

Construction projects that include both *New Development* and *Redevelopment Activity* shall provide post-construction stormwater management controls that meet the *sizing criteria* calculated as an aggregate of the *Sizing Criteria* in Part I.C.2.a. or b. of this permit for the *New Development* portion of the project and Part I.C.2.c of this permit for *Redevelopment Activity* portion of the project.

**D. Maintaining Water Quality**

The Department expects that compliance with the conditions of this permit will control *discharges* necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;
2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and
3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharges* authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharges* authorized by this permit are causing or contributing to a violation of *water quality standards*, or

(Part I.D)

if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharges* will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

#### **E. Eligibility Under This General Permit**

1. This permit may authorize all *discharges* of stormwater from *construction activity to surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.
2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharges* from *construction activities*.
3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater *discharges* may be authorized by this permit: *discharges* from firefighting activities; fire hydrant flushings; waters to which cleansers or other components have not been added that are used to wash vehicles or control dust in accordance with the SWPPP, routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated *groundwater* or spring water; uncontaminated *discharges* from construction site de-watering operations; and foundation or footing drains where flows are not contaminated with process materials such as solvents. For those entities required to obtain coverage under this permit, and who *discharge* as noted in this paragraph, and with the exception of flows from firefighting activities, these *discharges* must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.
4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

#### **F. Activities Which Are Ineligible for Coverage Under This General Permit**

All of the following are **not** authorized by this permit:

(Part I.F)

1. *Discharges after construction activities* have been completed and the site has undergone *final stabilization*;
2. *Discharges* that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;
3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;
4. *Construction activities* or *discharges from construction activities* that may adversely affect an endangered or threatened species unless the *owner or operator* has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.C.2 of this permit.
5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;
6. *Construction activities* for residential, commercial and institutional projects:
  - a. Where the *discharges* from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and
  - b. Which disturb one or more acres of land with no existing *impervious cover*; and
  - c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture (“USDA”) Soil Survey for the County where the disturbance will occur.
7. *Construction activities* for linear transportation projects and linear utility projects:
  - a. Where the *discharges* from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and
  - b. Which disturb two or more acres of land with no existing *impervious cover*; and
  - c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the USDA Soil Survey for the County where the disturbance will occur.

(Part I.F.8)

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.C.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:
- a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the construction site within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the construction site within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.
    - 1-5 acres of disturbance - 20 feet
    - 5-20 acres of disturbance - 50 feet
    - 20+ acres of disturbance - 100 feet, or
  - b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
    - (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
    - (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
    - (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
    - (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or
  - c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:
    - (i) No Affect
    - (ii) No Adverse Affect

(Part I.F.8.c.iii)

(iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharges from construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

## II. Part II. OBTAINING PERMIT COVERAGE

### A. Notice of Intent (NOI) Submittal

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed NOI form to the Department in order to be authorized to *discharge* under this permit. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (<http://www.dec.ny.gov/>). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address.

**NOTICE OF INTENT  
NYS DEC, Bureau of Water Permits  
625 Broadway, 4<sup>th</sup> Floor  
Albany, New York 12233-3505**

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the "MS4 SWPPP Acceptance" form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI.

The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the address in Part II.A.1.

(Part II.A.2)

The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.E. (*Change of Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4*.

3. The *owner or operator* shall have the SWPPP preparer sign the “SWPPP Preparer Certification” statement on the NOI prior to submitting the form to the Department.
4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

## **B. Permit Authorization**

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.
2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:
  - a. project review pursuant to the State Environmental Quality Review Act (“SEQRA”) have been satisfied, when SEQRA is applicable. See the Department’s website (<http://www.dec.ny.gov/>) for more information,
  - b. where required, all necessary Department permits subject to the *Uniform Procedures Act (“UPA”)* (see 6 NYCRR Part 621) have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators of construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,
  - c. the final SWPPP has been prepared, and
  - d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.
3. An *owner or operator* that has satisfied the requirements of Part II.B.2 above

(Part II.B.3)

will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

a. For *construction activities* that are not subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

(ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has not been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

(iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed “MS4 SWPPP Acceptance” form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed “MS4 SWPPP Acceptance” form.

4. The Department may suspend or deny an *owner’s or operator’s* coverage



(Part II.B.4)

under this permit if the Department determines that the SWPPP does not meet the permit requirements. In accordance with statute, regulation, and the terms and conditions of this permit, the Department may deny coverage under this permit and require submittal of an application for an individual SPDES permit based on a review of the NOI or other information pursuant to Part II.

5. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.B. of this permit.

### **C. General Requirements For Owners or Operators With Permit Coverage**

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination (“NOT”) has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.
2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-15-002), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, and all documentation necessary to demonstrate eligibility with this permit at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.
3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land use control MS4*, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:
  - a. The *owner or operator* shall

(Part II.C.3.a)

have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

- b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005.
  - c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.
  - d. The *owner or operator* shall install any additional site specific practices needed to protect water quality.
  - e. The *owner or operator* shall include the requirements above in their SWPPP.
4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.
5. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the *regulated, traditional land use control MS4* in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice

(Part II.D)

#### **D. Permit Coverage for Discharges Authorized Under GP-0-10-001**

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-10-001), an *owner or operator* of a *construction activity* with coverage under GP-0-10-001, as of the effective date of GP-0-15-002, shall be authorized to *discharge* in accordance with GP-0-15-002, unless otherwise notified by the Department.

An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-15-002.

#### **E. Change of *Owner or Operator***

2. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.A.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or operator* was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

(Part III)

III. **Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)**

**A. General SWPPP Requirements**

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.
2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.
3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.
4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP:
  - a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;
  - b. whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the *discharge* of *pollutants*; and
  - c. to address issues or deficiencies identified during an inspection by the *qualified inspector*, the Department or other regulatory authority.
5. The Department may notify the *owner or operator* at any time that the

(Part III.A.5)

SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.C.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor*. The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharges* from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the

(Part III.A.6)

*trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the construction site. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

**B. Required SWPPP Contents**

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:
  - a. Background information about the scope of the project, including the location, type and size of project;
  - b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge(s)*;
  - c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);
  - d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other

(Part III.B.1.d)

activity at the site that results in soil disturbance;

- e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;
- f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;
- g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;
- h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;
- i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005;
- j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;
- k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the construction site; and
- l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated August 2005. Include the reason for the deviation or alternative design

(Part III.B.1.I)

and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

The post-construction stormwater management practice component of the SWPPP shall include the following:

- a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;
- b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;
- c. A Stormwater Modeling and Analysis Report that includes:
  - (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;
  - (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;
  - (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;
  - (iv) Summary table, with supporting calculations, which demonstrates



(Part III.B.2.c.iv)

that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

- (v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and
  - (vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;
- d. Soil testing results and locations (test pits, borings);
- e. Infiltration test results, when required; and
- f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.
3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria*, Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

### **C. Required SWPPP Components by Project Type**

Unless otherwise notified by the Department, *owners or operators of construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators of the construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

(Part IV)

#### IV. Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

##### A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.
2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York, or protect the public health and safety and/or the environment.

##### B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.
2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.
3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

##### C. Qualified Inspector Inspection Requirements

(Part IV.C)

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, with the exception of:
  - a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;
  - b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;
  - c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and
  - d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.
2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:
  - a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.
  - b. For construction sites where soil disturbance activities are on-going and

(Part IV.C.2.b)

the *owner or operator* has received authorization in accordance with Part II.C.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

- c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4*, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.
- d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4*, the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization*, and all temporary, structural erosion and sediment control measures have been removed; and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the “*Final Stabilization*” and “*Post-Construction Stormwater Management Practice*” certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.A.1 of this permit.
- e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall

(Part IV.C.2.e)

be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization*, all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of *discharge* from the construction site.
4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:
  - a. Date and time of inspection;
  - b. Name and title of person(s) performing inspection;
  - c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;
  - d. A description of the condition of the runoff at all points of *discharge* from the construction site. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;
  - e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;
  - f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;
  - g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;
  - h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

(Part IV.C.4.i)

- i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;
  - j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);
  - k. Identification and status of all corrective actions that were required by previous inspection; and
  - l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.
5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.
  6. All inspection reports shall be signed by the *qualified inspector*. Pursuant to Part II.C.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

## V. Part V. TERMINATION OF PERMIT COVERAGE

### A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.A.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

(Part V.A.2)

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:
  - a. Total project completion - All *construction activity* identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;
  - b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;
  - c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.E. of this permit.
  - d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.
3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the “*Final Stabilization*” and “*Post-Construction Stormwater Management Practice certification statements*” on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.
4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the “*MS4 Acceptance*” statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector’s* final site inspection certification(s) required in Part V.A.3. of this permit.

(Part V.A.5)

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:
  - a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,
  - b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),
  - c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,
  - d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

## VI. Part VI. REPORTING AND RETENTION OF RECORDS

### A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

### B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.A.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.



(Part VII)

**VII. Part VII. STANDARD PERMIT CONDITIONS**

**A. Duty to Comply**

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

**B. Continuation of the Expired General Permit**

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

**C. Enforcement**

Failure of the *owner or operator*, its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to \$37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

**D. Need to Halt or Reduce Activity Not a Defense**

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

(Part VII.E)

### **E. Duty to Mitigate**

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

### **F. Duty to Provide Information**

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

### **G. Other Information**

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit, or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

### **H. Signatory Requirements**

1. All NOIs and NOTs shall be signed as follows:
  - a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
    - (i) a president, secretary, treasurer, or vice-president of the

(Part VII.H.1.a.i)

corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

- (ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

- (i) the chief executive officer of the agency, or

- (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named

(Part VII.H.2.b)

individual or any individual occupying a named position) and,

- c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.
3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.
4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4*, or by a duly authorized representative of that person.

It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

#### **I. Property Rights**

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

#### **J. Severability**

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

#### **K. Requirement to Obtain Coverage Under an Alternative Permit**

1. The Department may require any *owner or operator* authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any *discharger* authorized by a general permit to apply for an individual SPDES permit, it shall notify the *discharger* in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from *owner or operator* receipt of the notification letter, whereby the authorization to

(Part VII.K.1)

*discharge* under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge(s)*, the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

#### **L. Proper Operation and Maintenance**

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

#### **M. Inspection and Entry**

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a construction site which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the *owner's or operator's* premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;
2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and
3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.
4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

(Part VII.N)

**N. Permit Actions**

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

**O. Definitions**

Definitions of key terms are included in Appendix A of this permit.

**P. Re-Opener Clause**

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with *construction activity* covered by this permit, the *owner or operator* of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.
2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

**Q. Penalties for Falsification of Forms and Reports**

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

**R. Other Permits**

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

## VIII. APPENDIX A

### Definitions

**Alter Hydrology from Pre to Post-Development Conditions** - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

**Combined Sewer** - means a sewer that is designed to collect and convey both “sewage” and “stormwater”.

**Commence (Commencement of) Construction Activities** - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for “*Construction Activity(ies)*” also.

**Construction Activity(ies)** - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

**Direct Discharge (to a specific surface waterbody)** - means that runoff flows from a construction site by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a construction site to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

**Discharge(s)** - means any addition of any pollutant to waters of the State through an outlet or point source.

**Environmental Conservation Law (ECL)** - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

**Equivalent (Equivalence)** – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

**Final Stabilization** - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied

on all disturbed areas that are not covered by permanent structures, concrete or pavement.

**General SPDES permit** - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

**Groundwater(s)** - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

**Historic Property** – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

**Impervious Area (Cover)** - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

**Infeasible** – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

**Larger Common Plan of Development or Sale** - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

**Minimize** – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

**Municipal Separate Storm Sewer (MS4)** - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters,



ditches, man-made channels, or storm drains):

- (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State;
- (ii) Designed or used for collecting or conveying stormwater;
- (iii) Which is not a *combined sewer*; and
- (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

**National Pollutant Discharge Elimination System (NPDES)** - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

**New Development** – means any land disturbance that does meet the definition of Redevelopment Activity included in this appendix.

**NOI Acknowledgment Letter** - means the letter that the Department sends to an owner or operator to acknowledge the Department’s receipt and acceptance of a complete Notice of Intent. This letter documents the owner’s or operator’s authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

**Owner or Operator** - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications.

**Performance Criteria** – means the design criteria listed under the “Required Elements” sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf ) in Part I.C.2. of the permit.

**Pollutant** - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

**Qualified Inspector** - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

**Qualified Professional** - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York..

**Redevelopment Activity(ies)** – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

**Regulated, Traditional Land Use Control MS4** - means a city, town or village with land use control authority that is required to gain coverage under New York State DEC's SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s).

**Routine Maintenance Activity** - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Stream bank restoration projects (does not include the placement of spoil material),
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that makes the transition between the road shoulder and the ditch or embankment,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or embankment,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

**Site limitations** – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

**Sizing Criteria** – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), Overbank Flood (Qp), and Extreme Flood (Qf).

**State Pollutant Discharge Elimination System (SPDES)** - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

**Steep Slope** – means land area with a Soil Slope Phase that is identified as an E or F, or

the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture (“USDA”) Soil Survey for the County where the disturbance will occur.

**Surface Waters of the State** - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

**Temporarily Ceased** – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

**Temporary Stabilization** - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

**Total Maximum Daily Loads (TMDLs)** - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS).

**Trained Contractor** - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

**Uniform Procedures Act (UPA) Permit** - means a permit required under 6 NYCRR Part

621 of the Environmental Conservation Law (ECL), Article 70.

**Water Quality Standard** - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

IX. APPENDIX B

**Required SWPPP Components by Project Type**

**Table 1  
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP  
THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS**

<p><b>The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:</b></p> <ul style="list-style-type: none"><li>• Single family home <u>not</u> located in one of the watersheds listed in Appendix C or <u>not directly discharging</u> to one of the 303(d) segments listed in Appendix E</li><li>• Single family residential subdivisions with 25% or less impervious cover at total site build-out and <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E</li><li>• Construction of a barn or other agricultural building, silo, stock yard or pen.</li></ul>
<p><b>The following construction activities that involve soil disturbances of one (1) or more acres of land:</b></p> <ul style="list-style-type: none"><li>• Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains</li><li>• Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects</li><li>• Bike paths and trails</li><li>• Sidewalk construction projects that are not part of a road/ highway construction or reconstruction project</li><li>• Slope stabilization projects</li><li>• Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics</li><li>• Spoil areas that will be covered with vegetation</li><li>• Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields), excluding projects that <i>alter hydrology from pre to post development</i> conditions</li><li>• Athletic fields (natural grass) that do not include the construction or reconstruction of <i>impervious area</i> <u>and</u> do not <i>alter hydrology from pre to post development</i> conditions</li><li>• Demolition project where vegetation will be established and no redevelopment is planned</li><li>• Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with <i>impervious cover</i></li><li>• Structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State", excluding projects that involve soil disturbances of less than five acres and construction activities that include the construction or reconstruction of impervious area</li></ul>
<p><b>The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:</b></p> <ul style="list-style-type: none"><li>• All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.</li></ul>

**Table 2**  
**CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES**  
**POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES**

**The following construction activities that involve soil disturbances of one (1) or more acres of land:**

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other agricultural building(e.g. silo) and structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional, includes hospitals, prisons, schools and colleges
- Industrial facilities, includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW’s and water treatment plants
- Office complexes
- Sports complexes
- Racetracks, includes racetracks with earthen (dirt) surface
- Road construction or reconstruction
- Parking lot construction or reconstruction
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover*, and constructed as part of an over-head electric transmission line project , wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- All other construction activities that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

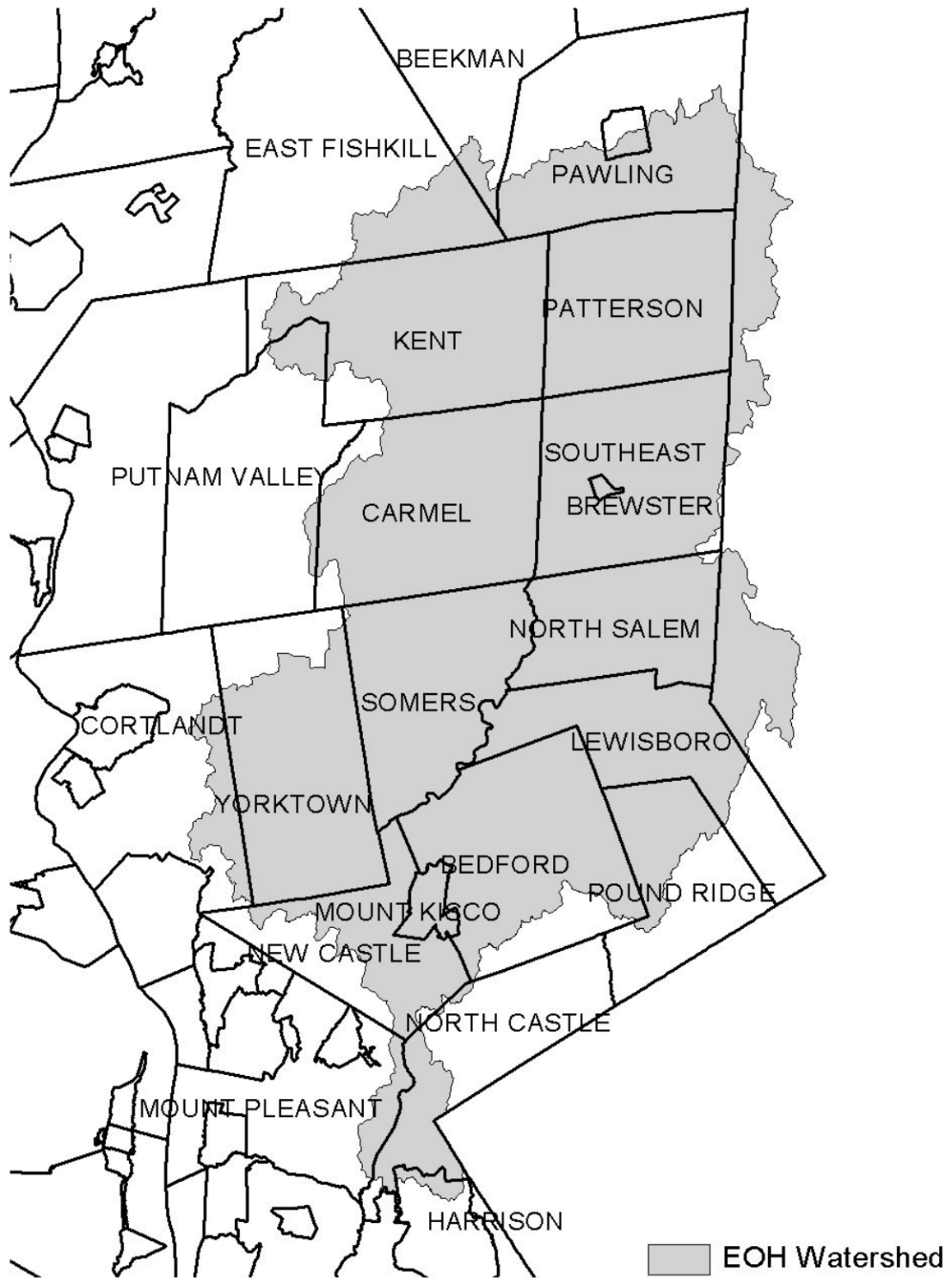
**APPENDIX C****Watersheds Where Enhanced Phosphorus Removal Standards Are Required**

**Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual (“Design Manual”).**

- Entire New York City Watershed located east of the Hudson River - Figure 1
- Onondaga Lake Watershed - Figure 2
- Greenwood Lake Watershed -Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5



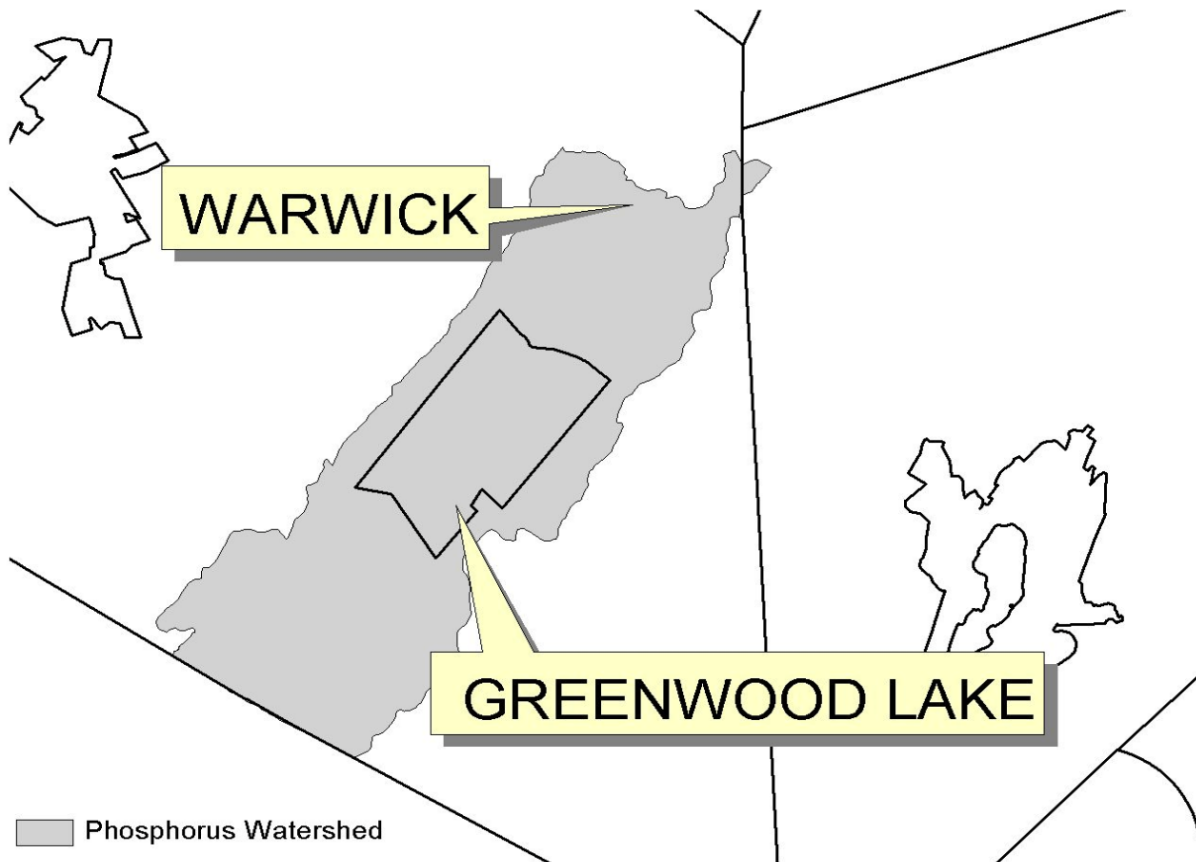
**Figure 1 - New York City Watershed East of the Hudson**



**Figure 2 - Onondaga Lake Watershed**



**Figure 3 - Greenwood Lake Watershed**



**Figure 4 - Oscawana Lake Watershed**

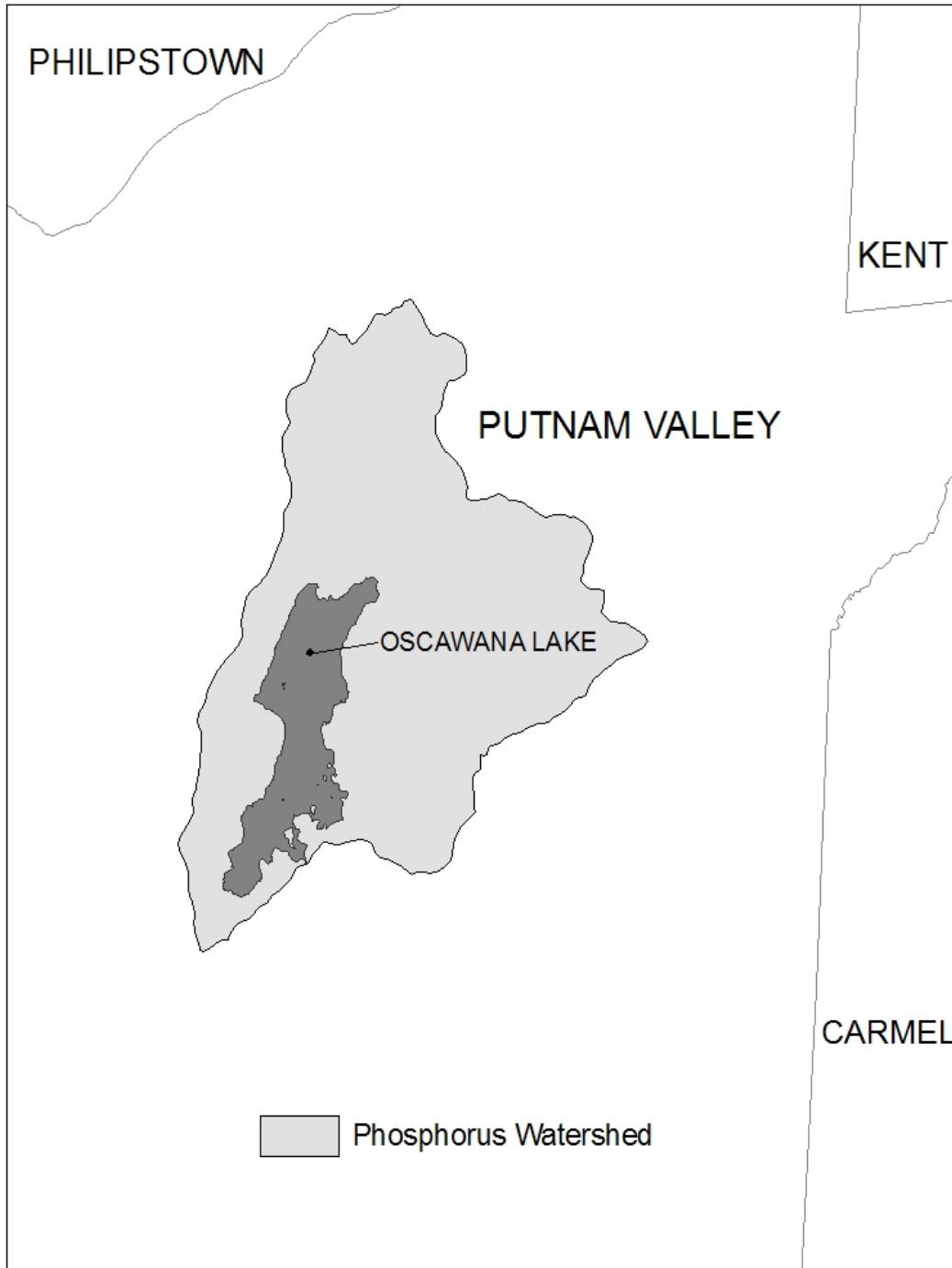
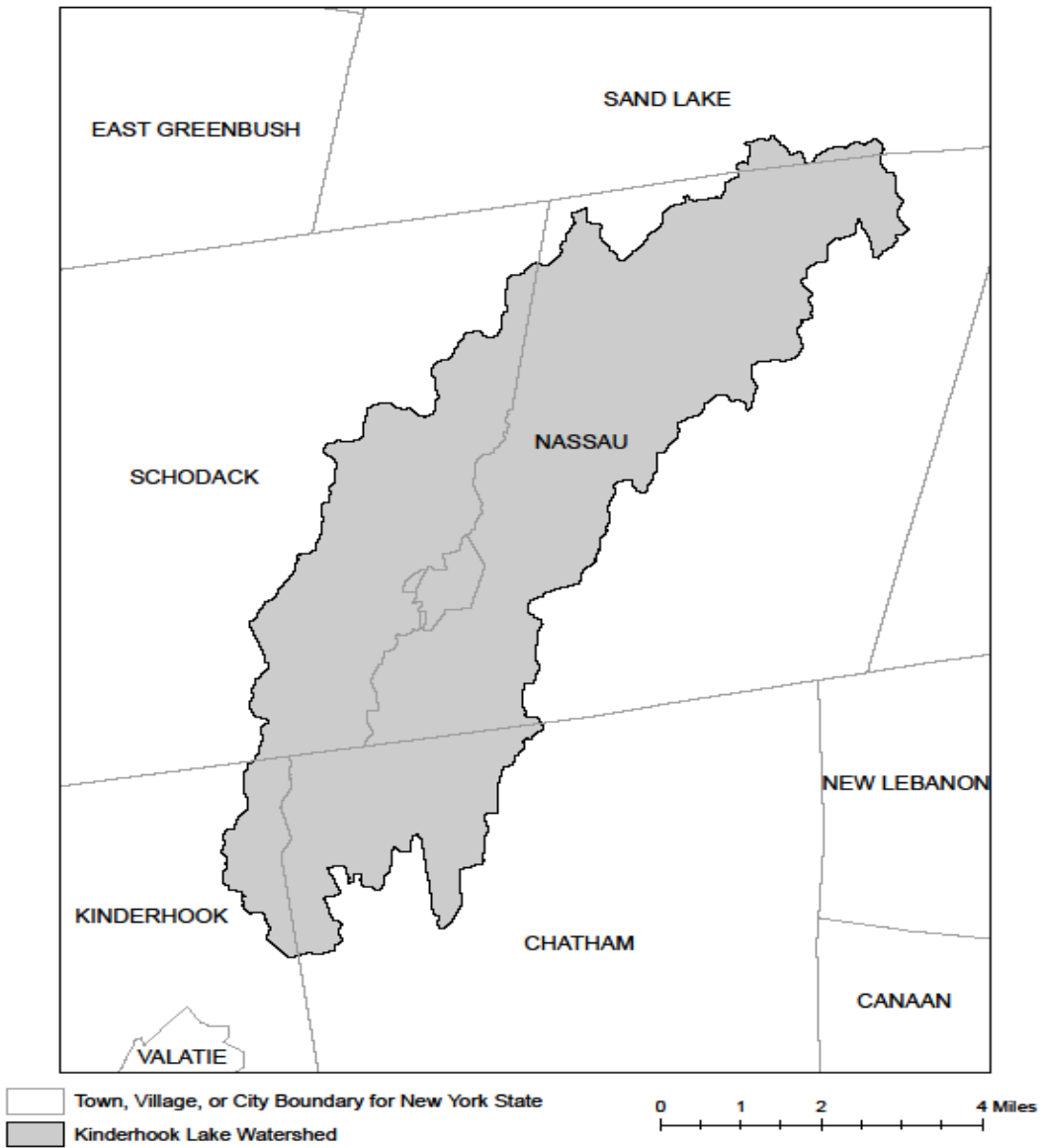


Figure 5: Kinderhook Lake Watershed



XI. **APPENDIX D**

**Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.**

Entire New York City Watershed that is located east of the Hudson River - See Figure 1 in Appendix C

XII. APPENDIX E

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015.

COUNTY	WATERBODY	COUNTY	WATERBODY
Albany	Ann Lee (Shakers) Pond, Stump Pond	Greene	Sleepy Hollow Lake
Albany	Basic Creek Reservoir	Herkimer	Steele Creek tribs
Allegheny	Amity Lake, Saunders Pond	Kings	Hendrix Creek
Bronx	Van Cortlandt Lake	Lewis	Mill Creek/South Branch and tribs
Broome	Whitney Point Lake/Reservoir	Livingston	Conesus Lake
Broome	Fly Pond, Deer Lake	Livingston	Jaycox Creek and tribs
Broome	Minor Tribs to Lower Susquehanna (north)	Livingston	Mill Creek and minor tribs
Cattaraugus	Allegheny River/Reservoir	Livingston	Bradner Creek and tribs
Cattaraugus	Case Lake	Livingston	Christie Creek and tribs
Cattaraugus	Linlyco/Club Pond	Monroe	Lake Ontario Shoreline, Western
Cayuga	Duck Lake	Monroe	Mill Creek/Blue Pond Outlet and tribs
Chautauqua	Chautauqua Lake, North	Monroe	Rochester Embayment - East
Chautauqua	Chautauqua Lake, South	Monroe	Rochester Embayment - West
Chautauqua	Bear Lake	Monroe	Unnamed Trib to Honeoye Creek
Chautauqua	Chadakoin River and tribs	Monroe	Genesee River, Lower, Main Stem
Chautauqua	Lower Cassadaga Lake	Monroe	Genesee River, Middle, Main Stem
Chautauqua	Middle Cassadaga Lake	Monroe	Black Creek, Lower, and minor tribs
Chautauqua	Findley Lake	Monroe	Buck Pond
Clinton	Great Chazy River, Lower, Main Stem	Monroe	Long Pond
Columbia	Kinderhook Lake	Monroe	Cranberry Pond
Columbia	Robinson Pond	Monroe	Mill Creek and tribs
Dutchess	Hillside Lake	Monroe	Shipbuilders Creek and tribs
Dutchess	Wappinger Lakes	Monroe	Minor tribs to Irondequoit Bay
Dutchess	Fall Kill and tribs	Monroe	Thomas Creek/White Brook and tribs
Erie	Green Lake	Nassau	Glen Cove Creek, Lower, and tribs
Erie	Scajaquada Creek, Lower, and tribs	Nassau	LI Tribs (fresh) to East Bay
Erie	Scajaquada Creek, Middle, and tribs	Nassau	East Meadow Brook, Upper, and tribs
Erie	Scajaquada Creek, Upper, and tribs	Nassau	Hempstead Bay
Erie	Rush Creek and tribs	Nassau	Hempstead Lake
Erie	Ellicott Creek, Lower, and tribs	Nassau	Grant Park Pond
Erie	Beeman Creek and tribs	Nassau	Beaver Lake
Erie	Murder Creek, Lower, and tribs	Nassau	Camaans Pond
Erie	South Branch Smoke Cr, Lower, and tribs	Nassau	Halls Pond
Erie	Little Sister Creek, Lower, and tribs	Nassau	LI Tidal Tribs to Hempstead Bay
Essex	Lake George (primary county: Warren)	Nassau	Massapequa Creek and tribs
Genesee	Black Creek, Upper, and minor tribs	Nassau	Reynolds Channel, east
Genesee	Tonawanda Creek, Middle, Main Stem	Nassau	Reynolds Channel, west
Genesee	Oak Orchard Creek, Upper, and tribs	Nassau	Silver Lake, Lofts Pond
Genesee	Bowen Brook and tribs	Nassau	Woodmere Channel
Genesee	Bigelow Creek and tribs	Niagara	Hyde Park Lake
Genesee	Black Creek, Middle, and minor tribs	Niagara	Lake Ontario Shoreline, Western
Genesee	LeRoy Reservoir	Niagara	Bergholtz Creek and tribs
Greene	Schoharie Reservoir	Oneida	Ballou, Nail Creeks
		Onondaga	Ley Creek and tribs
		Onondaga	Onondaga Creek, Lower and tribs

## APPENDIX E

### List of 303(d) segments impaired by pollutants related to construction activity, cont'd.

COUNTY	WATERBODY	COUNTY	WATERBODY
Onondaga	Onondaga Creek, Middle and tribs	Suffolk	Great South Bay, West
Onondaga	Onondaga Creek, Upp, and minor tribs	Suffolk	Mill and Seven Ponds
Onondaga	Harbor Brook, Lower, and tribs	Suffolk	Moriches Bay, East
Onondaga	Ninemile Creek, Lower, and tribs	Suffolk	Moriches Bay, West
Onondaga	Minor tribs to Onondaga Lake	Suffolk	Quantuck Bay
Onondaga	Onondaga Creek, Lower, and tribs	Suffolk	Shinnecock Bay (and Inlet)
Ontario	Honeoye Lake	Sullivan	Bodine, Montgomery Lakes
Ontario	Hemlock Lake Outlet and minor tribs	Sullivan	Davies Lake
Ontario	Great Brook and minor tribs	Sullivan	Pleasure Lake
Orange	Monhagen Brook and tribs	Sullivan	Swan Lake
Orange	Orange Lake	Tompkins	Cayuga Lake, Southern End
Orleans	Lake Ontario Shoreline, Western	Tompkins	Owasco Inlet, Upper, and tribs
Oswego	Pleasant Lake	Ulster	Ashokan Reservoir
Oswego	Lake Neatahwanta	Ulster	Esopus Creek, Upper, and minor tribs
Putnam	Oscawana Lake	Ulster	Esopus Creek, Lower, Main Stem
Putnam	Palmer Lake	Ulster	Esopus Creek, Middle, and minor tribs
Putnam	Lake Carmel	Warren	Lake George
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Warren	Tribs to L.George, Village of L George
Queens	Bergen Basin	Warren	Huddle/Finkle Brooks and tribs
Queens	Shellbank Basin	Warren	Indian Brook and tribs
Rensselaer	Nassau Lake	Warren	Hague Brook and tribs
Rensselaer	Snyders Lake	Washington	Tribs to L.George, East Shr Lk George
Richmond	Grasmere, Arbutus and Wolfes Lakes	Washington	Cossayuna Lake
Rockland	Congers Lake, Swartout Lake	Washington	Wood Cr/Champlain Canal, minor tribs
Rockland	Rockland Lake	Wayne	Port Bay
Saratoga	Ballston Lake	Wayne	Marbletown Creek and tribs
Saratoga	Round Lake	Westchester	Lake Katonah
Saratoga	Dwaas Kill and tribs	Westchester	Lake Mohegan
Saratoga	Tribs to Lake Lonely	Westchester	Lake Shenorock
Saratoga	Lake Lonely	Westchester	Reservoir No.1 (Lake Isle)
Schenectady	Collins Lake	Westchester	Saw Mill River, Middle, and tribs
Schenectady	Duane Lake	Westchester	Silver Lake
Schenectady	Mariaville Lake	Westchester	Teatown Lake
Schoharie	Engleville Pond	Westchester	Truesdale Lake
Schoharie	Summit Lake	Westchester	Wallace Pond
Schuyler	Cayuta Lake	Westchester	Peach Lake
St. Lawrence	Fish Creek and minor tribs	Westchester	Mamaroneck River, Lower
St. Lawrence	Black Lake Outlet/Black Lake	Westchester	Mamaroneck River, Upp, and tribs
Steuben	Lake Salubria	Westchester	Sheldrake River and tribs
Steuben	Smith Pond	Westchester	Blind Brook, Lower
Suffolk	Millers Pond	Westchester	Blind Brook, Upper, and tribs
Suffolk	Mattituck (Marratooka) Pond	Westchester	Lake Lincolndale
Suffolk	Tidal tribs to West Moriches Bay	Westchester	Lake Meahaugh
Suffolk	Canaan Lake	Wyoming	Java Lake
Suffolk	Lake Ronkonkoma	Wyoming	Silver Lake
Suffolk	Beaverdam Creek and tribs		
Suffolk	Big/Little Fresh Ponds		
Suffolk	Fresh Pond		
Suffolk	Great South Bay, East		
Suffolk	Great South Bay, Middle		

Note: The list above identifies those waters from the final New York State "2014 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy", dated January 2015, that are impaired by silt, sediment or nutrients.



XIII. APPENDIX F

**LIST OF NYS DEC REGIONAL OFFICES**

<b><u>Region</u></b>	<b><u>COVERING THE FOLLOWING COUNTIES:</u></b>	<b><u>DIVISION OF ENVIRONMENTAL PERMITS (DEP) PERMIT ADMINISTRATORS</u></b>	<b><u>DIVISION OF WATER (DOW) WATER (SPDES) PROGRAM</u></b>
<b>1</b>	NASSAU AND SUFFOLK	50 CIRCLE ROAD STONY BROOK, NY 11790 TEL. (631) 444-0365	50 CIRCLE ROAD STONY BROOK, NY 11790-3409 TEL. (631) 444-0405
<b>2</b>	BRONX, KINGS, NEW YORK, QUEENS AND RICHMOND	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4997	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4933
<b>3</b>	DUTCHESS, ORANGE, PUTNAM, ROCKLAND, SULLIVAN, ULSTER AND WESTCHESTER	21 SOUTH PUTT CORNERS ROAD NEW PALTZ, NY 12561-1696 TEL. (845) 256-3059	100 HILLSIDE AVENUE, SUITE 1W WHITE PLAINS, NY 10603 TEL. (914) 428 - 2505
<b>4</b>	ALBANY, COLUMBIA, DELAWARE, GREENE, MONTGOMERY, OTSEGO, RENSSELAER, SCHENECTADY AND SCHOHARIE	1150 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2069	1130 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2045
<b>5</b>	CLINTON, ESSEX, FRANKLIN, FULTON, HAMILTON, SARATOGA, WARREN AND WASHINGTON	1115 STATE ROUTE 86, Po Box 296 RAY BROOK, NY 12977-0296 TEL. (518) 897-1234	232 GOLF COURSE ROAD WARRENSBURG, NY 12885-1172 TEL. (518) 623-1200
<b>6</b>	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
<b>7</b>	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
<b>8</b>	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROAD AVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
<b>9</b>	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVE. BUFFALO, NY 14203-2999 TEL. (716) 851-7070

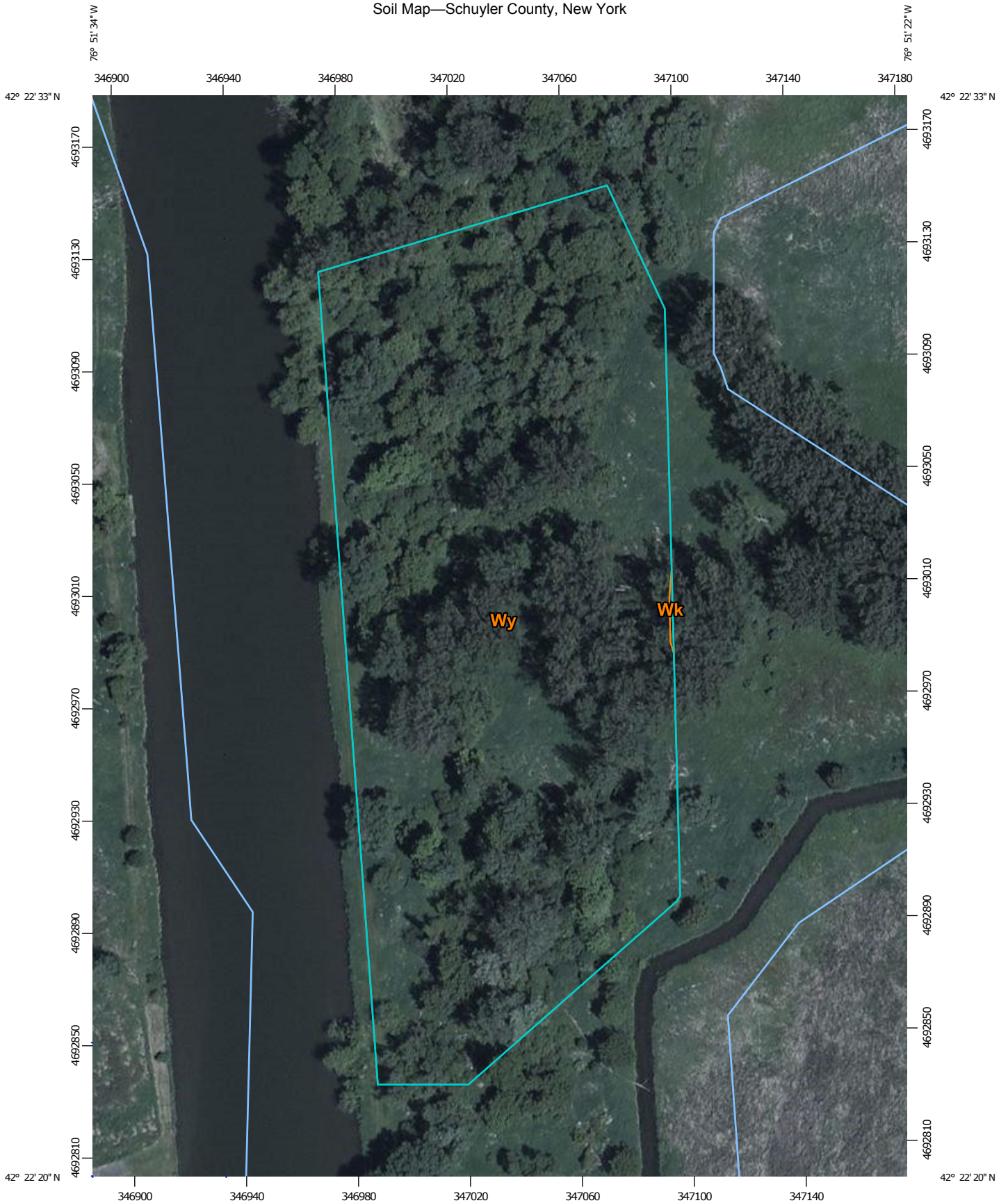
## **Appendix B**

### **Notice of Intent and Acknowledgement Letter**

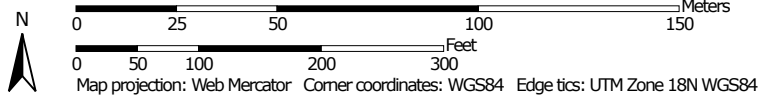
To be added later

**Appendix C**  
**Soils Map**

Soil Map—Schuyler County, New York




Map Scale: 1:1,880 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Schuyler County, New York  
 Survey Area Data: Version 10, Sep 16, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 2, 2010—Oct 8, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Schuyler County, New York (NY097)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Wk	Walkill silt loam	0.0	0.1%
Wy	Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded	8.2	99.9%
<b>Totals for Area of Interest</b>		<b>8.2</b>	<b>100.0%</b>

**Appendix D**

**Water Quality and  
Runoff Reduction Volume Calculations**

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?.....

Design Point:	1	
P=	1.00	inch

Breakdown of Subcatchments						
Catchment Number	Total Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (ft <sup>3</sup> )	Description
1	5.10	2.39	47%	0.47	8,734	Bioretention
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	5.10	2.39	47%	0.47	8,734	Subtotal 1
<b>Total</b>	5.10	2.39	47%	0.47	8,734	<b>Initial WQv</b>

Identify Runoff Reduction Techniques By Area			
Technique	Total Contributing Area	Contributing Impervious Area	Notes
	(Acre)	(Acre)	
Conservation of Natural Areas	0.00	0.00	minimum 10,000 sf
Riparian Buffers	0.00	0.00	maximum contributing length 75 feet to 150 feet
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	Up to 100 sf directly connected impervious area may be subtracted per tree
<b>Total</b>	<b>0.00</b>	<b>0.00</b>	

Recalculate WQv after application of Area Reduction Techniques					
	Total Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Runoff Coefficient Rv	WQv (ft <sup>3</sup> )
"<<Initial WQv"	5.10	2.39	47%	0.47	8,734
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	<b>5.10</b>	<b>2.39</b>	47%	0.47	8,734
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	5.10	2.39	47%	0.47	<b>8,734</b>
WQv reduced by Area Reduction techniques					0



0.20	af
------	----

0.20	af
0.00	af

Runoff Reduction Volume and Treated volumes						
	Runoff Reduction Techniques/Standard SMPs		Total Contributing Area	Total Contributing Impervious Area	WQv Reduced (RRv)	WQv Treated
			(acres)	(acres)	cf	cf
Area/Volume Reduction	Conservation of Natural Areas	RR-1	0.00	0.00		
	Sheetflow to Riparian Buffers/Filter Strips	RR-2	0.00	0.00		
	Tree Planting/Tree Pit	RR-3	0.00	0.00		
	Disconnection of Rooftop Runoff	RR-4		0.00		
	Vegetated Swale	RR-5	0.00	0.00	0	
	Rain Garden	RR-6	0.00	0.00	0	
	Stormwater Planter	RR-7	0.00	0.00	0	
	Rain Barrel/Cistern	RR-8	0.00	0.00	0	
	Porous Pavement	RR-9	0.00	0.00	0	
	Green Roof (Intensive & Extensive)	RR-10	0.00	0.00	0	
Standard SMPs w/RRv Capacity	Infiltration Trench	I-1	0.00	0.00	0	0
	Infiltration Basin	I-2	0.00	0.00	0	0
	Dry Well	I-3	0.00	0.00	0	0
	Underground Infiltration System	I-4	0.00			
	Bioretention & Infiltration Bioretention	F-5	5.10	2.39	3881	4853
	Dry swale	O-1	0.00	0.00	0	0
Standard SMPs	Micropool Extended Detention (P-1)	P-1				
	Wet Pond (P-2)	P-2				
	Wet Extended Detention (P-3)	P-3				
	Multiple Pond system (P-4)	P-4				
	Pocket Pond (p-5)	P-5				
	Surface Sand filter (F-1)	F-1				
	Underground Sand filter (F-2)	F-2				
	Perimeter Sand Filter (F-3)	F-3				
	Organic Filter (F-4)	F-4				
	Shallow Wetland (W-1)	W-1				
	Extended Detention Wetland (W-2)	W-2				
	Pond/Wetland System (W-3)	W-3				
	Pocket Wetland (W-4)	W-4				
Wet Swale (O-2)	O-2					
Totals by Area Reduction		→	0.00	0.00	0	
Totals by Volume Reduction		→	0.00	0.00	0	
Totals by Standard SMP w/RRV		→	5.10	2.39	3881	4853
Totals by Standard SMP		→	0.00	0.00		0
Totals ( Area + Volume + all SMPs)		→	5.10	2.39	3,881	4,853
	Impervious Cover v	okay				

	Total Area $\nu$	okay				
--	------------------	------	--	--	--	--

# Minimum RRv

**Enter the Soils Data for the site**

Soil Group	Acres	S
A		55%
B		40%
C		30%
D	<b>5.10</b>	20%
Total Area	5.102	

**Calculate the Minimum RRv**

S =	<b>0.20</b>	
Impervious =	2.39	<i>acre</i>
Precipitation	1	<i>in</i>
Rv	0.95	
<b>Minimum RRv</b>	<b>1,648</b>	<b><i>ft3</i></b>
	0.04	<i>af</i>

# NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	8734	0.201
30	Total RRV Provided	3881	0.089
31	Is RRV Provided $\geq$ WQv Required?	No	
32	Minimum RRV	1648	0.038
32a	Is RRV Provided $\geq$ Minimum RRV Required?	Yes	
33a	Total WQv Treated	4853	0.111
34	Sum of Volume Reduced & Treated	8734	0.201
34	Sum of Volume Reduced and Treated	8734	0.201
35	Is Sum RRV Provided and WQv Provided $\geq$ WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	$C_{pv}$	
37	Overbank	$Q_p$	
37	Extreme Flood Control	$Q_f$	
	Are Quantity Control requirements met?		

# Bioretention Worksheet

*(For use on HSG C or D Soils with underdrains)*

$$A_f = WQv * (df) / [k * (hf + df)(tf)]$$

- |                      |   |  |
|----------------------|---|--|
| <i>A<sub>f</sub></i> | Required Surface Area (ft <sup>2</sup> )      | The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: <b>Sand</b> - 3.5 ft/day (City of Austin 1988); <b>Peat</b> - 2.0 ft/day (Galli 1990); <b>Leaf Compost</b> - 8.7 ft/day (Claytor and Schueler, 1996); <b>Bioretention Soil</b> (0.5 ft/day (Claytor & |
| <i>WQv</i>           | Water Quality Volume (ft <sup>3</sup> )       |  |
| <i>df</i>            | Depth of the Soil Medium (feet)               | <i>k</i>   |
| <i>hf</i>            | Average height of water above the planter bed |  |
| <i>tf</i>            | Volume Through the Filter Media (days)        |  |

<b>Design Point:</b>	<b>1</b>						
<b>Enter Site Data For Drainage Area to be Treated by Practice</b>							
Catchment Number	Total Area (Acres)	Impervious Area (Acres)	Percent Impervious %	Rv	WQv (ft <sup>3</sup> )	Precipitation (in)	Description
1	5.10	2.39	0.47	0.47	8734.14	1.00	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops		0.00	47%	0.47	8,734	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						ft <sup>3</sup>	
<b>Soil Information</b>							
Soil Group		D					
Soil Infiltration Rate		0.00	<i>in/hour</i>	<i>Okay</i>			
Using Underdrains?		Yes	<i>Okay</i>				
<b>Calculate the Minimum Filter Area</b>							
				Value	Units	Notes	
WQv				8,734	ft <sup>3</sup>		
Enter Depth of Soil Media			<i>df</i>	2.5	ft	2.5-4 ft	
Enter Hydraulic Conductivity			<i>k</i>	0.5	ft/day		
Enter Average Height of Ponding			<i>hf</i>	0.5	ft	6 inches max.	
Enter Filter Time			<i>tf</i>	2	days		
<b>Required Filter Area</b>			<b><i>A<sub>f</sub></i></b>	<b>7278</b>	<b>ft<sup>2</sup></b>		
<b>Determine Actual Bio-Retention Area</b>							
Filter Width		16.5	ft				
Filter Length		490	ft				
Filter Area		8085	ft <sup>2</sup>				
Actual Volume Provided		9702	ft <sup>3</sup>				
<b>Determine Runoff Reduction</b>							
Is the Bioretention contributing flow to another practice?			No	Select Practice			
RRv		3,881					
<b>RRv applied</b>		<b>3,881</b>	<b>ft<sup>3</sup></b>	<b><i>This is 40% of the storage provided or WQv whichever is less.</i></b>			
Volume Treated		4,853	ft <sup>3</sup>	<i>This is the portion of the WQv that is not reduced in the practice.</i>			
Volume Directed		0	ft <sup>3</sup>	This volume is directed another practice			
Sizing V		OK	<i>Check to be sure Area provided ≥ A<sub>f</sub></i>				

**Appendix E**  
**Weekly Inspection Form**

## Stormwater Construction Site Inspection Report

General Information			
Project Name			
SPDES Tracking No.		Location	
Date of Inspection		Start/End Time	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
<b>Type of Inspection:</b> <input type="checkbox"/> Regular <input type="checkbox"/> Pre-storm event <input type="checkbox"/> During storm event <input type="checkbox"/> Post-storm event			
Weather Information			
<b>Has there been a storm event since the last inspection?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>If yes, provide:</b> Storm Start Date & Time:                      Storm Duration (hrs):                      Approximate Amount of Precipitation (in):			
<b>Weather at time of this inspection?</b> <input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain <input type="checkbox"/> Sleet <input type="checkbox"/> Fog <input type="checkbox"/> Snowing <input type="checkbox"/> High Winds <input type="checkbox"/> Other:    Temperature:			
<b>Have any discharges occurred since the last inspection?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>If yes, describe:</b>			
<b>Are there any discharges at the time of inspection?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <b>If yes, describe:</b>			

### Site-specific BMPs

- Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.
- Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	



	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
3		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
8		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
10		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
11		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
12		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
13		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
14		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
15		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
16		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
17		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
18		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
19		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
20		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

**Overall Site Issues**

*Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.*

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4	Are discharge points and receiving waters free of any sediment deposits?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5	Are storm drain inlets properly protected?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6	Is the construction exit preventing sediment from being tracked into the street?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

	<b>BMP/activity</b>	<b>Implemented?</b>	<b>Maintenance Required?</b>	<b>Corrective Action Needed and Notes</b>
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
12	(Other)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

**Non-Compliance**

Describe any incidents of non-compliance not described above:

**CERTIFICATION STATEMENT**

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

**Print name and title:** \_\_\_\_\_

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Appendix F**  
**Corrective Action Log**

**BEST MANAGEMENT PRACTICE (BMP)  
CORRECTIVE ACTION LOG**

Project: \_\_\_\_\_  
Job # \_\_\_\_\_  
Inspectors \_\_\_\_\_  
\_\_\_\_\_

Inspection Report Date	Date of Action Taken	BMP Corrected	Corrective Action Taken	Party Who Completed Work

By signing above:  
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

## **Appendix G**

### **Log of Changes and Updates to SWPPP**

## STORM WATER POLLUTION PREVENTION PLAN UPDATE LOG

Project: \_\_\_\_\_

Job # \_\_\_\_\_

Inspectors \_\_\_\_\_

\_\_\_\_\_

Date	SWPPP Changes/Update	Comments	Signatures		
			Inspector	Contractor	P.E. / CPESC

By signing above:  
 I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



**Appendix H**  
**Construction Inspection Checklists for**  
**Permanent Practices**

## Bioretention Construction Inspection Checklist

Project:  
 Location:  
 Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
<b>1. Pre-Construction</b>		
Pre-construction meeting		
Runoff diverted		
Facility area cleared		
If designed as exfilter, soil testing for permeability		
Facility location staked out		
<b>2. Excavation</b>		
Size and location		
Lateral slopes completely level		
If designed as exfilter, ensure that excavation does not compact susoils.		
Longitudinal slopes within design range		

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
<b>3. Structural Components</b>		
Stone diaphragm installed correctly		
Outlets installed correctly		
Underdrain		
Pretreatment devices installed		
Soil bed composition and texture		
<b>4. Vegetation</b>		
Complies with planting specs		
Topsoil adequate in composition and placement		
Adequate erosion control measures in place		
<b>5. Final Inspection</b>		
Dimensions		
Proper stone diaphragm		
Proper outlet		
Soil/ filter bed permeability testing		
Effective stand of vegetation and stabilization		
Construction generated sediments removed		
Contributing watershed stabilized before flow is diverted to the practice		

**Comments:**

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**Actions to be Taken:**

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## Barton & Loguidice, D.P.C.

**Memo To:** Project File **Date:** November 18, 2016

**From:** Grete L. Bader **Project No.:** 1733.001.003  
Environmental Scientist II

**Subject:** Threatened and Endangered Species Assessment  
Village of Watkins Glen and Village of Montour Falls  
Project Seneca Regional Wastewater

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### Project Area and Description

Barton & Loguidice, D.P.C. (B&L) was retained by the Village of Watkins Glen to design a Regional Wastewater Treatment Plant (WWTP) to replace the current treatment plants serving the Village of Watkins Glen and the Village of Montour Falls in Schuyler County, NY (Project). The proposed Regional Project includes the construction of two new pump stations and new sewer force main in the Villages of Watkins Glen and Montour Falls.. Approximately 5,859 feet of new 18-inch sewer force main and 9,500 feet of 10-inch force main will be installed in Watkins Glen and Montour Falls, respectively, to connect the pumps stations to the new WWTP. Additionally, a new WWTP will be constructed on a parcel between the Seneca Barge Canal and the Catharine Creek Marsh Wildlife Management Area (WMA). The existing Watkins Glen WWTP will be decommissioned and demolished. The new Watkins Glen pump station will be located on East 12<sup>th</sup> Street next to the Watkins Glen Fire Station. The Montour Falls WWTP will be decommissioned and converted to a new pump station and wet-weather flow management facility.

### Record Review

#### *Federally Protected Species*

The U.S. Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation (IPaC) system was queried to determine the potential for any federally protected species to occur within the project area. Leedy's roseroot and the northern long-eared bat were identified as protected species with the potential to occur in the area. An official IPaC results list from the USFWS is included as Attachment A. A recorded breeding pair of bald eagles also occupy habitat near the project site, and are protected under the Bald and Golden Eagle Protection Act. Effect determinations for federally listed species are provided in Table 1.

#### *Critical Habitat*

No areas of critical habitat designated by the USFWS are within or near the project location.

#### *State Protected Species and Significant Natural Communities*

The New York Natural Heritage Program (NYNHP) was consulted regarding the presence of state-protected species within or near the project area in 2013, and an updated inquiry was sent on August 22, 2016. Both responses are provided in Attachment B. The New York State Breeding Bird Atlas (BBA) was also consulted to obtain records of state protected species observed within the project area. The BBA results are included as Attachment C.



Memo to: Project File  
November 18, 2016  
Page 2

The original response from NYNHP included nine state-protected species within the project area, including the least bittern, pied-billed grebe, longtail salamander, marsh horsetail, nodding wild onion, Leedy's roseroot, Leiberger's panic grass, northern wild comfrey, and spreading globeflower. Habitat assessments were conducted for these species during wetland delineations completed in June 2014; none of the listed species were observed. The updated response letter from NYNHP additionally listed the bald eagle (the nest adjacent to the project site was discovered after the original letter was sent) and the comely shiner. Leiberger's panic grass, northern wild comfrey, and spreading globeflower were not listed in the 2016 NYNHP's response. These three species consist of historic observations (last documented in the 1800s) and have not been recently confirmed in the Watkins Glen or Montour Falls areas. These species were not observed while on site; no impacts to these species are anticipated. Effect determinations for state-listed species are provided in Table 2.

The NYNHP reported floodplain forest, silver maple-ash swamp, calcareous shoreline outcrop, hemlock-northern hardwood forest, and shale cliff and talus as significant natural communities located within or adjacent to the project area. The floodplain forest community is the only habitat that occurs within the project site. The other significant natural communities are located adjacent to the proposed Project and will not be impacted.

#### **Availability of Suitable Habitat and Effect Determinations**

##### *Leedy's Roseroot*

Leedy's roseroot (*Rhodiola integrifolia* ssp. *leedyi*) is a perennial succulent plant species that is federally threatened and listed as endangered in New York State. Two populations of this species occur in NY, one in Watkins Glen State Park (a single individual) and a significant population along the western shore of Seneca Lake on the cliffs of Glenora. Leedy's roseroot is a glacial relict and is limited to very specific habitat conditions within cliff habitat. The WWTP project area is located entirely south of Seneca Lake, and will not impact Leedy's roseroot or its known habitat areas. Therefore, the Project is not likely to adversely affect this species.

##### *Northern Long-Eared Bat*

The northern long-eared bat (*Myotis septentrionalis*) is a federally threatened species. Suitable habitat for northern long-eared bat consists of trees exhibiting roosting potential (e.g., flaking or platy bark, crevices and holes, etc.) with a diameter at breast height (DBH)  $\geq 3$  inches. There is suitable roosting habitat identified on the project site, including live trees and snags that offer potential roosting locations for the bats. There are no confirmed roosts or colonies on or near the project site. Tree clearing at the WWTP location is proposed to occur during the bats' hibernation period (October 1<sup>st</sup> through March 31<sup>st</sup>) to avoid direct impacts to the species. By abiding by this timeframe for vegetative removal, the proposed project is not likely to adversely impact the northern long-eared bat. Ample amounts of suitable habitat will remain around the perimeter of the project area and beyond. New tree plantings are proposed in some locations of the project site, particularly along the east edge of the property.



Memo to: Project File  
November 18, 2016  
Page 3

### *Bald Eagle*

The bald eagle (*Haliaeetus leucocephalus*) was listed in the 2016 NYNHP response and in the Breeding Bird Atlas. Although the bald eagle was removed from the Federal Endangered Species list in 2007, it is still federally protected by the Bald and Golden Eagle Protection Act and is listed as threatened in New York State. A large stick nest was first observed near the project site in January 2014, followed by sightings of bald eagles at the nest location in February that year. The location of the new Regional WWTP is located approximately 330 feet away (at closest point) from this active bald eagle nest. Due to the proximity of the nest location, the proposed project is anticipated to may affect, likely to adversely affect the Catharine Creek Marsh eagle pair. Ways to minimize potential impacts to the eagles and the nest location have been incorporated into the project through design modifications, construction sequence and timing considerations, visual screening efforts (short-term and long-term), etc. In addition, a Net Conservation Benefit Plan was put together to detail these elements and other initiatives being proposed so that a conservation benefit is provided to bald eagle populations within the Finger Lakes Region. This document is provided under separate cover.

### *Least bittern and Pied-billed grebe*

The least bittern (*Ixobrychus exilis*) and the pied-billed grebe (*Podilymbus podiceps*) typically occupy shallow emergent marsh habitats with areas of open water. Both of these avian species nest, forage, and roost in stands of cattail, common reed, or sedge species near edges of open water. The new WWTP will be located in an upland forested area and adjacent to freshwater wetland habitats. No direct impacts to open marsh habitat is expected. The Catharine Creek Marsh is large and extends to the east and south of the proposed project area. Areas of suitable habitat for the least bittern and pied-billed grebe are located in other locations of the marsh that are not as near to the proposed WWTP site and access road. Site clearing is proposed to occur between October 1 and March 31, which will also minimize impacts to potential nesting bird species since this timeframe matches the migratory period for most waterfowl. Based on the potential to minimally impact suitable habitat for these bird species, but not directly affect the species themselves, the proposed project is anticipated to may affect, not likely to adversely affect the least bittern and pied-billed grebe.

### *Longtail salamander*

The longtail salamander (*Eurycea longicauda*) is found in a variety of wetland habitats, including stream edges, swamps, and marshes. This species has been documented in Montour Falls at Aunt Sarah's Falls, in a plunge pool at the bottom of the waterfall and its associated creek bed, which leads to the Catharine Creek Marsh WMA. Threats to this species are primarily related to water quality changes, such as siltation of streams. Siltation and other forms of surface water pollution will be minimized during construction, as outlined by the project's Stormwater Pollution Prevention Plan (SWPPP). Additionally, the records for this species are located upstream of the project corridor, and no work is proposed in the Aunt Sarah's Falls area. Therefore, the proposed project is not likely to adversely affect longtail salamander populations.



Memo to: Project File  
November 18, 2016  
Page 4

*Comely shiner*

The comely shiner is a critically imperiled fish species in NY. This species was observed in Catharine Creek at the mouth of L'Hommedieu Creek in 2003. This location is within the project area, however, impacts to this stream resources, and other streams along the sewer force main alignments, will be avoided by using directionally drilling methods at the sewer main crossings. A SWPPP has been put together to minimize siltation and other forms of pollution to these streams during construction activities. No work is proposed within the L'Hommedieu Creek channel and minimal, isolated headwall work is associated with the Seneca Barge Canal banks near the proposed Regional WWTP. A main objective of the project is to improve water quality within the watershed by replacing two failing and incompliant pump stations with a new treatment plant. Therefore, the proposed project is not likely to adversely affect comely shiner populations within the Seneca Lake Watershed.

*Floodplain forest community*

The site of the new WWTP is considered characteristic of a floodplain forest community. However, non-native invasive species, such as European buckthorn (*Rhamnus cathartica*) and tatarian honeysuckle (*Lonicera tatarica*) dominate the understory in this area. Floodplain forest communities along the Catharine Creek WMA are highly fragmented. The proposed project will result in the loss of less than 4.8-acres of floodplain forest habitat, comprised of the area bound by the proposed WWTP perimeter fence and western vegetative boundary, which is characterized by open grassy meadows. The loss of floodplain forest habitat will occur in a significantly disturbed site that has historically been filled with dredge spoils from the Seneca Barge Canal. The floodplain forest community extends north, south, and east of the Regional WWTP location. Impacts to the surrounding vegetative communities have been minimized through design modifications. Vegetative plantings are proposed along the east side of the WWTP site to provide further visual buffer of the site to the surrounding area and remaining floodplain forest community.

GLB/akg  
Attachments



<b>Table 1. Federally Listed Species Conclusions</b>					
<b>Species or Habitat</b>	<b>Potential Habitat present?</b>	<b>Species present?</b>	<b>Critical habitat present?</b>	<b>ESA/Eagle Act Determination</b>	<b>Notes/Documentation Summary</b>
Bald eagle	Yes	Yes	No	May affect, likely to adversely affect  NYSDEC and USFWS incidental take permits are required.	A bald eagle nest is located within 330 feet (closest point) of the proposed WWTP.
Northern long-eared bat	Yes	No current survey conducted	No	May affect, not likely to adversely affect	The location for the new WWTP contains suitable bat habitat (trees with a DHB >3"). Tree clearing will occur on the site in order to construct the new WWTP. Tree removal will occur during the overlap of the bats' hibernation period and the non-breeding season for bald eagles (November 1 <sup>st</sup> -December 31 <sup>st</sup> ). Therefore, this project is determined to have a "May effect, not likely to adversely effect" determination for northern long eared bats.
Leedy's roseroot	No	No	No	Not likely to adversely affect	Leedy's roseroot is a perennial succulent plant that grows along the western cliffs of Seneca Lake. The project area is entirely south of Seneca Lake and will not disturb suitable habitat for this species.

**Table 2. State Listed Species Conclusions**

<b>Species</b>	<b>Potential habitat present?</b>	<b>Species present?</b>	<b>Critical habitat present?</b>	<b>ESA/Eagle Act Determination</b>	<b>Notes/Documentation Summary</b>
Least bittern	Yes	No	No	May affect, not likely to adversely affect	This species has been documented in the Catharine Creek Marsh Wildlife Management Area. Habitat for this species is not expected to be impacted, although fringe impacts to wetlands may occur. Ample suitable habitat for this species is located within the Marsh.
Pied-billed grebe	Yes	No	No	May affect, not likely to adversely affect	This species occurs in areas with open marsh habitat. The new WWTP will be located adjacent to the Catharine Creek Marsh Wildlife Management Area, which consists of mostly emergent marsh habitat. While temporary impacts may occur during construction, nesting habitat for this species will not be directly impacted. Ample suitable habitat for this species can be found in other areas of the Catharine Creek Marsh.
Longtail salamander	No	No	No	Not likely to adversely affect	The longtail salamander occurs in streams, waterfalls, plunge pools, and talus streams in forested areas. The project area does not include these habitats and is not near the documented records for this species (further south of the project area in Montour Falls).
Comely shiner	Yes	No current survey	No	Not likely to adversely affect	This species has been observed in Catharine Creek at the mouth of L'Hommedieu Creek. While this location is within the project boundaries, all stream crossings within the sewer main alignment will be directionally drilled and will not be impacted.
Marsh horsetail	Yes	No	No	No effect	Marsh horsetail has been documented in the Catharine Creek Wildlife Management Area in a shallow emergent marsh. However, this species was not observed within the project area and a "no effect" determination is recommended.
Nodding wild onion	No	No	No	No effect	Nodding wild onion was documented on the Montour Cliffs in 2001. Its habitat is outside of the project limits, therefore a "no effect" determination is recommended for nodding wild onion.
Leiberg's panic grass	No	No	No	No effect	This species is historically documented in Watkins Glen, and only one current population is known in NY (at a cemetery in Troy, NY). No evidence of this species or its habitat were observed, and updated correspondence from NYNHP did not list this species. Therefore, a "no effect" determination is recommended for Leiberg's panic grass.

**Table 2. State Listed Species Conclusions**

<b>Species</b>	<b>Potential habitat present?</b>	<b>Species present?</b>	<b>Critical habitat present?</b>	<b>ESA/Eagle Act Determination</b>	<b>Notes/Documentation Summary</b>
Northern wild comfrey	Yes	No	No	No effect	The distribution of northern wild comfrey is limited to northern New York. This species was no longer listed as occurring within the project area in updated NYNHP correspondence. Therefore, it is unlikely to occur at the project site and a “no effect” determination is recommended.
Spreading globeflower	Yes	No	No	No effect	Spreading globeflower occurs in calcareous wetlands, including various swamp and medium to rich fen habitats. Wetlands in the Catharine Creek WMA are largely emergent marsh habitat, which would be unsuitable for spreading globeflower. The proposed WWTP will be located on a forested upland area adjacent to the WMA. Therefore, a “no effect” determination is recommended for spreading globeflower.

# **Attachment A**

## **USFWS Official Species List**



# United States Department of the Interior



FISH AND WILDLIFE SERVICE  
New York Ecological Services Field Office  
3817 LUKER ROAD  
CORTLAND, NY 13045  
PHONE: (607)753-9334 FAX: (607)753-9699  
URL: [www.fws.gov/northeast/nyfo/es/section7.htm](http://www.fws.gov/northeast/nyfo/es/section7.htm)

Consultation Code: 05E1NY00-2016-SLI-2297

August 19, 2016

Event Code: 05E1NY00-2016-E-05452

Project Name: Project Seneca Regional Wastewater Facility

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

## To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). This list can also be used to determine whether listed species may be present for projects without federal agency involvement. New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list.

Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the ESA, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC site at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list. If listed, proposed, or candidate species were identified as potentially occurring in the project area, coordination with our office is encouraged. Information on the steps involved with assessing potential impacts from projects can be found at: <http://www.fws.gov/northeast/nyfo/es/section7.htm>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (

[http://www.fws.gov/windenergy/eagle\\_guidance.html](http://www.fws.gov/windenergy/eagle_guidance.html)). Additionally, wind energy projects should follow the Services wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the ESA. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment



United States Department of Interior  
Fish and Wildlife Service

Project name: Project Seneca Regional Wastewater Facility

## Official Species List

### Provided by:

New York Ecological Services Field Office

3817 LUKER ROAD

CORTLAND, NY 13045

(607) 753-9334

<http://www.fws.gov/northeast/nyfo/es/section7.htm>

**Consultation Code:** 05E1NY00-2016-SLI-2297

**Event Code:** 05E1NY00-2016-E-05452

**Project Type:** WASTEWATER FACILITY

**Project Name:** Project Seneca Regional Wastewater Facility

**Project Description:** The Villages of Watkins Glen and Montour Falls are proposing the replacement of their wastewater treatment facilities in Schuyler County, New York. The project includes the decommissioning and demolition of each municipality's existing wastewater treatment facility (WWTP) and the construction of two (2) pumping stations, approximately 15,400 linear-feet of sanitary sewer force main, and the new regional WWTP. The Montour Falls pumping station will be located at the existing Montour Falls WWTP site and the Watkins Glen pumping station will be located on a parcel nearby the existing Watkins Glen WWTP, at the east end of East 2nd Street. Both proposed pumping station sites will be located within residential and commercial areas. The regional WWTP is proposed on an undeveloped wooded parcel.

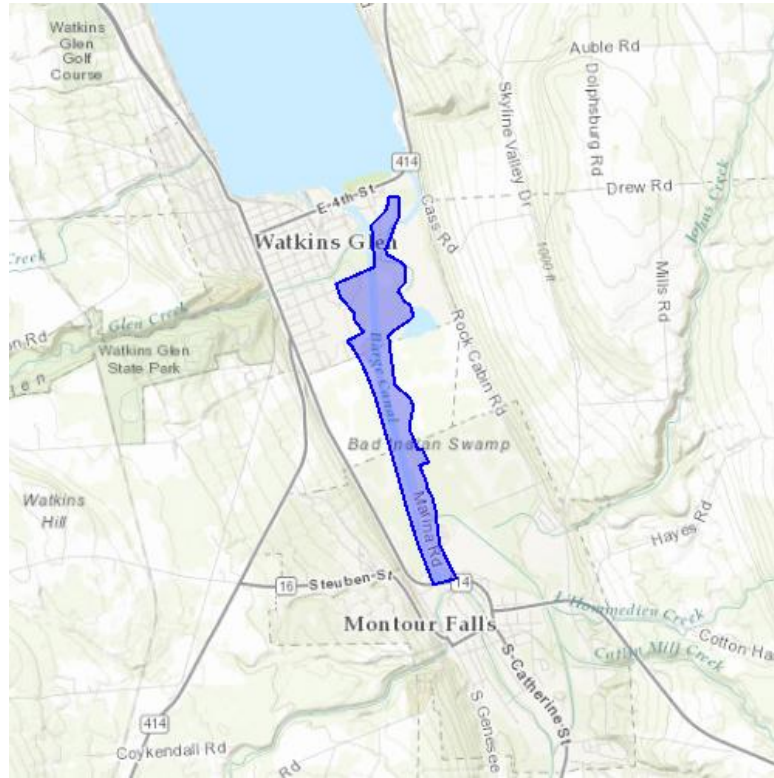
**Please Note:** The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.



United States Department of Interior  
Fish and Wildlife Service

Project name: Project Seneca Regional Wastewater Facility

### Project Location Map:



**Project Coordinates:** The coordinates are too numerous to display here.

**Project Counties:** Schuyler, NY





United States Department of Interior  
Fish and Wildlife Service

Project name: Project Seneca Regional Wastewater Facility

## Endangered Species Act Species List

There are a total of 2 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Flowering Plants	Status	Has Critical Habitat	Condition(s)
Leedy's roseroot ( <i>Rhodiola integrifolia</i> ssp. <i>leedyi</i> )	Threatened		
<b>Mammals</b>			
Northern long-eared Bat ( <i>Myotis septentrionalis</i> )	Threatened		



United States Department of Interior  
Fish and Wildlife Service

Project name: Project Seneca Regional Wastewater Facility

## **Critical habitats that lie within your project area**

There are no critical habitats within your project area.

# **Attachment B**

## **NYNHP Responses**

**NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION**  
**Division of Fish, Wildlife & Marine Resources**  
**New York Natural Heritage Program**  
625 Broadway, 5<sup>th</sup> Floor, Albany, New York 12233-4757  
**Phone:** (518) 402-8935 • **Fax:** (518) 402-8925  
**Website:** [www.dec.ny.gov](http://www.dec.ny.gov)



September 30, 2016

Grete L. Bader  
Barton & Loguidice, D.P.C.  
443 Electronics Parkway  
Liverpool, NY 13088

Re: New wastewater treatment facility, pump stations, and force main for Villages of Watkins Glen and Montour Falls (1733.003.001)

Town/City: Dix.

County: Schuyler.

Dear Grete L. Bader:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the above project.

Enclosed is a report of rare or state-listed animals and plants, and significant natural communities that our database indicates occur, or may occur, on your site or in the immediate vicinity of your site.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our database. We cannot provide a definitive statement as to the presence or absence of all rare or state-listed species or significant natural communities. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

Our database is continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review or permit conditions. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the NYS DEC Region 8 Office, Division of Environmental Permits, as listed at [www.dec.ny.gov/about/39381.html](http://www.dec.ny.gov/about/39381.html).

Sincerely,

A handwritten signature in black ink that reads "Nick Conrad".

Nicholas Conrad  
Information Resources Coordinator  
New York Natural Heritage Program



**The following state-listed animals have been documented in the vicinity of the project site.**

The following list includes animals that are listed by NYS as Endangered, Threatened, or Special Concern; and/or that are federally listed or are candidates for federal listing.

**For information about any permit considerations for your project, contact the Permits staff at the NYSDEC Region 8 Office. For information about potential impacts of your project on these species, and how to avoid, minimize, or mitigate any impacts, contact the Wildlife Manager.**

**A listing of Regional Offices is at <http://www.dec.ny.gov/about/558.html>.**

**The following species have been documented along the route of the force main from Montour Falls Pump Station.**

<i>COMMON NAME</i>	<i>SCIENTIFIC NAME</i>	<i>NY STATE LISTING</i>	<i>FEDERAL LISTING</i>
<b>Birds</b>			
<b>Pied-billed Grebe</b> <i>Breeding</i>	<i>Podilymbus podiceps</i>	Threatened	10671
<b>Least Bittern</b> <i>Breeding</i>	<i>Ixobrychus exilis</i>	Threatened	10994

**The following species has been documented nesting immediately adjacent to the proposed site of the new wastewater treatment plant.**

<i>COMMON NAME</i>	<i>SCIENTIFIC NAME</i>	<i>NY STATE LISTING</i>	<i>FEDERAL LISTING</i>
<b>Birds</b>			
<b>Bald Eagle</b> <i>Breeding</i>	<i>Haliaeetus leucocephalus</i>	Threatened	14941

This report only includes records from the NY Natural Heritage database. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the listed animals in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage’s Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org), and from NYSDEC at [www.dec.ny.gov/animals/7494.html](http://www.dec.ny.gov/animals/7494.html).



**The following rare plants, rare animals, and significant natural communities have been documented at the project site, or in its vicinity.**

We recommend that potential onsite and offsite impacts of the proposed project on these species or communities be addressed as part of any environmental assessment or review conducted as part of the planning, permitting and approval process, such as reviews conducted under SEQR. Field surveys of the project site may be necessary to determine the status of a species at the site, particularly for sites that are currently undeveloped and may still contain suitable habitat. Final requirements of the project to avoid, minimize, or mitigate potential impacts are determined by the lead permitting agency or the government body approving the project.

**The following animals, while not listed by New York State as Endangered or Threatened, are of conservation concern to the state, and are considered rare by the New York Natural Heritage Program.**

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
<b>Amphibians</b>			
<b>Longtail Salamander</b>	<i>Eurycea longicauda</i>	Special Concern	Imperiled in NYS
Falls along Route 14, between Watkins Glen and Montour Falls, 2005-07-04: The habitat at Aunt Sarahs Falls is a small plunge pool at the base of a very high falls and the associated creek bed of a short stretch of a small creek that flows into a large marsh complex. Talus lies at the base of the cliff to the north and south of the pool. Large and small, flat shale rocks are present both at the base of the falls and in the creek bed. At the falls to the north, a small permanent seep stream falls into a plunge pool with talus around the edges.			11075
<b>Longtail Salamander</b>	<i>Eurycea longicauda</i>	Special Concern	Imperiled in NYS
Along Rock Cabin Road, 2005-07-04: The salamanders were found in and near several streams, falls, and wet areas in limey shale in forested areas.			11076
<b>Fish</b>			
<b>Comely Shiner</b>	<i>Notropis amoenus</i>	Unlisted	Imperiled in NYS
Catherine Creek, at mouth of L'Hommedieu, 2003-09-04.			14623

**The following significant natural communities are considered significant from a statewide perspective by the NY Natural Heritage Program. They are either occurrences of a community type that is rare in the state, or a high quality example of a more common community type. By meeting specific, documented criteria, the NY Natural Heritage Program considers these community occurrences to have high ecological and conservation value.**

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
<b>Wetland/Aquatic Communities</b>			
Catharine Creek Wetlands: Exotics present, relatively small size, surrounding area disturbed.			
<b>Floodplain Forest</b>			Rare Community Type
<b>Silver Maple-Ash Swamp</b>			Uncommon Community Type

The following plants are listed as Endangered or Threatened by New York State, and/or are considered rare by the New York Natural Heritage Program, and so are a vulnerable natural resource of conservation concern.

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
<b>Vascular Plants</b>			
<b>Leedy's Roseroot</b>	<i>Rhodiola integrifolia</i> ssp. <i>leedyi</i>	Endangered and Federally Listed as Threatened	Critically Imperiled in NYS and Globally Rare
Watkins Glen State Park, 2009-06-18: The plant is growing on a south-facing shale cliff about 15 feet above the ground.			309
<b>Nodding Wild Onion</b>	<i>Allium cernuum</i> var. <i>cernuum</i>	Threatened	Imperiled in NYS
Cliffs along Rock Cabin Road, 2001-07-24: The plants are on steep, rocky, dry poorly vegetated west-facing shale cliffs.			8150
<b>Marsh Horsetail</b>	<i>Equisetum palustre</i>	Threatened	Imperiled in NYS
Catharine Creek Wetlands, Catherine Creek Wildlife Management Area, 2005-06-08: <i>Equisetum palustre</i> is growing in a shallow emergent marsh dominated by <i>Phalaris arundinacea</i> . The marsh is part of a larger wetland complex at the inlet to Seneca Lake. This wetland complex consists of a mosaic of shallow emergent marsh, floodplain forest and silver maple-ash swamp.			9861

This report only includes records from the NY Natural Heritage database. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org), from NatureServe Explorer at [www.natureserve.org/explorer](http://www.natureserve.org/explorer), and from USDA's Plants Database at <http://plants.usda.gov/index.html> (for plants).

Information about many of the natural community types in New York, including identification, dominant and characteristic vegetation, distribution, conservation, and management, is available online in Natural Heritage's Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org). For descriptions of all community types, go to [www.dec.ny.gov/animals/97703.html](http://www.dec.ny.gov/animals/97703.html) for Ecological Communities of New York State.

**NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION**  
**Division of Fish, Wildlife & Marine Resources**  
**New York Natural Heritage Program**  
625 Broadway, 5<sup>th</sup> Floor, Albany, New York 12233-4757  
**Phone:** (518) 402-8935 • **Fax:** (518) 402-8925  
**Website:** [www.dec.ny.gov](http://www.dec.ny.gov)



Joe Martens  
Commissioner

November 22, 2013

Chelsea Fanara  
Barton & Loguidice  
Box 3107, 290 Elwood Davis Road  
Syracuse, NY 13220

Re: Seneca Regional Wastewater Facility (File 160.005.001)  
Town/City: Dix, Montour. County: Schuyler.

Dear Chelsea Fanara :

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the above project

Enclosed is a report of rare or state-listed animals and plants, and significant natural communities, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement as to the presence or absence of all rare or state-listed species or significant natural communities. This information should not be substituted for on-site surveys that may be required for environmental impact assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review or permit conditions. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, as listed at [www.dec.ny.gov/about/39381.html](http://www.dec.ny.gov/about/39381.html).

Sincerely,

A handwritten signature in black ink that reads "Andrea Chaloux". The signature is written in a cursive, flowing style.

Andrea Chaloux  
Environmental Review Specialist  
New York Natural Heritage Program





**The following state-listed animals have been documented at your project site, or in its vicinity.**

The following list includes animals that are listed by NYS as Endangered, Threatened, or Special Concern; and/or that are federally listed or are candidates for federal listing. The list may also include significant natural communities that can serve as habitat for Endangered or Threatened animals, and/or other rare animals and rare plants found at these habitats.

**For information about potential impacts of your project on these populations, how to avoid, minimize, or mitigate any impacts, and any permit considerations, contact the Wildlife Manager or the Fisheries Manager at the NYSDEC Regional Office for the region where the project is located. A listing of Regional Offices is at <http://www.dec.ny.gov/about/558.html>.**

**The following species and habitats have been documented at or near the project site, generally within 0.5 mile. Potential onsite and offsite impacts from the project may need to be addressed.**

<i>COMMON NAME</i>	<i>SCIENTIFIC NAME</i>	<i>NY STATE LISTING</i>	<i>FEDERAL LISTING</i>
<b>Birds</b>			
<b>Least Bittern</b> <i>Breeding</i>	<i>Ixobrychus exilis</i>	Threatened	10994
<b>Pied-billed Grebe</b> <i>Breeding</i>	<i>Podilymbus podiceps</i>	Threatened	10671

This report only includes records from the NY Natural Heritage databases. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. This information should not be substituted for on-site surveys that may be required for environmental impact assessment.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the listed animals in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org), and from NYSDEC at <http://www.dec.ny.gov/animals/7494.html>.

Information about many of the rare plants and animals, and natural community types, in New York are available online in Natural Heritage's Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org), and from NatureServe Explorer at <http://www.natureserve.org/explorer>.



**The following rare plants, rare animals, and significant natural communities have been documented at your project site, or in its vicinity.**

We recommend that potential onsite and offsite impacts of the proposed project on these species or communities be addressed as part of any environmental assessment or review conducted as part of the planning, permitting and approval process, such as reviews conducted under SEQR. Field surveys of the project site may be necessary to determine the status of a species at the site, particularly for sites that are currently undeveloped and may still contain suitable habitat. Final requirements of the project to avoid, minimize, or mitigate potential impacts are determined by the lead permitting agency or the government body approving the project.

**The following animals, while not listed by New York State as Endangered or Threatened, are of conservation concern to the state, and are considered rare by the New York Natural Heritage Program.**

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
<b>Amphibians</b>			
<b>Longtail Salamander</b>	<i>Eurycea longicauda</i>	Special Concern	Imperiled in NYS
Montour Falls and Watkins Glen East, 2005-07-04: The salamanders were found in and near several streams, falls, and wet areas in limey shale in forested areas.			11076
<b>Longtail Salamander</b>	<i>Eurycea longicauda</i>	Special Concern	Imperiled in NYS
Route 14 Falls Montour Falls, 2005-07-04: The habitat at Aunt Sarahs Falls is a small plunge pool at the base of a very high falls and the associated creek bed of a short stretch of a small creek that flows into a large marsh complex. Talus lies at the base of the cliff to the north and south of the pool. The plunge pool and creek bed were bone dry on September 13, 2002. It was a year of extreme drought in the Southern Tier (no rain since June). Normally, the plunge pool would be a couple of feet deep and there would be some water in the creekbed. Large and small, flat shale rocks are present both at the base of the falls and in the creek bed. At the falls to the north, a small permanent seep stream falls into a plunge pool with talus around the edges. The water is very limy groundwater with			11075

**The following significant natural communities are considered significant from a statewide perspective by the NY Natural Heritage Program. They are either occurrences of a community type that is rare in the state, or a high quality example of a more common community type. By meeting specific, documented criteria, the NY Natural Heritage Program considers these community occurrences to have high ecological and conservation value.**

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS
<b>Wetland/Aquatic Communities</b>			
<b>Floodplain Forest</b>			Rare Community Type
Catherine Creek Wetlands: Exotics present, relatively small size, surrounding area disturbed.			308
<b>Silver Maple-Ash Swamp</b>			Uncommon Community Type
Catherine Creek Wetlands: Small area, hydrology altered by dikes and ditches. Exotics present.			10085

## Upland/Terrestrial Communities

### Calcareous Shoreline Outcrop

High Quality Occurrence of Rare Community Type

Watkins Glen: The outcrop is large and sparsely vegetated within a 700-acre natural area that is surrounded by agriculture. The community has several exotic species whose spread may be somewhat controlled by repeated, seasonal scouring.

9619

### Hemlock-Northern Hardwood Forest

High Quality Occurrence

Watkins Glen: This is a medium-sized, mature forest community with an 18-acre patch of old growth in good condition within a predominately agricultural landscape. A few exotic species are present, but not widespread within the community.

2041

### Shale Cliff and Talus Community

High Quality Occurrence of Uncommon Community Type

Watkins Glen: This is a large, shaded calcareous shale cliff and talus community that lines a deep gorge and is within a 700-acre natural area that is surrounded by agriculture. The cliff varies from approximately 15 to 120 feet (4 to 40 meters) in height and is associated with a broad band of talus shale along much of its length. Exotic species are present, but not particularly abundant on the cliff face or in the talus.

5206

**The following plants are listed as Endangered or Threatened by New York State, and/or are considered rare by the New York Natural Heritage Program, and so are a vulnerable natural resource of conservation concern.**

COMMON NAME	SCIENTIFIC NAME	NY STATE LISTING	HERITAGE CONSERVATION STATUS	
<b>Vascular Plants</b>				
<b>Marsh Horsetail</b>	<i>Equisetum palustre</i>	Threatened	Imperiled in NYS	
Catharine Creek Wetlands, 2005-06-08: Equisetum palustre is growing in a shallow emergent marsh dominated by Phalaris arundinacea. The marsh is part of a larger wetland complex at the inlet to Seneca Lake. This wetland complex consists of a mosaic of shallow emergent marsh, floodplain forest and silver maple-ash swamp.				9861
<b>Nodding Wild Onion</b>	<i>Allium cernuum</i> var. <i>cernuum</i>	Threatened	Imperiled in NYS	
Montour Cliffs, 2001-07-24: The plants are on steep, rocky, dry poorly vegetated west-facing shale cliffs. The area is used by joggers and mountain bikes.				8150
<b>Leedy's Roseroot</b>	<i>Rhodiola integrifolia</i> ssp. <i>leedyi</i>	Endangered and Federally Listed as Threatened	Critically Imperiled in NYS and Globally Rare	
Watkins Glen, 2009-06-18: The plant is growing on a south-facing shale cliff about 15 feet above the ground. The cliff is adjacent to a parking lot.				309

**This report only includes records from the NY Natural Heritage databases. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. This information should not be substituted for on-site surveys that may be required for environmental impact assessment.**

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org), from NatureServe Explorer at <http://www.natureserve.org/explorer>, and from USDA's Plants Database at <http://plants.usda.gov/index.html> (for plants).

Information about many of the natural community types in New York, including identification, dominant and characteristic vegetation, distribution, conservation, and management, is available online in Natural Heritage's Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org). For descriptions of all community types, go to <http://www.dec.ny.gov/animals/29384.html> and click on Draft Ecological Communities of New York State.



**The following rare plants and rare animals have  
historical records  
at your project site, or in its vicinity.**

The following rare plants and animals were documented in the vicinity of the project site at one time, but have not been documented there since 1979 or earlier, and/or there is uncertainty regarding their continued presence. There is no recent information on these plants and animals in the vicinity of the project site and their current status there is unknown. In most cases the precise location of the plant or animal in this vicinity at the time it was last documented is also unknown.

If suitable habitat for these plants or animals is present in the vicinity of the project site, it is possible that they may still occur there. We recommend that any field surveys to the site include a search for these species, particularly at sites that are currently undeveloped and may still contain suitable habitat.

COMMON NAME	SCIENTIFIC NAME	NYS LISTING	HERITAGE CONSERVATION STATUS	
<b>Vascular Plants</b>				
<b>Leiberg's Panic Grass</b>	<i>Dichanthelium leibergii</i>	Endangered	Critically Imperiled in NYS	
1832: Seneca Lake Head. Wet meadow.				5371
<b>Northern Wild Comfrey</b>	<i>Cynoglossum virginianum</i> <i>var. boreale</i>	Endangered	Critically Imperiled in NYS	
1881-06-11: Watkins Glen.				3226
<b>Spreading Globeflower</b>	<i>Trollius laxus</i>	Rare	Vulnerable in NYS and Globally Uncommon	
1857-06: Watkins Glen.				6499

**This report only includes records from the NY Natural Heritage databases. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. This information should not be substituted for on-site surveys that may be required for environmental impact assessment.**

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at [www.guides.nynhp.org](http://www.guides.nynhp.org), from NatureServe Explorer at <http://www.natureserve.org/explorer>, and from USDA's Plants Database at <http://plants.usda.gov/index.html> (for plants).

# **Attachment C**

## **Breeding Bird Atlas Results**



Department of  
Environmental  
Conservation

# NYS Breeding Bird Atlas

## Block 3468A

### 2000-2005



#### Navigation Tools

[Perform Another Search](#)  
[Show All Records](#)  
[Sort by Field Card Order](#)  
[Sort by Taxonomic Order](#)  
[View 1985 Data](#)

#### Block 3468A Summary

Total Species: 101  
 Possible: 11  
 Probable: 27  
 Confirmed: 63

Click on column heading to sort by that category.

#### List of Species Breeding in Atlas Block 3468A

Common Name	Scientific Name	Behavior Code	Date	NY Legal Status
Canada Goose	<i>Branta canadensis</i>	FL	6/13/2001	Game Species
Wood Duck	<i>Aix sponsa</i>	FL	6/13/2001	Game Species
Mallard	<i>Anas platyrhynchos</i>	FL	6/13/2001	Game Species
Wild Turkey	<i>Meleagris gallopavo</i>	FL	6/13/2001	Game Species
Pied-billed Grebe	<i>Podilymbus podiceps</i>	X1	6/17/2001	Threatened
Great Blue Heron	<i>Ardea herodias</i>	X1	5/28/2001	Protected
Green Heron	<i>Butorides virescens</i>	X1	5/28/2001	Protected
Turkey Vulture	<i>Cathartes aura</i>	X1	6/25/2001	Protected
Osprey	<i>Pandion haliaetus</i>	X1	5/25/2001	Protected-Special Concern
Northern Harrier	<i>Circus cyaneus</i>	S2	6/20/2001	Threatened
Sharp-shinned Hawk	<i>Accipiter striatus</i>	S2	6/2/2001	Protected-Special Concern
Cooper's Hawk	<i>Accipiter cooperii</i>	S2	6/2/2001	Protected-Special Concern
Red-tailed Hawk	<i>Buteo jamaicensis</i>	FL	7/1/2001	Protected
American Kestrel	<i>Falco sparverius</i>	FL	7/12/2001	Protected
Killdeer	<i>Charadrius vociferus</i>	NE	6/20/2002	Protected

American Woodcock	<i>Scolopax minor</i>	T2	6/2/2001	Game Species
Rock Pigeon	<i>Columba livia</i>	ON	6/2/2001	Unprotected
Mourning Dove	<i>Zenaida macroura</i>	FL	6/2/2001	Protected
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	T2	5/25/2001	Protected
Eastern Screech-Owl	<i>Megascops asio</i>	FL	7/1/2001	Protected
Great Horned Owl	<i>Bubo virginianus</i>	X1	6/2/2001	Protected
Chimney Swift	<i>Chaetura pelagica</i>	ON	7/1/2001	Protected
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	D2	5/28/2001	Protected
Belted Kingfisher	<i>Megaceryle alcyon</i>	X1	5/28/2001	Protected
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	FY	7/1/2001	Protected
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	FY	7/1/2001	Protected
Downy Woodpecker	<i>Picoides pubescens</i>	FL	6/13/2001	Protected
Hairy Woodpecker	<i>Picoides villosus</i>	FY	6/13/2001	Protected
Northern Flicker	<i>Colaptes auratus</i>	NE	5/23/2001	Protected
Pileated Woodpecker	<i>Dryocopus pileatus</i>	B2	5/28/2001	Protected
Eastern Wood-Pewee	<i>Contopus virens</i>	T2	5/28/2001	Protected
Willow Flycatcher	<i>Empidonax traillii</i>	T2	6/2/2001	Protected
Least Flycatcher	<i>Empidonax minimus</i>	T2	5/25/2001	Protected
Eastern Phoebe	<i>Sayornis phoebe</i>	ON	6/16/2001	Protected
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	NE	6/5/2002	Protected
Eastern Kingbird	<i>Tyrannus tyrannus</i>	ON	6/10/2001	Protected
Yellow-throated Vireo	<i>Vireo flavifrons</i>	NE	6/5/2002	Protected
Blue-headed Vireo	<i>Vireo solitarius</i>	T2	6/10/2001	Protected
Warbling Vireo	<i>Vireo gilvus</i>	NE	6/13/2001	Protected
Red-eyed Vireo	<i>Vireo olivaceus</i>	T2	5/25/2001	Protected
Blue Jay	<i>Cyanocitta cristata</i>	NE	5/28/2001	Protected
American Crow	<i>Corvus brachyrhynchos</i>	NE	5/23/2001	Game Species
Horned Lark	<i>Eremophila alpestris</i>	X1	6/2/2001	Protected-Special Concern
Tree Swallow	<i>Tachycineta bicolor</i>	NE	5/25/2001	Protected
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	X1	5/28/2001	Protected

Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	NE	6/2/2001	Protected
Barn Swallow	<i>Hirundo rustica</i>	B2	5/23/2001	Protected
Black-capped Chickadee	<i>Poecile atricapillus</i>	FY	6/2/2001	Protected
Tufted Titmouse	<i>Baeolophus bicolor</i>	NY	6/20/2002	Protected
White-breasted Nuthatch	<i>Sitta carolinensis</i>	T2	6/2/2001	Protected
Carolina Wren	<i>Thryothorus ludovicianus</i>	FY	7/20/2002	Protected
House Wren	<i>Troglodytes aedon</i>	FY	6/13/2001	Protected
Marsh Wren	<i>Cistothorus palustris</i>	FY	7/20/2002	Protected
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	FY	7/1/2001	Protected
Eastern Bluebird	<i>Sialia sialis</i>	FY	6/2/2001	Protected
Veery	<i>Catharus fuscescens</i>	NE	6/10/2001	Protected
Wood Thrush	<i>Hylocichla mustelina</i>	NE	6/5/2002	Protected
American Robin	<i>Turdus migratorius</i>	FY	5/25/2001	Protected
Gray Catbird	<i>Dumetella carolinensis</i>	FY	7/1/2001	Protected
Northern Mockingbird	<i>Mimus polyglottos</i>	T2	8/10/2001	Protected
European Starling	<i>Sturnus vulgaris</i>	FY	5/23/2001	Unprotected
Cedar Waxwing	<i>Bombycilla cedrorum</i>	X1	5/28/2001	Protected
Blue-winged Warbler	<i>Vermivora pinus</i>	T2	5/28/2001	Protected
Nashville Warbler	<i>Vermivora ruficapilla</i>	T2	6/10/2001	Protected
Yellow Warbler	<i>Dendroica petechia</i>	FY	7/1/2001	Protected
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	FY	6/20/2002	Protected
Magnolia Warbler	<i>Dendroica magnolia</i>	T2	5/28/2001	Protected
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	T2	6/5/2002	Protected
Yellow-rumped Warbler	<i>Dendroica coronata</i>	ON	6/20/2002	Protected
Black-throated Green Warbler	<i>Dendroica virens</i>	ON	6/20/2002	Protected
Blackburnian Warbler	<i>Dendroica fusca</i>	S2	6/10/2001	Protected
Prairie Warbler	<i>Dendroica discolor</i>	NY	6/20/2002	Protected
Black-and-white Warbler	<i>Mniotilta varia</i>	FY	6/10/2001	Protected
American Redstart	<i>Setophaga ruticilla</i>	T2	5/28/2001	Protected



Worm-eating Warbler	<i>Helmitheros vermivorum</i>	X1	5/10/2001	Protected
Ovenbird	<i>Seiurus aurocapilla</i>	T2	5/25/2001	Protected
Northern Waterthrush	<i>Seiurus noveboracensis</i>	FY	6/5/2002	Protected
Mourning Warbler	<i>Oporornis philadelphia</i>	T2	5/28/2001	Protected
Common Yellowthroat	<i>Geothlypis trichas</i>	FY	6/20/2002	Protected
Hooded Warbler	<i>Wilsonia citrina</i>	T2	5/28/2001	Protected
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	T2	5/25/2001	Protected
Chipping Sparrow	<i>Spizella passerina</i>	FY	6/10/2001	Protected
Field Sparrow	<i>Spizella pusilla</i>	FY	6/10/2001	Protected
Savannah Sparrow	<i>Passerculus sandwichensis</i>	FY	7/1/2001	Protected
Song Sparrow	<i>Melospiza melodia</i>	FY	6/10/2001	Protected
Swamp Sparrow	<i>Melospiza georgiana</i>	FL	7/1/2001	Protected
Dark-eyed Junco	<i>Junco hyemalis</i>	FL	5/28/2001	Protected
Scarlet Tanager	<i>Piranga olivacea</i>	ON	6/20/2002	Protected
Northern Cardinal	<i>Cardinalis cardinalis</i>	NY	6/20/2002	Protected
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	DD	6/10/2001	Protected
Indigo Bunting	<i>Passerina cyanea</i>	NY	6/20/2002	Protected
Bobolink	<i>Dolichonyx oryzivorus</i>	ON	6/10/2001	Protected
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	NE	5/25/2001	Protected
Eastern Meadowlark	<i>Sturnella magna</i>	T2	6/10/2001	Protected
Common Grackle	<i>Quiscalus quiscula</i>	NE	5/23/2001	Protected
Brown-headed Cowbird	<i>Molothrus ater</i>	FL	7/1/2001	Protected
Baltimore Oriole	<i>Icterus galbula</i>	NE	6/10/2001	Protected
Purple Finch	<i>Carpodacus purpureus</i>	T2	6/10/2001	Protected
House Finch	<i>Carpodacus mexicanus</i>	FL	6/10/2001	Protected
American Goldfinch	<i>Spinus tristis</i>	FY	7/26/2002	Protected
House Sparrow	<i>Passer domesticus</i>	FL	5/28/2001	Unprotected

Current Date: 9/12/2016



Department of  
Environmental  
Conservation

# NYS Breeding Bird Atlas

## Block 3469C

### 2000-2005



#### Navigation Tools

[Perform Another Search](#)  
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[Sort by Taxonomic Order](#)  
[View 1985 Data](#)

#### Block 3469C Summary

Total Species: 118  
 Possible: 8  
 Probable: 38  
 Confirmed: 72

Click on column heading to sort by that category.

#### List of Species Breeding in Atlas Block 3469C

Common Name	Scientific Name	Behavior Code	Date	NY Legal Status
Canada Goose	<i>Branta canadensis</i>	FL	5/20/2000	Game Species
Mute Swan	<i>Cygnus olor</i>	D2	5/25/2001	Protected
Wood Duck	<i>Aix sponsa</i>	FL	7/1/2000	Game Species
American Wigeon	<i>Anas americana</i>	P2	5/24/2000	Game Species
Mallard	<i>Anas platyrhynchos</i>	FL	6/16/2000	Game Species
Blue-winged Teal	<i>Anas discors</i>	FL	6/21/2000	Game Species
Hooded Merganser	<i>Lophodytes cucullatus</i>	FL	6/5/2000	Game Species
Common Merganser	<i>Mergus merganser</i>	FL	6/21/2000	Game Species
Ring-necked Pheasant	<i>Phasianus colchicus</i>	T2	4/10/2000	Game Species
Ruffed Grouse	<i>Bonasa umbellus</i>	T2	6/7/2000	Game Species
Wild Turkey	<i>Meleagris gallopavo</i>	NE	4/28/2000	Game Species
<b>Pied-billed Grebe</b>	<i>Podilymbus podiceps</i>	<b>X1</b>	5/14/2000	<b>Threatened</b>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	X1	4/25/2000	Protected
American Bittern	<i>Botaurus lentiginosus</i>	S2	7/1/2000	Protected-Special Concern
<b>Least Bittern</b>	<i>Ixobrychus exilis</i>	<b>D2</b>	7/1/2000	<b>Threatened</b>
Great Blue Heron	<i>Ardea herodias</i>	X1	6/7/2000	Protected

Green Heron	<i>Butorides virescens</i>	ON	6/7/2000	Protected
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	ON	6/7/2000	Protected
Turkey Vulture	<i>Cathartes aura</i>	X1	7/1/2000	Protected
Osprey	<i>Pandion haliaetus</i>	FY	7/29/2003	Protected-Special Concern
Northern Harrier	<i>Circus cyaneus</i>	S2	6/11/2000	Threatened
Red-shouldered Hawk	<i>Buteo lineatus</i>	X1	5/24/2000	Protected-Special Concern
Red-tailed Hawk	<i>Buteo jamaicensis</i>	FL	7/1/2000	Protected
American Kestrel	<i>Falco sparverius</i>	FY	7/1/2000	Protected
Virginia Rail	<i>Rallus limicola</i>	FL	7/1/2000	Game Species
Sora	<i>Porzana carolina</i>	D2	7/1/2000	Game Species
American Coot	<i>Fulica americana</i>	S2	5/24/2000	Game Species
Killdeer	<i>Charadrius vociferus</i>	FL	5/10/2000	Protected
Spotted Sandpiper	<i>Actitis macularius</i>	ON	6/7/2000	Protected
Wilson's Snipe	<i>Gallinago delicata</i>	D2	6/21/2000	Game Species
American Woodcock	<i>Scolopax minor</i>	T2	6/10/2001	Game Species
Ring-billed Gull	<i>Larus delawarensis</i>	NY	6/20/2000	Protected
Herring Gull	<i>Larus argentatus</i>	NY	6/20/2000	Protected
Rock Pigeon	<i>Columba livia</i>	NE	6/2/2001	Unprotected
Mourning Dove	<i>Zenaida macroura</i>	ON	4/15/2000	Protected
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	T2	7/1/2000	Protected
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	T2	6/7/2000	Protected
Eastern Screech-Owl	<i>Megascops asio</i>	X1	6/9/2000	Protected
Great Horned Owl	<i>Bubo virginianus</i>	FL	5/20/2000	Protected
Chimney Swift	<i>Chaetura pelagica</i>	ON	6/7/2000	Protected
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	FL	7/16/2000	Protected
Belted Kingfisher	<i>Megaceryle alcyon</i>	D2	6/7/2000	Protected
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	ON	6/1/2000	Protected
Downy Woodpecker	<i>Picoides pubescens</i>	FY	6/9/2000	Protected
Hairy Woodpecker	<i>Picoides villosus</i>	FY	6/9/2000	Protected
Northern Flicker	<i>Colaptes auratus</i>	FY	6/9/2000	Protected
Pileated Woodpecker	<i>Dryocopus pileatus</i>	ON	6/9/2000	Protected
Eastern Wood-Pewee	<i>Contopus virens</i>	T2	6/14/2000	Protected

Willow Flycatcher	<i>Empidonax traillii</i>	FY	7/4/2000	Protected
Least Flycatcher	<i>Empidonax minimus</i>	FY	6/28/2000	Protected
Eastern Phoebe	<i>Sayornis phoebe</i>	NY	6/9/2000	Protected
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	ON	6/9/2000	Protected
Eastern Kingbird	<i>Tyrannus tyrannus</i>	ON	7/1/2000	Protected
Blue-headed Vireo	<i>Vireo solitarius</i>	T2	7/11/2000	Protected
Warbling Vireo	<i>Vireo gilvus</i>	T2	6/7/2000	Protected
Red-eyed Vireo	<i>Vireo olivaceus</i>	T2	6/9/2000	Protected
Blue Jay	<i>Cyanocitta cristata</i>	FY	6/9/2000	Protected
American Crow	<i>Corvus brachyrhynchos</i>	FY	6/9/2000	Game Species
Horned Lark	<i>Eremophila alpestris</i>	NE	6/2/2001	Protected-Special Concern
Purple Martin	<i>Progne subis</i>	NY	6/30/2000	Protected
Tree Swallow	<i>Tachycineta bicolor</i>	ON	5/20/2000	Protected
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	ON	6/5/2000	Protected
Bank Swallow	<i>Riparia riparia</i>	ON	6/2/2001	Protected
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	FY	8/1/2000	Protected
Barn Swallow	<i>Hirundo rustica</i>	NY	7/1/2000	Protected
Black-capped Chickadee	<i>Poecile atricapillus</i>	FY	6/9/2000	Protected
Tufted Titmouse	<i>Baeolophus bicolor</i>	FY	6/9/2000	Protected
Red-breasted Nuthatch	<i>Sitta canadensis</i>	T2	6/9/2000	Protected
White-breasted Nuthatch	<i>Sitta carolinensis</i>	D2	6/9/2000	Protected
Carolina Wren	<i>Thryothorus ludovicianus</i>	FY	7/20/2000	Protected
House Wren	<i>Troglodytes aedon</i>	FY	6/24/2000	Protected
Marsh Wren	<i>Cistothorus palustris</i>	D2	7/1/2000	Protected
Eastern Bluebird	<i>Sialia sialis</i>	FY	6/21/2000	Protected
Wood Thrush	<i>Hylocichla mustelina</i>	T2	6/9/2000	Protected
American Robin	<i>Turdus migratorius</i>	NE	7/15/2002	Protected
Gray Catbird	<i>Dumetella carolinensis</i>	FL	7/29/2001	Protected
Northern Mockingbird	<i>Mimus polyglottos</i>	FY	7/26/2000	Protected
Brown Thrasher	<i>Toxostoma rufum</i>	T2	6/10/2001	Protected

European Starling	<i>Sturnus vulgaris</i>	FS	4/25/2000	Unprotected
Cedar Waxwing	<i>Bombycilla cedrorum</i>	X1	6/15/2000	Protected
Blue-winged Warbler	<i>Vermivora pinus</i>	FY	6/20/2000	Protected
Northern Parula	<i>Parula americana</i>	T2	5/20/2000	Protected
Yellow Warbler	<i>Dendroica petechia</i>	FY	5/20/2000	Protected
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	FY	6/1/2000	Protected
Magnolia Warbler	<i>Dendroica magnolia</i>	T2	6/1/2000	Protected
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	T2	6/20/2000	Protected
Black-throated Green Warbler	<i>Dendroica virens</i>	ON	6/9/2000	Protected
Pine Warbler	<i>Dendroica pinus</i>	T2	6/21/2000	Protected
Black-and-white Warbler	<i>Mniotilta varia</i>	T2	6/1/2000	Protected
American Redstart	<i>Setophaga ruticilla</i>	T2	5/20/2000	Protected
Ovenbird	<i>Seiurus aurocapilla</i>	D2	6/9/2000	Protected
Northern Waterthrush	<i>Seiurus noveboracensis</i>	T2	6/2/2001	Protected
Louisiana Waterthrush	<i>Seiurus motacilla</i>	FY	7/2/2001	Protected
Mourning Warbler	<i>Oporornis philadelphia</i>	T2	6/2/2001	Protected
Common Yellowthroat	<i>Geothlypis trichas</i>	FY	7/1/2000	Protected
Hooded Warbler	<i>Wilsonia citrina</i>	T2	6/21/2000	Protected
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	T2	5/24/2000	Protected
Chipping Sparrow	<i>Spizella passerina</i>	FL	7/25/2000	Protected
Field Sparrow	<i>Spizella pusilla</i>	FY	6/21/2000	Protected
Savannah Sparrow	<i>Passerculus sandwichensis</i>	T2	6/21/2000	Protected
Song Sparrow	<i>Melospiza melodia</i>	FY	6/1/2000	Protected
Swamp Sparrow	<i>Melospiza georgiana</i>	FY	6/14/2000	Protected
White-throated Sparrow	<i>Zonotrichia albicollis</i>	X1	5/15/2000	Protected
Dark-eyed Junco	<i>Junco hyemalis</i>	FY	6/9/2000	Protected
Scarlet Tanager	<i>Piranga olivacea</i>	T2	5/20/2000	Protected
Northern Cardinal	<i>Cardinalis cardinalis</i>	ON	6/9/2000	Protected
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	FL	7/26/2000	Protected
Indigo Bunting	<i>Passerina cyanea</i>	T2	6/14/2000	Protected

Bobolink	<i>Dolichonyx oryzivorus</i>	ON	6/21/2000	Protected
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	FL	6/1/2000	Protected
Eastern Meadowlark	<i>Sturnella magna</i>	P2	6/8/2000	Protected
Common Grackle	<i>Quiscalus quiscula</i>	FY	5/24/2000	Protected
Brown-headed Cowbird	<i>Molothrus ater</i>	FL	7/10/2000	Protected
Baltimore Oriole	<i>Icterus galbula</i>	ON	6/1/2000	Protected
Purple Finch	<i>Carpodacus purpureus</i>	FL	7/1/2000	Protected
House Finch	<i>Carpodacus mexicanus</i>	FL	7/1/2000	Protected
American Goldfinch	<i>Spinus tristis</i>	FY	7/30/2000	Protected
House Sparrow	<i>Passer domesticus</i>	FL	6/11/2000	Unprotected

Current Date: 9/12/2016

**Appendix I**

**Endangered Species and  
Historic Preservation Documentation**



# Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO  
Governor

ROSE HARVEY  
Commissioner

January 28, 2016

Ms. Johanna Duffy  
Sr. Project Environmental Scientist  
Barton & Loguidice, D.P.C.  
443 Electronics Parkway  
Liverpool, NY 13088

Re: USACE  
Seneca Regional WWTP  
Boat Launch Rd, Watkins Glen, Schuyler County, NY  
14PR00331

Dear Ms. Duffy:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act and/or the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8).

Based upon this review, the New York SHPO has determined that no historic properties will be affected by this undertaking.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Deputy Commissioner for Historic Preservation



**Appendix J**

**Technical Field Guidance for  
Spill Reporting and Initial Notification**

TECHNICAL  
FIELD GUIDANCE

**SPILL REPORTING AND INITIAL  
NOTIFICATION REQUIREMENTS**

## NOTES

### **Spill Reporting and Initial Notification Requirements**

#### **GUIDANCE SUMMARY AT-A-GLANCE**

- Reporting spills is a crucial first step in the response process.
- You should understand the spill reporting requirements to be able to inform the spillers of their responsibilities.
- Several different state, local, and federal laws and regulations require spillers to report petroleum and hazardous materials spills.
- The state and federal reporting requirements are summarized in Exhibit 1.1-1.
- Petroleum spills must be reported to DEC unless they meet all of the following criteria:
  - The spill is known to be less than 5 gallons; and
  - The spill is contained and under the control of the spiller; and
  - The spill has not and will not reach the State's water or any land; and
  - The spill is cleaned up within 2 hours of discovery.

All reportable petroleum spills and most hazardous materials spills must be reported to DEC hotline (1-800-457-7362) within New York State; and (1-518 457-7362) from outside New York State. For spills not deemed reportable, it is strongly recommended that the facts concerning the incident be documented by the spiller and a record maintained for one year.

- Inform the spiller to report the spill to other federal or local authorities, if required.
- Report yourself those spills for which you are unable to locate the responsible spiller.
- Make note of other agencies' emergency response telephone numbers in case you require their on-scene assistance, or if the response is their responsibility and not BSPR's.

## NOTES

### **1.1.1 Notification Requirements for Oil Spills and Hazardous Material Spills**

Spillers are required under state law and under certain local and federal laws to report spills. These various requirements, summarized in Exhibit 1.1-1, often overlap; that is, a particular spill might be required to be reported under several laws or regulations and to several authorities. Under state law, all petroleum and most hazardous material spills must be reported to DEC Hotline (1-800-457-7362), within New York State, and to 1-518-457-7362 from outside New York State. Prompt reporting by spillers allows for a quick response, which may reduce the likelihood of any adverse impact to human health and the environment. You will often have to inform spillers of their responsibilities.

Although the spiller is responsible for reporting spills, other persons with knowledge of a spill, leak, or discharge is required to report the incident (see Appendices A and B). You will often have to inform spillers of their responsibilities. You may also have to report spills yourself in situations where the spiller is not known or cannot be located. However, it is the legal responsibility of the spiller to report spills to both state and other authorities.

BSPR personnel also are responsible for notifying other response agencies when the expertise or assistance of other agencies is needed. For example, the local fire department should be notified of spills that pose a potential explosion and/or fire hazard. If such a hazard is detected and the fire department has not been notified, call for their assistance immediately. Fire departments are trained and equipped to respond to these situations; you should not proceed with your response until the fire/safety hazard is eliminated. For more information on interagency coordination in emergency situations see Part 1, Section 3, Emergency Response.

Another important responsibility is notifying health department officials when a drinking water supply is found to be contaminated as a result of a spill. It will be the health department's responsibility to advise you on the health risk associated with any contamination.

Exhibits 1.1-1 and 1.1-2 list the state and federal requirements to report petroleum and hazardous substance spills, respectively. The charts describe the type of material covered, the applicable act or regulation, the agency that must be notified, what must be reported, and the person responsible for reporting. New York state also has a emergency notification network for spill situations (e.g., major chemical releases) that escalate beyond the capabilities of local and regional response agencies/authorities to provide adequate response. The New York State Emergency Management Office (SEMO) coordinates emergency response activities among local, state, and federal government organizations in these cases.

**Exhibit 1.1-1**

**State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges**

<b>Materials Covered</b>	<b>Act or Regulation</b>	<b>Agency to Notify</b>	<b>What Must Be Reported and When</b>	<b>Who Must Report</b>
Petroleum from any source	Navigation Law Article 12; 17 NYCRR 32.3 and 32.4	DEC Hotline 1-800-457-7362	<p>The notification of a discharge must be immediate, but in no case later than two hours after discharge.</p> <ol style="list-style-type: none"> <li>1. Name of person making report and his relationship to any person which might be responsible for causing the discharge.</li> <li>2. Time and date of discharge.</li> <li>3. Probable source of discharge.</li> <li>4. The location of the discharge, both geographic and with respect to bodies of water.</li> <li>5. Type of petroleum discharges.</li> <li>6. Possible health or fire hazards resulting from the discharge.</li> <li>7. Amount of petroleum discharged.</li> <li>8. All actions that are being taken to clean up and remove the discharge.</li> <li>9. The personnel presently on the scene.</li> <li>10. Other government agencies that have been or will be notified.</li> </ol>	Any person causing discharge of petroleum. Owner or person in actual or constructive control must notify DEC unless that person has adequate assurance that such notice has already been given.
All aboveground petroleum and underground storage facilities with a combined storage capacity of over 1100 gallons.	ECL §17-1007; 6 NYCRR §613.8	DEC Hotline 1-800-457-7362	<ol style="list-style-type: none"> <li>1. Report spill incident within two hours of discovery.</li> <li>2. Also when results of any inventory, record, test, or inspection shows a facility is leaking, that fact must be reported within two hours of discovery.</li> </ol>	Any person with knowledge of a spill, leak, or discharge.
Petroleum contaminated with PCB.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of PCB oil.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.

**Exhibit 1.1-1**

**State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges  
(continued)**

<b>Materials Covered</b>	<b>Act or Regulation</b>	<b>Agency to Notify</b>	<b>What Must Be Reported and When</b>	<b>Who Must Report</b>
Any liquid (petroleum included) that if released would be likely to pollute lands or waters of the state.	ECL §17-1743	DEC Hotline 1-800-457-7362	Immediate notification that a spill, release, or discharge of any amount has occurred. Owner or person in actual or constructive possession or control of more than 1,100 gallons of the liquid.	
Petroleum Discharge in violation of §311(b)(3) of the Clean Water Act	40 CFR §110.10 (Clean Water Act)	<ol style="list-style-type: none"> <li>1. National Response Center (NRC) 1-800-424-8802.</li> <li>2. If not possible to notify NRC, notify Coast Guard or predesignated on-scene coordinator.</li> <li>3. If not possible to notify either 1 or 2, reports may be made immediately to nearest Coast Guard units, provided NRC notified as soon as possible.</li> </ol>	<p>Immediate notification as soon as there is knowledge of an oil discharge that violates water quality standards or causes sheen on navigable waters.</p> <p>Procedures for notice are set forth in 33 CFR Part 153, Subpart B, and in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, Subpart E.</p>	Person in charge of vessel or on-shore or off-shore facility.
Petroleum, petroleum by-products or other dangerous liquid commodities that may create a hazardous or toxic condition spilled into navigable waters.	33 CFR 126.29 (Ports and Waters Safety Act)	Captain of the Port or District Commander	As soon as discharge occurs, owner or master of vessel must immediately report that a discharge has occurred.	Owner or master of vessel or owner or operator of the facility at which the discharge occurred.

**Exhibit 1.1-1**

**State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges  
(continued)**

<b>Materials Covered</b>	<b>Act or Regulation</b>	<b>Agency to Notify</b>	<b>What Must Be Reported and When</b>	<b>Who Must Report</b>
Petroleum or hazardous substance from a vessel, on-shore or off-shore facility in violation of §311(b)(3) of the Clean Water Act.	33 CFR 153.203 (Clean Water Act)	<ol style="list-style-type: none"> <li>1. NRC U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; 1-800-424-8802.</li> <li>2. Where direct reporting not practicable, reports may be made to the Coast Guard (District Offices), the 3rd and 9th district of the EPA regional office at 26 Federal Plaza, NY, NY 10278; 1-201-548-8730.</li> <li>3. Where none of the above is possible, may contact nearest Coast Guard unit, provided NRC notified as soon as possible.</li> </ol>	Any discharger shall immediately notify the NRC of such discharge.	Person in charge of vessel or facility.

**Exhibit 1.1-2**

**State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges**

<b>Materials Covered</b>	<b>Act or Regulation</b>	<b>Agency to Notify</b>	<b>What Must Be Reported and When</b>	<b>Who Must Report</b>
Any hazardous substance pursuant to Article 37. Does not include petroleum.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597; ECL 40-0113(d)	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of a hazardous substance.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.
Hazardous materials or substances as defined in 49 CFR §171.8 that are transported. (See federal reporting requirements.)	Transportation Law 14(f); 17 NYCRR 507.4(b)	Local fire department or police department or local municipality	<p>Immediate notification must be given of incident in which any of the following occurs as a direct result of a spill of hazardous materials:</p> <ol style="list-style-type: none"> <li>1. Person is killed.</li> <li>2. Person receives injuries requiring hospitalization.</li> <li>3. Estimated damage to carrier or other property exceeds \$50,000.</li> <li>4. Fire, breakage, spillage, or suspected contamination due to radioactive materials.</li> <li>5. Fire, breakage, spillage, or suspected contamination involving etiologic agents.</li> <li>6. Situation is such that, in the judgment of the carrier, a continuing danger to life or property exists at the scene of the incident.</li> </ol>	All persons and carriers engaged in the transportation of hazardous materials.



**Exhibit 1.1-2**  
**State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges**  
**(continued)**

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous materials (wastes included) that are transported, whose carrier is involved in an accident.	Department of Transportation Regulations 49 CFR 171.15; 17 NYCRR Part 924; 17 NYCRR Part 507	<ol style="list-style-type: none"> <li>1. U.S. Department of Transportation 1-800-424-8802</li> <li>2. DEC Hotline 1-800-457-7362</li> <li>3. Rail Carrier <u>On-Duty</u> 518-457-1046 <u>Off-Duty</u> 518-457-6164</li> <li>4. Notify local police or fire department.</li> </ol>	<p>Notice should be given by telephone at the earliest practicable moment and should include:</p> <ol style="list-style-type: none"> <li>1. Name of reporter.</li> <li>2. Name and address of carrier represented by reporter.</li> <li>3. Phone number where reporter can be contacted.</li> <li>4. Date, time, and location of incident.</li> <li>5. The extent of injuries, if any.</li> <li>6. Classification, name and quantity of hazardous materials involved, if available.</li> <li>7. Type of incident and nature of hazardous material involved and whether a continuing danger to life exists at scene.</li> <li>8. Each carrier making this report must also make the report required by §171.16.</li> </ol>	<p>Each carrier that transports hazardous materials involves in an accident that causes any of the following as a direct result:</p> <ol style="list-style-type: none"> <li>1. A person is killed</li> <li>2. A person receives injuries requiring hospitalization</li> <li>3. Estimated damage to carrier or other property exceeds \$50,000</li> <li>4. Fire, breakage, spillage, suspected or otherwise involving radioactive material.</li> <li>5. Fire, breakage, spillage, suspected contamination involving etiologic agents.</li> <li>6. Situation is such that carrier thinks it should be reported in accordance with paragraph b.</li> </ol>

**Exhibit 1.1-2**  
**State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges**  
**(continued)**

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Reportable quantity of a hazardous substance into navigable waters or adjoining shorelines. Substances are listed in 40 CFR 302.4.	Department of Transportation Regulations 49 CFR §171.16 as authorized by the Hazardous Materials Transportation Act	U.S. Coast Guard National Response Center (NRC), 1-800-424-8802 or 1-202-267-2675	<p>As soon as person in charge becomes aware of a spill incident, he must notify NRC and provide the following information:</p> <ol style="list-style-type: none"> <li>1. The information required by 49 CFR §171.15 (see above).</li> <li>2. Name of shipper of hazardous substance.</li> <li>3. Quantity of hazardous substance discharged, if known.</li> <li>4. If person in charge is incapacitated, carrier shall make the notification.</li> <li>5. Estimate of quantity of hazardous substance removed from the scene and the manner of disposition of any unremoved hazardous substance shall be entered in Part (H) of the report required by 49 CFR 171.16 (see above).</li> </ol>	Person in charge of aircraft, vessel, transport vehicle, or facility. Must inform NRC directly, or indirectly through carrier.
Reportable quantity of a hazardous substance from vessel, on-shore or off-shore facility. Substances and requirements specified in 40 CFR §117.3.	40 CFR §117.21 as authorized under the FWPCA	NRC 1-800-424-8802. If not practicable report may be made to the Coast Guard (3rd or 9th Districts) District Offices or to EPA, designated On-Scene Coordinator, Region II, 26 Federal Plaza, NY, NY 10278; 1-201-548-8730	Immediate notification is required.	Person in charge of vessel, or on-shore or off-shore facility

**Exhibit 1.1-2**  
**State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges**  
**(continued)**

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
<p>Facilities where a hazardous chemical is produced, used, or stored, and there is a reportable quantity of any extremely hazardous substance as set out in Appendix A to 40 CFR 355 or a CERCLA hazardous substance as specified in 40 CFR 302.4. (This section does not apply to a release that does not go beyond the facility, that emanates from a facility that is federally permitted, is continuous as defined under §103(f) of CERCLA or to any release exempt from CERCLA §103(a) reporting under §101(22) of CERCLA.)</p>	<p>40 CFR 355.40 (SARA)</p> <p>Releases of CERCLA Hazardous Substances are subject to release reporting requirements of CERCLA §103, codified at 40 CFR Part 302, in addition to being subject to the requirements of this Part.</p>	<p>Community emergency coordinator for the local emergency planning committee of any area likely to be affected and the State Emergency Response Commission of any state likely to be affected by the release. If there is no local emergency planning commission notification shall be made to relevant local emergency response personnel.</p>	<p>Immediately notify agencies at left and provide the following information when available:</p> <ol style="list-style-type: none"> <li>1. Chemical name or identity of any substance involved in the release.</li> <li>2. Indication of whether the substance is an extremely hazardous substance.</li> <li>3. An estimate of the quantity released.</li> <li>4. Time and duration of release.</li> <li>5. Medium or media into which the release occurred.</li> <li>6. Known health risks associated with emergency and where appropriate advice regarding medical attention for those exposed.</li> <li>7. Proper precautions/actions that should be taken, including evacuation.</li> <li>8. Names and telephone numbers of person to be contacted for further information.</li> </ol> <p>As soon as practicable after release, followup notification by providing the following information:</p> <ol style="list-style-type: none"> <li>1. Actions taken to respond to and contain the release.</li> <li>2. Health risks.</li> <li>3. Advice on medical attention for exposed individuals.</li> </ol>	<p>Owner or operator of facility</p>

**Exhibit 1.1-2**  
**State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges**  
**(continued)**

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous liquids transported in pipelines, a release of which results in any circumstances as set out in 195.50(a) through (f). Also any incident that results in circumstances listed in 195.52(g).	49 CFR 195.50, 195.52 and 195.54 (Hazardous Liquid Pipeline Safety Act).	NRC, 1-800-424-8802	<p>Notice must be given at the earliest practicable moment and the following information provided:</p> <ol style="list-style-type: none"> <li>1. Name and address of the operator.</li> <li>2. Name and telephone number of the reporter.</li> <li>3. Location of the failure.</li> <li>4. The time of the failure.</li> <li>5. The fatalities and personal injuries, if any.</li> <li>6. All other significant facts known by the operator that are relevant to the cause of the failure or extent of the damages.</li> </ol>	Operator of system.
Hazardous wastes in transport	40 CFR §263.30(a) (RCRA)	<ol style="list-style-type: none"> <li>1. Local authorities</li> <li>2. If required by 49 CFR 171.15, notify the NRC at 1-800-424-8802 or 1-202-426-2675</li> <li>3. Report in writing to Director of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, DC 20590</li> </ol>	<p>Notification must be immediate.</p> <p>For discharge of hazardous waste by air, rail, highway, or water, the transporter must:</p> <ol style="list-style-type: none"> <li>1. Give notice as in 49 CFR 161.15 (if applicable).</li> <li>2. Report in writing as in 49 CFR 171.16.</li> </ol> <p>Wastes transporter (bulk shipment) must give same notice as required by 33 CFR 153.20.</p>	Transporter by air, rail, highway, or water.

**Exhibit 1.1-2**  
**State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges**  
**(continued)**

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Vinyl Chloride from any manual vent valve, or polyvinyl chloride plants	Clean Air Act 40 CFR 61.64	Administrator of EPA	<p>Within 10 days of any discharge from any manual vent valve, report must be made, in writing, and the following information provided:</p> <ol style="list-style-type: none"> <li>1. Source, nature and cause of the discharge</li> <li>2. Date and time of the discharge</li> <li>3. Approximate total vinyl chloride loss during discharge</li> <li>4. Method used for determining loss</li> <li>5. Action taken to prevent the discharge</li> <li>6. Measures adopted to prevent future discharges.</li> </ol>	Owner or operator of plant.
Radioactive Materials	6 NYCRR §380.7	Commissioner of DEC	<ol style="list-style-type: none"> <li>1. Notify immediately by telephone when concentration, averaged over a 24-hour period, exceeds or threatens to exceed 5000 times the limits set forth in Schedule 2 of 380.9 (in uncontrolled areas).</li> <li>2. Notify within 24 hours by telephone when concentration, averaged over 24- hour period, exceeds or threatens to exceed 500 times the limits set forth in Schedule 2 above (in uncontrolled areas).</li> <li>3. Report within 30 days the concentration and quantity of radioactive material involved, the cause of the discharge, and corrective steps taken or planned to ensure no recurrence of the discharge.</li> </ol>	Operator of the radiation installation.

**Exhibit 1.1-2**  
**State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges**  
**(continued)**

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Low Level radioactive wastes in transport. Any suspected or actual uncontrolled releases.	6 NYCRR 381.16 ECL §27-0305 Waste Transporter Permits	DEC and Department of Health	Immediate notification.	Transporter

TECHNICAL  
FIELD GUIDANCE

**SPILL REPORTING AND INITIAL NOTIFICATION  
ENFORCEMENT OF SPILLER RESPONSIBILITY**

## **NOTES**

### **Spill Reporting and Initial Notification - Enforcement of Spiller Responsibility**

#### **GUIDANCE SUMMARY-AT-A-GLANCE**

# Use the "Notification Procedures Checklist" (Exhibit 1.1-3) to document conversations with the responsible party or potentially responsible party (PRP/RP) concerning his or her clean-up responsibilities.

# The steps to follow when you inform the PRP/RP of his or her legal responsibility are:

- Give your name and identify yourself as a DEC employee;
- Inform them that they have been identified as the party responsible for the spill;
- Inform PRP/Rps of their liability for all clean-up and removal costs. (If necessary, cite Section 181 of the Navigation Law);
- Ask PRP/Rps "point blank" if they will accept responsibility for the cleanup; and
- If the PRP/RP does not accept responsibility, or does not admit to being the PRP/RP, inform him or her that DEC will conduct the cleanup and send the bill to whoever is the PRP/RP. Also inform them that a DEC-conducted cleanup could be more costly than a PRP/RP-conducted cleanup, and that the PRP/RP could face interest charges and penalties for refusing to clean up the spill.

# If the PRP/RP accepts responsibility for the cleanup:

- (1) Send the PRP/RP a "Spiller Responsibility Letter" (Exhibit 1.1-5) and an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) and
- (2) Send the PRP/RP an "Option Letter," which should outline the options available to the PRP/RP to clean up the spill. See Exhibit 1.1-4 for a summary of how and when to use these forms and what they may include.



## **NOTES**

### **1.1.2 Spill Reporting and Initial Notification - Enforcement of Spiller Responsibility**

This section provides guidance on those steps you take to inform responsible parties or potentially responsible parties (PRP/Rps) or spillers of their responsibility under state law for cleaning up spills. This guidance applies to all contacts (by phone, by mail, or in person) you have with Rps throughout the response process concerning their fulfillment of this legal responsibility. The possible consequences of an RP's refusal or inability to conduct the spill response are also discussed.

#### **1. State Law and Policy**

Under Article 12 of the Navigation Law and Article 71 of the Environmental Conservation law (ECL), those parties responsible for a petroleum release are liable for all costs associated with cleaning up the spill as well as third party damages (see Introduction-A for more information). Section 181 of the Navigation Law states:

*Any person who has discharged petroleum shall be strictly liable, without regard to fault, for all cleanup and removal costs and all direct damages, no matter by whom sustained as defined in this section.*

There are two ways by which PRP/RPs can pay for the costs associated with cleanups. First, the PRP/RP can reimburse the state for site investigation, clean-up, and remediation costs incurred by the State Oil Spill Fund or federal Leaking Underground Storage Tank (LUST) Trust Fund. Second, the PRP/RP can assume full responsibility for the cleanup from the beginning and bear all costs throughout the clean-up process. It is DEC's policy to make every effort to have PRP/RPs pay for cleanups from the outset.<sup>1</sup>

To achieve PRP/RP-directed and PRP/RP-financed cleanups, your responsibilities are to: (1) identify the PRP/RP(s), (2) inform them of their legal responsibilities for the spill, and (3) ensure that they carry out these responsibilities. All investigations of spills and PRP/RPs should be pursued vigorously and without prejudice. Use to your advantage the argument that having the PRP/RP assume responsibility for clean-up costs benefits both DEC and the spiller. It saves DEC the expense of cost-recovery procedures. It also allows the PRP/RP to be more involved in clean-up decisions (e.g., choosing their clean-up contractors) and, more significantly, it usually results in **lower clean-up costs. Because the PRP/RP is responsible for all indirect costs incurred if DEC conducts the cleanup, the spiller will pay for the DEC contractor's clean-up work, as well as the supervision costs incurred by DEC, any third-party claims associated with the spill, and any punitive fines levied.**

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<sup>1</sup> Spillers are not only responsible for assuming the costs of a cleanup, but also can be subject to a \$25,000 per day fine for not paying the clean-up costs (among other violations). The Navigation Law provides for these penalties in Section 192, which states:

Any person who knowingly gives or causes to be given any false information as a part of, or in response to, any claim made pursuant to this article for cleanup and removal costs, direct or indirect damages resulting from a discharge, or who otherwise violates any of the provisions of this article or any rule promulgated thereunder or who fails to comply with any duty created by this article shall be liable to a penalty of not more than twenty-five thousand dollars for each offense in court of competent jurisdiction. If the violation is of a continuing nature each day during which it continues shall constitute an additional, separate, and distinct offense. (emphasis added)

## **NOTES**

### **2. Notification Process**

Part 1, Section 4, of this manual discusses the process of identifying the PRP/RP as part of the spill investigation for a particular site. Once you identify the PRP/RP, follow the guidance provided below for informing the PRP/RP of his or her responsibilities for spill cleanup. If you are uncertain about who the PRP/RP is, apply the procedures outlined below with all suspected RPs until the responsible party or parties are identified.

#### **a. Informing RPs of Their Responsibility at the Spill Scene**

It is important to inform PRP/RPs of their legal responsibility to clean up a spill as soon as possible. When you arrive at a spill site, you should immediately inform the representative of any PRP/RP of their liability under the Navigation Law and the Environmental Conservation Law. In doing so, follow the steps covered in the "Notification Procedures Checklist" (Exhibit 1.1-3).

Document completion of the notification steps, and identify your contact(s).

Although you should be firm and direct in informing the PRP/RP of their responsibility, you should make every attempt to avoid an adversarial relationship with the RP. The full cooperation of the PRP/RP will result in a more efficient and effective cleanup.

#### **b. Informing Spillers of Their Responsibility in Writing**

You should send three different letters to the PRP/RP to inform them of their responsibility (see Exhibit 1.1-4, "Notification Forms Summary"). If a site response was initiated and you are able to confirm the spill visually, the "Spiller Responsibility Letter" (Exhibit 1.1-5) along with an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) should be sent as soon as possible. In addition, an "Option Letter" that informs the PRP/RP of their possible options for addressing a spill should be sent. These letters should be kept as part of the Corrective Action Plan (CAP) (see Part 1, Section 5, "Corrective Action Plans.")

**Exhibit 1.1-3  
Notification Procedures Checklist**

<b>Completed</b>	<b>Step</b>	<b>Date</b>	<b>Contact(s)</b>
_____	1. Give your name and identify yourself as a DEC employee.		
_____	2. Inform the PRP/RP that he/she has been identified as the party responsible for the spill.		
_____	3. Inform PRP/RPs of their responsibility to pay for all clean-up costs. (As necessary, cite Section 181 of the Navigation Law or Article 71 of the ECL.)		
_____	4. Ask PRP/RPs "point blank" if they will accept responsibility for the cleanup.		
	Response: _____ _____ _____ _____		
_____	5. If the PRP/RP does not accept responsibility, or does not admit to being the spiller, inform him/her that DEC will conduct the cleanup and send the bill to whoever is the spiller.		
_____	6. If the PRP/RP does not accept responsibility also inform him or her that a DEC-conducted cleanup could be more costly than a spiller-conducted cleanup, and that the spiller could face interest charges and a fine for refusing to pay for the billed clean-up costs.		

Exhibit 1-A-4

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**Notification Forms Summary  
(Send Forms by Certified Mail)**

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<b>Notification Form</b>	<b>When and How to Use</b>	<b>Information to be Included</b>
Spiller Responsibility Letter	Send by certified mail to PRP/RP for confirmed spill.	<ul style="list-style-type: none"><li># Spill location;</li><li># Spiller's responsibility under the Navigation Law;</li><li># Penalties that can be levied if the spiller does not cooperate; and</li><li># Deadline for spiller to begin containment and removal of the spill.</li></ul>
Acceptance of Spiller Responsibility Form	Send by certified mail to PRP/RP for confirmed spill.	<ul style="list-style-type: none"><li># Request for spiller's signature acknowledging his or her acceptance of responsibility for the spill cleanup.</li></ul>
Option Letter	Send by certified mail to PRP/RP for confirmed or suspected release (e.g., failed tightness test).	<ul style="list-style-type: none"><li># Spill number;</li><li># Date spill was discovered or reported;</li><li># Exact location of the spill;</li><li># Authority of Article 12 of the Navigation Act; and</li><li># Penalties for noncompliance.</li></ul>

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Exhibit 1.1-5

Spiller Responsibility Letter

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[Date]

[Addressee]

[Address]

Dear [ ]:

This is to inform you that as a result of investigation by our Department, we consider you responsible for Petroleum Spill Number \_\_\_\_\_, dated \_\_\_\_\_, at \_\_\_\_\_. Under Article 12 of the Navigation Law, Section 192, any person who discharges petroleum without a permit and fails to promptly clean up such prohibited discharge may be subject to a penalty of up to \$25,000 a day.

Containment and removal of this spill must be initiated within \_\_\_\_\_ hours.

Your failure to initiate timely spill cleanup and removal, in addition to the penalty stated above, will result in your being billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law. These costs include cleanup and removal, all direct and indirect damages, including damages incurred by third parties.

Sincerely,

Regional Spill Engineer  
Region

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Exhibit 1.1-6  
Acceptance of Spiller Responsibility Letter

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[Date]

SPILL # \_\_\_\_\_

ACCEPTANCE OF FINANCIAL RESPONSIBILITY

\_\_\_\_\_, hereby assumes responsibility for containment and  
(Name of Company and Person)

cleanup of \_\_\_\_\_ discharged from \_\_\_\_\_  
(Substance) (Source)

on \_\_\_\_\_, and recognizes that the determination of the adequacy and propriety of  
(Date)

the containment and cleanup operation continues to rest with the New York State  
Department of Environmental Conservation On-Scene Coordinator.

\_\_\_\_\_  
(Authorized Signature and Title)

\_\_\_\_\_  
(Name and Title Printed)

\_\_\_\_\_  
(Address of Company)

\_\_\_\_\_  
(Date and Time)

\_\_\_\_\_  
(Witness)

## NOTES

The "Spiller Responsibility Letter" informs spillers of their responsibility under the Navigation Law and explains the penalties that can be levied if the spiller does not cooperate. It should be sent to the spiller or suspected spiller as soon as a petroleum spill has been confirmed. The letter notifies the spiller that he or she is required to initiate containment and removal of the spill within a period of time you specify.

There are at least three factors you should consider when specifying a deadline in this letter:

- # The size and nature of the spill;
- # The proximity of the spill to, or its possible effects on, water supplies (surface or ground water), nearby homes and other structures, and/or sensitive environmental areas; and The possible environmental, safety, and/or human health effects of delaying containment and removal.

The "Acceptance of Spiller Responsibility Form" requires the spiller's signature acknowledging his or her responsibility for containment and cleanup of the spill. This form and the "Spiller Responsibility Letter" should be sent by certified mail.

The "Option Letter" outlines the possible options available to the PRP/RP for cleanup of the spill. The contents of this letter can vary somewhat depending on how the release was discovered (e.g., through a complaint or a failed tightness test), the extent and type of spill, and the policies and procedures of your regional office. There is, however, some information that should appear in every "Option Letter." All "Option Letters" should contain the following: spill number, date the spill was discovered, and exact location of the spill. In addition, the letter should cite the response authority provided DEC by Article 12 of the Navigation Act and describe the penalties for noncompliance.

Each "Option Letter" should outline clearly the options open to the PRP/RP to address the spill and the information you wish submitted, and may also specify certain deadlines for taking action. However, it is up to you to determine the particular options, information requirements, and dates you include in the letter. Depending on the circumstances, you may list in your letter one or several options from which the PRP/RP can choose. For example, when an UST fails an initial tank test the following options could be included:

- # Conduct separate integrity tests on the piping and the tanks in order to verify the release source within the tank system.
- # Remove the "non-tight" tank and either remove and dispose of all contaminated soils, or install monitoring wells.

## NOTES

- # Install monitoring wells and abandon the "non-tight" tank in-place.
- # Remove the tank within 30 days, according to the requirements for tank removal (outline these requirements in the letter).

The "Option Letter" should always be sent by certified mail. In addition, you should have the PRP/RP inform you as soon as possible about the option(s) he or she has chosen.

Several examples of possible "Option Letters" are included as Exhibits 1.1-7 through 1.1-12. These are provided as examples only; you should use "Option Letters" developed by your own office, or develop your own.

Exhibit 1.1-7 is a sample option letter to an PRP/RP for removal of contaminated soil from an UST release. Note that this option letter includes: (a) specific requirements for removal of the contaminated soil; (b) dates for when the removal must be completed, and (c) requirements for the PRP/RP to forward to DEC copies of the landfill disposal receipt and ample test results. The additional sample option letters apply to the following situations: when an UST has failed an initial tightness test (Exhibit 1.1-8), when an UST fails an isolation tank test (Exhibit 1.1-9), when an UST fails a Petro-tite Systems Test (Exhibit 1.1-10), and ground-water contamination cleanup (Exhibit 1.1-11).

### 3. Dealing with Uncooperative Spillers

There are generally two ways in which an PRP/RP may fail to fulfill his or her legal responsibilities for spill cleanup: (1) a PRP/RP may refuse from the beginning to accept responsibility, or (2) an PRP/RP may fail to conduct a cleanup in the manner, or in as timely a fashion, as agreed upon with the DEC. If a PRP/RP refuses to cooperate from the outset, try again to change the RP's mind. Send additional notices of spiller responsibility (Exhibit 1.1-12) and/or initiate phone conversations with PRP/RPs to inform them again of the consequences of not cooperating (i.e., higher clean-up costs and possible penalties). If a party claims not to be the PRP/RP, you should inform them of your reasons for believing they are the PRP/RP under the Navigation Law.

If a PRP/RP agrees to conduct and pay for the cleanup and then does not proceed in the manner agreed upon or as quickly as agreed upon, you should inform the PRP/RP immediately that you are dissatisfied with the progress of the cleanup and that DEC is considering taking it over. There are no hard-and-fast rules for deciding when you should take over a cleanup. If possible, you should always work toward having the PRP/RP continue the cleanup in the agreed-upon manner. Attempt to determine why the cleanup is not proceeding as planned and consider means of helping the PRP/RP-directed cleanup get back on track.



**Exhibit 1.1-7**

Sample Option Letter:  
Soil Cleanup Spill

[Date]

[Addressee]

[Address]

Dear [ ]:

This letter is to confirm your - (site meeting) (telephone conversation) with \_\_\_\_\_ of this Department on \_\_\_\_\_, (Name) (day) (date) (year) in regards to the above-mentioned spill site. This site involves \_\_\_\_\_ (explanation)

The following items were discussed and agreed upon:

1. All contaminated material must be removed and stored on site until it can be properly disposed of at a properly permitted landfill.
2. All contaminated material must be sampled for \_\_\_\_\_ (analyses). The results must be negative for the material to be considered non-hazardous oily debris. You must contact your selected sanitary landfill to verify the sample analyses that they require for disposal.
3. A hauler with a Part 364 permit must be used to haul the contaminated soil to your selected landfill.
4. Please notify this Department after the work is completed but prior to any backfilling of the spill area so that an inspection of the excavation may be made.
5. Please forward to us a copy of the landfill disposal receipt and the sample results.

A schedule for this work is required by \_\_\_\_\_ (day) (date) (year).

Cleanup must be performed by no later than \_\_\_\_\_ (day) (date) (year).

If you have any questions, please feel free to contact \_\_\_\_\_ (Name)

at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

**Exhibit 1.1-8**

Sample Option Letter:  
Initial Tank Failure

---

[Date]

[Addressee]

[Address]

Dear [ ]:

This Department received notification on \_\_\_\_\_ that (a)  
\_\_\_\_\_ (day) (date) (year)  
\_\_\_\_\_ tank(s) failed its (their) tank test performed by  
(gallons) (product stored)  
\_\_\_\_\_. On \_\_\_\_\_, Mr. \_\_\_\_\_ of this Department  
(contractor) (date) (name)  
discussed with \_\_\_\_\_ that one of the following options must be done concerning this tank.  
(person)

- OPTION 1:
1. The tank is to be immediately isolated from the piping and is to be retested. If the tank tests tight, it may remain in service.
  2. The lines are to be repaired, if necessary, and retested by a state-approved method. Exposed piping may be air tested.
  3. A copy of any test results are to be sent to this office.

- OPTION 2: If the tank fails the retest, or if you decide not to retest, the following must now be done:
1. All product must be immediately removed from the tank.
  2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form must be submitted to this Department prior to tank removal.
  3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
  4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
  5. Once the tank has been cleaned out, it may be disposed as scrap.

Mr. \_\_\_\_\_ must be notified when you have a firm date for retesting or removal. Please note, we must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

If you have any questions, please contact \_\_\_\_\_ at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

**Exhibit 1.1-9**

Sample Option Letter:  
Retest Failure, Tank Removal

---

[Date]

[Addressee]

[Address]

Dear [ ]:

On \_\_\_\_\_, a \_\_\_\_\_ gallon \_\_\_\_\_, underground store storage tank at the  
(day) (date) (year) (#) (material)  
above-mentioned address failed a system tank test. On \_\_\_\_\_, this tank failed an isolation tank test.  
(day) (date) (year)

Since the tank failed the retest, the following must now be done:

1. All product must be immediately removed from the tank.
2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form (enclosed) must be submitted to this Department prior to tank removal.
3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
5. Once the tank has been cleaned out, it may be disposed as scrap.

\_\_\_\_\_ of this Department must be notified when you have a firm  
(Name)

date for removal. We must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

For your use, enclosed is a list of contractors that are known by this Department to do this type of work. This list is by no means complete. Any contractor may be used by you for this work.

If you have any questions, please feel free to call \_\_\_\_\_ at 847-4590.  
(Name)

Your cooperation will be appreciated.

Sincerely,

[ ]

**Exhibit 1.1-10**

Sample Option Letter:  
Failed Tank Test

[Date]

CERTIFIED - RETURN RECEIPT REQUESTED

[Addressee]

[Address]

RE: Spill No.

Gentlemen:

This office has been informed by \_\_\_\_\_ (Name) that \_\_\_\_\_ (tank) failed a Petrotite systems test. In accordance with Article 12 of the New York State Navigation Law, I must determine if there has been any harm to the lands or the groundwater of the State. In order for me to make this determination, you have three options:

1. Prove that it was not a leaking tank by removing all the piping from the tank and separately Petrotite test the tank. If the tank passes the Petrotite test, it is a piping leak. The tank may then be abandoned or the piping can be repaired, attached to the tank, and the system Petrotite tested.
2. Excavate and remove the tank in the presence of a representative from this office so that an inspection of the tank and the soil can be made. If the tank is sound, and there is no evidence of product loss, nothing further need be done. If there is a problem, proceed as in 3 below.
3. Abandon the tank in-place and install several four (4) inch diameter PVC site wells extending five (5) feet into the groundwater with a screen length of ten (10) feet, with slot size of .020 inches. The exact location and number of wells will be determined by a representative from this office. These wells will be checked for a period of twelve months by New York State, and if there is no evidence of product for that period, the spill will be removed from our listing. If free or dissolved product appears, cleanup must begin immediately.

If cleanup does not begin by \_\_\_\_\_ (Date) by the responsible party, the State will begin the cleanup and bill the responsible party.

Sincerely,

[            ]

**Exhibit 1.1-11**

Sample Option Letter:  
Ground-water Cleanup

[Date]

[Addressee]

[Address]

Dear [ ]:

This letter is to confirm your (site meeting) (telephone conversation) with (Name) of this Department on (day) (date) (year). Groundwater at this spill site is contaminated with (free floating oil) (dissolved oil components). The following items were discussed and agreed upon:

1. (#) additional four-inch monitoring wells will be installed at the agreed upon locations. A sketch of a typical monitoring well is enclosed for your use.
2. One recovery well will be installed to recover oil product. Groundwater must be pumped to depress the groundwater table. The groundwater must be pumped to an oil-water separator tank. Accumulated oil may be recovered from the well by bailing or by a second pump. A second type of recovery well pumps both oil and water to a separator tank. Oil from the tank is then recovered. You should check with your contractor to determine the best method for the recovery well. Groundwater must be pumped to depress the groundwater table.
3. The discharge water must be sampled for (Contaminates). Dependent upon the sampling results, it may be discharged with a SPDES permit to (Name). The water must at all times be sheenless. An air stripper or a carbon filter may be necessary for the discharge water.
4. All collected oil must be properly disposed. Copies of receipts indicating the disposal site must be forwarded to this office.

It was also agreed that these actions be completed by (Date). Should you have any questions, please do not hesitate to contact (Name) at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

**Exhibit 1.1-12**

Sample Option Letter:  
Soil Disposal, Soil Still On Site

[Date]

[Addressee]

[Address]

Dear [ ]:

A recent inspection by  (Name)  of this office indicated that the contaminated soil at your facility still remains on site. We are requesting this oil be removed by  (day) (date) (year)  to an acceptable landfill. Please send a copy of the disposal receipt to this office.

If you cannot remove the soil by that date, please contact this office immediately. If you do not contact this office and the soil still remains on site past  (Date) , DEC will have the soil removed from your site. You will then be billed for the costs of removal and disposal as well any relevant penalties.

If you have any questions, please feel free to contact  (Name)  at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

## NOTES

If all efforts to encourage a PRP/RP to continue the cleanup fail, send a certified letter (Exhibit 1.1-13) notifying them that their actions have been unsatisfactory and that DEC will assume responsibility for the cleanup. This letter again informs the PRP/RP of his or her liability for all costs incurred by DEC during its cleanup.

**Exhibit 1.1-13**

Unsatisfactory Cleanup Notice Letter

[Date]

CERTIFIED MAIL

SPILL #

[Addressee]

[Address]

Dear Sir:

My letter of (Date) notified you of New York State's interest in a pollution incident for which you are presently considered responsible.

You are hereby given notice that your actions to remove the pollutant and mitigate its effects have been evaluated as unsatisfactory. Effective (Date), the New York State Department of Environmental Conservation will conduct all cleanup activities under the authority of Article 12 of the Navigation Law. Removal will be effected in accordance with the regulations of the Department of Environmental Conservation. You will be billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law, as well as interest and penalties.

Should you require further information concerning this matter, contact: (Name)

Sincerely,

[            ]

Received and Acknowledged

\_\_\_\_\_

\_\_\_\_\_

Time

\_\_\_\_\_

Date



**TECHNICAL  
FIELD GUIDANCE**

**SPILL REPORTING AND INITIAL NOTIFICATIONS -  
ACCESS AND RIGHT-OF-ENTRY**

## NOTES

### **Spill Reporting and Initial Notifications - Access and Right-of-Entry**

#### **GUIDANCE SUMMARY AT-A-GLANCE**

- # Section 178 of the Navigation Law gives you the authority to enter private property to investigate or clean up a suspected spill.
  
- # In general, you should inform the property owner of your right to enter onto private property and obtain consent from the owner. This consent can be either written or verbal.
  
- # Detailed information and procedures for access and right-of-entry is considered confidential for spill responders. This information is contained in Appendix L, and is marked confidential.

## NOTES

### 1.1.3 Access and Right-of-Entry

This section addresses the right of NYSDEC personnel to enter private property on which a spill has occurred or is suspected, for the purpose of investigating, containing, and/or cleaning up the spill. Detailed information and procedures of access and right-of-entry are considered confidential. Therefore, this information can be found in Appendix L, including your legal rights to enter property and the procedures to follow to ensure that no charges of trespassing are brought against the Department.

#### 1. State Law and Policy

You have the authority, under the Navigation Law, to enter property to investigate or clean up a real or suspected spill. Specifically, Section 178 of the Navigation Law states:

*The department is hereby authorized to enter and inspect any property or premises for the purpose of inspecting facilities and investigating either actual or suspected sources of discharges or violation of this article or any rule or regulations promulgated pursuant to this article. The department is further authorized to enter on property or premises in order to assist in the cleanup or removal of the discharge. Any information relating to secret processes or methods of manufacture shall be kept confidential.*

In any emergency or non-emergency, you must possess information supporting a reasonable belief to suspect that a spill has occurred or is occurring, or that the spill is impacting the premises for which access is sought. A reasonable belief may be based on a report of a spill or visual observation. For example, if a gasoline station operator reports an unexpected loss of product from his underground storage tanks that are located near private household wells, you might want to investigate those wells and check the water.

Although you have the authority to enter the premises, *it is always advisable to obtain the consent of the property owner or his or her agent before entering the property.* This consent can be either written or verbal. Obtaining this consent may help avoid civil or criminal charges for trespass being logged. In cases where the owner/agent is not available or not ascertainable, entry should be made.

**Appendix K**  
**Notice of Termination**

**New York State Department of Environmental Conservation  
Division of Water  
625 Broadway, 4th Floor  
Albany, New York 12233-3505  
\*(NOTE: Submit completed form to address above)\***

**NOTICE OF TERMINATION for Storm Water Discharges Authorized  
under the SPDES General Permit for Construction Activity**

**Please indicate your permit identification number:** NYR \_\_\_\_\_

**I. Owner or Operator Information**

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person:

4a. Telephone:

4b. Contact Person E-Mail:

**II. Project Site Information**

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

**III. Reason for Termination**

9a.  All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. **\*Date final stabilization completed** (month/year): \_\_\_\_\_

9b.  Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR \_\_\_\_\_  
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c.  Other (Explain on Page 2)

**IV. Final Site Information:**

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices?  yes  no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed?  yes  no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?  
\_\_\_\_\_

**NOTICE OF TERMINATION for Storm Water Discharges Authorized under the  
SPDES General Permit for Construction Activity - continued**

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit?     yes     no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

- Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.
- Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).
- For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.
- For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? \_\_\_\_\_  
(acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4?     yes  
 no  
(If Yes, complete section VI - "MS4 Acceptance" statement)

**V. Additional Information/Explanation:**  
(Use this section to answer questions 9c. and 10b., if applicable)

**VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative** (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:

Date:

**NOTICE OF TERMINATION for Storm Water Discharges Authorized under the  
SPDES General Permit for Construction Activity - continued**

**VII. Qualified Inspector Certification - Final Stabilization:**

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature:

Date:

**VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):**

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature:

Date:

**IX. Owner or Operator Certification**

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature:

Date:

(NYS DEC Notice of Termination - January 2015)

**Appendix L**  
**Contract Drawings**  
**(Bound Separately)**



**Appendix M**  
**Post-Construction Operation and  
Maintenance Checklist**

## Bioretention Operation, Maintenance and Management Inspection Checklist

Project:  
 Location:  
 Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
<b>1. Debris Cleanout (Monthly)</b>		
Bioretention and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
<b>2. Vegetation (Monthly)</b>		
Plant height not less than design water depth		
Fertilized per specifications		
Plant composition according to approved plans		
No placement of inappropriate plants		
Grass height not greater than 6 inches		
No evidence of erosion		
<b>3. Check Dams/Energy Dissipaters/Sumps (Annual, After Major Storms)</b>		
No evidence of sediment buildup		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Sumps should not be more than 50% full of sediment		
No evidence of erosion at downstream toe of drop structure		
<b>4. Dewatering (Monthly)</b>		
Dewaterers between storms		
No evidence of standing water		
<b>5. Sediment Deposition (Annual)</b>		
Swale clean of sediments		
Sediments should not be > 20% of swale design depth		
<b>6. Outlet/Overflow Spillway (Annual, After Major Storms)</b>		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		
<b>7. Integrity of Filter Bed (Annual)</b>		
Filter bed has not been blocked or filled inappropriately		

**Comments:**

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**Actions to be Taken:**

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## SECTION 01 61 00

### COMMON PRODUCT REQUIREMENTS

#### PART 1 – GENERAL

##### 1.01 DEFINITIONS

- A. Products:
  - 1. New items for incorporation into the Work, whether purchased by Contractor for the Project, or taken from previously purchased stock, and may also include existing materials or components required for reuse.
  - 2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software and terms of similar intent and is not intended to change meaning of such other terms used in Contract Documents, as those terms are self-explanatory and have well recognized meanings in the construction industry.
  - 3. Items identified by manufacturer's product name, including make or model designation, indicated in manufacturer's published product literature, that is current as of the date of the Contract Documents.

##### 1.02 DESIGN REQUIREMENTS

- A. Where Contractor design is specified, design of installation, systems, equipment and components, including support and anchorage shall be in accordance with the provision of the latest edition of the New York State Uniform Code.
  - 1. Seismic Design: Building Risk Category IV, Importance Factor: 1.25, Site Class: E, mapped maximum considered earthquake, 5 percent damped, spectral response at short periods,  $S_{ds} = 0.211$ , mapped maximum condition earthquake, 5 percent damped, spectral response at period of 1 second,  $S_{d1} = 0.061$ , unless specified otherwise.

##### 1.03 ENVIRONMENTAL REQUIREMENTS

- A. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at nominally 450 feet above sea level.

##### 1.04 PREPARATION FOR SHIPMENT

- A. When practical, factory-assemble products. Mark or tag separate parts and assemblies to facilitate field-assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable protective coating.

- B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project or Contractor, equipment number, and approximate weight. Include complete packing list and bill of materials with each shipment.
  
- C. Extra Materials, Special Tools, Test Equipment and Expendables:
  - 1. Furnish as required by individual Specifications.
  - 2. Schedule:
    - a. Ensure that shipment and delivery occur concurrently with ship of associated equipment.
    - b. Transfer to Owner shall occur immediately subsequent to Contractor's acceptance of equipment from Supplier.
  - 3. Packaging and Shipment:
    - a. Package and ship extra materials and special tools to avoid damage during long-term storage in original containers insofar as possible, or in appropriately-sized hinged cover, wood, plastic or metal box.
    - b. Prominently displayed on each package, the following:
      - 1) Manufacturer's part nomenclature and number, consistent with Operation and Maintenance Manual identification system.
      - 2) Applicable equipment description.
      - 3) Quantity of parts in package.
      - 4) Equipment manufacturer.
  
- D. Equipment Delivery: Respective contractor will coordinate delivery schedules with respective suppliers.
  
- E. Factory Test Results: Reviewed and accepted by RPE before product shipment as required in individual specification sections.

#### 1.05 DELIVERY AND INSPECTION

- A. Deliver products in accordance with accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at the Site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.
  
- B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.

- C. Unload products in accordance with manufacturer's instructions for unloading or as specified. Record receipt of products at the Site. Promptly inspect for completeness and evidence of damage during shipment.
- D. Remove damaged products from Site and expedite deliver of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

#### 1.06 HANDLING, STORAGE, AND PROTECTION

- A. Handle and store products in accordance with manufacturer's written instructions and in a manner to prevent damage. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by the Owner.
- B. Manufacturer's instructions for material requiring special handling, storage, or protection shall be provided prior to delivery of material.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered, but not installed in the Work.
- D. Store electrical, instrumentation, and control products, and equipment with bearings in weather-tight structures maintained above 60 degrees F, and relative humidity at least five degrees above the dew point. Protect electrical, instrumentation, and control products, and insulate against moisture, water and dust damage. Connect and operate continuously space heaters furnished in electrical equipment.
- E. Store fabricated products above ground on blocking or skids, and prevent soiling or staining. Store loose granular materials in well-drained area on solid surface to prevent mixing with foreign matter. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
- F. Store finished products that are ready for installation in dry and well-ventilated areas. Do not subject to extreme changes in temperature or humidity.
- G. After installation, provide coverings to protect products from damage due to traffic and construction operations. Remove coverings when no longer needed.

- H. Hazardous Materials: Prevent contamination of personnel, storage area, and Site. Meet requirements of product specification, codes and manufacturer's instructions.

## PART 2 – PRODUCTS

### 2.01 GENERAL

- A. Provide manufacturer's standard materials suitable for service conditions, unless otherwise specified in the individual specifications.
- B. Where product specifications include a named manufacturer, with or without model number, and also include performance requirements, named manufacturer's products must meet the performance specifications.
- C. Like items of products furnished and installed in the Work shall be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, manufacturer's services, and implement same or similar process instrumentation and control functions in same or similar manner.
- D. Equipment, Components, Systems, and Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, State and local health and safety regulations.
- E. Regulatory Requirements: Coating materials shall meet Federal, State, and local requirements limiting the emission of volatile organic compounds and for worker exposure.
- F. Safety Guards: Provide for all belt and chain drives, fan blades, couplings, and other moving or rotary parts. Cover rotating part on all sides. Design for easy installation and removal. Use 16-gauge or heavier galvanized steel or galvanized expanded steel mesh. Provide galvanized steel accessories and supports, including bolts. For outdoor applications, prevent entrance of rain and dripping water.
- G. Authority Having Jurisdiction (AHJ):
  - 1. Provide the Work in accordance with NFPA 70, National Electric Code. Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.



2. Materials and equipment manufactured within the scope of standards published by Underwriter Laboratories, Inc. shall conform to those standards and shall have an applied UL listing mark.
- H. Equipment Finish:
1. Provide manufacturer's standard finish and color, except where specified color is indicated. Equipment scheduled to be field-painted shall be shop-primed with a primer compatible with the specified finish coating system. Comply with Section 09 90 00, Painting for coating systems, including mil thickness.
  2. If manufacturer has no standard color, provide equipment with finish as approved by the Owner.
- I. Special Tools and Accessories: Furnish to Owner, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, hand wheels, chain operators, special tools, and other spare parts as required for maintenance.
- J. Lubricant: Provide initial lubricant recommended by equipment manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by Owner.

## 2.02 FABRICATION AND MANUFACTURE

- A. General:
1. Manufacture parts to U.S.A. standard sizes and gauges.
  2. Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
  3. Design structural members for anticipated shock and vibratory loads.
  4. Use 1/4-inch minimum thickness for steel that will be submerged, wholly or partially, during normal operation.
  5. Modify standard products as necessary to meet performance specifications.
- B. Lubrication System:
1. Require no more than weekly attention during continuous operation.
  2. Convenient and accessible; oil drains with bronze or stainless steel valves and fill plugs, easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
  3. Provide constant-level oilers or oil level indicators for oil lubrication systems.

4. For grease type bearings which are not easily accessible, provide and install stainless steel tubing, protect and extend tubing to convenient location with suitable grease fitting.

### 2.03 SOURCE QUALITY CONTROL

- A. Where specifications call for factory testing to be witnessed by the RPE, notify RPE not less than 14 days prior to scheduled test date, unless otherwise specified.
- B. Calibration Instruments: Bear the seal of a reputable laboratory certifying instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).
- C. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

## PART 3 – EXECUTION

### 3.01 INSPECTION

- A. Inspect materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage.
- B. Do not install material or equipment showing such effects.
- C. Remove damaged material or equipment from the Site and expedite delivery of identical new material or equipment.
- D. Delays to the Work resulting from material or equipment damage that necessitates procurement of new products will be considered delay within the Contractor's control.

### 3.02 INSTALLATION

- A. Equipment Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.
- B. No shimming between machined surfaces is allowed.
- C. Install the Work in accordance with NECA Standard of Installation, unless otherwise specified.
- D. Repaint painted surfaces that are damaged prior to equipment acceptance.

- E. Do not cut or notch any structural member or building surface without specific approval of the RPE.
- F. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions, and as may be specified. Retain a copy of manufacturers' instructions at the Site, available for review at all times.

### 3.03 FIELD FINISHING

- A. In accordance with Section 09 90 00, Painting.

### 3.04 ADJUSTMENT AND CLEANING

- A. Perform required adjustments, tests, operational checks, and other startup activities.

### 3.05 LUBRICANTS

- A. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by Owner.

++ END OF SECTION ++

## SECTION 01 77 00

### CLOSEOUT PROCEDURES

#### PART 1 – GENERAL

##### 1.01 SUBMITTALS

- A. Informational Submittals:
  - 1. Submit prior to application for payment:
    - a. Record documents: as required in the General Conditions, and as specified herein.
    - b. Approved shop drawings and samples: As required in the General Conditions.
    - c. Special bonds, Special Guarantees, and Service Agreements.
    - d. Consent of Surety to Final Payment: as required in the General Conditions.
    - e. Releases or waivers of liens and claims: As required in the General Conditions.
    - f. Releases from Agreements.
    - g. Final Application for Payment: Submit in accordance with Section 01 29 00, Payment Procedures.
    - h. Extra materials: as required by the individual specification sections.

##### 1.02 RECORD DOCUMENTS

- A. Quality Assurance:
  - 1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
  - 2. Accuracy of Records:
    - a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
    - b. Purpose of Project Record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
  - 3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.

4. Prior to submitting each request for progress payment, request RPE's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by RPE to recommend whole or any part of Contractor's application for Payment, either partial or final.

### 1.03 RELEASES FROM AGREEMENTS

- A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.
- B. In the event the Contractor is unable to secure written releases:
  1. Inform the Owner of the reasons.
  2. Owner or its representatives will examine the Site, and Owner will direct Contractor to complete the Work that may be necessary to satisfy terms of side agreement or special easement.
  3. Should the Contractor refuse to perform this Work, the Owner reserves the right to complete the Work under separate contract and deduct cost of same from the Contract Price, or require the Contractor to furnish a satisfactory bond in a sum to cover legal Claims for damages.
  4. When Owner is satisfied that the Work has been completed in accordance with the Contract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if:
    - a) Contractor's failure to obtain such statement is due to grantor's refusal to sign and this refusal is not based on any legitimate claim that the Contractor has failed to fulfill terms of the side agreement or special easement, or
    - b) The Contractor is unable to contact or has had undue hardship in contacting the Grantor.

### PART 2 – PRODUCTS (Not used)

### PART 3 – EXECUTION

#### 3.01 MAINTENANCE OF RECORD DOCUMENTS

- A. General:
  1. Revise approved shop drawings to reflect as-built conditions, including control logic, interlocks, fail-safes, etc.

2. Record information concurrently with construction progress and within 24 hours after receipt of information that a change has occurred. Do not cover or conceal Work until required information is recorded.
- B. Preservation:
1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
  2. Make documents and Samples available at all times for inspection and review by the RPE.
- C. Making Entries on Drawings:
1. Date entries.
  2. Call attention to entry by revision “cloud” drawn around area or areas affected.
  3. Legibly mark to record actual changes made during construction, including, but not limited to:
    - a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
    - b. Horizontal and vertical locations of existing and new underground facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
    - d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
    - e. Changes made by addendum, field order, work change directive, change order, and RPE’s written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
  4. Dimensions on Schematic Layouts: Show on record drawings by dimension, the centerline of each run of items such as are described in previous subparagraphs above.
    - a. Clearly identify the item by accurate note such as “cast iron drain”, “galvanized water”, etc.
    - b. Show, by symbol or note, vertical location of item (“under slab”, “in ceiling plenum”, etc).
    - c. Make identification so descriptive that it may be related reliably to specifications.

### 3.02 FINAL CLEANING

- A. At completion of the Work or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion, or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire Site or parts thereof, as applicable.
- B. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to the Owner.
- C. Remove grease, dirt, dust paint or plaster spatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
- D. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
- E. Clean all windows.
- F. Clean and wax wood, vinyl, or painted floors.
- G. Broom clean exterior paved driveways and parking areas.
- H. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
- I. Rake clean all other surfaces.
- J. Remove snow and ice from access to buildings.
- K. Replace air-handling filters and clean ducts, blowers, and coils of ventilation units operated during construction.
- L. Leave water courses, gutters, and ditches open and clean.
- M. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

++ END OF SECTION ++

## SECTION 01 78 23

### OPERATION AND MAINTENANCE DATA

#### PART 1 – GENERAL

##### 1.01 SCOPE

- A. Detailed information for the preparation, submittal, and RPE's review of Operations and Maintenance (O&M) Data, as required by individual specification sections.

##### 1.02 DEFINITIONS

- A. Preliminary Data: Initial and subsequent submissions for RPE's review.
- B. Final Data: RPE-accepted data, submitted as specified herein.
- C. Maintenance Operation: Any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operation are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

##### 1.03 SEQUENCING AND SCHEDULING

- A. Equipment and System Data:
  - 1. Preliminary Data:
    - a. Do not submit until Shop Drawing for equipment or system has been reviewed and approved by RPE.
    - b. Submit prior to shipment date.
  - 2. Final Data: Submit Instructional Manual formatted data not less than 30 days prior to equipment or system field functional testing. Submit Compilation Formatted and Electronic Media formatted data prior to Substantial Completion of the Project.
- B. Materials and Finishes Data:
  - 1. Preliminary Data: Submit at least 15 days prior to request for final inspection.
  - 2. Final Data: submit within 10 days after final inspection.



## 1.04 DATA FORMAT

- A. Prepare preliminary and final data in the form of an instructional manual. Prepare final data in data compilation format. Submit both hard-copy binders and electronic format, as specified herein.
- B. Instructional Manual Format:
1. Binder: Commercial-quality, permanent three-ring or three-post binders with durable plastic cover.
  2. Size: 8-1/2 inches by 11 inches, minimum.
  3. Cover: Identify manual with typed or printed title "OPERATION AND MAINTAINENCE DATA", and list:
    - a. Project title.
    - b. Designate applicable system, equipment, material, or finish.
    - c. Identity of separate structure as applicable.
    - d. Identify volume number if more than one volume.
    - e. Identity of general subject matter covered in manual.
  4. Spine:
    - a. Project Title.
    - b. Identify volume number if more than one volume.
  5. Title Page:
    - a. Contractor name, address, and telephone number.
    - b. Subcontractor, Supplier, installer, or maintenance contractor's name, address, and telephone number, as appropriate.
      - 1) Identify area of responsibility of each.
      - 2) Provide name and telephone number of local source of supply for parts and replacement.
  6. Table of Contents:
    - a. Neatly typewritten and arranged in systematic order with consecutively numbered pages.
    - b. Identify each product by product name and other identifying numbers or symbols, as set forth in Contract Documents.
  7. Paper: 20-pound minimum, white for typed pages.
  8. Text: Manufacturer's printed data, or neatly typewritten.
  9. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
  10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.
- C. Electronic O&M Data:
1. Electronic submittals shall contain all information described above and shall meet the requirements herein.

2. Electronic equipment manual files shall be submitted in a portable document format (PDF), compatible with Acrobat Reader, by Adobe.
3. Electronic files shall be submitted on one or more compact disks (4.7 GB DVD+RW).
4. Two sets of compact disks shall be provided, one for Owner and one for Engineer.
5. CDs and covers shall be labeled with the project name, supplier, equipment identification, and specification section.
6. CDs shall be provided in individual hard plastic cases.
7. In addition to the complete manual submitted in PDF, the supplier shall furnish electronic files containing the information described herein in Microsoft Word (.docx), rich text (.rtf), or ASCII text (.txt) format.

C. Data Compilation Format:

1. Compile all RPE-accepted preliminary O&M data into a hard-copy, hard-bound set.
2. Each set shall consist of the following:
  - a. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
  - b. Cover: Identify each volume with typed or printed title "OPERATION AND MAINTENANCE DATA, VOLUME No. XX" and list:
    - 1) Project title.
    - 2) Contractor's name, address, and telephone number.
    - 3) If entire volume covers equipment or system provided by one supplier, include the following:
      - a) Identity of general subject matter covered in manual.
      - b) Identity of equipment number and specification section.
  - c. Provide each volume with title page and type table of contents with consecutively numbered pages. Place contents of entire set, identified by volume number, in each binder.
  - d. Table of contents neatly typewritten, arranged in a systematic order:
    - 1) Include list of each product, indexed to content of each volume.
    - 2) Designate system or equipment for which it is intended.
    - 3) Identify each product by product name and other identifying numbers or symbols.
  - e. Section Dividers:
    - 1) Heavy, 80-pound cover weight, tabbed with numbered plastic index tabs.
    - 2) Fly leaf:

- a) For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.
- b) List with each product:
  - i) Name, address, and telephone number of Subcontractor, Supplier, installer and maintenance contractor, as appropriate.
  - ii) Identify area of responsibility of each.
  - iii) Provide local source of supply for parts and replacement.
- c) Identity of separate structure as applicable.
- f. Assemble and bind material, as much as possible, in same order as specified in the Contract Documents.

## 1.05 SUBMITTALS

- A. Informational:
  - 1. Data outline: Submit three copies of a detailed outline of proposed organization and contents of Final Data prior to preparation of Preliminary Data.
  - 2. Preliminary Data:
    - a. Submit three copies for RPE's review.
    - b. If data meets conditions of the Contract:
      - 1) One copy will be returned to the Contractor.
      - 2) One copy will be forwarded to field staff.
      - 3) One copy will be retained by the RPE.
    - c. If data does not meet conditions of the Contract:
      - 1) All copies will be returned to Contractor with RPE's comments (on separate document) for revision.
      - 2) RPE's comments will be retained in the RPE's file.
      - 3) Resubmit three copies revised in accordance with RPE's comments.
  - 3. Final Data: Submit two copies in format specified herein.

## 1.06 DATA FOR EQUIPMENT AND SYSTEMS

- A. Content for each unit (or common units) and System:
  - 1. Product Data:
    - a. Include only those sheets that are pertinent to specific product.
    - b. Clearly annotate each sheet to:
      - 1) Identify specific product or part installed.
      - 2) Identify data applicable to installation.
      - 3) Delete references to inapplicable information.
    - c. Function, normal operating characteristics, and limiting conditions.

- d. Performance curves, engineering data, nameplate data, and tests.
  - e. Complete nomenclature and commercial number of replaceable parts.
  - f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
  - g. Spare parts ordering instructions.
  - h. Where applicable, identify installed spares and other provisions for future work (e.g. reserved panel space, unused components, wiring, terminals, etc.).
2. As-installed, color-coded piping diagrams.
  3. Charts of valve tag numbers, with the location and function of each valve.
  4. Drawings: supplement product data with drawings as necessary to clearly illustrate:
    - a. Format:
      - 1) Provide reinforced, punched, binder tab; bind in with text.
      - 2) Reduced to 8-1/2 inches by 11-inches, or 11 inches by 17 inches, folded to 8-1/2 inches by 11 inches.
      - 3) Where reduction is impractical, fold and place in 8-1/2 inch envelopes.
    - b. Relations of component parts of equipment and systems.
    - c. Control and flow diagrams.
    - d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
  5. Instructions and Procedures: Within text, as required to supplement product data.
    - a. Format:
      - 1) Organize in consistent format under separate heading for each different procedure.
      - 2) Provide logical sequence of instructions for each procedure.
      - 3) Provide information sheet for Owner's personnel, including:
        - a) Proper procedures in event of failure.
        - b) Instances that might affect validity of guarantee or Bond.
    - b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
    - c. Operating Procedures:
      - 1) Startup, break-in, routine, and normal operating instructions.
      - 2) Test procedures and results of factory tests where required.
      - 3) Regulation, control, stopping and emergency instructions.
      - 4) Description of operation sequence by control manufacturer.

- 5) Shutdown instructions for both short and extended duration.
- 6) Summer and winter operating instructions, as applicable.
- 7) Safety precautions.
- 8) Special operating instructions.
- d. Maintenance and Overhaul Procedures:
  - 1) Routine maintenance.
  - 2) Guide to troubleshooting.
  - 3) Disassembly, removal, repair, reinstallation, and re-assembly.
- 6. Guarantee, Bond, and Service Agreement: In accordance with Section 01 77 00, Closeout Procedures.

B. Content for Each Electric or Electronic Item or System:

- 1. Description of Unit and Component Parts:
  - a. Function, normal operating characteristics, and limiting conditions.
  - b. Performance curves, engineering data, nameplate data, and tests.
  - c. Complete nomenclature and commercial number of replaceable parts.
  - d. Interconnection wiring diagrams, including control and lighting systems.
- 2. Circuit Directories of Panelboards.
- 3. Electric service.
- 4. Control requirements and interfaces.
- 5. Communication requirements and interfaces.
- 6. List of electrical relay settings, and control and alarm contact settings.
- 7. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
- 8. As-installed control diagrams by CSSI.
- 9. Operating procedures:
  - a. Routine normal operating instructions.
  - b. Startup and shutdown sequences, normal and emergency.
  - c. Safety precautions.
  - d. Special operating instructions.
- 10. Maintenance Procedures:
  - a. Routine maintenance.
  - b. Guide to troubleshooting.
  - c. Adjustment and checking.
  - d. List of relay settings, control and alarm contact settings.
- 11. Manufacturer's printed operating and maintenance instructions.
- 12. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

## 1.07 DATA FOR MATERIALS AND FINISHES

- A. Content for Architectural Products, Applied Materials, and Finishes:
  - 1. Manufacturer's data, giving full information on products:
    - a. Catalog number, size, and composition.
    - b. Color and texture designations.
    - c. Information required for re-ordering special-manufactured products.
  - 2. Instructions for Care and Maintenance:
    - a. Manufacturer's recommendation for types of cleaning agents and methods.
    - b. Cautions against cleaning agents and methods that are detrimental to product.
    - c. Recommended schedule for cleaning and maintenance.
  
- B. Content for Moisture Protection and Weather Exposed Products:
  - 1. Manufacturer's data, giving full information on products:
    - a. Applicable standards.
    - b. Chemical composition.
    - c. Details of installation.
  - 2. Instructions for inspection, maintenance, and repair.

PART 2 – PRODUCTS  
(Not used)

PART 3 – EXECUTION  
(Not used)

++ END OF SECTION ++

## SECTION 01 91 14

### EQUIPMENT TESTING AND FACILITY START-UP

#### PART 1 – GENERAL

##### 1.01 DEFINITIONS

- A. Facility: Facilities furnished under the Contractor's scope of supply.
- B. Functional Test: Test or test in presence of RPE and Owner to demonstrate that installed equipment meets manufacturer's installation, calibration, and adjustment requirements and other requirements as specified.
- C. Performance Test: Test or tests performed after required functional test in the presence of the RPE and Owner to demonstrate and confirm individual equipment meets performance requirements specified in individual sections.

##### 1.02 SUBMITTALS

- A. Informational Submittals:
  - 1. Facility Startup and Performance Demonstration Plan.
  - 2. Functional and performance test results.
  - 3. Completed unit process startup documentation for each unit process.
  - 4. Completed facility performance demonstration documentation.

##### 1.03 FACILITY STARTUP AND PERFORMANCE DEMONSTRATION PLAN

- A. Develop a written plan, in conjunction with the Owner's operations personnel to include the following:
  - 1. Step-by-step instructions for startup of each unit process and the complete facility.
  - 2. Unit process startup documentation to minimally include the following:
    - a. Description of the unit process, including equipment numbers/nomenclature of each item of equipment and all included devices.
    - b. Detailed procedures for startup of the unit process including valves to be opened/closed, order of equipment startup, etc.
    - c. Startup requirements for each unit process, including water, power, chemicals, etc.
    - d. Space for evaluation comments.
  - 3. Facility performance demonstration documentation:
    - a. Description of unit processes included in the facility startup.

- b. Sequence of unit process startup to achieve facility startup.
- c. Description of remote/SCADA operations included in the facility.
- d. Contractor certification that the facility is capable of performing its intended function(s), including fully automatic operation.
- e. Signature spaces for Contractor and RPE.

PART 2 – PRODUCTS  
(Not used)

PART 3 – EXECUTION

3.01 GENERAL

- A. Facility Startup Meetings: schedule to discuss test schedule, test methods, materials, chemical and liquids required, facilities operations interface, and Owner involvement.
- B. Contractor's Testing Startup Representative:
  - 1. Designate and furnish one or more personnel to coordinate and expedite testing and facility startup.
  - 2. Representative(s) shall be present during startup meetings and shall be available at all times during testing and startup.
- C. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required for testing and startup.
- D. Provide Subcontractor and equipment manufacturer's staff adequate notice to prevent delays. Schedule ongoing work so as not to interfere with or delay testing and startup.
- E. Owner will:
  - 1. Provide water, power, chemicals, and other items as required for startup, unless otherwise indicated.
  - 2. Operate process units and facility with support of Contractor.
  - 3. Provide labor and materials as required for laboratory analyses.
  - 4. Make available spare parts, special tools, and operation and maintenance information for Owner-furnished products.

3.02 EQUIPMENT TESTING

- A. Preparation:
  - 1. Complete installation before testing.



2. Furnish qualified manufacturer's representatives, when required by individual specification sections.
3. Obtain and submit from equipment manufacturer's representative a certification of proper installation, in accordance with Section 01 43 33, Manufacturers' Field Services.
4. Equipment Test Report Form: Provide written test report for each item of equipment to be tested, to include the minimum information:
  - a. Owner/Project Name.
  - b. Equipment or item tested.
  - c. Date and time tested.
  - d. Type of test performed (Functional or Performance).
  - e. Test method.
  - f. Test conditions.
  - g. Test results.
  - h. Signature spaces for Contractor and RPE as witness.
5. Cleaning and Checking: Prior to beginning functional testing:
  - a. Calibrate testing equipment in accordance with manufacturer's instructions.
  - b. Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
  - c. Lubricate equipment in accordance with manufacturer's recommendations.
  - d. Turn rotating equipment by hand when possible to confirm that equipment is not bound.
  - e. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
  - f. Check power supply to electric-powered equipment for correct voltage.
  - g. Adjust clearances and torque.
  - h. Test piping for leaks.
6. Ready-to-test determination will be by the RPE based at least on the following:
  - a. Acceptable Operation and Maintenance Data.
  - b. Notification by Contractor of equipment readiness for testing.
  - c. Receipt of manufacturer's certification of proper installation.
  - d. Adequate completion of work adjacent to, or interfacing with, equipment to be tested.
  - e. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
  - f. Satisfactory fulfillment of other specified manufacturer's responsibilities.
  - g. Equipment and electrical tagging complete.
  - h. Delivery of all spare parts and special tools.

- B. Functional Testing:
  - 1. Conduct as specified in individual specification sections.
  - 2. Notify Owner and RPE in writing at least 10 days prior to schedule date of testing.
  - 3. Prepare an equipment test report summarizing test method and results.
  - 4. When, in the RPE's opinion, equipment meets functional requirements specified, such equipment will be accepted for purposes of advancing to performance testing phase, if so required by individual specification section. Such acceptance will be evidenced by RPE/Owner's signature as witness to the equipment test report.
  
- C. Performance Testing:
  - 1. Conduct as specified in individual specification sections.
  - 2. Notify RPE and Owner in writing at least 10 days prior to schedule date of test.
  - 3. Performance testing shall not commence until equipment has been accepted by RPE as having satisfied functional test requirements specified.
  - 4. Type of fluid, gas, or solid for testing shall be as specified.
  - 5. Unless otherwise indicated, furnish labor, materials, and supplies for conducting the test and taking samples and performance measurements.
  - 6. Prepare equipment test report summarizing test method and results.
  - 7. When, in the RPE's opinion, equipment meets performance requirements specified, such equipment will be accepted as to conforming to Contract requirements. Such acceptance will be evidenced by RPE's signature on the equipment test report.

### 3.03 STARTUP OF UNIT PROCESSES

- A. Prior to unit process startup, equipment within unit process shall be accepted by RPE as having met functional and performance testing requirements specified.
  
- B. Make adjustments, repairs, and corrections necessary to complete unit process startup.
  
- C. Startup shall be considered complete when, in the opinion of the RPE, unit process has operated in a manner intended for fourteen (14) continuous days without significant interruption. This period is in addition to functional or performance test periods specified elsewhere.
  
- D. Significant Interruption: May include any of the following events:
  - 1. Failure of Contractor to provide and maintain qualified onsite startup personnel as scheduled.
  - 2. Failure to meet specified functional operation for more than 2 consecutive hours.

3. Failure of any critical equipment or unit process that is not satisfactorily corrected within 5 hours after failure.
  4. Failure of any non-critical equipment or unit process that is not satisfactorily corrected within 8 hours after failure.
  5. As determined by the RPE.
- E. A significant interruption will require startup then in progress to be stopped. After corrections are made, startup test period shall start from beginning again.

#### 3.04 FACILITY PERFORMANCE DEMONSTRATION

- A. When, in the opinion of the RPE, startup of all unit processes has been achieved, sequence of each unit operation to the point that facility is operational.
- B. Demonstrate proper operation of required interfaces within and between individual unit processes.
- C. After facility is operating, complete performance testing of equipment and systems not previously tested.
- D. Document, as defined in Facility Startup and Performance Demonstration Plan, the performance of the facility including its SCADA system.
- E. “Satisfactory facility operation” shall be defined as successful automatic/remote operation of the facility, controlled by SCADA where intended by the design and producing effluent within discharge permit limits.
- F. Demonstrate satisfactory facility operation for a period of no less than 14 consecutive days.
- G. The Facility will not be accepted until the Contractor can demonstrate at least 14 consecutive days of uninterrupted satisfactory operation.
- H. Operating periods interrupted by significant interruptions will not be cumulative. Each interruption to the Operational Demonstration shall re-set the 14 consecutive day requirement of uninterrupted satisfactory operation.
- I. Certify, on the Facility performance demonstration form, that facility is capable of performing its intended function(s), including fully automatic operation.

++ END OF SECTION ++

## SECTION 03 21 00

### REINFORCING STEEL

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for installing all Reinforcing Steel, welded wire fabric and accessories for cast-in-place concrete as shown on the Plans, as specified, and/or directed.

##### 1.2 REFERENCES

1.2.1 Reference to standard specifications for the following organizations is intended to specify minimum standards for quality of materials and performance of workmanship, and for standard test methods.

- a. American Society for Testing and Materials (ASTM ) Publications, Latest Edition.
- b. American Concrete Institute (ACI) Standards, Latest Edition.
- c. American Welding Society (AWS) Publications, Latest Edition.
- d. American National Standards Institute (ANSI) Publications, Latest Edition.
- e. Concrete Reinforcing Steel Institute (CRSI) Publications, Latest Edition.

##### 1.3 SUBMITTALS: The following shall be submitted to

1.3.1 Shop Drawings: Indicate bar sizes, spacings, locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices. No work on fabricating or placing steel shall be done until such drawings and schedules have been approved.

1.3.2 Manufacturer's Certificate: Submit certified copies of mill test report of reinforcement materials analysis.

1.3.3 Welder's Certificate: Submit certification from welders employed on the work, verifying AWS qualification within the previous twelve months.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

2.1.1 Reinforcing steel bars shall be free from defects, kinks, bends, rust, scale or other irregularities. Reinforcing mesh shall be of the electrically welded type, with wires arranged in rectangular or square patterns.

2.1.2 Reinforcing bars shall be deformed billet steel meeting the requirements of ASTM A615 Grade 60.

2.1.3 Steel wire fabric shall meet the requirements of ASTM A185.

2.1.4 Stirrup steel shall be cold drawn steel wire meeting the requirements of ASTM A82.

2.1.5 Epoxy coated reinforcing bars shall be deformed billet steel meeting the requirements of ASTM A775, Grade 60.

2.1.6 Galvanized reinforcing bars shall be deformed billet steel meeting the requirements of ASTM A767, Grade 60.

2.1.7 Accessory materials shall include: tie wire, minimum 16 gage annealed type. Epoxy-coated reinforcing bars shall be tied with plastic-; epoxy-; or nylon-coated tie wire. Chairs, bolsters, bar supports, and spacers shall be sized and shaped for strength and support of reinforcement during concrete placement conditions.

### 2.2 IDENTIFICATION AND PROTECTION OF BARS AND FABRIC

2.2.1 Reinforcing steel shall be delivered to the work in strongly tied bundles identified with metal tags corresponding to the bar schedules and diagrams. Identification marks shall show quantity, producing mill, bar size, type of steel and grade mark.

2.2.2 All bars and fabric shall be stored off the ground and shall, at all times, be protected from moisture and be kept free from dirt, oil, or injurious coatings. Epoxy-coated reinforcing bars shall be stored on protective cribbing. If concreting is delayed for any considerable number of days after the reinforcing is placed in position, it shall be protected by covering with canvas or other satisfactory covering, or, if directed, shall be painted with a coat of neat cement grout.

2.2.3 Any bar or fabric having a scaly rust shall be cleaned. Epoxy-coated reinforcing bars that are cut, welded or otherwise damaged shall be repaired with patching material conforming to ASTM A775 and done in accordance with the Material Manufacturer's recommendation. Galvanized reinforcing bars that are cut, welded or otherwise damaged shall be repaired with

patching material conforming to ASTM A767 and done in accordance with the Material Manufacturer's recommendation. The Contractor will be required to replace bars exhibiting severely damaged coatings.

## PART 3 - EXECUTION

### 3.1 FABRICATION AND INSTALLATION

3.1.1 Metal reinforcing shall be properly fabricated in accordance to references specified.

3.1.2 Metal reinforcing shall be properly placed in accordance to CRSI, ACI 301, ACI 318, ACI SP-66, as shown on the approved Shop Drawings and as herein directed.

3.1.3 Bars shall be bent in the shop to the shapes shown or required. Field bending shall be done only with the written approval of the RPE. Field welding shall not be allowed without direct approval and supervision of the RPE.

3.1.4 Unless otherwise shown, splices in tension reinforcement shall not be permitted, and splices in compression reinforcement shall be lapped 40 diameters. All bar splices shall be staggered, wherever possible. Locate splices not indicated on drawings, at point of minimum stress. Splice locations must be approved by the RPE.

3.1.5 Reinforcing shall be securely tied and supported and must not be displaced during concrete placing operations. Epoxy-coated reinforcing bars shall rest on coated wire bar supports, or other acceptable materials. Dowels must be wired in place before concreting begins. All metal shall be kept away from exposed surfaces of concrete.

3.1.6 Conduit in slabs on grade shall be placed in a depression below the slab and the mesh run continuous over conduit. Conduit in slabs on forms shall be above the bottom reinforcing and below the top reinforcing. No conduit is permitted in thin joist slabs.

3.1.7 Cutting of bars to clear openings in walls or slabs is strictly prohibited. Warp bars around such openings.

3.1.8 Provide two #6 diagonal bars at each corner of every rectangular opening in walls, unless otherwise shown on the Plans.

3.1.9 All slabs, unless otherwise shown on the Plans, to be reinforced with not less than WWF 6 x 6 - W2.9 x W2.9 welded wire mesh.

3.1.10 Placing of concrete shall not be scheduled until all of the reinforcing for the section is secured in place and the reinforcing and forms have been approved by the RPE or his representative. Contractor shall notify the RPE 24 hours prior to a concrete pour.

3.1.11 Welded wire mesh in slabs is to be placed in the upper third of the depth of the slab. Lap 6" minimum. Fabric shall be straightened as required before placement.

3.1.12 Provide bent bars 6'-0" long of same size and spacing as horizontal bars for all corners of foundation walls, unless otherwise shown on the Plans.

3.1.13 Do not displace or damage vapor barrier.

3.1.14 For footing reinforcement - support bars on small precast concrete blocks; space at intervals as shown on the Plans and within minimum height specified above underside of slab or footing.

3.1.15 Reinforcement shall not be bent after being partially embedded in hardened concrete.

### 3.2 CONCRETE PROTECTION FOR REINFORCEMENT

3.2.1 Unless otherwise shown or directed, concrete protection, measured from the surface of the bar, shall be the following:

3.2.1.1 For concrete deposited against the ground, without the use of forms..... 3 inches

3.2.1.2 For formed concrete in contact with the ground..... 2 inches

3.2.1.3 For slabs and walls contacting water or sewage..... 2 inches

3.2.1.4 For beams, girders and columns not directly exposed to ground and weather ..... 1-1/2 inches

3.2.1.5 For formed concrete exposed to the weather ..... 2 inches

3.2.1.6 For slabs and walls, not directly exposed to ground, weather, water or sewage.....1 inch

3.2.2 Exposed reinforcing bars intended for bonding with future extensions shall be protected from corrosion by a covering of concrete or other approved material.

### 3.3 FIELD QUALITY CONTROL:

3.3.1 Field inspection will be performed under the provisions of Section 033000.

++ END OF SECTION ++

## SECTION 03 30 00

### CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.
- B. Waterproofing is specified in Division 7.

##### 1.02 DESCRIPTION OF WORK

- A. This section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

##### 1.03 QUALITY ASSURANCE

- A. Reference Standards:
  - 1. ACI 117 "Specification for Tolerances for Concrete Construction and Materials."
  - 2. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete."
  - 3. ACI 301 "Specifications for Structural Concrete for Buildings."
  - 4. ACI 304 "Guide for Measuring, Mixing, Transporting, and Placing Concrete"
  - 5. ACI 305 "Hot-Weather Concreting."
  - 6. ACI 306 "Cold-Weather Concreting."
  - 7. ACI 311 "ACI Manual of Concrete Inspection" and "Guide for Concrete Plant Inspection and Testing of Ready-Mixed Concrete."
  - 8. ACI 315 "Details and Detailing of Concrete Reinforcement."
  - 9. ACI 318 "Building Code Requirements for Structural Concrete."
  - 10. ACI 347 "Guide to Formwork for Concrete."
  - 11. ACI 350 "Code Requirements for Environmental Engineering Concrete Structures and Commentary"
  - 12. ACI SP-15 "Field Reference Manual." A copy of this publication shall be kept in the field office at all times during concrete construction.
  - 13. AWS D1.4 "Structural Welding Code - Reinforcing Steel."
  - 14. CRSI "Manual of Standard Practice."
  - 15. NYSDOT "Standard Specification for Construction and Materials."



- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. **Source Limitations:** To minimize irregularities in appearance or color, obtain cementitious materials of the same brand from the same manufacturer's plant. Obtain aggregates, admixtures, and water for each type of concrete construction exposed to view in completed project from same source for duration of that type of construction.
- D. **Pre-installation Conference:** Refer to Specification Section 014533 and Schedule of Special Inspections.

#### 1.04 SPECIAL INSPECTIONS

- A. Refer to Specification Section 014533 and Schedule of Special Inspections.

#### 1.05 MATERIAL EVALUATION/QUALITY CONTROL

- A. **Preconstruction Testing:** Contractor shall employ Testing Agency acceptable to Engineer and Architect to perform material evaluation tests and evaluate concrete mixes prior to submitting.
  - 1. Testing Agency shall be qualified according to ASTM C 1077 and ASTM E329.
- B. Submit concrete testing service qualifications demonstrating experience with similar projects.
- C. Require concrete supplier to provide delivery tickets for each truckload of concrete. Tickets shall be presented to and reviewed by Contractor and Special Inspector or Testing Agency prior to discharging concrete into structure.
  - 1. Tickets shall contain project identification name, name of Contractor, name of concrete supplier, location of batch plant, date and time of concrete batching, truck number, delivery ticket number, concrete type and class, concrete mix number, design compressive strength at 28 days, concrete mix proportions and materials, and amount of total mix design water that can be added at site prior to discharging into structure if total mix design water was not used when batched. See Part 3 of this section for maximum water amount that can be added at site.
- D. The Registered Design Professionals (RDPs) for the Construction Phase and Architecture and the Special Inspector will visit construction site at appropriate intervals to determine if work is in general conformance with Contract Documents and specifications. Notify RDPs 48 hours before anticipated time of completion of

reinforcement for a given section of work so they may determine if site observations are required. If site observations are required, do not place concrete until RDPs have had opportunity to observe reinforcement.

## 1.06 SUBMITTALS

### A. Shop Drawings:

1. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Show bar sizes, lengths, material grade, schedules, spacing, diagrams of bent bars, arrangements of reinforcement, splices and laps, mechanical connections, and supports for reinforcement. Include special reinforcement required for openings through concrete.
  - a. Show elevations of reinforcement for all members at minimum 1/4 inch = 1 foot scale.
  - b. Show locations of construction and control joints.
  - c. Reference Contract Drawing number and addendum number in each shop drawing.
  - d. Do not place reinforcing information from more than one design discipline (structural, civil, landscape) in each drawing.
2. Submit for information only formwork, shoring, and reshoring drawings including details and sequencing of installation, removal, and reinstallation (if applicable) for structural concrete slab and beams. Design and construction of formwork, shoring, and reshoring remains sole responsibility of Contractor. Formwork drawings shall be prepared and stamped by New York State Professional Engineer.

B. Mix Designs: Submit proposed mix designs for concrete 15 days minimum before start of concreting. Submittal must be in the Concrete Mix Design Submittal Form at end of this section for each class of concrete.

C. Submit to Special Inspector and Engineer material certificates signed by manufacturers certifying each material complies with specifications. Submit proposed admixtures including chloride ion content prior to submitting mix design.

D. Submit data and installation instructions for proprietary materials.

## 1.07 WATERTIGHTNESS TESTING

A. Contractor shall provide labor, materials, and devices to seal off pipe openings for testing watertightness of structures in manner acceptable to the RPP for the Construction Phase.

B. Test clarifiers, tanks, chambers, vaults, distribution units, wet wells, and manholes before backfilling and before equipment is installed by filling them to overflow level. Rate of filling shall be such that depth of water shall not increase by more than 6 feet

in 24-hour period; however, no tank shall be filled in under 3 days. Test each unit separately and, if necessary, bulkhead from adjacent units. No structure shall be tested until concrete is at least 28-days old. Fill each unit to appropriate level, at which time tank will be allowed 7-day stabilization period. No testing shall take place until after stabilization period. After stabilization period has elapsed, test tank for watertightness during a 7-day period. Contractor shall provide a minimum of four measurement locations per tested unit.

1. Maximum allowable leakage shall be in compliance with ACI 350, "Environmental Engineering Concrete Structures."

- C. Leaks including those caused by form ties, construction joints, expansion joints, shrinkage cracks, wall embedments, honeycombing, etc., shall be repaired by Contractor. Retested unit until leakage rate is acceptable.
- D. The cost of repairs and retesting shall be borne entirely by the Contractor at no additional cost to the Owner.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store materials so as to preserve their quality and fitness for work.
  1. Store reinforcement and formwork in manner to prevent bending, damage (including damage to coatings) and accumulation of dirt.
  2. Store waterstops in a manner to prevent exposure to moisture, sunlight, dirt, oil, and other contaminants.

#### 1.09 WORKMANSHIP

- A. Contractor shall be responsible for correction of concrete work not conforming to specified requirements, including strength, tolerances, and finishes. Correct deficient concrete as directed by Architect.
- B. Remove work found to be defective. Replace with new acceptable work.

### PART 2 - PRODUCTS

#### 2.01 FORM MATERIALS:

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed/plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown in drawings. Plywood materials shall be one of the following:
  1. Overlaid plywood complying with U.S. Product Standards PS 1 "A-C or B-B High Density Overlaid (HDO) Concrete Form," Class 1, exterior grade or better.

2. Plywood complying with U.S. Product Standard PS 1 "B-B (Concrete Form) Plywood," Class 1, exterior grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
  - C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
  - D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
  - E. Form Release Agent: Provide commercial formulation form-coating compounds with maximum VOC of 450 g/l that will not bond with, stain, or adversely affect concrete surfaces or impair subsequent treatments of concrete surfaces requiring bond or adhesion or impede wetting of surfaces to be cured with water or curing compound.
    1. Formulate form release agent with rust inhibitor for steel form-facing materials.
  - F. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off, metal form ties, designed to prevent form deflection and spalling concrete upon removal. Provide units that will leave no metal closer than 2 inches to exposed surface. Remaining tie material shall create watertight seal or tie shall be removed and hole plugged and grouted with acceptable product.
    1. Provide ties that will leave holes no larger than 1-inch diameter in concrete surface when removed.
    2. Unexposed concrete: "Type A-3 Snap Tie Standard" by Dayton Superior or accepted equivalent.
    3. Exposed concrete: "Type A-3 Snap Tie Heavy" by Dayton Superior or accepted equivalent.
    4. Provide galvanized or stainless steel ties for concrete elements that are reinforced with epoxy-coated reinforcing.
    5. Internal wood spreaders are prohibited.
  - G. Shores and Reshores: Wood (minimum 4 by 4) or steel with integral screw-type jacks. Members shall be straight and without twist or warp.

## 2.02 REINFORCING MATERIALS

- A. Deformed bars: ASTM A 615, Grade 60.
- B. Deformed bars to be welded, ASTM A 706.
- C. Deformed Epoxy-Coated Reinforcing Bars: ASTM A 775.
- D. Steel Wire: ASTM A 82, plain, cold-drawn steel.

- E. Epoxy-coated Wire: ASTM A 884.
- F. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.
- G. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Use wire bar-type or all plastic-type supports complying with CRSI specifications. Use chairs with sand plates or horizontal runners where base material will not support chair legs.
  - 1. Concrete bricks may be used to support footing reinforcing. Stagger brick locations.
    - a. Do not use clay bricks.
    - b. Do not use bricks to support epoxy-coated reinforcing.
  - 2. Supports for epoxy-coated reinforcing shall be either wire bar-type coated with epoxy, plastic, or vinyl compatible with concrete for a minimum distance of 2 inches from the point of contact with reinforcing or all plastic-type.
  - 3. Finish (epoxy-coated) for supports formed from reinforcing bars shall match the finish of the supported reinforcing.
  - 4. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are plastic-protected (CRSI, Class 1) or stainless-steel protected (CRSI, Class 2).
- H. Minimum 16-gauge annealed tie wire, ASTM A 82.
  - 1. Provide coated tie wire for use with epoxy-coated bars. Acceptable coatings include epoxy, nylon, or vinyl. Do not use plain tie wire.
- I. Reinforcement Couplers: “Lenton Concrete Products” by Erico; “Bar-Lock Rebar Coupler System” by Dayton Superior;

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II. Material shall not contain more than 8 percent tri-calcium aluminate.
- B. Aggregates: NYSDOT-approved, Section 703-02 (normal weight), one source and as specified.
  - 1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps, or other deleterious substances.
  - 2. Coarse Aggregate: Clean, uncoated, processed aggregate free from clay, mud, loam, or foreign matter.
    - a. For mat footing, tank walls, and slabs, blend of NYSDOT size 1 and 2 (25 percent size 1 and 75 percent size 2) or gradation conforming to ASTM C 33, size 467:

Sieve Size      Percent Passing

2 inch	100
1 1/2 inch	95 to 100
3/4 inch	35 to 70
3/8 inch	10 to 30
No. 4	0 to 5

- C. Water: ASTM C 94, clean, fresh, drinkable.
- D. Fly Ash: ASTM C 618, Type F, with a loss on ignition of less than 6 percent.
- E. Ground-Granulated, Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

#### 2.04 ADMIXTURES

- A. Air Entraining: ASTM C 260.
- B. Water-Reducing Admixture: "Eucon WR-75" or "Eucon WR-91" by Euclid Chemical Co.; "MasterPozzolith 200" by Master Builders; or "Plastocrete 161" by Sika Chemical Corp. Admixture shall conform to ASTM C 494, Type A, and not contain more chloride ions than in municipal drinking water.
- C. Water-Reducing and Retarding Admixture: "Eucon Retarder-75" by Euclid Chemical Co.; "MasterSet R100" by Master Builders; or "Plastiment" by Sika Chemical Corp. Admixture shall conform to ASTM C 494, Type D, and not contain more chloride ions than in municipal drinking water.
- D. Noncorrosive, Nonchloride Accelerator: ASTM C 494, Type C or E, and not contain more chloride ions than in municipal drinking water.
- E. High-Range, Water-Reducing Admixture (Superplasticizer): "Eucon 37" by Euclid Chemical Co. or "Sikament SPMN" by Sika Chemical Corp. Admixture shall conform to ASTM C 494, Type F or G, and not contain more chloride ions than in municipal drinking water.
- F. Polycarboxylate Polymer Superplasticizer for Self-Consolidating Concrete: "Eucon SPJ" by Euclid Chemical Co. or "Sika Viscocrete 2100" by Sika Chemical Corp, "MasterGlenium 7500" by Master Builders.
- G. Viscosity Modifier for Self-Consolidating Concrete: "Visctrol" by Euclid Chemical Co. or "MasterMatrix VMA 358 or 362" by Master Builders.

- H. Prohibited Admixtures: Calcium chloride, thiocyanates, and admixtures containing more than 0.05 percent water-soluble chloride ions by weight of cement or more than 0.3 percent thiocyanates by weight of cement shall not be permitted.

## 2.05 RELATED MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 ounces a square yard when dry and complying with AASHTO M 182, Class 2.
- B. Curing-Sheet Materials: One of the following moisture-retaining covers, complying with ASTM C 171. Waterproof paper, polyethylene film, or polyethylene-coated burlap.
- C. Clear Curing and Sealing Compound (VOC compliant): ASTM C 309, Type 1, Class B with minimum 18 percent solids content. Use "Diamond Clear VOX" by Euclid Chemical Co. or accepted equivalent.
- D. Horizontal Joint Sealants: "MasterSeal SL2" by Master Builders; "Sikaflex-2c SL" by Sika Corp.; "Eucolastic 2 SL" by Euclid Chemical Co.; or accepted equivalent.
- E. Vertical Joint Sealants: "Eucolastic 2NS" by Euclid Chemical Co.; "MasterSeal NP2" by Master Builders; "Sikaflex-2c NS" by Sika Corporation; or accepted equivalent.
- F. Joint Filler: ASTM D 1751, 1/2-inch-thick, premolded, expansion and isolation joint filler strips.
- G. Backer Rod: Polyethylene closed-cell foam. "MasterSeal 920 or 921" by Master Builders or accepted equivalent.
- H. PVC Waterstops: Polyvinyl Chloride, dumbbell-type or center bulb-type, conforming to Corps of Engineers CRD-C 572. "Wirestop CR-6380" or "Wirestop FD-6380" by Paul Murphy Plastics Company; "Sealtight PVC Waterstop 6380" by W.R. Meadows; or accepted equivalent at below-grade wall control joint locations and at locations shown in drawings.
- I. Chamfer Strips: Provide wood, metal, PVC, or rubber chamfer strips fabricated to provide 3/4-inch chamfer on exposed edges.
- J. Sleeves: See Process Drawings for mechanical joint and other sleeves.
- K. Non-shrink Grout: Corp of Engineers CRD-C 621. "Sure-Grip High Performance Grout" by Dayton Superior; "NS Grout" by Euclid Chemical Co.; "SikaGrout 212" by Sika Corp.; "Masterflow 928" by Master Builders, Inc.; or accepted equivalent.

- L. Bonding Agent: ASTM C 1059, Type II “Acrylic Bonding Agent J40” by Dayton Superior; “SBR Latex” by Euclid Chemical Co.; “Everbond” by L&M Construction Chemicals, Inc.; “SikaLatex” by Sika Corp.;; or accepted equivalent.
- M. Chemical Adhesive for Doweled Reinforcement:
  - 1. Anchors to solid concrete, grouted CMU, solid brick, or stone:
    - a. Anchors for use when base material temperature is 0°F or greater: “HIT-Ice” by Hilti; “Epcon A7” by ITW Ramset/Red Head; “AC 100 + Gold” by Powers Fasteners; “AT-XP” by Simpson/Strong-Tie; or accepted equivalent.
    - b. Anchors for use when base material temperature is 40°F or greater; “HIT HY 200” by Hilti; “Epcon C6+” by ITW Ramset/Red Head; “PE 1000+” by Powers Fasteners; “ET-HP” by Simpson/Strong-Tie; or accepted equivalent.

## 2.06 PROPORTIONING AND MIX DESIGN

- A. Prepare design mixtures for type and strength of concrete. Use independent testing facility acceptable to Architect for preparing and reporting proposed mix designs.
- B. Where concrete production facility can establish uniformity of its production for concrete of similar strength and materials based on recent test data, the average strength used as a basis for determining mix design proportions shall exceed specified design strength by requirements of ACI 318, Section 5.3.2.1 or ACI 301, Section 3.9.
- C. When a concrete production facility does not have field-test records for calculation of standard deviation, the required average strength shall be determined in accordance with ACI 318, Section 5.3.2.2.
- D. Pozzolans:
  - 1. Pozzolans shall be substituted for cement in normal-weight concrete. Provide fly ash, at a minimum rate of 20 percent by weight up to a maximum rate of 25 percent by weight, or ground-granulated, blast-furnace slag at a minimum rate of 20 percent by weight up to a maximum rate of 35 percent by weight.
  - 2. Submittals shall include actual mix design, including percentage of pozzolans and test results showing mix meets specified 7-day compressive strength where indicated, 28-day compressive strength, and air content.
  - 3. Protect and heat concrete containing pozzolans during cold-weather conditions. Maintain protection and heat until 70 percent of specified design strength is achieved.
- E. Quantity of coarse aggregate in pounds must be in the range of 1.25 to 1.5 times quantity of fine aggregate in pounds.



F. Concrete Quality:

Location	Required 7-day Compressive Strength psi	Required 28-day Compressive Strength psi	Maximum Water/Cement Ratio	Percent Entrained Air
Mat Footing Slabs on Grade	3,000	4,500	0.42	4.5*
Tank Walls, Tank Roof Slab	3,000	5,000	0.42	4.5*
Lean concrete	NA	1,500	0.65	4.5*

\* Plus or minus 1.5 percent.

G. Slump:

1. Concrete: 3 inches to 5 inches.
2. Concrete containing high-range, water-reducing admixture (superplasticizer) shall have a maximum slump of 9 inches unless otherwise accepted by Engineer. Concrete shall arrive at the job site at a slump of 2 to 3 inches, shall be verified, then high-range, water-reducing admixture added to increase slump as required for placement and workability.
3. Type G superplasticizer may be added at plant if adequate quality control measures are implemented to verify slump and admixture quantities at plant before addition of superplasticizer. Concrete shall maintain required slump during transportation and placement. Quality control testing at plant shall be performed by an independent testing laboratory employed by Contractor and acceptable to Architect.
4. Ready-Mix Concrete: ASTM C 94.
5. Provide batch ticket for each batch discharged and used in work indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

H. Self-Consolidating Concrete Mix: ASTM C1611/C1611M and ASTM C1621/C1621M:

1. Slump Flow: 24 inches to 30 inches.
2. Visual Stability Index Rating: 1 or less. J-Ring Flow: Difference between slump flow and J-ring flow shall not be more than 2 inches.

2.07 REINFORCING FABRICATION

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Fabricate bars to required lengths, shapes, and bends. Do not rebend or straighten reinforcement in manner that could weaken material.

- B. Reinforcing shall not be heated or welded unless specified in the structural drawings.

## PART 3 - EXECUTION

### 3.01 JOB CONDITIONS

- A. Examine conditions under which concrete shall be placed. Do not proceed with work until unsatisfactory conditions are corrected.

### 3.02 FORMWORK INSTALLATION

- A. General: Design, erect, shore, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347 and ACI 117.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, chamfers, blocking, screeds, bulkheads, anchorages, inserts, sleeves, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent concrete mortar leakage.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, recesses, etc., for easy removal.
- D. Erect forms in logical sequence to allow placement and inspection of reinforcement and other embedded items.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for concrete placement. Securely brace temporary openings, and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- F. Provide cleanout panels at bottoms of deep wall forms.
- G. Chamfer exposed corners and edges as indicated using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- H. Fit corners and joints with gaskets or tape to prevent leakage.

- I. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- J. Sleeves: Provide sleeves in concrete formwork for plumbing, electrical, and mechanical penetrations. Coordinate size and location of sleeves with Contractors and Process drawings.
  - 1. Accurately place and secure in forms.
  - 2. Coordinate sleeve locations with reinforcing bars.
  - 3. Penetrations shall not occur through footings, piers, columns, beams, joists, grade beams, or supported slabs unless shown in structural drawings.
- K. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before placing concrete as required to prevent mortar leaks and maintain proper alignment.
- L. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing materials are not acceptable. Apply new form-release agent. When forms are reused for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets.
- M. Clean and coat forms before erection. Do not coat forms in place.
- N. Place concrete plugs in exposed holes left by form-tie cones. Plugs shall provide watertight seal and be recessed to allow for 2 inch minimum grout cover after installation.

### 3.03 SHORES AND SUPPORTS

- A. General: Comply with ACI 347 for shoring and reshoring in multistory construction and as herein specified.
- B. Provide thermometers adjacent to formwork to record curing temperatures.
- C. Design formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure.
- D. Formwork for slabs and other parts that support weight of concrete shall remain in place at least 7 days and until concrete has reached 75 percent of the 28-day design strength as indicated by field-cured cylinders. Shoring shall not be removed and no additional loads of any sort shall be permitted on the structure until it has reached its

28-day design strength or has been properly reshored. Forms shall be removed at risk of the Contractor, and no pointing or patching shall be done until RDP for the Construction Phase has observed the concrete and permitted such work.

- E. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.
- F. Reshore removal shall be based on compressive test results of field-cured cylinders and shall not occur until concrete has reached the 28-day design strength.
- G. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- H. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

#### 3.04 STEEL REINFORCEMENT PLACEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust, mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, hangers, or concrete brick as required.
  - 1. Wire-tie intersections as required to prevent displacement of reinforcement.
  - 2. Do not wet set reinforcing bars. Wet setting is not permitted.
- D. Place reinforcement to obtain at least minimum concrete coverages for protection of bars. Minimum required concrete cover is noted in drawings.
- E. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- F. Use of nails in forms and use of clay brick to support reinforcement **is** prohibited.

- G. Lap bar splices as indicated. Stagger splices in adjacent bars. Wire-tie splices.
- H. At points where bars lap-splice, including distribution steel, provide wire-tied minimum lap of 30-bar diameters unless otherwise required.
- I. Coordinate placement of reinforcement with openings, including sleeves and other embedded items. Where one or more bars are interrupted, provide additional reinforcement at openings. Additional reinforcement is noted in drawings.
- J. Place concrete in manner to ensure alignment of elements remains unchanged.
- K. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
- L. Comply with manufacturer-recommended procedures for installing and anchoring of doweled reinforcement using chemical adhesives, including drilling and cleaning of holes and mixing and applying of adhesives.

### 3.05 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items including anchor rods, leveling plates, embedded plates, and angles required for other work attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.
- B. Do not wet set embedded items. Accurately position, support, and secure embedded items against displacing by formwork, construction, or concrete placement operations.
  - 1. Provide No. 3 rebar ties at top and bottom of anchor rods to maintain position or other accepted method.
- C. Anchor rods and embedded structural supports incorrectly located or damaged after installation shall be field modified, including repair or replacement, by Contractor.
  - 1. Notify Engineer of defective work. Submit proposed field modifications to Engineer for review and acceptance prior to making corrections.
  - 2. Proposed field modifications shall include design details and calculations, signed and sealed by a licensed Professional Engineer hired by Contractor.
  - 3. Cost of field modifications shall be borne entirely by Contractor at no additional cost to Owner. Contractor shall reimburse Owner for cost of additional testing required.

### 3.06 INSTALLATION OF NON-STRUCTURAL EMBEDDED ITEMS

- A. General: Notify other trades to permit installation of their work, including conduit, and piping and to coordinate requirements of this section. Cooperate with other trades in setting work as required.
- B. ACI 318, Article 6.3, and guidelines listed below apply to conduit and piping.
  - 1. Do not embed aluminum items unless coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.
  - 2. Other than those passing through concrete elements, do not embed items that are larger than one-third of thickness of concrete element in which they are embedded.
  - 3. Unless shown otherwise in structural drawings, install items as follows:
    - a. Space at least 12 inches apart and not less than three diameters or widths on center.
    - b. Place so they do not cross over each other within concrete elements.
    - c. Place so they do not displace reinforcing bars from their proper location.
    - d. Provide at least 1 1/2-inch concrete cover between items and reinforcing bars or concrete surfaces not exposed to weather or in contact with ground. Do not lay items on reinforcing bars. Provide at least 1/2-inch concrete cover between items and concrete surfaces exposed to weather or earth.
    - e. Securely position items by wire tying to support chairs or supports formed from reinforcing bars.
    - f. Install sleeves at penetrations for nonstructural items passing through concrete elements.

### 3.07 PREPARATION OF FORM SURFACES

- A. General: Coat contact surfaces of forms with an accepted form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or to come in contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- C. Coat steel forms with a nonstaining, rust-preventive material. Rust-stained steel formwork is not acceptable.

### 3.08 CONSTRUCTION JOINTS:

- A. Construct joints true to line with faces perpendicular to surface plane of concrete. Locate and install construction joints so strength and appearance of concrete are not impaired, at locations indicated in the structural drawings.

1. Provide keyways at least 1-1/2 inches deep in construction joints in walls. Roughen joints between reinforced concrete walls and footings to a minimum 1/4-inch amplitude and remove dirt and concrete laitance prior to casting concrete walls.
2. Space vertical joints in walls as indicated in drawings.
3. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements.
4. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
5. Provide water stops in construction joints below grade and where indicated. Install water stops to form continuous diaphragm in each joint. Make provisions to support and protect exposed water stops during progress of work. Field-fabricate joints in water stops in accordance with manufacturer's printed instructions.
6. Mandatory wall construction joints for the SBR Complex are indicated in the drawings. Placement of wall sections shall be staggered. Allow 48 hour minimum cure time prior to placing new wall sections adjacent to or between previously cast wall sections.

### 3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement and embedded items is complete and required inspections have been performed.
  1. Notify other trades to permit installation of their work. Cooperate with other trades in setting work as required.
- B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete" and as specified.
- C. A maximum of 2 1/2 gallons for each cubic yard of total mix design water can be added in field. Water must be added prior to discharging and testing concrete. At no time shall total water exceed amount listed in accepted mix design.
- D. Deposit concrete continuously in one layer or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within section. Provide construction joints if section cannot be placed continuously.
- E. Deposit concrete as nearly as practicable to its final location to avoid segregation caused by rehandling or flowing.
- F. Deposit concrete in forms in horizontal layers not deeper than 24 inches and in manner to avoid inclined construction joints.

- G. Keep excavations free of water. Do not deposit concrete in water, mud, snow, or on frozen ground.
- H. Maximum drop of concrete shall not exceed 5 feet. Use hopper and trunk for greater drops.
- I. Maintain reinforcing in proper position during concrete placement.
- J. Contractor shall be responsible for controlling the proper placing of embedded pipe, conduit, and other embedded items. See section "Installation of Non-Structural Embedded Items" for additional information.
- K. Pumping concrete is permitted only if mix designs specifically prepared and used previously for pumping are submitted. Pump line shall have 5-inch-minimum inside diameter and be used with 5-inch pumps.

### 3.10 CONSOLIDATION

- A. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
- B. Do not use vibrators to transport concrete inside formwork.
- C. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Vibrators shall penetrate placed layer of concrete at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set.
- D. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- E. Do not allow vibrator to come in contact with form.
- F. Consolidation is typically not required for self-consolidating concrete mixes. However, provide internal vibration as required to prevent cold joints between pour lifts.



### 3.11 SURFACE FINISHES

- A. Rough-Form Finish: Provide as-cast, rough-form finish to formed concrete surfaces that shall be concealed in finished work or by other construction. Standard rough-form finish is concrete surface having texture imparted by form-facing material used, with tie holes and other defective areas repaired and patched, and fins or other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth-Form Finish: Provide smooth-form finish for formed concrete surfaces that shall be exposed to view or covered with material applied directly to concrete such as waterproofing, dampproofing, veneer plaster, painting, or other similar systems. Produce smooth-form finish by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Nonslip Broom Finish: Apply nonslip, heavy broom finish to top surfaces of structural slabs and walkways. Immediately after trowel finishing, roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.12 CONCRETE PROTECTING AND CURING

- A. Protect freshly placed concrete from premature drying, excessive hot or cold temperature, and damage in accordance with provisions of ACI 306 for cold-weather project and ACI 305, for hot-weather protection.
- B. Curing Methods: Perform concrete curing in accordance with ACI 308 by wet-curing or moisture-retaining cover curing or combinations thereof as specified.
- C. Provide wet-curing by following methods:
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Use continuous water-fog spray.
  - 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges with 4-inch lap over adjacent absorptive covers.

- D. Provide moisture-retaining-cover curing as follows:
1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair holes or tears during curing period using cover material and waterproof tape.
- E. Curing Vertical-Formed Surfaces:
1. Keep forms in place for minimum of 7 days, 14 days in cold weather or until concrete has achieved 70 percent of its design strength.
  2. If forms are removed before minimum time period, alternate methods of curing, wet-curing, moisture-retaining-cover curing, or liquid-membrane curing, are required.
    - a. Contractor shall submit procedures to Architect for review.
    - b. Forms shall remain in place for a minimum of 24 hours when alternating methods of curing are used. For placement during cold weather, the minimum time to form removal shall be extended based on expected weather conditions and Contractor's submitted procedures.
- F. Cure concrete placed under cold-weather conditions completely covering exposed surface of concrete with moisture-retaining cover completely sealed around edges. Cure concrete 14 days minimum with concrete temperature at or above 40 degrees F or 7 days minimum with concrete temperature at or above 70 degrees F.
- G. During hot weather after concrete has hardened, loosen form ties, keeping forms in place, and apply water to inside face of form to keep concrete continuously moist.

### 3.13 COLD-WEATHER CONCRETING

- A. Place concrete in accordance with ACI 306.
- B. For cold-weather concreting (defined as a period when for more than 3 successive days the mean daily temperature is below 40 degrees F), maintain concrete temperature in accordance with Table 3.1, and maintain concrete protection in accordance with Table 5.3 in "Cold-Weather Concreting" reported by ACI Committee 306.
- C. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain concrete mixture temperature recommended in Table 3.1 of ACI 306.
1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.

### 3.14 HOT-WEATHER CONCRETING

- A. Place concrete in accordance with ACI 305.
- B. Cool ingredients before mixing to maintain concrete temperature below 85 degrees F at time of placement.
- C. Mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water.
- D. Cover reinforcing steel with water-soaked burlap if temperature of reinforcing steel exceeds ambient air temperature.
- E. Wet forms thoroughly before placing concrete.
- F. Fog-spray forms and reinforcing steel just before placing concrete.
- G. Use water-reducing, retarding admixture when required by high temperature, low humidity, or other adverse placing conditions when acceptable to Architect.

### 3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after form removal when acceptable to Architect.
  - 1. Cut out honeycombs, rock pockets, voids over 1/2 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but not to a depth of less than 1 inch. Make edges of cuts perpendicular to concrete surface. Thoroughly clean, dampen with water, and brush-coat area to be patched with bonding agent. Place patching mortar before bonding compound has dried.
  - 2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so patching mortar will match surrounding color when dry. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. These include surface defects such as color, texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form-tie holes, and fill with dry-pack mortar or precast-cement cone plugs secured in place with bonding agent.
  - 1. Where possible, repair concealed formed surfaces containing defects affecting concrete durability. If defects cannot be repaired, remove and replace concrete.

- C. Repair of Unformed Surfaces: Test unformed surfaces for smoothness, and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using template having required slope.
  - 1. Repair finished unformed surfaces containing defects affecting concrete durability. These include surface defects such as crazing, cracks, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
- D. Repair methods not specified above may be used subject to acceptance of Architect.

### 3.16 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades unless otherwise shown or directed after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown in drawings. Coordinate sizes and locations with equipment supplied. Prior to placing concrete, set anchorage devices for machines and equipment using setting drawings, templates, diagrams, instructions and directions furnished with the equipment.

### 3.17 TOLERANCES

- A. Mat Footing:
  - 1. Variation of dimensions in plan: plus 2 inches or minus 1/2 inch.
  - 2. Variation of center from specified center in plan: 2 percent of width in direction of variation, plus or minus 2-inches maximum variation.
  - 3. Variation of bearing surface from specified elevation: plus or minus 1/2 inch, unless otherwise specified.
- B. Tank Walls:
  - 1. Variation in cross-sectional dimensions and in thickness of walls: plus or minus 1/4 inch.
  - 2. Variation in plan from specified location in plan: plus or minus 1/2 inch for any member in any location.
  - 3. Deviation in plan from straight lines parallel to specified linear building lines: 1/4 inch for adjacent members less than 20 feet apart or any wall length less than 20 feet; 1/2 inch for adjacent members 20 feet or more apart or any wall length of 20 feet and greater.

4. Deviation from plumb: 1/4 inch for any 10 feet of height; 1 inch maximum for entire height.
  5. Variation in elevation from specified elevation: plus or minus 1/2 inch for any member in any location.
  6. Deviation in elevation from lines parallel to specified grade lines: 1/4 inch for adjacent members less than 20 feet apart or any wall length less than 20 feet; 1/2 inch for adjacent members 20 feet or more apart or any wall length of 20 feet and greater.
- C. Anchor Rods and Sleeves:
1. Variation from specified location in plan: plus or minus 1/4 inch.
  2. Variation from specified elevation: plus or minus 1/2 inch.
- D. Embedded Items (plates, angles, etc.) other than anchor rods and sleeves:
1. Variation from specified location in plan: plus or minus 1/4 inch.
  2. Variation from specified elevation: plus or minus 1/4 inch.
- E. Elevated Concrete Slabs:
1. Thickness of elements not including roof slab:
    - a. 12 inches or less – plus 3/8 inch or minus 1/4 inch.
  2. Thickness of roof slab: Plus 1/2 inch or minus 1/4 inch.
  3. Deviation from elevation of top surface of formed slabs before removal of supporting shores: +/- 3/4 inch.
  4. Deviation from elevation of other formed surfaces before removal of shores: +/- 3/4 inch.
  5. Horizontal deviation from specified location:
    - a. Vertical elements measured at the top of foundation: +/- 1 inch.
    - b. Other elements: +/- 1 inch.
    - c. Edge location of all openings: +/- 1 inch.
- F. Reinforcement:
1. Variation in specified horizontal or vertical location:
    - a. Member depth 4 inch or less: +/- 1 1/4 inch.
    - b. Member depth (or thickness) more than 4 inch but less than or equal to 12 inch: +/- 3/8 inch.
    - c. Member depth (or thickness) more than 12 inches: +/- 1/8 inch.
  2. Spacing:
    - a. Elevated slabs and walls: +/- 1 inch
  3. Longitudinal location of bends in bars and ends of bars:
    - a. At discontinuous ends of elements: +/- 1 inch.
    - b. At other locations: +/- 2 inches.
  4. Length of bar lap: - 1 inch.

**CONCRETE MIX DESIGN SUBMITTAL FORM**

Submit separate form for each mix design

Project: \_\_\_\_\_ Location: \_\_\_\_\_

General Contractor: \_\_\_\_\_ Concrete Supplier: \_\_\_\_\_

Mix Design No: \_\_\_\_\_ Concrete Grade: \_\_\_\_\_

Use (Describe): \_\_\_\_\_

Methods of Placement (chute, pump, chute and buggy, etc.): \_\_\_\_\_

If placing by pumping, verify concrete mix can be pumped distances required in project: \_\_\_\_\_

**A. DESIGN MIX INFORMATION:**

Based on Standard Deviation Analysis: \_\_\_\_\_ or Trial Mix Design Data: \_\_\_\_\_

Design Characteristics - Density: \_\_\_\_\_ pcf; Strength: \_\_\_\_\_ psi (28-day);

Slump: \_\_\_\_\_ in. required BEFORE adding superplasticizer (if used)

Slump: \_\_\_\_\_ in. required AFTER adding superplasticizer (if used)

Entrained Air Content: \_\_\_\_\_ % specified

Materials:

Aggregates: (size; type; source; gradation; specification)

Coarse: \_\_\_\_\_

Fine: \_\_\_\_\_

<u>Other Materials:</u>	<u>Type</u>	<u>Product-Manufacturer (Source)</u>
Cement:	_____	_____
Fly Ash:	_____	_____
Slag:	_____	_____

Admixtures:

Water Reducer: \_\_\_\_\_

Air-Entraining Agent: \_\_\_\_\_

High-Range, Water-Reducing Admixtures (superplasticizer): \_\_\_\_\_

Non-Corrosive Accelerator: \_\_\_\_\_

Other: \_\_\_\_\_

**B. FINAL MIX DESIGN DATA:**

RATIOS

Water \_\_\_\_\_ lb  
Cementitious Materials lb = \_\_\_\_\_

Course Agg. \_\_\_\_\_ lb  
Fine Agg. lb = \_\_\_\_\_

SPECIFIC GRAVITIES

Fine Agg. \_\_\_\_\_

Coarse Agg. \_\_\_\_\_

Other: \_\_\_\_\_

ADMIXTURES

W.R.: \_\_\_\_\_ oz. per 100 # Cement

HRWR: \_\_\_\_\_ oz. per 100 #Cement

Non-Corrosive Accelerator: \_\_\_\_\_ oz.  
Per 100# Cement

A.E.A.: \_\_\_\_\_ oz. per 100 # Cement

Other: \_\_\_\_\_ oz. per 100# Cement

MIX PROPORTIONS

WEIGHT (LBS.)      ABSOLUTE VOL. (CU. FT.)

Cement: \_\_\_\_\_

Fly Ash: \_\_\_\_\_

Slag: \_\_\_\_\_

Fine Aggregate: \_\_\_\_\_

Coarse Aggregate: \_\_\_\_\_

Water: \_\_\_\_\_

Entrained Air: \_\_\_\_\_

Other: \_\_\_\_\_

TOTALS: \_\_\_\_\_

PLASTIC CONCRETE

Initial Slump = \_\_\_\_\_ in.      Air Content = \_\_\_\_\_ %  
Final Slump = \_\_\_\_\_ in.      Unit Dry Wt. = \_\_\_\_\_ pcf  
Unit Wet Wt. = \_\_\_\_\_ pcf

STANDARD DEVIATION ANALYSIS (from experience records):

Number of Test Cylinders Evaluated: \_\_\_\_\_ Standard Deviation: \_\_\_\_\_

$f_{cr} = f_c + 1.34s$  or  $f_{cr} = f_c + 2.33s - 500$

(Refer to ACI for increased deviation factor when fewer than 30 tests are available.)

Mix # \_\_\_\_\_ Job Name \_\_\_\_\_

**C. LABORATORY TEST DATA (HARDENED CONCRETE):**

COMPRESSIVE STRENGTH

Age (days)	Mix #1	Mix #2	Mix #3
7	_____	_____	_____
14	_____	_____	_____
28	_____	_____	_____
Other	_____	_____	_____

28-day average compressive strength: \_\_\_\_\_ psi

Mix design proportioned to achieve  $f_{cr} = f_c + 1200$  psi (1400 psi for strength higher than 5000 psi at 28 days)

CHLORIDE ION CONTENT: \_\_\_\_\_

Remarks: \_\_\_\_\_  
\_\_\_\_\_

NOTE: Fill in all blank spaces. Use 0- (Zero) or N.A. (Not Applicable) where appropriate. See "Design and Control of Concrete Mixtures," 13<sup>th</sup> Edition by Portland Cement Association, for assistance in completing this form.



**D. REQUIRED ATTACHMENTS:**

- \_\_\_\_\_ Coarse aggregate gradation report and DOT certification
- \_\_\_\_\_ Fine aggregate gradation report and DOT certification
- \_\_\_\_\_ Concrete compressive strength data used for standard deviation calculations
- \_\_\_\_\_ Chloride ion data and related calculations
- \_\_\_\_\_ Rapid chloride permeability test report
- \_\_\_\_\_ Admixture compatibility certification letter

Submitted by

Ready-Mix

Supplier: Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Phone Number \_\_\_\_\_ Date \_\_\_\_\_

Main Plant Location \_\_\_\_\_ Miles from Project \_\_\_\_\_

Secondary Plant Location \_\_\_\_\_ Miles from Project \_\_\_\_\_

END OF SECTION

## SECTION 03 48 00

### RECTANGULAR, PRECAST, POST-TENSIONED, CONCRETE TANK

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work:
  - 1. As a bid alternate, the Work shall consist of constructing the SBR Complex as shown on the Drawings and as specified herein using pre-cast, post-tensioned methods.
  - 2. The concrete base slab and superstructure for the SBR Complex shall be designed, fabricated, and erected by one manufacturer.
  
- B. Related Work Specified Elsewhere:
  - 1. Section 03 30 00, Cast-in-place Concrete.
  - 2. Applicable Sections of Division 31.

##### 1.02 REFERENCES

- A. The following standards are included by reference into this specification. Where conflict exists between reference standard and this specification, the more stringent requirement shall govern
  - 1. American Concrete Institute (ACI):
    - a. 318, Latest Edition, Building Code Requirements for Reinforced Concrete.
    - b. 350, Latest Edition, Building Code Requirements for Environmental Structures.
    - c. 350.3, Latest Edition, Seismic Design of Liquid-Containing Concrete Structures.
    - d. 301, Specifications for Structural Concrete.
    - e. 347, Guide to formwork for Concrete.
    - f. 306.1R, Standard Specifications for Cold Weather Concreting.
    - g. 224.1R, 2R, 3R: Cracking of Concrete Members.
    - h. 546 R, Concrete Repair Guide.
  - 2. Prestressed Concrete Institute (PCI):
    - a. 116, Quality Control for Plants and Production of Structural Precast Concrete Products.
    - b. Design Handbook, latest edition.
  - 3. American Society of Civil Engineers (ASCE):
    - a. 7, Minimum Design Loads for Buildings and Other Structures.

### 1.03 QUALITY ASSURANCE

#### A. Manufacturer's Qualifications:

1. The SBR Complex shall be designed, fabricated, and erected by a firm having a minimum of 15 years of experience in designing and constructing tanks of a similar rectangular arrangement, using a precast post-tensioned design.
2. The manufacturer shall document the installation of a minimum of thirty (30) such functioning facilities.
3. The manufacturer shall have a qualified Professional Engineer on-staff with at least 5 years of experience designing projects of similar size and configuration.
4. All manufacturer technicians performing post-tensioning in the field shall be certified by the Post-Tensioning Institute (PTI).
5. The precast post-tensioned structure shall be designed and constructed by a manufacturer participating in PCI's Certification Program at the time of bidding and is designated a PCI-certified plant in Group C, Category C3.
6. Fluid retaining tank designs that primarily rely on bolted or welded connections from one wall panel to another will not be acceptable.
7. All wall joints shall be compression joints.
8. Shiplap wall joint systems will not be allowed for exterior wall joints. Ship lap joints will only be allowed for interior accessory structures such as columns or sumps.

#### B. Testing:

1. In general compliance with applicable provisions of PCI Manual 116, Manual for Quality Control for Plant, Production of Precast/Prestressed Concrete Products and Post-Tensioning Institute Design Manual.

### 1.04 SUBMITTALS

#### A. Comply with Section 01 33 00, Submittal Procedures:

#### B. Action Submittals:

1. Submit manufacturer's concrete mix design.
2. Submit manufacturer's reinforcing steel and tendon data.
3. Submit typical methods and materials for repairs.
4. Product Design Criteria, including but not limited to:
  - a. A complete structural design, signed and sealed by a Professional Engineer in New York State, certifying design compliance with all national and State standards of practice, recommendations and the Uniform Code of New York State.
  - b. Design shall be in accordance with applicable codes, ACI 318, ACI 350 and Post-Tensioning Standards Specifications.

- c. Designs shall be based on precast, post-tensioned, concrete wall panels and walkways.
- d. Elements shall be post-tensioned after erection with the un-bonded tendons. Anchor castings for un-bonded tendons shall be totally encapsulated with a plastic coating to prevent corrosion.
- e. Base Design:
  - 1) Reinforcing steel and cast-in-place concrete shall comply with Section 03 30 00, Cast-in-Place Concrete.
  - 2) Hydrostatic uplift when the tank is empty, or when the tank water level is lowered rapidly, shall be accounted in the design and detailing.
  - 3) Dead and live loads and load combinations as specified in the Contract Documents and that can be reasonably anticipated during the intended use of the SBR Complex.
  - 4) All fluid, soil, groundwater, wind forces and effect of earthquake.
- f. Water tightness:
  - 1) Where penetrations and joints are required, suitable methods and/or devices shall be employed to prevent leakage.
  - 2) Where the wall base shear is transferred into tension in the slab, additional post-tensioned and/or mild reinforcement steel shall be provided as required.

5. Structural Drawings:

- a. The RPE will not review steel placement or other structural fabrication drawings until the mix design, reinforcing and tendon steel, and Product Design submittals have been accepted with a disposition of “Approved” or “Approved as Noted”.
- b. Plans, sections, and details locating and defining all material furnished by manufacturer.
- c. Plans, sections, and details locating and defining all penetrations through the wall, roof, and their material.
- d. Sections and details showing connections, cast-in items, and their relationship to the structure.
- e. Furnish all laying schedules, tendon schedules, and other schedules of field erection.

C. Informational Submittals:

- 1. Credentials of all PTI-certified technicians engaged on the project.
- 2. Reports of tests on concrete and other materials are to be submitted upon request.
- 3. All quality control documentation generated by the manufacturer’s quality control program, as it relates to the production of finished product for this Project.

## 1.05 STRUCTURAL WARRANTY, 10-YEAR

- A. The Manufacturer shall provide a 10-year structural warranty to the Owner.
- B. The warranty shall be provided without additional cost to the Owner. The warranty shall include all necessary labor and materials to repair all material defects subject to the warranty after notification from the Owner to the Manufacturer.
- C. This warranty shall not create any obligation upon the Manufacturer to discover or inspect the Structure(s) for possible defects subject to this warranty.
- D. Exclusions from Warranty:
  - 1. All items within the Tank Structure(s) and plumbing connections to the Tank Structure(s).
  - 2. All equipment. The Manufacturer shall pass on the warranty of equipment suppliers to the Owner.
  - 3. Sealants are not included, unless the condition of the sealant allows for leakage or passing of water exceeding ACI 350.06 standards.
  - 4. Items not required for structural soundness and all non-structural items.
  - 5. Emptying of tanks, inspection of tanks, processing of the water/wastewater, filling of tanks, etc. complete in preparation for the Manufacturer to make repairs, and after completion of repairs by the Manufacturer.
- E. Terms and Conditions:
  - 1. The Manufacturer shall warrant to the Owner that the Tank Structure(s) will be free from material defect due to faulty design, workmanship, or materials which appear, are discovered, and are reported in writing (notice) to the Manufacturer within ten (10) years of the Project Acceptance Date.
  - 2. The Project Acceptance Date is defined as the date of Substantial Completion granted to the General Contractor.
  - 3. Timely notice shall be provided to the Manufacturer (30 days' notice) prior to commencement of any warranty related work.
  - 4. The maximum cost of warranty repair by The Manufacturer shall be limited to the Manufacturer's contract value of the tank in question.
  - 5. The Warranty coverage is only for repair of items provided and installed by The Manufacturer and shall in no event cover items such as bodily injury or death or damage to personal property.

## PART 2 – PRODUCTS

### 2.01 MATERIALS

- A. All materials shall comply with the specifications, standards and codes quoted herein. All materials shall comply with the requirements of Section 03 30 00, Cast-in-Place Concrete.
- B. Post- Tensioning Tendons:
  - 1. Polymer sheathed, 7-wire, Stress-Relieved Strand: ASTM A416-Grade 270K.
  - 2. Polymer sheath to be minimum thickness of 40 mils.
- C. Anchors and Inserts:
  - 1. Structural steel: ASTM A36, finished with hot dipped galvanized: ASTM A153.
  - 2. Anchors shall be totally encapsulated with plastic coating.
- D. Grout:
  - 1. Cement Grout: Portland cement, sand and water sufficient for placement and hydration. ASTM C150.
  - 2. The minimum compressive strength shall meet the ACI codes at service load conditions. ASTM C109
  - 3. All grout shall pass through a screen with 0.125-inch maximum clear openings prior to being introduced in the grout pump.
  - 4. Compressive stress shall match the compressive stress of the walls unless it can be shown by sealed calculation that a lesser compressive stress will work for this installation.
- E. Bearing Pads and Shims:
  - 1. Pads shall be chloroprene, rubber, plastic, or neoprene.
  - 2. Shims may be hard polymer material as manufactured by Korolath or approved equal, with a minimum thickness of 1/8 inch. No less than two shims to be used at any location.
- F. Water Sealant Materials:
  - 1. Sikaflex 1A one part polyurethane, elastomeric sealant/adhesive or approved equal.
  - 2. Sikagard 62 High build, protective, solvent-free, colored epoxy coating or approved equal.
  - 3. Sika Swell S-2 Polyurethane, extrudable swelling waterstop or approved equal.

## 2.02 CONCRETE MIXES

- A. A 28-day compressive strength: Minimum of 5,000 psi for the precast components and minimum of 4,000 psi for the cast-in-place base slab.
- B. Use of calcium chloride, chloride ions or other salts is not permitted.

## 2.03 MANUFACTURE – PRECAST COMPONENTS

- A. Manufacturing procedures shall be in general compliance with PCI-116.
- B. Manufacturing Tolerances:
  - 1. As specified herein.
  - 2. All reinforcing steel shall have the minimum cover required by the ACI code and shall be accurately located as indicated on the approved structural shop drawings.
  - 3. Plastic chairs shall be used.
  - 4. Reinforcement shall be installed as indicated on approved structural shop drawings.
- C. Penetrations/Openings:
  - 1. All penetrations/openings to be cast with the required hardware as specified on the approved structural shop drawings.
  - 2. Size, location and hardware of all penetration/openings shall be submitted and approved prior to fabrication.
  - 3. In the event that other openings, which have not been specified on the Contract Drawings, need to be field-drilled or cut after the precast, post-tensioned products have been erected; the precast engineer shall be notified and must approve all modifications.
- D. Handling Devices and Locations:
  - 1. Handling devices shall be designed, located and specified to properly handle the precast piece during stripping, shipping and handling.
  - 2. Finishes:
    - a. Broom finishes: all walkways.
    - b. Form side finishes: all other surfaces.
- E. Acceptable Pre-Cast Manufacturers:
  - 1. Dutchland, Inc. Gap, PA.
  - 2. Mack Industries, Valley City, Ohio

## PART 3 – EXECUTION

### 3.01 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling:
  - 1. Comply with Section 01 61 00, Common Product Requirements.
  - 2. Precast concrete members shall be lifted and supported during manufacturing, stockpiling, transporting, and erection operations only at the lifting or supporting points, or both, as shown on the shop drawings, and with approved lifting devices.
  - 3. All lifting devices shall have a minimum safety factor of 4:1.
  - 4. Lifting and handling shall be according to written standards or job specific designs.
  - 5. Precast products handling, and trained qualified personnel shall perform erection.
  
- B. Storage:
  - 1. Store all units off ground.
  - 2. Place stored units so that identification marks are discernible.
  - 3. Separate stacked members by batten across full width of each bearing point.
  - 4. Stack so that lifting devices are accessible and undamaged.
  - 5. Do not use upper member of stacked tier as storage area for shorter members or heavy equipment.

### 3.02 CONSTRUCTION AND INSTALLATION

- A. Erection:
  - 1. The General Contractor shall be responsible for providing true, level surfaces/sloped according to elevation of bottom of base of the tank as on the shop drawings.
  - 2. Installation:
    - a) Only competent workmen who are properly trained to handle and erect precast concrete units shall be employed.
    - b) All precast concrete units shall be erected level, plumb, square, and true within the allowable tolerances.
    - c) They must be positioned so that dimensional error does not accumulate.
    - d) Horizontal and vertical joints shall be correctly aligned and uniform joint width shall be maintained as erection progresses
  - 3. Alignment:
    - a) Members shall be properly aligned and leveled as required by the approved shop drawings.



- b) Variations between adjacent members shall be reasonable leveled out by jacking, loading, or any other feasible method as recommended by the manufacturer.
- B. Post-Tensioning:
  - 1. Threading the tendons through the wall panels shall begin after all panels are erected and plumbed.
  - 2. All wall joints shall be grouted prior to the tendons being tensioned.
  - 3. Tendons shall be stressed as required by the design and in accordance with referred standards of ACI and PTI.
  - 4. Tendon elongations shall be shown on a chart on the structural drawings.
- C. Grouting:
  - 1. When quick setting occurs due to hot weather, the grout shall be cooled by acceptable methods such as cooling the mixing water to prevent blockages during pumping operations.
  - 2. When freezing weather conditions prevail during and following the placement of grout, adequate means shall be provided to protect the grout in the ducts from freezing until the grout attains a minimum strength of 800 psi.
  - 3. After the post tensioning, the end anchorage recess pockets shall be cleaned, coated with a bonding agent and filled with a grout.
  - 4. The grout minimum compressive strength of 2500 psi is required prior to the start of post-tensioning.
- D. Sealants:
  - 1. The sealants shall be applied as shown on approved submittal drawings.
  - 2. The sealants materials shall be approved by the RPE with the shop drawings.
- E. Non-Structural Repair Procedures:
  - 1. The manufacturer shall make non-structural repairs following procedures as described in ACI 224.1R-07, routing and sealing.
  - 2. Some of the repairs covered under this section are:
    - a) Non-structural shrinkage cracks.
    - b) Misaligned dowel ports or penetrations.
    - c) Surface blemishes as a result of handling.
  - 3. Non-Structural Shrinkage Cracks:
    - a) Using a wire wheel, clean and roughen on each side of the crack approximately 3 inches wide.
    - b) Grind a notch on the crack 3/8" wide and 3/8" deep.
    - c) Apply a primer coat of Sika Arimatec 110 EpoCem to the crack and allow it to cure for 12 to 16 hours depending on the temperature.

- d) Apply the Sikaflex 1a to the crack surface for the width of the 3/8" wide notched area and allow it to cure for 7 days.
  - e) After the cure time, apply SikaTop seal 107 as a protective waterproofing cover over an area approximately 6 inches wide. This shall serve as an additional barrier to prevent seepage of any moisture through to the reinforcement steel.
4. Misaligned Dowel Ports or Penetrations:
- a) Where a grout port is misaligned with its mating wall panel the port shall be relocated.
  - b) Patch the existing hole with new grout and allow it to cure for 7 days.
  - c) Using a core drill, drill a new porthole in the relocated position.
  - d) Install the dowel in the port and then grout the port closed, as it would normally have been done.
5. Surface blemishes or spalls:
- a) If a piece has been scratched, spalled, or chipped during handling it shall be dressed properly to prevent a crack from developing or to present an acceptable appearance.
  - b) Remove all cracked, loose, spalled, or broken concrete from each piece.
  - c) Coat the area with Sika Armatec 110 EpoCem as a bonding agent to make the new concrete adhere to the existing surface.
  - d) Patch and repair with Sika Top 123 Plus new concrete materials to rebuild the walls to return them to their original dimensions.

### 3.03 TESTS FOR WATERTIGHTNESS

- A. All concrete tanks designed to contain liquid shall be tested for acceptance with the following procedure:
- 1. Comply with Section 01 43 33, Manufacturer's Field Services.
  - 2. "Water-tight" shall be defined as: the absence of damp or wet areas, with discernible flow, and the loss of less than 0.05 percent of water.
  - 3. For each 24-hour period, the total allowable liquid volume loss by measurement shall not exceed 0.05 percent.
  - 4. If the water loss exceeds this amount, or if repairs are necessary because of damp or wet areas, with discernible flow, the tank must be drained, the repairs made and the test repeated, at no additional cost to the Owner, until satisfactory completion of the test.
  - 5. After the concrete tanks have been constructed and cured to design strength, fill the tanks to the levels as indicated on the submittal drawings with water.

6. The water shall not be removed for a minimum of 48 hours unless otherwise instructed by the Precast Engineer. The precast/ manufacturer Engineer will inspect and evaluate for evidence of leakage, or damped area and any area, which show evidence of leakage.
7. Impervious protective coating or barriers may be used as needed to achieve water tightness in accordance with ACI-350-06, page 3, General Commentary-e.
8. The RPE will determine the appropriate sealant to achieve water tightness for any non-structural issues.
9. The sealing procedures will be done in accordance with the manufacturer's recommendations and will be forwarded to the review engineer for record.
10. No product or material shall be incorporated into the Work without a submittal approved by the RPE.

B. Acceptance and Substantial Completion:

1. Comply with Section 01 91 14, Equipment Testing and Facility Startup.
2. Successful leakage testing is a necessary condition to meet substantial completion for the facility. However, successful leakage testing alone will not set the date of Substantial Completion for the SBR Complex.

3.04 CLEAN UP

- A. Comply with Section 01 77 00, Closeout Procedures.

++ END OF SECTION ++

## SECTION 04 20 00

### UNIT MASONRY

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Unit Masonry, including accessory items of work herein described, as shown on the Plans, as specified and/or directed.

##### 1.2 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

1.2.1 Reference to standard specifications for the following organizations is intended to specify minimum standards for quality of materials and performance of workmanship, and for standard test methods.

- a. American Society for Testing and Material (ASTM) Latest Edition.
- b. American Concrete Institute (ACI) and American Society of Civil Engineers (ASCE), Building Code Requirements For Masonry Structures, Latest Edition.
- c. National Concrete Masonry Association (NCMA) Specifications, Latest Edition.

##### 1.3 SUBMITTALS: The following shall be submitted to RPE

###### 1.3.1 Design Data:

- a. Pre-mixed mortar mix design
- b. Grout mix design

###### 1.3.2 Manufacturer's Catalog Data:

- a. Masonry accessories
- b. Reinforcement
- c. Pre-mixed mortar
- d. Control joints
- e. Expansion joints
- f. Water-repellent admixture
- g. Flashing
- h. Grout

Submit for each type.

### 1.3.3 Drawings:

- a. Reinforcing steel
- b. Accessories

Indicate splicing, laps, shapes, dimensions, and details of reinforcing bars and accessories. Include details of anchors, adjustable wall ties, positioning devices, bond beams, and lintels. Do not scale drawings to determine lengths of bars.

### 1.3.4 Manufacturer's Instructions:

- a. Masonry cement

If masonry cement is used, submit the manufacturer's printed instructions on proportions of water and aggregates and on mixing to obtain the type of mortar required.

### 1.3.5 Samples:

- a. Masonry units
- b. Mortar colors
- c. Wall reinforcement
- d. Anchors
- e. Wall ties

Submit five representative full size masonry units showing full range of color, texture, finish, and dimensions, two samples of each color of mortar, and two samples of each type of wall reinforcement, anchor, and wall tie.

### 1.3.6 Sample Panel:

- a. Masonry panel

At the job site submit for approval by the RPE, a sample masonry panel approximately 6 feet long by 4 feet high showing the workmanship, coursing, bond, weep holes, flashing, thickness, anchors, joint reinforcing, wall ties, rigid-board insulation, intersection of walls, bond beams, expansion and control joint, and tooling of joints, range of color, texture of masonry, and mortar color.

### 1.3.7 Factory Test Reports:

- a. Efflorescence test

Submit efflorescence test reports on masonry units that are to be exposed to weathering. Schedule tests far enough in advance of starting masonry work to permit retesting if necessary. Test five pairs of specimens of each type of masonry unit for efflorescence in accordance with ASTM C67. If any pair is rated "effloresced," reject the units represented by the samples.

1.3.8 Certificates of Compliance: The Contractor shall submit to the RPE prior to delivery, manufacturer's or supplier's certification of compliance of units with specified standards, as determined by an acceptable testing agency conforming to the applicable requirements of ASTM.

- a. Masonry cement
- b. Grout
- c. Pre-mixed mortar
- d. Compressive strength tests for block

#### 1.4 QUALITY ASSURANCE

1.4.1 Appearance: Do not change source or supply of materials after the work has started if the appearance of the finished work would be affected. Units should be sound and free from cracks or other defects that would interfere with proper setting, impair strength and performance of construction, or be objectionable in appearance.

1.5 DELIVERY, STORAGE, AND HANDLING: Deliver cementitious materials to the site in unbroken containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious materials in dry, weathertight sheds or enclosures and handle so as to prevent entry of foreign materials and damage by water or dampness. Store masonry units off the ground and handle with care to avoid chipping and breakage. Protect materials from damage and, except for sand, keep dry until used. Cover sand to prevent intrusion of water and foreign materials and to prevent drying. Do not use materials containing frost or ice.

#### 1.6 ENVIRONMENTAL CONDITIONS

1.6.1 Cold Weather Construction: During cold weather, that is when the air temperature is below 40 degrees F and falling, or when it appears that the air temperature will drop to 40 degrees F or below within 24 hours, do not lay masonry unless the work is protected from freezing as specified below. Surfaces receiving mortar shall be free of ice and frost. Comply with the requirements specified below for the respective air temperatures:

- a. Air Temperature 40 to 25 Degrees F: Heat sand or mixing water to produce mortar temperature between 40 and 120 degrees F.

- b. Air Temperature 25 to 20 Degrees F: Heat sand and mixing water to produce mortar temperature between 40 and 120 degrees F. Use salamanders or other heat sources on both sides of walls under construction. Use windbreaks when wind is in excess of 15 mph.
- c. Air Temperature 20 Degrees F and Below: Heat sand and mixing water to produce mortar temperature between 40 and 120 degrees F. Provide enclosures and auxiliary heat to maintain air temperature above 32 degrees F on both sides of walls under construction. Ascertain that temperatures of masonry units are not less than 20 degrees F when units are laid.

1.6.2 Cold Weather Protection: Protect newly laid masonry as specified below for the respective mean daily air temperature (MDAT), that is, the average of the daytime high temperature and the forecasted nighttime low temperature.

- a. MDAT 40 to 25 Degrees F: Protect masonry from rain and snow by covering with weather-resistive membrane for 24 hours after laying.
- b. MDAT 25 to 20 Degrees F: Completely cover newly-laid masonry with insulating blankets and weather-resistive membrane for 24 hours.
- c. MDAT 20 Degrees F and Below: Maintain temperature of masonry above 32 degrees F for 24 hours by providing enclosures and supplementary heat or other approved means.

1.7 SCHEDULING: Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS

2.1.1 Concrete Masonry Units: Units shall be of modular dimensions and be air, water, or steam cured. Surfaces of units which are to be exposed shall be of uniform texture. Exterior concrete masonry units shall have water-repellant admixture added during manufacture. Provide textured units where indicated. Unit texture and color indicated on contract drawings. Acceptable manufactures are Barnes and Bone, Inc., Northern Concrete Block, Inc., Auburn Cement Products Co., Inc., or equal. The color, texture, and range of units shall match as closely as possible.

- a. Hollow Load-Bearing Units: ASTM C90, Grade N-I or N-II, made with normal weight aggregate, 2 cores per unit. Minimum net compressive strength of masonry ( $f'm$ ) shall not be less than 1,500 psi for all block.
- b. Hollow Non-Load-Bearing Units: ASTM C129, Type I or II, made with normal weight aggregate. Load-bearing units may be provided in lieu of non-load-bearing units.
- c. Special Shapes: Provide special shapes such as closures, header units, and jamb units as necessary to complete the work. Special shapes shall conform to the requirements for the units with which they are used.

2.1.2 Water-Repellant Admixture: Polymeric type formulated to reduce porosity and water transmission. Construct panels of masonry units and mortar which contain the water-repellant admixture. When tested in accordance with ASTM E72, such panels shall be flexural strength not less than 20 percent greater, and compressive strength not less than 3 percent greater, than similar panels which do not contain the admixture. When tested in accordance with ASTM E514, panels shall exhibit no water visible on back of test panel and no leaks through the panel after 24 hours, and not more than 25 percent of wall area shall be damp after 72 hours.

## 2.2 MORTAR

2.2.1 Masonry Cement: ASTM C91, except that for masonry cement used in mortar for exterior walls, the air content of the mortar specimen shall be not more than 16 percent by volume in lieu of 22 percent. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar.

2.2.2 Sand: ASTM C144. The sand in combination with the cementitious materials shall produce a mortar of the specified color.

2.2.3 Water: Clean, potable, and free from substances which could adversely affect the mortar.

2.2.4 Mortar Types: ASTM C270, Type M for foundation walls, bearing walls, exterior walls, Type N or S for non-load bearing, non-shear wall interior masonry; and Type S for all other masonry work; except where higher compressive strength is indicated on structural drawings. Air content shall be limited to 12 percent.

2.2.5 Pre-Mixed Mortar: ASTM C270, Type S, compressive strength of 1800 psi in 28 days. Air content shall be less than 12 percent. Admixtures may be used in mortar to retard curing and provide up to 36 hours of workability. Provided that the admixture does not adversely affect bonding or compressive strength.



2.2.6 Admixtures: No air-entraining admixtures, anti-freeze compounds or calcium chlorides shall be included in mortar. Where colored mortar is indicated, add pigment to obtain the color indicated. Mortar colors shall consist of inorganic compounds not to exceed 15% of the weight of the cement. Admixtures may be used in mortar to retard curing and provide up to 36 hours of workability, provided the admixture does not adversely affect bonding or compressive strength.

## 2.3 ACCESSORIES

2.3.1 Horizontal Joint Reinforcement: Fabricate from cold drawn steel wire, ASTM A82. Wire shall be hot-dipped galvanized after fabrication in accordance with ASTM A153 (1.5 oz of zinc per square foot). Reinforcement shall be truss type with two or more longitudinal wires welded to a continuous diagonal cross wire, or ladder type with perpendicular cross wires not more than 16 inches o.c. Provide flat sections 10 feet long, and preformed corners and tees approximately 30 inches long. Overall width shall be approximately 2-inches less than nominal thickness of wall.

2.3.1.1 Single-Wythe: For single-wythe walls and partitions, provide two 9-gauge (0.1483-inch) longitudinal wires and 9-gauge cross wires.

2.3.2 Anchors and Ties: Provide approved designs of stainless steel, zinc-coated steel, or noncorrosive metal having the equivalent total strength of steel types. Zinc coat steel by the hot-dip process after fabrication to a minimum of 1.25 ounces of zinc per square foot of surface when tested in accordance with ASTM A90.

- a. Corrugated Metal Ties: Not less than 7/8-inch wide by approximately 7 inches long and not lighter than 22 gauge.
- b. Dovetail Wire Anchors: Flat bar: corrugated sheet steel, not lighter than 16 gauge, and 7/8-inch wide, with end turned up 1/4 inch. Wire: not lighter than 6 gauge, 7/8-inch wide with wire looped and closed. Dovetail slots and inserts are specified in Section 03 30 00, "Cast-in-Place Concrete".

2.3.3 Fastenings: Build in bolts, metal wall plugs, and other metal fastenings furnished under other sections for securing furring and other items.

2.3.4 Reinforcing Bars: Vertical steel and dowel reinforcing shall be 60,000 psi and conform to ASTM A615 as specified in Section 03 21 00.

2.3.5 Vertical Wall Contraction Joint Shear Key: Provide preformed contraction joint shear material conforming to ASTM D2000, M2AA-805 rubber with minimum durometer hardness of 80 or ASTM d2287 654-4 PVC with minimum durometer hardness of 85.

## PART 3 - EXECUTION

### 3.1 PREPARATION

#### 3.1.1 Protection:

- a. Stains: Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.
- b. Loads: Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed.
- c. Provide temporary bracing as required to prevent damage during construction.
- d. Polyester Embossed Film: Provide protective boards for polyester film during job installation to ensure no damage from building debris.

3.1.2 Surface Preparation: Surfaces on which masonry is to be placed shall be smooth, clean, and free of foreign substances when mortar is applied.

3.2 WORKMANSHIP: Carry masonry up level and plumb. Furnish and use story poles or gauge rods throughout the work. Changes in coursing or bonding after the work is started will not be permitted. Do not carry one section of the walls up in advance of the others. Step back unfinished work for joining with new work. Tothing will not be permitted. Check heights of masonry with an instrument at each floor and at sills and heads of openings to maintain the level of the walls. Build in door and window frames, louvered openings, anchors, pipes, ducts, and conduits as the masonry work progresses. Fill spaces around metal door frames solidly with mortar. Handle masonry units with care to avoid chipping, cracking, and spalling of faces and edges. Drilling, cutting, fitting, and patching to accommodate the work of others shall be performed by masonry mechanics. Cut masonry with masonry saws for exposed work. Structural steelwork, bolts, anchors, inserts, plugs, ties, lintels, and miscellaneous metalwork specified elsewhere shall be placed in position as the work progresses. Provide chases of approved dimensions for pipes and other purposes where indicated and where necessary. Inspect scaffolding regularly to ensure that it is amply strong, well braced, and securely tied in position. Do not overload scaffolding.

### 3.3 MORTAR MIXING

3.3.1 Mix mortar in accordance with ASTM C270 to obtain type mortar required. Where colored mortars are required, pigments may be added at the site or provided as part of prepackaged mortar mix. When masonry cement is used, conform to printed mixing instructions

of the masonry cement manufacturer. During mixing, add water-repellant admixture in quantity recommended by the admixture manufacturer to mortar which will be used in exterior concrete masonry unit walls.

3.4 MORTAR JOINTS: Uniform thickness of 3/8 inch unless otherwise indicated. Tool exposed joints slightly concave with a round or other suitable jointer when the mortar is thumb print hard. For horizontal joints, jointers shall be at least 12 inches long for brickwork and 16 inches long for concrete masonry. Jointers shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Strike flush joints that will not be exposed. Tool vertical joints first. Brush joints to remove all loose and excess mortar. Horizontal joints shall be level; vertical joints shall be plumb and in alignment from top to bottom of wall within a tolerance of plus or minus 1/2 inch in 40 feet.

3.5 TOLERANCES: Masonry work shall be within the following limits:

- a. Face of Concrete Masonry Unit: 1/16 inch from face of adjacent unit.
- b. Variation From True Plane: 1/4 inch in 10 feet and 1/2 inch maximum in 20 feet or more.
- c. Variation From Plumb: 1/4 inch in each story, noncumulative and 1/2 inch maximum in two stories or more.
- d. Variation From Level: 1/8 inch in 3 feet, 1/4 inch in 10 feet, and 1/2-inch maximum.
- e. Variation in Wall Thickness: Plus or minus 1/4 inch.

3.6 CONCRETE MASONRY UNIT WORK: Lay the first course in a full bed of mortar for the full width of the unit. Lay succeeding courses in running bond unless otherwise indicated. Form bed-joints by applying the mortar to the entire top surfaces of the inner and outer face shells. Form head joints by applying the mortar for a width of about 1 inch to the ends of the adjoining units. The mortar shall be of such thickness that it will be forced out of the joints as the units are placed in position. Where anchors, bolts, and ties occur within the cells of the units, place metal lath in the joint at the bottom of such cells, and fill the cells with mortar or grout as the work progresses. Use concrete brick or cut block for bonding walls, working out the coursing, topping out walls under sloping slabs, distributing concentrated loads, backing brick headers, and elsewhere as required. Do not dampen concrete masonry units before or during laying.

- a. **Special Concrete Masonry Unit Work:** Provide special concrete masonry unit work for all exposed concrete masonry unit walls and partitions. Select units for uniformity of size, texture, true plane, and undamaged edges and ends of exposed surfaces. Place units plumb, parallel, and with properly tooled joints of maximum 3/8-inch thickness. Keep exposed surfaces clean and free from blemishes or defects.

**3.7 BONDING AND ANCHORING:** Unless indicated otherwise, extend partitions from the floor to the bottom of the construction above. Structurally bond or anchor walls and partitions to each other.

- a. **Corners of Load-Bearing Walls:** Provide a true masonry bond in each course, except where indicated or specified otherwise.
- b. **Intersections of Load-Bearing Walls:** Provide a true masonry bond in each course, or anchor with rigid steel anchors not more than 2 feet apart vertically, unless otherwise indicated.
- c. **Masonry Walls Facing or Abutting Concrete Members:** Anchor masonry to the concrete with dovetail or wire-type anchors inserted in slots or inserts built into the concrete, unless otherwise indicated. Locate anchors not more than 18 inches o.c. vertically and not more than 24 inches o.c. horizontally.

**3.8 HORIZONTAL JOINT REINFORCEMENT:** Provide reinforcement in every course of concrete masonry unit walls and in first two courses above and below openings in walls and partitions of concrete masonry units. Reinforcement shall be continuous except at control joints and expansion joints. Reinforcement above and below openings shall extend not less than 24 inches beyond each side of openings. Provide reinforcement in the longest available lengths, utilizing the minimum number of splices. Overlap ends not less than 6 inches. Provide welded L-shaped assemblies and welded T-shaped assemblies to match the straight reinforcement, at corners and intersections of walls and partitions. Provide mortar cover for the wire of at least 5/8 inch for exterior face of wall and 1/2 inch for interior face of wall.

**3.9 CONCRETE MASONRY UNIT LINTELS AND BOND BEAMS:** Provide special units, fill cells solidly with grout, and provide not less than two No. 5 reinforcing bars, unless indicated otherwise. Reinforcing shall overlap a minimum of 40 bar diameters at splices. Bond beams and their reinforcement shall be continuous at control (contraction) joints. Terminate bond beams and reinforcing on each side of expansion joints. Concrete masonry units used for lintels and bond beams shall have exposed surfaces of the same material and texture as the adjoining masonry units. Lintels shall be straight and true and shall have at least 8 inches of bearing at each end. Cells under lintel bearing on each side of openings shall be filled solid with grout or concrete for 2 courses. Allow lintels to set at least 6 days before shoring is removed. During mixing, add water-repellant admixture in quantity recommended by the admixture manufacturer to concrete and grout which will be used to fill lintels and bond beams in exterior walls.

3.10 CONTROL JOINTS: Provide where indicated in concrete masonry-unit walls. Provide sawed type or built-in type as required. Joints shall occur directly opposite each other on both faces of the wall and shall be filled as indicated on contract drawings

3.11 FORMS AND SHORING: Construct to the shape, lines, and dimensions of members indicated and make sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry. Do not remove until members have cured.

### 3.12 CLEANING

3.12.1 Protection: Protect work which may be damaged, stained, or discolored during cleaning operations.

3.12.2 Pointing: Upon completion of masonry work and before cleaning, cut out defective mortar joints and tuck point joints and all holes solidly with prehydrated mortar.

3.12.3 Cleaning: Clean exposed masonry surfaces with clear water and stiff fiber brushes and rinse with clear water. Where stains, mortar, or other soil remain, continue scrubbing with warm water and detergent. Immediately after cleaning each area, rinse thoroughly with clear water. Restore damaged, stained, and discolored work to original condition or provide new work.

++ END OF SECTION ++

SECTION 04 47 00

CAST STONE MASONRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Architectural precast concrete accent banding.
- B. Supports, anchors, and attachments.
- C. Caulking of joints.

1.02 REFERENCES: The publications listed below form a part of these specifications.

ACI 301	Specifications for Structural Concrete for Buildings
ACI 318	Building Code Requirements for Reinforced Concrete
ASTM A386	Zinc Coating (Hot-Dip) on Assembled Steel Products
ASTM C143	Test for Slump of Portland Cement Concrete
ASTM C150	Portland Cement
ASTM C260	Air-Entraining Admixtures for Concrete
ASTM A325	High Strength Bolts for Structural Steel Joints
ASTM A615	Deformed and Plain Billet Steel Bars for Concrete Reinforcement
ASTM C33	Concrete Aggregates
PCI Manual for Structural Design of Architectural Precast Concrete	
PCIMNL-117	Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products
PCIMNL-120	Design Handbook - Precast and Prestressed Concrete

1.03 DESIGN REQUIREMENTS

- A. All calculations and shop drawings shall be sealed by a professional engineer licensed in the State of New York.
- B. Design units to withstand all dead loads, wind loads, and erection forces.
- C. Design units to accommodate construction tolerances, deflection of building structural members and clearances of intended openings.

- D. Design and size components and connections to withstand seismic loads and sway displacement as calculated in accordance with New York State Building Code.
- E. Design component connections to accommodate building movement and thermal movement. Provide adjustment to accommodate misalignment of structure without unit distortion or damage.
- F. Calculations shall be neatly kept and maintained for any necessary review by the Engineer.

#### 1.04 SUBMITTALS

- A. Submit evidence that shows current PCI certification.
- B. Shop Drawings - Indicate layout, unit locations, configuration, unit identification marks, reinforcement, connection details, support items, location of lifting devices, dimensions, openings, relationship to adjacent materials, and concrete mix design. Provide erection drawings.
- C. Shop drawings shall be sealed per Article 1.04, paragraph B.
- D. Samples - The Contractor shall submit two 12-inch by 12-inch samples for each type of surface. Additional samples will be required until approved in writing by the Engineer. Casting of actual units shall not begin prior to receipt of written approval. Samples of each type of insert proposed for the project shall be submitted for approval.
- E. The approved sample(s) shall serve as the standard for quality, color and texture. The Engineer shall be notified when the first unit is completed and shall inspect same. The units shall be approved by the Engineer in writing prior to starting the remaining units.
- F. Submit one-page catalog cut for grout.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer shall be PCI-certified plant for production of precast concrete as specified herein.
- B. Perform Work in accordance with the PCI MNL-117, PCI MNL-120, PCI Manual for Structural Design of Architectural Precast Concrete, and ACI 318.
- C. Welding - AWS D1.1.

## 1.06 QUALIFICATIONS

- A. Precaster - Company specializing in performing the work of this Section with minimum five years' documented experience.
- B. The facilities shall be suitably enclosed to provide quality control and a consistently controlled environment during production, and the facilities shall also have sufficient capacity and equipment capable of producing the work all within the allotted time.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site using special care to protect units and prevent staining, chipping, or spalling of concrete. All units shall be stored off the ground.
- B. Lifting or Handling Equipment shall be capable of maintaining "as new" condition of the units during manufacture, storage, transportation, erection, installation, and in position for fastening.
- C. Mark units with date of production in location not visible to view when in final position in structure.
- D. All damaged units shall be replaced to the satisfaction of the Engineer.

## 1.8 FIELD MEASUREMENTS

- A. Verify field conditions and measurements prior to fabrication.

## PART 2 - PRODUCTS

### 2.01 CONCRETE MATERIALS

- A. Cement - ASTM C150, Portland Type I or III.
- B. Aggregates shall be natural sand for fine aggregate and crushed stone for coarse aggregate, complying with the requirements of ASTM C-33 and/or C-330. The sand for white concrete shall be a white silica sand, white dolomite, and/or equal.
- C. Reinforcing Steel - ASTM A615, Grade 60, deformed steel bars. ASTM A185 for welded steel wire fabric. Strength and size commensurate with precast unit design.
- D. Air Entrainment Admixture - ASTM C260.



- E. Admixtures containing calcium chloride shall not be used.
- F. The source of all cement and aggregates shall remain the same for all elements to insure maximum uniformity of color and texture.
- G. Surface Finish - Clean, smooth color to be selected.
- H. Grout - Non-shrink minimum 4,500 psi 7-day strength. Use Five Star Special Grout 130 or equal.
- I. Water shall be potable, clear and free from deleterious substances.

## 2.02 SUPPORT DEVICES

- A. Connecting and Support Devices - ASTM A36 steel (hot dip galvanized) or ASTM A666, Type 304 stainless steel.
- B. Miscellaneous steel weld plates, angles, anchors, etc., shall comply with ASTM A-36, hot dip galvanized or stainless steel.
- C. Wedge type and threaded inserts shall be as manufactured by Hohmann & Barnard, Inc., Superior, Star, or equal.
- D. Bolts, Nuts, and Washers - Type 304 stainless steel.

## 2.03 MIX

- A. Concrete - Minimum 5000 psi, 28-day strength, air entrained to 6 percent in accordance with ACI 301.

## 2.04 FABRICATION

- A. Maintain plant records and quality control program during production of precast units. Make records available upon request.
- B. Use rigid molds, constructed to maintain precast unit uniform in shape, size and finish. Molds shall be constructed of steel, plastic coated wood, or fiberglass.
- C. All exposed edges and corners shall have a radius or chamfer to avoid sharp weakened areas that are vulnerable to breakage.

- D. All concrete shall be consolidated in the forms by means of internal and/or external vibration to assure high density concrete. Concrete shall be transported, placed and vibrated in a manner that will prevent segregation. Proper care shall be taken to assure that all reinforcing, inserts, etc., remain in the proper location during concrete placement.
- E. Proper curing of all units is required to minimize shrinkage and to secure concrete design strengths. Stripping of precast units shall not commence until concrete has reached a minimum average strength of 2,500 psi. During stripping, the manufacturer shall be responsible for handling units in a manner insuring conformity to the design requirements.
- F. Maintain consistent quality during manufacture.
- G. Fabricate connecting devices, plates, angles, inserts, bolts, and accessories. Fabricate to permit initial placement, adjustment, and final attachment.
- H. All precast units shall be smooth concrete, color to be selected. When possible, exposed surfaces shall be cast against the form with other non-form exposed surfaces steel troweled.
- I. Immediately upon stripping, fill and rub all surface imperfections resulting from air, water, or from oil with a mixture of the same cement and sand as used for the concrete placement. Prior to shipment, the skin (cement paste surface) of all exposed surfaces shall be removed by means to assure a more uniform surface. This etching shall produce a "sand finish" surface similar to sand finish plaster. Surfaces shall be thoroughly washed with water to remove all traces of acid.
- J. Place recessed flashing reglets continuous and straight.
- K. Locate hoisting devices to permit removal after erection.
- L. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- M. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

## 2.05 FINISH - PRECAST UNITS

- A. Finish Type A - Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.

## 2.06 FINISH - SUPPORT DEVICES

- A. Galvanize after fabrication to 2.0 oz/sq.ft. in accordance with ASTM A386 or use stainless steel. Field-welded components shall be stainless steel.

## 2.07 FABRICATION TOLERANCES

- A. Overall dimensions for small size elements such as sills shall not vary more than  $\pm 1/4$  inch in length and  $\pm 1/8$  inch in a cross section.
- B. Maximum Out of Square - 1/8 inch in 10 feet non-cumulative.
- C. Variation From Dimensions Indicated on Drawings -  $\pm 1/4$ -inch.
- D. Maximum Misalignment of Anchors, Inserts, Weld Plates - 1/4-inch.
- E. Maximum Bowing of Units - Length of span/360.
- F. Location of Reglets - 1/4-inch from true position.

## 2.08 SOURCE QUALITY CONTROL AND TESTS

- A. Provide testing and analysis of concrete mix.
- B. Take four concrete test cylinders at least once for each day of production and for every 5 cubic yards of concrete placed in accordance with ASTM C31. One to be broken at seven days, two at 28 days and one held in reserve.
- C. Take slump tests for every batch and/or placement operation, in accordance with ASTM C143.
- D. Perform one air entrainment test for each set of concrete test cylinders taken.
- E. Records of these tests shall be made available to the Engineer upon request.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verify that building structure, anchors, and openings are ready to receive work of this Section.

### 3.02 PREPARATION

- A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.
- B. Provide necessary hoisting equipment.

### 3.03 ERECTION

- A. Erect units without damage to shape or finish. Replace damaged units as directed by the Engineer.
- B. Erect units level and plumb within allowable tolerances.
- C. Align and maintain uniform horizontal and vertical joints as erection progresses.
- D. Fasten and/or weld units in place. Perform welding in accordance with AWS D1.1.
- E. Touch-up field welds and scratched or damaged galvanized surfaces.
- F. Chips, cracks, spalls or other damaged incurred in storage, shipment and/or erection shall be patched only by the manufacturer to the Engineer's satisfaction, providing the damage is not detrimental to the element's structural and visual function.
- G. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Pack grout to base of unit.
- H. Exposed Joint Dimension - 3/8-inch.

### 3.04 ERECTION TOLERANCES

- A. Maximum Variation from Plane of Location - 1/4-inch in 10 feet and 3/8-inch in 100 feet, non-cumulative.
- B. Maximum Offset from True Alignment Between Two Connecting Units - 1/4-inch.
- C. Joint Tolerance -  $\pm 1/4$ -inch.

### 3.05 PROTECTION

- A. Provide non-combustible shields during welding operations.

++ END OF SECTION ++

## SECTION 04 70 00

### STONE VENEER

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Manufactured stone veneer and application materials.

##### 1.02 REFERENCES

- A. American Concrete Institute (ACI).
- B. American Society for Testing and Materials (ASTM):
1. ASTM C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  2. ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
  3. ASTM C 177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
  4. ASTM C 192, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
  5. ASTM C 270, Standard Specification for Mortar for Unit Masonry.
  6. ASTM C 482, Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
  7. ASTM D 226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
  8. ASTM E 2556/ E 2556M Standard Specification for Vapor Permeable Flexible Sheet Water Resistive Barriers Intended for Mechanical Attachment.
- C. Masonry Standards Joint Committee (MSJC) of The Masonry Society.

##### 1.03 SUBMITTALS

- A. Reference Section 01 33 00—Submittal Procedures; submit following items:
1. Product Data: Manufactured masonry and application materials including mortar color charts, and water resistive barrier.
  2. Samples: Panel containing full-size samples of specified manufactured masonry showing full range of colors and textures complete with specified mortar.
    - a. Actual size of masonry sample approximately 12 by 12 inches (300 by 300 mm).

3. Quality Assurance/Control Submittals:
  - a. Qualifications:
    - 1) Proof of manufacturer qualifications.
    - 2) Proof of installer qualifications.
  - b. Certificates: ICC-ES Report.
  - c. Test Reports for physical properties.
  - d. Manufacturer's Installation Instructions.
- B. Closeout Submittals: Reference Section 01 78 00–Closeout Submittals; submit following items:
  1. Maintenance Instructions.
  2. Special Warranties.

#### 1.04 QUALITY ASSURANCE

##### A. Qualifications:

1. Manufacturer Qualifications:
  - a. Minimum five years of experience in producing manufactured masonry.
  - b. Member of following organizations:
    - 1) MSJC.
    - 2) ACI.
2. Installer Qualifications: Company with documented experience in installation of manufactured masonry including minimum 5 projects within 400 mile radius of this Project.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Reference Section 01 66 00–Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions.
- C. Store moisture-sensitive materials in weather protected enclosures.

#### 1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Maintain materials and ambient temperature in area of installation at minimum 40 degrees F (4 degrees C) prior to, during, and for 48 hours following installation.

#### 1.07 WARRANTY

- A. Special Warranty: Provide manufacturer's standard limited warranty against defects in manufacturing for a period of 50 years following date of Substantial Completion.

## 1.08 MAINTENANCE

- A. Extra Materials: Furnish extra manufactured stone material in a variety of shapes and sizes in quantity equal to three percent of the installed stone.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

- A. Boral Stone Products LLC- Ledgestone style
- B. Eldorado Stone - Ledgestone style
- C. Coronado Stone- Ledgestone style

### 2.02 MANUFACTURED MASONRY MATERIALS

- A. Cultured Stone Textures:
  - 1. Single Texture Color to be selected.
  - 2. Receptacle Stones—Raised Chamfered Edge:
    - a. Color: match stone selection.
    - b. Size: nominal 6 by 8 by 1-1/2-inches.
- B. Manufactured Masonry Physical Properties:
  - 1. Compressive Strength: ASTM C 192 and ASTM C 39, 1800 psi (12.4 MPa).
  - 2. Bond Between Stone Unit, Type S Mortar, and Backing: ASTM C 482, 50 psi (345 kPa).
  - 3. Thermal Resistance: ASTM C 177, R-factor, 0.355 per inch (25.4 mm) of thickness.
  - 4. Freeze/Thaw: ASTM C 67, 50 cycles, no disintegration and less than 3 percent weight loss.
  - 5. Fire Hazard Test, UL 723:
    - a. Flame spread: 0.
    - b. Smoke Development: 0.
  - 6. Maximum Veneer Unit Weight: 15 psf (73 kg/m<sup>2</sup>).

### 2.03 RELATED MATERIALS

- A. Mortar: Premixed Type N, Type S or mortar mixed using components and proportions following manufactured masonry manufacturer's installation instructions. Comply with ASTM C 270.
  - 1. Mortar Color: Iron oxide pigments.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates upon which manufactured masonry will be installed.
- B. Coordinate with responsible entity to correct unsatisfactory conditions.
- C. Commencement of work by installer is acceptance of substrate conditions.

### 3.02 PREPARATION

- A. Protection: Prevent work from occurring on the opposite of walls to which manufactured masonry is applied during and for 48 hours following installation of the manufactured masonry.
- B. Surface Preparation: Follow manufacturer's instructions designated below for the appropriate type of manufactured masonry and substrate.

### 3.03 INSTALLATION

- A. Install Cultured Stone products in accordance with manufacturer's Cultured Stone installation instructions using tight fit joints.
- B. Install/Apply Related Materials specified above in accordance with type of substrate and manufactured masonry manufacturer's installation instructions.

### 3.04 CLEANING

- A. Clean manufactured masonry in accordance with manufacturer's installation instructions.

### 3.05 PROTECTION

- A. Protect finished work from rain during and for 48 hours following installation.
- B. Protect finished work from damage during remainder of construction period.

++ END OF SECTION ++



SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall provide all labor, materials and equipment required to furnish, fabricate, deliver and erect Structural Steel Framing as shown on the Plans, as specified, and/or directed.

1.1.2 Included are lintels, angles, anchor bolts for column bases, bearing plates, columns, beams, girders, bracing, clips, hangers and other framing.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American Association of State Highway and Transportation Officials (AASHTO) Publication:

Standard Specifications for Highway Bridges

1.2.2 American Institute of Steel Construction (AISC) Publications:

Manual of Steel Construction

Manual of Steel Construction - Load and Resistance Factor Design

Detailing for Steel Construction

Engineering for Steel Construction

1.2.3 American National Standards Institute (ANSI) Publication:

B46.1 Surface Texture (Surface Roughness, Waviness and Lay)

1.2.4 American Railway Engineering Association (AREA) Publication:

Manual for Railway Engineering (Fixed Properties)

### 1.2.5 American Society for Testing and Materials (ASTM) Publications:

A36/A36M	Structural Steel
A53	Steel Pipe, Hot-Dipped, Zinc-Coated Welded and Seamless
A108	Steel Bars, Carbon, Cold-Finished, Standard Quality
A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A242/A242M	High-Strength Low-Alloy Structural Steel
A307	Carbon Steel Externally Threaded Standard Fasteners
A325	High-Strength Bolts for Structural Steel Joints
A449	Quenched and Tempered Steel Bolts and Studs
A490	Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints
A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
A514/A514M	High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM A529/A529M	Structural Steel with 42 ksi Minimum Yield Point (1/2-Inch Maximum Thickness)
A563	Carbon and Alloy Steel Nuts
A568/A568M	General Requirements for Steel, Carbon and High Strength Low-Alloy Hot-Rolled Sheet and Cold-Rolled Sheet
A572/A572	High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality

A588/A588M	High-Strength Low-Alloy Structural Steel With 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick
A618	Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
A668	Steel Forgings, Carbon and Alloy, for General Industrial Use
A780	Repair of Damaged Hot-Dip Galvanized Coatings
A992/A992M	High Strength Low-Alloy Structural Steel With 50 ksi (345 MPa) Minimum Yield Point
B695	Coatings of Zinc Mechanically Deposited on Iron and Steel
C827	Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
F436	Hardened Steel Washers
F844	Washers, Steel, Plain (Flat), Unhardened for General Use
F959	Compressible-Washer-Type Direct Tension Indicators for Use With Structural Fasteners

1.2.6 American Welding Society, Inc. (AWS) Publication:

D1.1	Structural Welding Code - Steel
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1.2.7 Crane Manufacturers Association of America (CMAA) Specification:

70	Electric Overhead Traveling Cranes
74	Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist

1.2.8 Steel Structures Painting Council (SSPC) Publications:

PA 1	Shop, Field, and Maintenance Painting
Paint 25	Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer

SP 2	Hand Tool Cleaning
SP 3	Power Tool Cleaning
SP 6	Commercial Blast Cleaning

1.3 SYSTEM DESCRIPTION: Provide the structural steel system, including shop primer or galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, and testing shall be provided in accordance with AISC "Manual of Steel Construction", and/or "Manual of Steel Construction - Load and Resistance Factor Design", except as modified in this Section.

1.4 MODIFICATIONS TO REFERENCES: The "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", including Supplement No. 1; the "Code of Standard Practice for Steel Buildings and Bridges", and "Structural Joints Using ASTM A325 or A490 Bolts" except as modified in this Section, shall be considered a part of the AISC "Manual of Steel Construction" and is referred to in this Section as the AISC "Manual of Steel Construction". The "Load and Resistance Factor Design Specification for Structural Steel Buildings", the "Code of Standard Practice for Steel Buildings and Bridges", the "Load and Resistance Factor Design Specifications for Structural Joints Using ASTM A325 or A490 Bolts", and the "Allowable Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts" including Appendix A shall be considered a part of the AISC "Manual of Steel Construction - Load and Resistance Factor Design" and is referred to in this Section as the AISC "Manual of Steel Construction - Load and Resistance Factor Design".

1.5 SUBMITTALS: The following shall be submitted to RPE

1.5.1 Shop Drawings: Submit for approval prior to fabrication. Prepare in accordance with AISC "Detailing for Steel Construction" and AISC "Engineering for Steel Construction". Shop drawings shall not be reproductions of Contract Drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS standard welding symbols. Review of shop drawings shall be for size and arrangement of principal and auxiliary members and strength of connections. Dimensions and proper fit shall be the responsibility of the Contractor.

1.5.2 Erection Plan: Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing, and a detailed sequence of welding, including each welding procedure required.

1.5.3 Manufacturer's Data: Submit for the following:

- a. Shop primer, including test report for Class B primer.

1.5.4 Certificates of Compliance: Submit for the following:

- a. Steel
- b. Bolts, nuts, and washers
- c. Shop primer
- d. Welding electrodes and rods
- e. Nonshrink grout
- f. Galvanizing

1.5.5 Welder's, Welding Operator's, and Tacker's Qualifications: Prior to welding, submit certification for each stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

## PART 2 - PRODUCTS

### 2.1 STEEL

#### 2.1.1 Structural Steel:

W: ASTM A992 (FY = 50 KSI)  
M, S, HP, C, MC, L, & PLATES: ASTM A36 (FY = 36 KSI)  
HSS: ASTM A500 GR. B (FY = 46 KSI)  
STEEL PIPE: ASTM A53 GR. B (FY = 35 KSI)  
HIGH STRENGTH BOLTS: ASTM A325-N, 3/4" Ø MIN.  
NUTS: ASTM A563  
WASHERS: ASTM F436  
DIRECT TENSION INDICATORS: ASTM F959  
THREADED ROD: ASTM A36  
ANCHOR RODS: ASTM F1554 GR. 36  
SHEAR STUD CONNECTORS: ASTM A108

2.1.2 High-Strength Low-Alloy Structural Steel: ASTM A572, Grade 50.

2.1.3 Weathering Structural Steel: ASTM A242 Grade 50; ASTM A588, Grade 50.

2.1.4 Structural Steel Tubing: ASTM A500, Grade B; 2.1.5 Steel Pipe: ASTM A53, Type E or S, Grade B, weight class; ASTM A501.

2.1.5 Sag Rods: ASTM A36.

2.2 BOLTS, NUTS, AND WASHERS: Provide the following unless indicated otherwise.

2.2.1 Structural Steel Joints:

2.2.1.1 Bolts: ASTM A325, Type 1; ASTM A490, Type 1 or 2.

2.2.1.2 Nuts: ASTM A563, Grade C and heavy hex style or as specified in the applicable ASTM bolt standard.

2.2.1.3 Washers: ASTM F436, plain carbon steel.

2.2.2 Weathering Structural Steel Joints:

2.2.2.1 Bolts: ASTM A325, Type 3; ASTM A490, Type 3.

2.2.2.2 Nuts: ASTM A563, heavy hex style, Grade DH3, except Grade C3 may be furnished for ASTM A325 bolts.

2.2.2.3 Washers: ASTM F436, weathering steel.

2.2.3 Foundation Anchorage:

2.2.3.1 Bolts: ASTM A307, Grade A, ASTM A325, Type 1.

2.2.3.2 Nuts: ASTM A563, Grade C, heavy hex style, except nuts under 1.5 inches may be provided in hex style.

2.2.3.3 Washers: ASTM F844,

## 2.3 STRUCTURAL STEEL ACCESSORIES

2.3.1 Welding Electrodes and Rods: AWS D1.1. Welding rods for manual shielded metal arc-welding shall conform to E-70 series of ASTM A233.

2.3.2 Nonshrink Grout: Grout shall be nonmetallic such as "Embeco" as manufactured by Master Builders, "Introplast" as manufactured by Sika, or equal.

2.4 SHOP PRIMER: SSPC Paint 25, except provide a Class B coating in accordance with AISC "Manual of Steel Construction" for slip critical joints.

2.5 GALVANIZING: ASTM A123 or A153, as applicable, unless specified otherwise galvanize after fabrication where practicable. Touch up primer for galvanized surfaces SSPC 20, Type I.

2.6 OVERHEAD, TOP RUNNING CRANE RAIL: AISC "Manual of Steel Construction", 3000pound crane rail section and welded joints. Provide rail fasteners and a minimum rail length of 10 feet.

## 2.7 FABRICATION

2.7.1 Markings: Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded or on surfaces of weathering steels that will be exposed in the completed structure. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Manufacturer's symbol and grade markings shall appear on all bolts and nuts.

2.7.2 Shop Primer: Shop prime structural steel, except as modified herein, in accordance with SSPC-PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces to receive epoxy coatings, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking is to be welded). Slip critical surfaces shall be primed with a Class B coating. Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the RPE.

2.7.2.1 Cleaning: SSPC SP 6. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.7.2.2 Primer: Apply primer to a minimum dry film thickness of 2.0 mil except provide the Class B coating for slip critical joints in accordance with the coating manufacturer's recommendations. After erection, repair damaged primed surfaces with an additional coat of primer.

2.7.3 Surface Finishes: ANSI B46.1 maximum surface roughness of 125 for pin, pinholes, and sliding bearings, unless indicated otherwise.

2.7.4 Gas cutting may be used for concealed or minor items of work, i.e.: blocking, etc., but will not be allowed for cutting or enlarging of bolt holes. Bearing ends of columns shall be accurately milled to a plane surface perpendicular to the axis of the shaft.

2.7.5 Provide holes required for use of other trades that can be determined prior to fabrication of structural steel.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

3.1.1 Overhead, Top Running Cranes: Runway rails and beams shall be provided in accordance with AISC" Manual of Steel Construction and CMAA 70, except that in case of conflict, the requirements of CMAA 70 shall govern. In addition, provide a maximum vertical difference of 0.03 inch in the elevation between adjacent runway rail tops and adjacent runway beam tops at joints. Provide adjustable runway support connections to allow placement of the crane rails and beams to the tolerances specified. Stagger runway rail joints a minimum of one foot, except that the stagger shall not be the same as the crane wheel spacing.

### 3.2 ERECTION

3.2.1 Column baseplates and leveling plates shall be set level to correct elevations and temporarily supported on steel wedges or shims until the supported members have been plumbed and grouted.

3.2.2 After final positioning of steel members, provide full bearing under baseplates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions. The entire bearing area under the plates shall be grouted solid.

3.2.3 Templates shall be furnished as required for the accurate placement of anchor bolts and bearing plates.

3.2.4 Structural steel framing shall be carried up true and plumb, and temporary bracing shall be used wherever necessary to withstand all loads to which the structure may be subjected, including erection equipment and its operation. Bracing shall be left in place as long as may be required for safety and then removed by the Contractor. As erection progresses, the work shall be securely connected to take care of all dead load, wind and erection stresses.

3.3 CONNECTIONS: Except as modified in this Section, connections not detailed shall be designed in accordance with AISC" Manual of Steel Construction". Build connections into existing work. Shop connections shall be welded. All connections shall be properly designed for the moments or shears shown on the drawing, or for the standard end loads of the members to be



connected as tabulated for uniform loads in the AISC Handbook. Provide for unusual end loads where necessary. All welding shall be performed with procedures and by operators recently certified in accordance with the standards of the American Welding Society. Connections shall be types shown on the drawings and/or specified. No burning of holes for connections will be allowed. Field holes shall be drilled. Punch, sub-punch and ream, or drill bolt holes. Bolts, nuts, and washers shall be clean of dirt and rust, and lubricated immediately prior to installation.

3.3.1 Tightening of Shear/Bearing Connections: ASTM A307 and ASTM bolts, in connections not defined as slip critical or subject to direct tension loads, shall be tightened to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a worker using a spud wrench, contact the RPE for further instructions. Bolts which may be tightened only to a snug tight condition shall be clearly identified on the drawing.

3.3.2 Tightening of Connections Requiring Full Pretensioning: ASTM A325 and A490 bolts shall be fully tensioned to 70 percent of their minimum tensile strength. Bolts shall be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, bolts shall then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

3.3.3 Tightening of Foundation Bolts: Unless otherwise directed, anchor bolts shall be set prior to concrete pouring. Do not tighten with an impact torque wrench and/or until concrete has cured minimum of 14 days.

3.4 WELDING: AWS D1.1, except use only shielded metal arc welding and low hydrogen electrodes for ASTM A514 steel. Do not stress relieve ASTM A514 steel by heat treatment. Provide AWS D1.1 qualified welders, welding operators, and tackers.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips: Remove only from finished areas.

3.4.2 Field welding will not be permitted on primed or painted steel. Contractor is responsible for properly cleaning steel before welding.

3.5 GALVANIZING REPAIR: Provide as indicated or specified. Galvanize after fabrication where practicable. Repair damage to galvanized coatings using ASTM A780 zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.6 FIELD QUALITY CONTROL: Perform field tests, and provide labor, equipment, and incidentals required for testing. The RPE shall be notified in writing of defective welds within 7 working days of the date of weld inspection.

### 3.6.1 Welds:

3.6.1.1 Furnish the services of AWS-certified welding inspectors for fabrication, erection, testing and verification inspections. Welding inspectors shall inspect and mark welds, including fillet weld end returns. All defective welds that have been repaired shall be retested.

3.6.1.2 Shop welds required for structural connections shall be visually inspected and approved by an independent testing laboratory. All questionable welds shall be radiographically or ultrasonically tested. If questionable welds prove defective, Contractor shall test minimum 10% or all other welds at no additional cost.

3.6.1.3 Field welds required for structural connections shall be visually inspected and approved by independent testing laboratory. All questionable welds and at least 10% of all other welds shall be tested by magnetic particle testing or ultrasonic testing.

### 3.6.2 Bolts:

3.6.2.1 Fully Pretensioned Connections: RPE shall require Contractor to verify bolt tension on a minimum of 10 percent of fasteners. Contractor shall provide and operate bolt tension indicator device.

++ END OF SECTION ++

SECTION 05 21 00

STEEL JOISTS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall provide all labor, materials and equipment required to furnish and erect Steel Joists, as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American Welding Society, Inc. (AWS) Publication:

D1.1 Structural Welding Code-Steel

1.2.2 Steel Joist Institute (SJI) Publications:

SSTSJ Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders, Latest Revised Edition

RCSPSJ Recommended Code of Standard Practice for Steel Joists and Joist Girders, Latest Revised Edition

1.2.3 Steel Structures Painting Council (SSPC) Publication:

PS14.01 Steel Joist Shop Painting System

1.3 SUBMITTALS: The following shall be submitted to RPE

1.3.1 Drawings:

- a. Steel joist structure

Show joist type and size, layout in plan, and erection details including methods of anchoring, framing at openings, type and spacing of bridging, requirements for field welding, and details of accessories as applicable.

### 1.3.2 Statements:

#### a. Welder qualification

Prior to welding, submit certification for welder, welding operation, and tacker, stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

### 1.3.3 Certificates of Compliance:

- a. Joists
- b. Accessories

### 1.3.4 Field Test Reports:

- a. Erection inspection
- b. Welding inspection

1.4 DELIVERY AND STORAGE: Handle, transport, and store joists in a manner to prevent bending, twisting or other damage affecting their structural integrity. Store all items off the ground in a well drained location protected from the weather and easily accessible for inspection and handling. Damaged material shall be corrected at the Contractor's expense, before being built into the work.

## PART 2 - PRODUCTS

2.1 JOISTS AND ACCESSORIES: SJI RCSPSJ for the joist [and joist girders] series indicated.

2.1.1 Carefully review structural and architectural drawings, and include required special sizes, loose and connected bearing plates, anchor bolts, headers, extended top chords, ceiling extensions, extended bottom chords at columns or other such requirements not necessarily normal to manufacturer.

## 2.2 PAINTING

2.2.1 Shop Painting: Clean and prime joists in accordance with SSPC PS14.01, Steel Joist Shop Painting System, using only Type I Red Oxide Paint. Finish coat of paint is specified in Section 099000, "Painting" or as shown.

2.2.2 Paint: Paints used for touch up and shop painting may contain toxic lead or zinc compounds. Appropriate measures shall be taken to control worker exposure to toxic substances during their use.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

3.1.1 Handling and Erection: SJI RCSPSJ for the joist series indicated.

3.1.2 Welding: AWS D1.1.

3.1.3 Permanently bolt and/or weld joists in place per SJI requirements or as detailed. Bottom chord extensions shall be welded to columns only after Full Dead Load is imposed.

3.1.4 Ends of bridging runs shall be attached to masonry, concrete and/or steel frame per SJI requirements.

### 3.2 PAINTING

3.2.1 Touch Up Painting: After erection of joists touch up connections and areas of abraded shop coat with paint of the same type used for the shop coat.

3.3 VISUAL INSPECTIONS: AWS D1.1, Section 6. The Contractor shall perform erection and field welding inspections with AWS certified welding inspectors. Welding inspectors shall visually inspect and mark welds. Provide copies of field test reports as specified in Section 1.3.4.

++ END OF SECTION ++

## SECTION 05 31 00

### STEEL DECKING

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall provide all labor, materials and equipment required to furnish and install Steel Decking and accessories, as shown on the Plans, as specified, and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

##### 1.2.1 American Iron and Steel Institute (AISI) Publication:

SG671	Specification for the Design of Cold-Formed Steel Structural Members
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##### 1.2.2 American Society for Testing and Materials (ASTM) Publications:

A525	General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
A611	Steel, Cold Rolled, Carbon
A653	Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
C423	Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

##### 1.2.3 American Welding Society, Inc. (AWS) Publications:

D1.1	Structural Welding Code, Steel
D1.3	Structural Welding Code - Sheet Steel

1.2.4 Factory Mutual Engineering and Research Corporation (FM) Publications:

P7825	Approval Guide
D/S1-28	Insulated Steel Deck, Loss Prevention Data Sheet 1-28

1.2.5 Steel Deck Institute (SDEI) Publication:

DMCDFDRD	Design Manual for Composite Decks, Form Decks and Roof Decks
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1.2.6 Underwriters Laboratories, Inc. (UL) Publications:

BMD	Building Materials Directory
580	Tests for Uplift Resistance of Roof Assemblies

1.3 SUBMITTALS: The following shall be submitted to RPE.

1.3.1 Manufacturer's Catalog Data: Submit manufacturer's catalog data for mezzanine deck and accessories. Include decking design properties, allowable loadings and applicable published literature covering the specific type of construction required by this project. Submit and obtain approval before delivery of material to the project site.

1.3.2 Drawings: Before starting work, submit completely detailed shop drawings indicating the decking, connections, bearing on supports, methods of anchoring, accessories, attachment of accessories, mezzanine layout, placement directions, size and location of holes to be cut and reinforcement to be provided, type and sequence of welded connections, and other pertinent details.

1.3.3 Statements:

- a. Welder Certification: Submit qualifications of welders and duration of qualification period in accordance with AWS.

1.3.4 Certificates of Compliance:

- a. Steel Deck Materials: Submit manufacturer's certification attesting that mezzanine decks meet the requirements of SDI and AISI.

## 1.4 QUALITY ASSURANCE

1.4.1 Steel Deck: Deck and accessories shall be the products of a manufacturer regularly engaged in the manufacture of steel mezzanine decking.

1.4.2 Welder Certification: Provide qualification of welders and duration of qualification period in accordance with AWS.

1.4.3 Regulatory Requirements:

1.5 DELIVERY AND STORAGE: Do not damage or overload decking and accessories during delivery, storage, or handling. Do not use decking for storage or as working platform until units have been welded into position. Stack decking on platforms or pallets, and cover with weathertight ventilated covering. Elevate one end during storage to provide for drainage. Contractor is responsible for replacing damaged material.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

2.1.1 Steel: Deck units shall be manufactured from steel conforming to ASTM A653, Grade A having a minimum yield of strength of 33,000 psi. Quality and properties shall conform to AISI SG671.

2.1.2 Sound Absorbing Material: Provide glass fiber in roll or premolded form for acoustical noncellular steel mezzanine deck in accordance with the manufacturer's standards.

2.1.3 Accessories: Provide accessories of the same material as the deck and not lighter than 20-gauge, unless specified otherwise herein. Provide manufacturer's standard type accessories, as specified herein.

2.1.3.1 Adjusting Plates: Provide plates of the same gauge and configuration as the roof units. Use factory cut plates of predetermined sizes where possible.

2.1.3.2 End Closures: Factory fabricate of minimum 22 gauge sheet metal.

2.1.3.3 Closures Above Partitions: Provide flexible rubber or sheet steel closures above typical partitions.

2.1.3.4 Cover Plates: Provide butt cover plates, underlapping sleeves; or 2-inch wide noncombustible, pressure sensitive tape.



2.1.3.5 Miscellaneous Accessories: Provide cant strips, fasteners, sump pans, ridge and valley plates, and various types of plates and closures as indicated or as necessary to complete the work. Provide accessories required for a finished installation.

2.2 FABRICATION: Provide decking in accordance with SDEI DMCDFDRD.

2.2.1 Decking shall have the structural properties indicated on drawings. Deck units shall conform to manufacturer's published load tables. Deck shall safely support uniformly distributed live loads as indicated on drawings, plus dead loads of construction indicated and/or specified. Deflection shall not exceed 1/240 of maximum span for live loads specified.

2.2.2 Acoustical Steel Mezzanine Deck: Provide a Noise Reduction Coefficient (NRC) rating of not less than 0.7 when tested in accordance with ASTM C423, Standard Mounting No. 6.

2.2.3 Composite Steel Mezzanine Decking: Provide one of the following types of shear devices:

- a. Mechanically varied shear devices such as wires, resistance welded across corrugations of decks by the manufacturer. Size and spacing of wires as recommended by the manufacturer and in accordance with recognized structural design practice.
- b. Mechanically fixed shear devices such as embossments, holes, welded buttons.
- c. Mechanically fixed shear devices such as inverted triangular shaped ribs.

## PART 3 - EXECUTION

3.1 INSPECTION OF SUPPORT STRUCTURE: Prior to installation of steel mezzanine deck and accessories, inspect the support structure to verify that the as-built structure will permit the indicated field installation of the decking system without modification.

3.2 INSTALLATION: Install steel mezzanine deck units in accordance with approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the RPE and make necessary corrections before deck units are anchored permanently in place. Locate end laps over supports only, with minimum lap of 2 inches. Do not use unanchored deck units as a work or storage platform. Permanently anchor units placed by the end of each working day. Install sound absorbing glass

fiber roll or premolded form, neatly in the voids between the perforated webs of the acoustical noncellular steel mezzanine deck. Suspended ceilings, light fixtures, ducts, utilities, or other loads shall not be supported by the steel deck.

3.2.1 Anchorage Methods: After placement and alignment, and after inaccuracies have been corrected, permanently fasten steel mezzanine deck units in place by welding, or with self-drilling screws or powder-actuated fasteners. Use methods as recommended by the Steel Deck Institute, subject to the RPE's approval. Length of side and end laps of deck and intervals of fastening shall be as recommended by the steel deck manufacturer, but not less than 2 inches. Clamp or weight deck units to provide firm contact between deck units and structural supports while welding or fastening is being performed.

3.2.1.1 Welding: Perform welding in accordance with AWS D1.3 using methods and electrodes as recommended by the manufacturers of the base metal alloys being used. Welds shall be made only by operators previously qualified by test prescribed in AWS to perform the type of work required. Location, size and spacing of welds shall be designed to withstand the loads indicated and in accordance with the Steel Deck Institute recommendations and as shown on the approved shop drawings. Clean welds immediately by chipping and wire brushing. Heavily coat welds, weld scars, cut edges, drill holes, rust spots and damaged portions of shop finish and zinc-rich primer provided by the deck supplier and approved by the RPE.

3.2.1.2 Fasteners, Powder Actuated and Screwed: Provide fasteners for anchoring the deck to structural supports and adjoining units that are designed to withstand the design loads indicated and that are standard with the Steel Deck Institute and the manufacturer. Provide fasteners of a positive locking type; approved prior to installation.

3.2.2 Accessories: Install cover plates, adjusting plates, finish strips, closures and closure sheets as necessary to complete the work. Install finish strips and closure sheets so as to lap one support a minimum of 2 inches.

3.2.2.1 Adjusting Plates: Provide in locations too narrow to accommodate full-size deck units and install as shown on shop drawings.

3.2.2.2 End Closures: Provide end closure to close open ends of cells at end walls and openings in mezzanine deck.

3.2.2.3 Closures Above Partitions: Provide for closing voids between cells above interior walls and over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inches nominal or less in width and two-piece closure strips for wider partitions.

3.2.2.4 Cover Plates: Provide at end joints between adjoining non-lapping units.

3.2.3 Openings:

3.2.3.1 Openings required in deck larger than five square feet, or greater than 24 inches in either direction or 30 inches in diameter, shall be predetermined and provided as a part of fabrication herein.

3.2.3.2 Punching, drilling or cutting deck openings smaller than above stated for passage of pipes, ducts, or attachment of other items shall be performed in field by Contractor requiring such. Obtain approval of the RPE for such holes or other openings larger than 6 inches in diameter.

3.2.3.3 Steel reinforcing members indicated or require around openings through decks for roof hatches, fans, and similar projections, will be provided by others when shown on drawings. If not shown, but required, this Contractor shall provide such.

3.2.3.4 Steel reinforcing members required for auxiliary openings smaller than stated above and not indicated on drawings shall be provided by Contractor requiring opening.

3.3 FIELD QUALITY CONTROL: Inspect the decking top surface for flatness after installation. The top flanges of each sheet shall be flat with concavity or convexity not to exceed 1/16-inch (1.58-mm). A straight edge placed across any three contact surfaces shall leave a gap of not more than 1/16-inch between the straight edge and any point of the contact surface; when gap is more than 1/16-inch, provide corrective measures or replacement. Reinspect the decking after performing corrective measures or replacement.

3.3.1 Complete installation of deck and accessories shall be subject to approval by roofing Contractor and RPE.

++ END OF SECTION ++

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall provide all labor, materials and equipment required to fabricate and erect all Metal Fabrications, complete with anchorage devices, connections, accessories and incidental work, as shown on the Plans, as specified, and/or directed.

1.1.2 No attempt is made to enumerate or describe each item of miscellaneous metal work, but simply to describe major items, certain special items, and general construction requirements for all items.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 Aluminum Association, Inc. (AA) Publications:

SAA46	Standards for Anodized Architectural Aluminum
DAF45	Designation System for Aluminum Finishes

1.2.2 American Institute of Steel Construction (AISC) Publications:

M011	Manual of Steel Construction
S326	Specifications for Structural Steel Buildings

1.2.3 American National Standards Institute, Inc. (ANSI) Publications:

SNT-101	Safety Requirements for Heavy Duty, Portable, Compressed Air Actuated Fastener Driving Tools
A14.3	Safety Requirements for Fixed Ladders
B18.2.1	Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws

B18.2.4	Square and Hex Nuts
B18.5	Round Head Bolts
B18.21.1	Lock Washers

1.2.4 American Society for Testing and Materials (ASTM) Publications:

A36/A572/A992	Structural Steel
A48	Gray Iron Castings
A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A167	Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and Strip
A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A501	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
A525	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements
A687	High Strength Non-Headed Steel Bolts and Studs
A786	Rolled Steel Floor Plates
B26	Aluminum-Alloy Sand Castings
B108	Aluminum-Alloy Permanent Mold Castings
B209	Aluminum and Aluminum Alloy Sheet and Plate
B221	Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

B429 Aluminum-Alloy Extruded Structural Pipe and Tube

1.2.5 American Welding Society, Inc. (AWS) Publication:

D1.1 Structural Welding Code, Steel

1.2.6 National Association of Architectural Metal Manufacturers (NAAMM) Publication:

MFM Metal Finishes Manual

1.2.7 National Fire Protection Association (NFPA) Publication:

101 Code for Safety to Life from Fire in Buildings and Structures

1.2.8 Steel Structures Painting Council (SSPC) Publications:

SP 2 Hand Tool Cleaning

SP 3 Power Tool Cleaning

SP 6 Commercial Blast Cleaning

Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer

1.3 SUBMITTALS: The following shall be submitted to RPE.

1.3.1 Manufacturer's Catalog Data:

- a. Access doors and panels
- b. Cover plates and frames
- c. Floor gratings and frames
- d. Guard posts
- e. Handrails
- f. Ladders
- g. Safety nosings and treads
- h. Steel stairs
- i. Structural steel door frames
- j. Trench covers and frames

### 1.3.2 Drawings:

- a. Access doors and panels
- b. Cover plates and frames
- c. Floor gratings and frames
- d. Guard posts
- e. Handrails
- f. Ladders
- g. Miscellaneous plates and shapes
- h. Safety nosings and treads
- i. Steel stairs
- j. Structural steel door frames
- k. Trench covers and frames

1.3.3 Certificates of Compliance: Attest that materials comply with requirements of this Specification and of referenced documents.

- a. Carbon steel
- b. Steel pipe and tubing
- c. Cast iron gratings
- d. Floor plate
- e. Shop primer
- f. Welding electrodes and rods
- g. Steel floor grating

1.3.4 Submit drawings for approval prior to fabrication. Include templates, and erection and installation details, indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

## 1.4 SUBMITTALS

- A. General: Review of Shop Drawings will be for general conformance only. Compliance with requirements for materials, fabrication, erection, and dimensioning of structural steel shall be the Contractor's responsibility. Resubmitted Shop Drawings shall have revisions identified and dated.
- B. Shop Drawings: Submit detailed drawings showing:
  1. Plans, elevations, details, and sections.
  2. Anchorages.
  3. Accessory items.

- C. Material Data: Submit to the Special Inspector and Engineer laboratory test reports and other data as required to show compliance with Specifications. Submit producer's or manufacturer's specifications and installation instructions for the following products:
1. Miscellaneous steel, including certified copies of mill reports covering chemical and physical properties.
  2. High-strength bolts, including nuts and washers.
  3. Unfinished bolts and nuts.
  4. Miscellaneous steel primer paint, if used.
  5. Welding electrodes.
  6. Post-installed Anchors (Expansion, Sleeve, or Chemical Adhesive), if used.
- D. Bolt Certification: Submit to the Special Inspector and Engineer certification that bolts, nuts, and washers furnished comply with specifications. Submit manufacturer's inspection certificates for mill tests. For fasteners to be accepted, certification numbers must appear on the product containers and correspond to the identification numbers on the mill test reports. Manufacturer's symbol and grade markings must appear on bolts and nuts.
- E. Field Modifications: Submit drawings showing any field modifications required to correct errors in the Shop Drawings, fabrication, or erection.

1.5 QUALIFICATION OF WELDERS: In accordance with AWS D1.1 using procedures, materials, and equipment of the type required for the work.

- A. Provide one of the following certifications for welders to be employed in the work.
1. Certification of satisfactorily passing AWS qualification tests within previous 12 months to perform the type of welding in the work.
  2. Work record signed by supervisor showing regular employment within previous 12 months to perform the type of welding in the work.

1.6 DELIVERY AND STORAGE: Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Contractor shall replace and remove damaged items with new items.

#### 1.7 SPECIAL INSPECTIONS

- A. Refer to Specification Section 014533 and the Schedule of Special Inspections.

### PART 2 - PRODUCTS

2.1 MATERIALS: Products shall conform to the respective reference specifications and standards and to the requirements specified herein.



2.1.1 Steel and Iron: If not specified otherwise, use standard mill finished structural steel shapes or bar iron in compliance with AISC Specifications for Structural Steel Buildings.

- A. Rolled-Steel W Shapes: ASTM A 992.
- B. Rolled-Steel Plates, Angles, and Bars: ASTM A 36 or ASTM A 572, Grade 50
- C. Rolled-Steel C and MC Shapes: ASTM A 36, or ASTM A 572 Grade 50.

2.1.2 Structural Tubing: ASTM A500, Grade B or ASTM A501.

2.1.3 Steel Pipe: ASTM A53, Type E or S, Grade B, standard weight unless otherwise specified.

2.1.4 Fittings for Steel Pipe: Standard malleable iron fittings.

2.1.5 Cast Iron Gratings: Gray cast iron conforming to ASTM A48, Class 40.

- A. Open Floor Grating: Welded or press locked steel construction, bearing bars 1 3/16 inch on center, cross bars 4 inches on center, banded ends, depth as shown in drawings, galvanized.

2.1.6 Floor Plates: Steel plate where shown, shall conform to ASTM A786. Unless otherwise shown, steel plate shall be not less than 14 gauge.

2.1.7 Anchors and Fasteners: Where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.7.1 Lag Screws and Bolts: ANSI B18.2.1, type and grade best suited for the purpose.

2.1.7.2 Toggle Bolts: ANSI B18.2.1 and ANSI B18.5.

2.1.7.3 Bolts, Nuts, Studs and Rivets: ANSI B18.2.4 and ASTM A687.

2.1.7.4 Powder Driven Fasteners: Use when permitted by ANSI. Follow safety provisions of ANSI SNT-101.

2.1.7.5 Lock Washers: Circular washers shall conform to ANSI B18.21.1. Beveled washers for American Standard beams and channels shall be square or rectangular, taper in thickness, and be smooth.

2.1.8 Aluminum Alloy Products: Shall conform to ASTM B209 for sheet plate, ASTM B221 for extrusions and ASTM B26 or ASTM B108 for castings, as applicable. Provide aluminum extrusions at least 1/8-inch thick and aluminum plate or sheet at least 0.050-inch thick.

2.2 DISSIMILAR MATERIALS: Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wood, or absorptive materials subject to wetting, protect the surfaces with a coat of bituminous paint, a coat of varnish or a coat of zinc chromate primer to prevent galvanic or corrosive action.

A. Chemical Adhesive Anchors:

1. Anchors to solid concrete:

- a. Anchors for use when base material temperature is 0°F or greater: “HIT-Ice” by Hilti; “Epcon A7” by ITW Ramset/Red Head; “AC 100 Plus” by Powers Fasteners; “AT Acrylic-Tie” by Simpson/Strong-Tie; or accepted equivalent.
- b. Anchors for use when base material temperature is 40°F or greater; “HIT-HY 200 Safe Set System with HIT-Z Rod or Hollow Drill Bit System” or “HIT-RE 500-SD” by Hilti; “Epcon C6” by ITW Ramset/Red Head; “T308 Plus” by Powers Fasteners; “ET Epoxy-Tie” by Simpson/Strong-Tie; or accepted equivalent.

2. Anchors to hollow masonry (brick or hollow CMU), grouted CMU, solid brick, or stone:

- a. Anchors for use when base material temperature is 0°F or greater: “Epcon A7” by ITW Ramset/Red Head; “AC 100 Plus” by Powers Fasteners; “AT Acrylic-Tie” by Simpson/Strong-Tie; or accepted equivalent.
- b. Anchors for use when base material temperature is 40°F or greater: “HIT-HY 70” by Hilti; “Epcon C6” by ITW Ramset/Red Head; “T308 Plus” by Powers Fasteners; “ET Epoxy-Tie” by Simpson/Strong-Tie; or accepted equivalent.
- c. Provide manufacturer’s standard screen tubes for use with anchors.

B. Galvanizing Touch-up Compound: Zinc-rich, anti-corrosion paint complying with ASTM A780. “ZRC Galvilite” by ZRC Worldwide; “Roval ZC Galvanizing Repair” by Roval Corporation; or accepted equivalent. Use for field touch-up of hot-dip galvanized surfaces.

C. Unfinished Bolts and Nuts: ASTM A 307, Grade A.

D. Galvanized Hardware: ASTM A 307, or ASTM A 325, Type 1, including bolts, nuts, and washers, hot-dip galvanized in accordance with ASTM A 153, Class C. Provide bolts and nuts shipped together from same manufacturer.

E. Electrodes for Welding: E70, and in accordance with AWS.

- F. Headed Stud Anchors: ASTM A 108, Grades 1010 through 1020, solid fluxed and in accordance with AWS. Provide Type B studs, having a minimum yield strength of 50,000 psi, in accordance with AWS D1.1. An arc shield (ferrule) shall be used with each anchor. Size as indicated in drawings.
  - 1. Stainless steel anchors, where noted in drawings, shall be Type 18-8.
- G. Fasteners: Zinc-coated with galvanizing in accordance with ASTM A153. Select fasteners for the type, grade, and class required for installations.
- H. Expansion Anchors: "Kwik-Bolt 3" or "Kwik-Bolt-TZ" by Hilti; "Trubolt Wedge Anchors" by ITW Ramset/Red Head; "Power-Stud" by Powers Fasteners; "Wedge-All" by Simpson/Strong-Tie; or accepted equivalent.

## PART 3 - EXECUTION

3.1 FABRICATION: By mechanics skilled in the trade and in accordance with the manufacturer's directions. Metal work shall be well formed to shape and size, with sharp lines, angles, and true curves. All work shall be fabricated to allow for expansion and contraction of materials. Provide welding and bracing of adequate strength and durability, with tight, flush joints, dressed smooth and clean.

- A. General:
  - 1. Fabricate according to reviewed Shop Drawings.
  - 2. Wherever possible, prefabricate items in the shop so that they are ready for installation.
  - 3. Weld shop connections, unless indicated otherwise. Make joints and intersections tightly fitting. Make work square, plumb, straight, and true. Provide continuous welds. Grind smooth where exposed to view or touch.
  - 4. Weld headed stud anchors with automatically timed stud welding equipment. Remove arc shields from studs after welding.
  - 5. Drill or punch all holes. Burned holes are not acceptable.
  - 6. For beams which will be hot-dip galvanized, predrill (not punch) the beam to form the radius portion of all copes as shown in AISC Specification Commentary.
  - 7. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
  - 8. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
  - 10. Shop Assembly: Preassemble items in the shop to greatest extent possible, so as to minimize field splicing and assembly of units at project site. Disassemble units only to extent necessary for reassembly and coordinated installation.
- B. Surface Preparation: For steel to be galvanized, clean galvanized surface to remove oxidation in accordance with SSPC-SP7 "Brush-Off Blast Cleaning."

- C. Hot-dip galvanize items noted.
- D. For items to be hot-dip galvanized, coordinate fabrication methods with galvanizer. Provide vent holes required, and seal weld joints to be galvanized.
- E. Provide hot-dip galvanized hardware for connections in galvanized components or where shown in drawings.

### 3.2 TOUCH-UP PAINTING

- A. Touch up paint damaged galvanized surfaces and welded areas with galvanizing repair compound applied in accordance with manufacturer's instructions.
- B. Prepare surfaces of hot-dip galvanized members where the galvanization was omitted, or damaged in accordance with SSPC-SP3 "Power Tool Cleaning." Prepare field-welded galvanized members similarly.
- C. Remove weld slag before applying touch-up paint.

3.3 MEASUREMENTS: Before fabrication, provide necessary field measurements and verify all measurements. Wherever possible, field measurements shall be taken prior to fabrication. Do not delay job progress; allow for trimming where final dimensions cannot be established before fabrication. The Contractor is solely responsible for fit and shall make all corrections required to items fabricated off site at no additional cost to Owner.

3.4 METAL SURFACES: Shall be clean and free from mill scale, flake rust and rust pitting; well formed and finished to shape and size, with sharp lines, angles, and smooth surfaces. Shearing and punching shall leave clean true lines and surfaces. Weld or rivet permanent connections. Welds and flush rivets shall be used and finished flush and smooth on surfaces that will be exposed after installation. Do not use screws or bolts where they can be avoided; when used, heads shall be countersunk, screwed up tight and threads nicked to prevent loosening.

3.5 CONSTRUCTION: Thickness of metal and details of assembly and supports shall give ample strength and stiffness for the minimum loads specified or indicated.

3.6 FASTENING: Provide the necessary rabbets, lugs, and brackets so that the work can be assembled in a neat and substantial manner. Holes for bolts and screws shall be drilled. Joints exposed to the weather shall be formed to exclude water. Conceal fastenings where possible.

3.7 SHOP FABRICATION: Fabrication and assembly shall be done in the shop to the greatest extent possible. Provide holes required for connection of other adjacent or adjoining work.

3.8 MISCELLANEOUS ITEMS: Provide as noted on drawing.

3.8.1 Access Doors and Access Panels: Shall be flush type. Fabricate frames for access doors of steel not lighter than 14-gauge with welded joints and anchorage for securing into construction. Provide access doors with a minimum of 14 by 20 inches and of not lighter than 14-gauge steel, with stiffened edges and welded attachments. Provide access doors hinged to frame and with a flush-face, turn-screw-operated latch. Provide exposed metal surfaces with a shop applied prime coat.

3.8.1.1 Treads and Platforms: Constructed of steel grating with abrasive nosing.

3.8.1.2 Rail Standards: Constructed of 3/4-inch square steel bar stock. Bolt one standard rail to the outer edge of each riser.

3.8.1.3 Railings: Provide standard weight steel pipe. Provide handrail on stairs with single one-inch pipe with clevis type attachment to each standard. Rail at platform to be a double line of 1-1/4-inch pipe, with fittings for attachment to center post and floor.

3.8.2 Closure Plates: Provide closure plates around horizontal loading conveyor, located in pits, flush with finish floor. Design plates and supporting framework to resist a 10,000 pound axle load as conveyor is fed with an articulated loader. Closure plates shall be a minimum of 3/4 inch thick. Provide bolted front plate, fastened to metal framing with countersunk hex screws, minimum full width of conveyor. Side plates shall be skip welded. Design closure plates to bear along the edge of the pit. Bearing closure plates on conveyor frame will not be permitted. The Contractor shall assume responsibility for system design and details of construction.

3.8.3 Corner Guards and Shields: Jambs and sills of openings and edges of platforms shall be steel shapes and plates anchored in masonry or concrete with welded steel straps or end-weld stud anchors. Form corner guards for use with finish on walls, of 0.025-inch thick stainless steel conforming to ASTM A167 with polished finish. Extend corner guards 5 feet above the top of cove base or to the top of the wainscot, whichever is less, and anchor with adjustable anchors of 16-gauge expanded metal.

3.8.4 Cover Plates and Frames: Fabricate cover plates of galvanized 1/4-inch thick rolled steel to weigh not less than 70 nor more than 100 pounds per plate having smooth dull edges with a selected raised pattern non-slip top surface. Reinforce to sustain a live load of 60 pounds per square foot. Flush type, U-shaped bar steel, lifting handles centered not more than 3 inches from the edge shall be provided in the ends of each plate. Provide holes and openings with 1/2-inch clearance as necessary for pipes and equipment. Support cover plates on structural steel angle frames anchored in place securely with 1-inch by 3/16-inch by 12-inch bars bent at one end and welded to the frames 2 feet on centers. Butt-joint frames tightly in straight runs, miter at corners, and install level and in true alignment. Weld all connections and grind top surface smooth. Provide bar stops 1/4-inch thick by one-inch wide, welded or riveted every 6 inches on the frames for the cover plates. Provide 1/8-inch clearance between cover plates and bar stops.

3.8.5 Dirt Control Foot Grating: Provide grating as indicated and constructed of a 4-1/8-inch high frame of 6063-T5 extruded aluminum with corners mitered and adjustable concrete anchor bolts.

3.8.5.1 Frame: Provide with 1-5/8-inch high tread rails and locking cross bar of 6061-T6 extruded aluminum.

3.8.5.2 Tread Rails: Provide black vinyl treads with a pyramid pattern for non-slip surface designed to shed water and dirt into an aluminum catch basin beneath.

3.8.5.3 Cross Supports: Extruded aluminum 2-7/16-inch deep by 1-3/4-inch wide to be provided under tread rails at a maximum of 2 feet on center and anchored at both ends by a 3/8-by 6-inch aluminum stud embedded 3 inches into concrete.

3.8.5.4 Gratings: Provide gratings in sections as indicated.

3.8.5.5 Catch Basin: Provide under the entire foot grating a heavy-duty aluminum catch basin with a central drain.

3.8.6 Floor Gratings: Grating shall be serrated bar grating constructed of steel unless noted otherwise. Floor gratings shall be galvanized

3.8.6.1 Design: Floor gratings to support a live load of 60 pounds per square foot and 300 pound concentrated load for the spans indicated, unless noted otherwise. The deflection shall not be greater than 0.10 inch, except that an increase of 0.03 inch will be permitted for each 6-inch increase in span length for spans greater than 2 feet.

3.8.6.2 Floor Grating: Band the ends of gratings with bars of the same or greater thickness than the metal used for grating. Weld banding in accordance with the manufacturer's standard for trim. Band diagonal or round cuts by welding bars of the same or greater thickness metal used for grating in accordance with the manufacturer's standard for trim unless otherwise indicated. The tops of bearing bars, cross, or intermediate bars shall be in the same plane and match the finish of the grating.

3.8.6.3 Fastening Methods: Gratings shall be anchored to structural members with clips, bolts or self drilling fasteners.

3.8.7 Gates: Provide swing gates where indicated. Provide two self closing type hinges, fixed stop and keeper. Gates shall be minimum 30 inches wide. Fabrication details shall be similar to steel railings.

3.8.8 Guard Posts: Provide 8-inch galvanized standard weight steel pipe as specified in ASTM A53. Anchor posts in concrete as indicated and fill solidly with minimum 2500 psi concrete conforming to Section 033000, "Cast-in-Place Concrete".

### 3.8.9 Handrails and Railings:

3.8.9.1 Steel Rails, Including Carbon Steel Inserts: Steel rails, including inserts in concrete, shall be steel pipe conforming to ASTM A53 or structural tubing conforming to ASTM A500, Grade B. Steel rails shall be 1-1/2-inch nominal size, Schedule 40. Steel railings shall be shop painted.

- a. Fabrication: Jointing of posts, rail, and corners shall be by one of the following methods:
  - (1) Flush-type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8-inch hexagonal-recessed-head setscrews.
  - (2) Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.
  - (3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.
- b. Installation: Shall be in pipe sleeves embedded in concrete and filled with molten lead or quick setting anchoring cement with anchorage covered with standard pipe collar pinned to post, or shall be secured by steel pipe flanges anchored by expansion shields and bolts.
- c. Removable Sections: Shall be as indicated.

3.8.9.2 Aluminum Railings: Shall consist of 1-1/2-inch nominal Schedule 40 pipe conforming to ASTM B429. Railings shall be mill finish aluminum pipe.

- a. Fabrication: Jointing shall be one of the following methods:
  - (1) Flush-type rail fittings, welded and ground smooth with splice locks secured with 3/8-inch CRS or cadmium plated plain cup point or reverse knurled cup pointed hexagonal recessed head setscrews.
  - (2) Mitered and welded joints made by fitting post to top rail, intermediate rail to post, mitering corners, groove welding joints and grinding smooth. Railing splices, where allowed, shall be butted and reinforced by a tight fitting dowel or sleeve not less than 6 inches in length. Dowel or sleeve shall be tack welded or epoxy cemented to one side of the splice.

b. Installation: Shall be affixed to base structure by flanges anchored by expansion shields. Bolts used to anchor aluminum alloy flanges shall be corrosion resisting steel of a size appropriate to the standard product of the manufacturer. Where aluminum or alloy fittings or extrusions are to be in contact with dissimilar metals or Portland cement concrete, the contact surface shall be given a heavy coating of bituminous paint or asphaltic varnish.

c. Removable Railing Sections: Shall be as indicated on the drawings.

3.8.10 Insect Screen: Bronze or aluminum color, 18-by 18-mesh.

3.8.11 Ladders: Fabricate vertical ladders conforming to Section 7 of ANSI A14.3 of 2-1/2 inches by 3/8-inch steel flats for strings and 3/4-inch diameter steel rods for rungs. Provide rungs of not less than 16 inches wide, spaced one foot apart, plug welded or shouldered and headed into strings. Install ladders so that the distance from the runs to the finished wall surface will not be less than 7 inches. Secure to the adjacent construction with heavy clip angles riveted or bolted to the string and secured to masonry or concrete with not less than two 1/2-inch diameter expansion bolts. Install intermediate clip angles not over 48 inches on centers. Install brackets as required for securing of ladders welded or bolted to structural steel and built into the masonry or concrete. In no case shall ends of ladders rest upon finished roof

3.8.12 Miscellaneous Plates and Shapes: ASTM A36. Provide for items that do not form a part of the structural steel framework, such as lintels, sill angles,

3.8.12.1 Built-Up Lintels: Bolt weld, or rivet together with separators if required. End bearings shall be not less than one inch per foot of span; with MINIMUM bearing 8 inches. Set lintel with clearance of 1/2 inch above head of buck or frame,

3.8.12.2 Loose Lintels: Provide over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with necessary connections and fasteners welds. Construct to have at least 8 inches bearing on masonry at each end

3.8.12.3 Angle Lintels: Provide masonry furring with not less than 1/4-inch by width and depth of leg 1/2 inch greater than thickness of furring. For clear spans exceeding 5 feet, support lintels by intermediate wall anchors spaced at intervals of not more than 4 feet



3.8.13 Safety Chains and Guard Rails: Construct safety chains of galvanized wrought iron, straight link type, 3/16-inch diameter, with at least twelve links per foot, and with snap hooks on each end. Snap hooks shall be boat type and eye bolts for attachment of chains shall be galvanized 3/8-inch bolt with 3/4-inch eye diameter, anchored as indicated. Two chains, 4 inches longer than the anchorage spacing, shall be supplied for each guarded area. Locate guard rails where indicated. Mount the top chain or rail 3 feet 6 inches above the floor, and mount the lower chain or rail 2 feet above the floor.

3.8.14 Safety Nosings: Shall be of cast aluminum with cross-hatched abrasive surfaces. Provide nosing at least 4 inches wide and 1/4-inch thick and terminating at not more than 6 inches from the ends of treads for stairs and as indicated]for platforms and landings. Provide safety nosings with anchors embedded in the concrete and with tops flush with the top of the traffic surface.

3.8.15 Safety Treads: Match grating size and type, and provide checkered plate nosing at each tread.

3.8.16 Sleeves: Fit pipes passing through concrete or masonry construction with pipe sleeves. Extend each sleeve through its respective wall and cut flush with each surface. Provide sleeves at least one inch greater in diameter than the pipe passing through them. Caulk sleeve and pipe after the piping is installed and tested. Reference Specification Section 079200, "Sealants".

3.8.17 Steel Stairs: Provide steel stairs complete with structural or formed channel stringers, steel-plate treads and risers, grating treads, landings, columns, handrails, and necessary bolts and other fastenings. Steel stairs and accessories shall be hot-dip galvanized shop painted.

3.8.17.1 Design Loads: Design stairs to safely sustain a live load of not less than 100 pounds per square foot, except that stair landings shall be designed to sustain a minimum live load of 150 pounds per square foot.

3.8.17.2 Materials: Steel stairs shall be of structural steel reinforced properly and in a manner to provide rigid construction, and shall be of welded construction except that rivets or bolts may be used where welding is not practicable; screw or screw-type connections are not permitted.

- a. Structural Steel: Shall conform to ASTM A36.
- b. Gratings for Treads and Landings: Gratings shall have non-slip nosings.

3.8.17.3 Installation: Provide anchor bolts, grating fasteners, washers, and all parts or devices necessary for proper installation. Use lock washers under nuts.

3.8.17.4 Outside Stairs: Shall conform to NFPA 101; fabricate of steel shapes with treads, platforms, and railings as specified herein for steel stairs, and provide complete with required fastenings and accessories. Galvanize outside stairs and accessories.

#### 3.8.18 Structural Steel Door Frames:

3.8.18.1 Frames: For slide-up overhead doors, power operated service doors, freight elevator hoistway entrances Provide frames as shown on the drawings and where not otherwise shown shall be of structural shape or shape and plate composite to provide a full depth channel shape surrounded with at least 1-1/2-inch outstanding legs. For single swing doors, provide continuous 5/8-inch by 1-1/2-inch bar stock stops at head and jambs. For freight elevator hoistway entrance, include the non-skid metal sill.

3.8.18.2 Jamb Members: Where track, guides, hoods, hangers, operators, and other such accessories are required, extend the trim legs of jamb members above the opening head to the height and with the anchorage necessary for their support.

3.8.18.3 Built-up Members: Plug weld or flush riveted 10 inches on center. Cut, drill, and tap frames for attachment of hardware from template or approved hardware samples.

3.8.18.4 Jamb Anchors: Provide near top, bottom, and at not more than 24-inch intervals. Provide the bottom of each jamb member with a clip angle welded in place with two 1/2-inch diameter floor bolts for adjustment.

3.8.19 Structural Steel Door Frames: Provide frames of rolled shapes as shown on the drawings. Provide heads mitered and welded to the jambs or have riveted clip angle connections concealed in the finished work. Frames for swinging doors shall have 5/8-inch by 1-1/2-inch solid bar stops secured to the frame by welding or 1/4-inch diameter countersunk machine screws spaced not more than 12 inches on centers. Provide for head openings greater than 3 feet with additional stiffening sufficient to limit deflection to not more than 1/16-inch. Secure frames to masonry with bent zinc-coated metal anchors spaced not more than 30 inches on centers. Where necessary to engage sufficiently the threads of machine screws for fastening hardware, back frames on inside faces with steel plates of suitable thickness; tap frames and reinforcing plates as necessary for the installation of hardware and other work. Countersink rivets and screw heads where exposed in the finished work. Grind welds smooth.

3.8.20 Trench Covers and Frames: Shall be structural steel shapes and plates, with steel straps welded to frame for anchoring to concrete. Weld all corners and frames. Frame construction so that tops of frames and cover plate will finish flush with floor. Provide cover checkered steel floor plate as specified. Provide holes for removal tools. Provide flush drop handles for removal formed from 1/4-inch round stock where indicated. Remove sharp edges and burrs from cover plates and exposed edges of frames. Reinforce covers with structural steel channels where clear spans exceed 24 inches. Reinforcing channels shall be 24 inches on center as required. Frames, covers, and reinforcing are hot-dip galvanized

### 3.9 ANCHORAGE, FASTENINGS, AND CONNECTIONS:

3.9.1 Anchorage: Provide anchorage for fastening work securely in place. Set anchors in concrete as the work progresses and space not more than 2 feet on centers unless indicated otherwise. Sizes, kinds, and spacings of anchors not indicated or specified shall be as necessary for the purpose, as approved. Anchorage not otherwise specified or indicated includes slotted inserts, expansion shields, and powder-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Provide inserts of suitable and approved types where required for support or anchorage of equipment and finish construction. Inserts shall be gray or malleable iron castings or galvanized steel unless indicated or specified otherwise. Slotted inserts shall be of types required to engage with anchors. Except where specified otherwise, anchors and anchor bolts in exterior walls shall be zinc-coated, and all other anchors and anchor bolts shall be heavily coated with bituminous paint.

3.9.1.1 Fastenings: Do not use wood plugs in any material. Use nonferrous attachments for nonferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, and harmonizing with the material to which fastenings are applied. Conceal fastenings where practicable. Drill and punch to produce clean true lines and surfaces. Countersink metal work to receive hardware.

3.9.1.2 Threaded Connections: Make threaded connections up tight so that threads are entirely concealed. Make bolted work up tight and nick the threads or bush the stem to prevent loosening. Rivet, bolt, and screw heads shall be flat and countersunk in exposed work and elsewhere as required.

3.9.1.3 Anchors and Connecting Members: Provide in concrete or masonry as the work progresses, to avoid unnecessary cutting and drilling. Cut, fit, and drill as necessary so all materials are properly set in place and to permit engaging work to be properly installed.

3.9.1.4 Design Connections: Where not shown or indicated, connection details shall be in accordance with AISC M011, and connections shall be provided using A-307 or A-325 steel bolts. Provide necessary holes for securing work to building. Use lock washers under nuts.

3.9.1.5 Built-In Work: Metal work built-in with concrete or masonry shall be formed for anchorage, or be provided with suitable anchoring devices as shown or as required. Furnish metal work in ample time for securing in place as the work progresses.

3.10 WELDING: Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1. Weld in a manner to prevent permanent distortion of the connected parts. Weld continuously along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Grind smooth visible welds in the finished installation.

### 3.11 FINISHES:

3.11.1 Galvanizing: Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A123, ASTM A153 and ASTM A525, as applicable.

3.11.1.1 Galvanize: Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

3.11.1.2 Repair of Zinc-Coated Surfaces: Repair surfaces damaged by welding or other means with galvanizing repair paint or by the application of stick or thick paste material specifically designed for repair of galvanizing, as approved. Clean areas to be repaired, and remove the slag from the welds. Surfaces to which stick or paste material is applied, shall be heated with a torch to a temperature sufficient to melt the metallics in stick or paste; spread the molten material uniformly over surfaces to be coated and wipe the excess material off.

3.11.2 Shop Cleaning and Painting: After surface preparation, apply pretreatment and primer as specified. Do not coat surfaces of items to be embedded in concrete or to be welded. Recoat damaged surfaces using surface preparation, treatment, primer and paint that was applied to the adjacent surfaces upon completion of work. Do not apply bituminous protective coatings to items to be finish painted.

3.11.2.1 Environmental Conditions: Do not clean or paint surface when damp or exposed to foggy or rainy weather, when the metallic surfaces temperature is within 5 degrees F of the dew point of the surrounding air, or when the surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the RPE.

3.11.2.2 Surface Preparation: Unless otherwise specified herein, abrasive blast clean exposed surfaces in accordance with SSPC SP 6. Surfaces that will be in spaces above ceiling, attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 2 or SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete shall be free of dirt and grease. Do not paint or galvanize bearing surfaces, including contact surfaces within slip-critical joints, but coat them with an approved rust preventive, applied in the shop. Remove such coating just prior to field erection using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, shall be free of rust, grease, dirt and other foreign matter.

3.11.2.3 Pretreatment, Priming and Painting: Apply pretreatment, primer, and paint in accordance with the manufacturer's standard practice. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 0.1 mil. Tint the additional prime coat with a small amount of tinting pigment. Structural steel shall be shop primed with one coat SSPC Paint 25. Finish coat of paint is specified in Section 099000, "Painting".

3.11.3 Nonferrous Metal Surfaces: Protect by plating, anodic, organic, or other coatings as specified.

3.11.4 Aluminum Surfaces:

3.11.4.1 Surface Condition: Before finishes are applied, exposed aluminum sheets, plates, and extrusions shall be free of roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and any other defects which will affect uniform appearance of finished surfaces.

3.11.4.2 Aluminum: Unexposed sheet, plate and extrusions may have mill finish as fabricated. Castings shall have sandblast finish, medium, equal to NAAMM MFM, Metal Finishes Manual, Designation AA-M43 or AA SAA46, Standards for Anodized Architectural Aluminum and AA DAF45 Designation System for Aluminum Finishes of The Aluminum Association Publications.

END OF SECTION

## SECTION 06 10 00

### ROUGH CARPENTRY

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This section includes general rough carpentry, used for blocking and mounting for construction and equipment

##### 1.02 REFERENCES

- A. Standards: Comply with the following unless otherwise specified or indicated on the Drawings:
  1. Lumber: American Softwood Lumber Standard PS 20 by the U.S. Department of Commerce. Comply with applicable provisions for each indicated use.
  2. Plywood: Product Standard PS 1 for Softwood Plywood, Construction and Industrial by the U.S. Department of Commerce.
  3. Plywood Installation: APA Design/Construction Guide, Residential & Commercial by the American Plywood Association (APA).
  4. Grading Rules:
    - a. Douglas Fir, Hem-Fir, Idaho White Pine, and other Western Woods: Western Wood Products Association (WWPA) or West Coast Lumber Inspection Bureau (WCLIB).
    - b. Southern Pine: Southern Pine Inspection Bureau (SPIB).
    - c. Redwood: Redwood Inspection Service (RIS).
    - d. Spruce-Pine-Fir: National Lumber Grades Authority (NLGA).
  5. User Specification for Treated Wood, American Wood Protection Association Standard (AWPA) U1-02
  6. Framing Installation: American Forest and Paper Association (AFPA).

##### 1.03 SUBMITTALS: THE FOLLOWING SHALL BE SUBMITTED TO RPE

- A. Quality Control Submittals:
  1. Certificates: Certification for the following wood treatments:
    - a. Dip Treatment: Certification by treating plant stating chemical solutions used, submersion period, and conformance with applicable standards.
    - b. Pressure Treatment: Certification by treating plant stating chemicals and process used, net amount of chemical preservative retained, and conformance with specified standards.

- c. Waterborne Preservatives: Certified written statement that moisture content of treated materials was reduced to a maximum of 19 percent prior to shipment to Project site.

#### 1.04 QUALITY ASSURANCE

- A. Mill and Producers Mark: Each piece of lumber and plywood shall be grade stamped indicating type, grade, mill, and grading agency certified by the Board of Review of the American Lumber Standards Committee. Mark shall appear on unfinished surface, or ends of pieces with finished surfaces.
  - 1. Pressure Preservative Treated Material: Accredited agency quality mark on each piece of wood indicating treatment.
  - 2. Fire-Retardant Treated Material: Accredited testing agency mark on each piece of wood indicating compliance with the fire hazard classification.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials dry during delivery. Store materials 6 inches minimum above ground surface. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation between stacks.
- B. Cover stored materials until ready for use for protection from moisture. Place and anchor covering in a manner which will assure good ventilation under the covering.

#### 1.06 PROJECT CONDITIONS

- A. Correlate location of supporting members to allow proper attachment of other Work.

### PART 2 - PRODUCTS

#### 2.01 LUMBER

- A. General: Furnish seasoned dimension lumber dressed to nominal sizes indicated with 19 percent maximum moisture content at time of dressing, marked "S-DRY". Comply with dry size requirements of PS 20.
  - 1. Dress: Surfaced 4 sides (S4S) unless otherwise indicated.
- B. Miscellaneous Lumber: Standard grade, No. 3 grade, or better grade of the following species unless otherwise indicated:
  - 1. Nailers and Blocking: Douglas Fir, Hem-Fir, Idaho White Pine, Southern Pine, or Spruce-Pine-Fir.
  - 2. Furring: Douglas Fir, Southern Pine, or Spruce-Pine-Fir.

## 2.02 PLYWOOD

- A. Sheathing: APA RATED SHEATHING, EXPOSURE 1. Furnish APA PS 1 veneered panels, with span ratings for the required thicknesses as listed below unless otherwise indicated.

Thickness	Span Rating
3/8 inch	24/0
1/2 inch	32/16
5/8 inch	40/20
3/4 inch	48/24

## 2.03 MISCELLANEOUS MATERIALS

- A. Asphalt Felt: Asphalt-saturated felt, No. 15, without perforations, complying with ASTM D 226.
- B. Rosin Paper: Commercial, rosin-sized building paper, 0.010 inch thick.

## 2.04 FRAMING HARDWARE

- A. Fasteners and Anchoring Devices: Select and furnish items of type, size, style, grade, and class as required for secure installation of the Work. Items shall be galvanized for exterior use. Items exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185. Unless shown or specified otherwise, comply with the following:
1. Nails and Staples: FS FF-N-105.
  2. Wood Screws: FS FF-S-111.
  3. Bolts and Studs: FS FF-B-575.
  4. Nuts: FS FF-N-836.
  5. Washers: FS FF-W-92.
  6. Lag Bolts or Lag Screws: FS FF-B-561.
  7. Masonry Anchoring Devices: Expansion shields, masonry nails and drive screws: FS FF-S-325.
  8. Toggle Bolts: FS FF-B-588.
  9. Bar or Strap Anchors: ASTM A575 carbon steel bars.
  10. Wall Plugs: Corrugated type, galvanized steel, 24 USS gage min, not less than 2 inches wide x 2-1/2 inches deep.
  11. Cross Bridging: Nailable type, galvanized steel, 16 USS gage min, by 3/4 inch wide.
  12. Metal Hangers and Framing Anchors: Size and type for intended use, galvanized finish, manufacturer's recommended fasteners. Items exposed to treated wood shall be Hot-Dip galvanized conforming to ASTM Standard A653; Class G-185 and epoxy coated in the field.



## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Examine substrate and supporting structure on which rough carpentry is to be installed for defects that will adversely affect the execution and quality of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

### 3.02 INSTALLATION – GENERAL

- A. Do not use units of material with defects which impair the quality of the Work and units which are too small to fabricate the Work with minimum joints or with optimum joint arrangement.
- B. Install Work accurately to required lines and levels with members plumb and true, accurately cut and fitted and securely fastened. Closely fit rough carpentry to other associated construction.
- C. Securely attach carpentry Work to substrates by anchoring and fastening as indicated or, if not indicated, as required by the referenced standards. Select fasteners of size that will not penetrate through members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required. Set nail heads in exposed Work which is to be painted or stained and fill resulting holes.

### 3.03 WOOD NAILERS, BLOCKING, AND GROUNDS

- A. Install required items where indicated and where required for support, attachment or screeding of other Work. Form to shapes indicated or required. Coordinate locations and cut and shim as required to provide items at true and level planes to receive Work to be attached. Install closure strips for nailers at all edges.
  - 1. Attach to substrates as indicated; if not indicated, size and space fasteners as required to support applied loading. Maximum spacing of fasteners shall not exceed 16 inches. Unless otherwise shown on the Drawings, install and secure material to non-wood construction as follows:
    - a. To Concrete: Attach material less than 1-1/2 inches thick with screws and non-ferrous metal expansion shields. Attach material 1-1/2 inches and thicker with machine bolts and non-ferrous metal compound type anchors.
    - b. To Concrete Unit Masonry: Attach material to new masonry with annular ring nails driven into wall plugs where fastening occurs at joints of masonry or with special hardened steel masonry nails where fastening occurs in the masonry units. Attach material to existing masonry with machine screws and

non-ferrous metal expansion shields where fastening occurs in solid portions of masonry. If fastening occurs at cells of masonry, secure material in place with toggle bolts.

- c. To Brick Masonry: Attach material to new masonry with annular ring nails driven into wall plugs. Attach material to existing masonry with machine screws and non-ferrous metal expansion shields.
- d. To Steel: Attach material with galvanized bolts and nuts or stainless steel machine screws tapped into the metal, as required by conditions.
- e. To Non-Ferrous Metal: Attach material with stainless steel or other approved non-ferrous metal bolts and nuts or self-tapping screws, as required by conditions.

B. Counter-sink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry Work. Where possible, anchor to formwork before concrete placement. Bevel both edges of members to be anchored in concrete. Shims shall be cedar shingles or redwood wedges.

C. Install permanent grounds of dressed, preservative treated, key- beveled lumber not less than 1-1/2 inches wide and of the thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

#### 3.04 PLYWOOD SHEATHING

A. Comply with printed installation requirements of the APA Design/ Construction Guide, Residential & Commercial for plywood application required, unless otherwise indicated

++ END OF SECTION ++

## SECTION 07 21 00

### BUILDING INSULATION

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This section includes all types of installed insulation as indicated on the contract documents.

##### 1.02 SUBMITTALS

- A. Product Data: Catalog sheets, specifications, and installation instructions for each type of insulation specified.
  - 1. Include data substantiating that the materials comply with the specified thermal resistance and vapor resistance qualities.
- B. Samples:
  - 1. Rigid Type: 6 inch sq.
  - 2. Blanket, Batt or Roll: 12 inch square
- C. Quality Control Submittal:
  - 1. Certificate: Affidavit required under Quality Assurance Article.

##### 1.03 QUALITY ASSURANCE

- A. Allowable Thickness Variations: Manufacturer's standard units which vary slightly from the thickness indicated may be acceptable, subject to the approval of the Director.
- B. Thermal Resistance: The thicknesses shown are for the thermal resistance (R-Value in accordance with ASTM C 177 or ASTM C 518) specified for each material. The R-Values specified are minimum acceptable. Provide adjusted thicknesses as directed for the use of material having a different thermal resistance.
- C. Certification: Affidavit by the polystyrene thermal insulation manufacturer, certifying that the insulation was manufactured with CFC-free blowing agents.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Do not allow insulation materials to become wet or soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B. Do not deliver flammable insulation materials to the project site more than 2 days ahead of the time of installation. Protect at all times against ignition.
- C. Protect insulation materials subject to deterioration by sunlight from exposure to sunlight.
- D. Complete the installation and concealment of insulation materials as rapidly as possible.

#### 1.05 PROJECT CONDITIONS

- A. Do not proceed with the installation of insulation on walls or under slabs until the Work which follows (and which conceals the insulation) is ready to be performed.
- B. Examination of Substrate: Examine the substrate and the conditions under which the insulation Work is to be performed. Do not proceed with the insulation Work until unsatisfactory conditions have been corrected.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Rigid (Board) Insulation: Rigid cellular polyurethane or polyisocyanurate thermal insulation boards surfaced with other materials; FS HH-I-1972/GEN.
  - 1. Aged R-Value:
    - a. 1/2 Inch Thick: R = 4.0 @ 40 degrees F and 3.6 @ 75 degrees F.
    - b. 1 Inch Thick: R = 6.0 @ 40 degrees F and 7.2 @ 75 degrees F.
    - c. 1-1/2 Inches Thick: R = 9.0 @ 40 degrees F and 10.8 @ 75 degrees F.
    - d. 2 Inches Thick: R = 12.1 @ 40 degrees F and 14.4 @ 75 degrees F.
    - e. 2-1/2 Inches Thick: R = 15.3 @ 40 degrees F and 18.0 @ 75 degrees F.
    - f. 3 Inches Thick: R = 18.5 @ 40 degrees F and 21.6 @ 75 degrees F.
  - 2. Facings Classification: FS HH-I-1972/1; aluminum foil on both sides.
  - 3. Facings Classification: FS HH-I-1972/4, Style 1; gypsum board on one side and aluminum foil on the other side.
- B. Rigid (Board) Insulation: Extruded polystyrene thermal insulation boards; ASTM C 578, Type IV, manufactured with CFC-free blowing agents.

1. Aged R-Value:
  - a. 1/2 Inch Thick: R = 2.5 @ 40 degrees F and 2.5 @ 75 degrees F.
  - b. 1 Inch Thick: R = 5.0 @ 40 degrees F and 5.0 @ 75 degrees F.
  - c. 1-1/2 Inches Thick: R = 7.5 @ 40 degrees F and 7.5 @ 75 degrees F.
  - d. 2 Inches Thick: R = 10.0 @ 40 degrees F and 10.0 @ 75 degrees F.
  - e. 3 Inches Thick: R = 15.0 @ 40 degrees F and 15.0 @ 75 degrees F.
  - f. 4 Inches Thick: R = 20.0 @ 40 degrees F and 20.0 @ 75 degrees F.
  
- C. Mineral Fiber Insulation: Glass or other inorganic fibers and resinous binders formed into flexible blankets, batts or rolls; ASTM C 665.
  1. R-Value:
    - a. 2-1/2 Inches Nominal Thickness: R = 7.0.
    - b. 3-1/2 or 3-5/8 Inches Nominal Thickness: R = 11.0.
    - c. 6-1/4 or 6-1/2 Inches Nominal Thickness: R = 19.0.
    - d. 7-1/2 Inches Nominal Thickness: R = 22.0.
    - e. 9-1/2 Inches Nominal Thickness: R = 30.0.
    - f. 12 Inches Nominal Thickness: R = 38.0.
  2. Type I - Blankets with no membrane covering.
  3. Type II, Class C - Blankets with a nonreflective barrier membrane covering one principal face.
  4. Type III, Class A - With a reflective barrier membrane covering one principal face. Membrane flame spread rating of 25 or less.
  5. Type III, Class B or C - With a reflective barrier membrane covering one principal face. Membrane flame spread rating greater than 25.
  
- D. Adhesive for Bonding Insulation: The type recommended by the insulation manufacturer.
  
- E. Mechanical Anchors: Type and size shown or, if not shown, as recommended by the insulation manufacturer for the type of application shown and condition of substrate.
  
- F. Vapor Barrier: Polyethylene sheeting; ASTM D 4397; 6 mils minimum thickness, 3.7 g/m<sup>2</sup> per 24 hr maximum water vapor transmission rate.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Verify that adjacent materials are dry and ready to receive insulation.
- B. Close off openings in areas to receive loose insulation to permanently prevent escape of insulation.

### 3.02 INSTALLATION

- A. Comply with manufacturer's printed instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.
- B. Extend insulation full thickness over entire surface to be insulated. Apply a single layer of insulation of the required thickness, unless otherwise indicated or required to make up the total thickness. Cut and fit tightly around obstructions, and fill voids with insulation.
- C. Install insulation with factory applied barrier membrane facing the warm side of building spaces. Tape ruptures in barrier membrane.
  - 1. Install reflective barrier membrane insulation with 3/4 inch air space in front of reflective barrier membrane wherever possible.
- D. Install separate polyethylene sheeting vapor barrier where shown, in accordance with manufacturer's printed instructions. Lap all seams and joints a minimum of 6 inches.

++ END OF SECTION ++

## SECTION 07 27 26

### COLD FLUID APPLIED-WATERPROOFING MEMBRANE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Supply labor, materials to complete the Work as shown on the Drawings and as specified herein including, but not limited to the following:
  - 1. Foundation Walls
  - 2. Elastomeric Asphalt Emulsion Waterproofing Membrane,
  - 3. On the interior of CMU knee walls to act as a vapor barrier where rigid insulation and finish system is called.

##### 1.02 REFERNECES

- A. CAN/CGSB-37.2: Membrane, Elastomeric, Cold Applied Liquid.
- B. CAN/CGSB-37.9M: Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing.

##### 1.03 SUBMITALS: The following shall be submitted to RPE.

- A. Prior to commencing the Work submit manufacturers complete set of standard details for waterproofing systems.

##### 1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with the printed requirements of the membrane manufacturer and this specification. Advise designer of any discrepancies prior to commencement of the Work.
- B. Maintain one copy of manufacturer's literature on site throughout the execution of the Work.
- C. At the beginning of the Work and at all times during the execution of the Work, allow access to site by the waterproofing membrane manufacturer's representative.

- D. Materials used in this Section, including, primers, mastics and membranes, asphaltic protection boards, composite drainage boards and expansion joint membranes shall be fully compatible and shall be sourced and or produced by one manufacturer.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
- B. Cold applied elastomeric membrane should be stored in closed containers outdoors.
- C. Store membrane at temperature of 40 degrees F and above to facilitate handling.
- D. Membrane contains petroleum solvents and are flammable. Do not use near open flame.
- E. Store roll materials horizontally in original packaging.
- F. Store adhesives and primers at temperatures of 40 degrees F and above to facilitate handling.
- G. Keep solvents away from open flame or excessive heat.

#### 1.06 COORDINATION

- A. Ensure continuity of the waterproofing membrane throughout the scope of this section.
- B. Work shall be so scheduled as to provide a watertight seal at the end of each working day on the areas worked upon during the day.

#### 1.07 SITE CONDITONS

- A. Environmental Requirements
  - 1. No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.
- B. Protection
  - 1. Provide adequate protection of materials and work of this section from damage by weather backfilling operations and other causes.
  - 2. Protect work of other trades from damage resulting from work of this section. Make good such damage at own expense to satisfaction of the consultant.



3. Apply protection board as soon as possible after installation of membrane.

## 1.8 WARRANTY

- A. Waterproofing membrane manufacturer hereby warrants the waterproofing membrane for leak coverage as a result of faulty materials for a period of ten years (five years for single ply without Henry DB Drain Board). Scope of warranty shall include materials required to return the membrane to a watertight condition.

## PART 2 - MATERIALS

### 2.01 MATERIALS

- A. Waterproofing membrane components and accessories must be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.
  1. Acceptable Manufacturer: Henry Company- Aqua Block, or equal

### 2.02 WATERPROOFING MEMBRANE (Basis-of-Design)

- A. Primary cold applied elastomeric asphalt emulsion waterproofing membrane in compliance with CGSB 37.2 shall be Aqua-Bloc<sup>®</sup> WB Elastomeric Asphalt Emulsion Waterproofing Membrane manufactured by Henry, a one component waterproofing compound compatible with sheet waterproofing membranes and substrates, having the following characteristics:
  1. Elongation: 2000%,
  2. Maximum VOC: 10 g/l
  3. Water vapour permeance: 0.1 perm (10 ng/Pa.m<sup>2</sup>.s), ASTM E96,
  4. Chemical resistance: Alkalis, calcium chloride, mild acid and salt solutions
  5. Application Temperature: Minimum 40 degrees F.

### 2.03 JOINT TREATMENT MESH

- A. Joint Treatment and Reinforcement Mesh, open weave glass fabric yarn saturated with synthetic resins complying with ASTM D1668, Type I, shall be Henry 183 manufactured by Henry.

## 2.04 FLASHING AND TRANSITION MEMBRANE

- A. Flashing and Transition Membrane shall be Blueskin® WP200 manufactured by Henry, 1.5mm (60 mils) SBS modified bitumen, self-adhering sheet membrane with a cross-laminated polyethylene film, and having the following physical properties:
1. Thickness: 1.5 mm (60 mils) min.,
  2. Flexibility: Pass @ -40 degrees C to ASTM D1970,
  3. Vapour permeance: 2.8 ng/Pa.s.m<sup>2</sup> ( 0.05 perms) to ASTM E96,
  4. Tensile strength (membrane): 2.24 MPa to ASTM D412,
  5. Tensile strength (film): 34.5 MPa to ASTM D882,
  6. Elongation: 300% to ASTM D412,
  7. Puncture resistance: 222 N min. to ASTM E154.
- B. Primer for self-adhering membranes at temperatures above 25 degrees F shall be Aquatac™ Primer manufactured by Henry, a polymer emulsion based adhesive, quick setting, having the following physical properties:
1. Colour: Aqua,
  2. Weight: 8.7 lbs/gal,
  3. Solids by weight: 53%,
  4. Water based, no solvent odours,
  5. Drying time (initial set): 30 minutes at 50% RH and 70 degrees F.

## 2.05 LIQUID MEMBRANE & TERMINATION SEALANT

- A. Termination Sealant shall be Polybitume® 570-05 Polymer Modified Sealing Compound manufactured by Henry, a polymer modified sealing compound having the following characteristics:
1. Compatible with sheet waterproofing membrane and substrate,
  2. Solids by volume: 70%,
  3. Complies with CGSB 37.29,
  4. Remains flexible with ageing,
  5. Chemical resistance: Alkalis, calcium chloride, mild acid and salt solutions.

## PART 3 - EXECUTION

### 3.01 CONDITION OF SURFACES

- A. Before commencing work, ensure environmental and site conditions are suitable for installation of waterproofing membrane.

- B. The substrate shall be clean and dry, free from surface water, ice, snow or frost, dust, dirt, oil, grease, curing compounds or any other foreign matter detrimental to the adhesion of the waterproofing membrane.
- C. Can be applied to damp or new green concrete. Ensure concrete is smooth and free from voids and honeycombing prior to application of waterproofing membrane.
- D. Voids, cracks, holes and other damages to horizontal or vertical surfaces shall be repaired before application of the membrane.

### 3.02 PRIMARY WATERPROOFING MEMBRANE APPLICATION

- A. Single Coat Application (Vertical Applications)
  - 1. Apply a full and continuous coat of primary waterproofing membrane with a trowel, long handled squeegee, roofing brush or spray. Apply membrane at a rate of 20ft.<sup>2</sup> per 1 U.S. gal. to provide a minimum wet thickness of 80 mils ensuring no pinholes or blisters. Allow membrane to fully cure/dry prior to subsequent application coatings.

### 3.03 CURING AND PROTECTION

- A. Allow membrane to dry thoroughly. Protect from rain until fully cured. Allow membrane to fully cure prior to installing protection board, drainage composite or backfilling. Patch or repair damaged areas using same material as original coating.
- B. Protect cured membrane from damage caused by backfilling by using Drainage Composite prior to commencing backfill.

### 3.04 CLEAN-UP

- A. Promptly as the work proceeds and on completion clean up and remove from site all rubbish and surplus materials resulting from the foregoing work.

### 3.05 PROTECTION

- A. Protect waterproofing membrane and drain board work from other trades during construction.
- B. Backfill with specified materials, protect membrane from damage.

++ END OF SECTION ++

## SECTION 07 92 00

### JOINT SEALANTS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes sealants for the following applications:
  - 1. Exterior joints in the following vertical surfaces and non-traffic horizontal surfaces:
    - a. Joints between stone veneer and precast stone
    - b. Control joints in unit masonry.
    - c. Perimeter joints between materials listed above and frames of doors and windows.
  - 2. Interior joints in the following vertical surfaces and horizontal non traffic surfaces:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    - c. Perimeter joints between interior wall surfaces and frames of interior doors, windows.
    - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
- B. Related Sections include the following:
  - 1. Division 4 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.

##### 1.02 PERFORMANCE REQUIREMENTS

- A. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

##### 1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
- E. Product Test Reports: From a qualified testing agency indicating sealants comply with requirements, based on comprehensive testing of current product formulations.
- F. Warranties: Special warranties specified in this Section.

#### 1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- B. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  1. Use manufacturers standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  2. Testing will not be required if joint sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
  1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates as follows:
  1. Locate test joints where indicated or, if not indicated, as directed by Architect.
  2. Conduct field tests for each application indicated below:
    - a. Each type of elastomeric sealant and joint substrate indicated.
    - b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Test Method: Test joint sealants by hand-pull method described below:
  - a. Install joint sealants in 60-inch-long joints using same materials and methods for joint preparation and joint-sealant installation required for the completed Work. Allow sealants to cure fully before testing.
  - b. Make knife cuts from one side of joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2-inch piece.
  - c. Use fingers to grasp 2-inch piece of sealant between cross-cut end and 1-inch mark; pull firmly at a 90-degree angle or more in direction of side cuts while holding a ruler alongside of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for 10 seconds.
  - d. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side, and then repeating this procedure for opposite side.
4. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
6. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  - a. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.
7. Preinstallation Conference: Conduct conference at Project site prior to proceeding with all work and installations.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## 1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
  - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
  - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

## 1.07 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.
- D. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
  - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.01 PRODUCTS AND MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each type in the sealant schedules at the end of Part 3.

### 2.02 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

### 2.03 ELASTOMERIC JOINT

- A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses

### 2.04 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  - 1. Type C: Closed-cell material with a surface skin.

### 2.05 MISCELLANEOUS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.



- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
    - a. Concrete.
    - b. Masonry.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. As previously noted in "Miscellaneous Materials" Article, purpose of primers is to improve adhesion of sealant to substrate.
- B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

### 3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses provided for each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealants from surfaces adjacent to joint.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

### 3.04 FIELD QUALITY

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
    - a. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
  - 2. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

3. Inspect tested joints and report on the following:
    - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field- adhesion hand-pull test criteria.
    - b. Whether sealants filled joint cavities and are free from voids.
    - c. Whether sealant dimensions and configurations comply with specified requirements.
  4. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
  5. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- B. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.05 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.06 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

### 3.07 ELASTOMERIC JOINT-SEALANT

- A. Single-Component Nonsag Polysulfide Sealant Where joint sealants of this type are indicated, provide products complying with the following:
  1. Products:
    - a. Deck-O-Seal One Step; W.R. Meadows, Inc.

- b. Thiokol 1P; Morton International, Inc.
  - c. GC-9 Synthacalk; Pecora Corporation.
  - d. PSI-7000; Polymeric Systems, Inc.
2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- B. Mildew-Resistant Silicone Sealant -Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:
1. Products:
    - a. 786 Mildew Resistant; Dow Corning.
    - b. Sanitary 1700; GE Silicones.
    - c. NuFlex 302; NUCO Industries, Inc.
    - d. 898 Silicone Sanitary Sealant; Pecora Corporation.
    - e. PSI-611; Polymeric Systems, Inc.
    - f. Tremsil 600 White; Tremco.
  2. Type and Grade: S (single component) and NS (nonsag).
  3. Class: 25.
  4. Use Related to Exposure: NT (nontraffic).
  5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
  6. Applications: At interior applications subject to high humidity and mildew
  7. Products:
    - a. Vulkem 922; Mameco International.
    - b. Dynatrol II; Pecora Corporation.
    - c. Flexiprene 2000; Polymeric Systems, Inc.
    - d. Sikaflex - 2c NS; Sika Corporation.
    - e. DYmeric 511; Tremco.
  8. Type and Grade: M (multicomponent) and NS (nonsag).
  9. Class: 25.
  10. Additional Movement Capability: 50 percent movement in extension and 50 percent in compression for a total of 100 percent movement. Use Related to Exposure: NT (nontraffic).
  11. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
  12. Applications: Control and Expansion Joints.

++ END OF SECTION ++

## SECTION 08 11 02

### STEEL DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Steel doors and frames, including borrowed lites; sidelights; vision lites; glass moldings and stops; louvers; panels; hardware reinforcements; and accessories as shown in the contract documents.

##### 1.02 REFERENCES

- A. ANSI- American National Standard Institute
  1. A240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
  2. A250.4-2001 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
- B. NAAMM National Association of Architectural Metal Manufacturers
  1. HMMA 830-1997 Hardware Preparations and Locations for Hollow Metal Doors and Frames.
  2. HMMA 831-1997 Recommended Hardware Locations for Hollow Metal Doors and Frames.
  3. HMMA 840-1999 Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.
  4. HMMA 861-2000 Guide Specification for Commercial Hollow Metal Doors and Frames.
- C. NFPA National Fire Protection Association
  1. NFPA 80- 2010 Standard for Fire Doors and other Opening Protectives.

##### 1.03 DEFINITIONS

- A. Steel Door and Frame Manufacturer: Manufacturer of steel doors and frames regularly engaged in the manufacturing of such products for use in commercial, institutional, educational and other similar applications.
- B. Company Field Advisor(s): An employee of the steel door and frame manufacturer who is certified in writing by the manufacturer to be technically qualified in design, installation, and servicing of products.

- C. Steel Door and Frame Distributor: Distribution Company who regularly engages in the distribution of steel doors and frames of the manufacturer whose doors and frames are submitted for this project.
- D. Certified Installation Supervisor: Designated supervisor/installer, who has a minimum three years of experience in steel frame and door installation, and is certified in writing by the steel door and frame manufacturer as qualified and responsible to ensure approved steel frames and doors are installed, adjusted, and operate properly.

#### 1.04 SUBMITTALS

- A. Submittals Packages
  - 1. Door and Frame Schedule and Shop Drawings Package: Submit as a complete package. Incomplete packages will be returned unreviewed.
    - a. Quality Assurance Submittal
      - 1) Certification of Compliance as described in the Quality Assurance Article.
      - 2) Company Field Advisor's Qualification Data
        - a) Name of Company Field Advisor and Employer's name, business address and telephone number and e-mail address.
        - b) Names and addresses of 3 similar projects Company Field Advisor has worked on during the past three years.
      - 3) Certified Supervisor's and Installer's Qualification Data
        - a) Name of Supervisor and each Installer performing Work, and Employer's name, business address and telephone number.
        - b) Names and addresses of 3 similar projects Supervisor and each Installer has worked on during the past three years.
    - b. Door and Frame Schedule:
      - 1) Include a Cover Sheet that lists:
        - a) Project name, project number, and project address.
        - b) Manufacturer's name, address, and telephone number.
        - c) Distributor's name, address, and telephone number.
        - d) Shop drawing preparer's name, and telephone number and e-mail address.
        - e) Submission date.
      - 2) List by opening
        - a) Door and Frame number and location by building and room name. Use same reference numbers for

- openings and as those shown on Contract Drawings.
    - b) Door width, height, thickness, type, gage, and options
    - c) Frame type, width, height, jamb depth, gage, anchor type and options.
    - d) Door and frame elevations; head and jamb profiles and details; welding requirements; and reinforcements.
    - e) Fire Rating.
    - f) Glass type.
    - g) Undercut.
    - h) Electric preparations, if any.
    - i) Hardware Set.
    - j) Show dimensioned elevations; construction details of each door including vertical and horizontal edge details; and frame details for each type, including dimensions profiles; locations for finish hardware, including cutouts and reinforcements; gage of reinforcements; details of connections; anchors and accessories; and details of conduit and preparations for electrified door hardware and controls.
  - 3) Product Data: Manufacturer's catalog sheets, specifications, and detailed installation instructions. Highlight products and options pertaining to this Project. Cross out information irrelevant to this Project.
  - 4) Manufacturer's Written Certification of Compliance that their products conform to the requirements of the references named in the References Article of this specification section, and as modified by this specification.
- 3. Closeout Submittals: Submit as a complete package.
  - a. Operation and Maintenance Manuals: Furnish 2 (two) hard cover three ring binders with project name and number prominently displayed on the front cover and the spine.
  - b. Listing of Manufacturer, address and contact information
  - c. Approved Door and Frame Submittal including shop drawings and product data sheets
  - d. Manufacturer's dated warranty for this specific project identified by Facility, OGS project number, and manufacturer's order number.
  - e. Certification: Written certification from the Company Field Advisor that their products are installed according to manufacturer's printed installation instructions, and are operating properly.

## 1.05 QUALITY ASSURANCE

- A. Uniformity and single source responsibility:
  - 1. Provide frames from a single source manufacturer who specializes in this type of work.
- B. Certification of Compliance: A statement, written on frame manufacturer's letterhead, that certifies their products, submitted for this Project, have been tested and comply with references named in the References Article of this specification section, and as modified by other requirements this specification.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver frames in heavy paper cartons or other protective packaging. Remove any plastic protective wrap from the package.
- B. Store frames under cover, in a dry area, on raised platforms in vertical position with minimum 4 inch blocking between units to allow air circulation.
- C. Clearly label packaging, for identification and installation location.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A1011/A1011M-04a 2004.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel complying with ASTM A1008/A1008M-04b 2004.
- C. Galvannealed Steel Sheets: Zinc Iron Alloy-Coated carbon steel sheets of commercial quality complying with ASTM A 653/653M, with A 60 zinc coating.
- D. Anchors and Supports: Fabricate of not less than 16 gage sheet steel unless otherwise indicated.
  - 1. Galvanized Units: Galvanize anchors and supports to be used with galvanized frames, complying with ASTM A 153, Class B.
- E. Anchorage Devices, Bolts, and Other Fasteners: Manufacturer's standard units unless otherwise indicated.
  - 1. Galvanized Units: Galvanize items and comply with ASTM A 153, Class C or D as applicable.
- F. Solid Block polyurethane core with minimum .07 U Factor.



## 2.02 FRAMES

- A. General:
1. Furnish steel frames for doors, transoms, sidelites, borrowed lites, and other openings, as shown, of size and profile as indicated.
  2. Construction: Full welded unit construction, with corners mitered and continuously welded full depth and width of frame, unless otherwise specified or shown. Knock-down type frames will not be accepted.
    - a. Fixed Stops: Integral 5/8 inch stop unless otherwise shown.
    - b. Removable Beads: Removable steel beads secured with machine screws. Form corners with butted hairline joints.
  3. Do not drill frames for silencers.
  4. Weld steel shipping spreaders to the underside of the jamb legs, requiring removal of the spreaders prior to frame installation.
- B. Frames: Form of hot-rolled steel sheets, not less than 14 gage, zinc alloy iron coated A60 galvanized.
- C. Mullions and Transom Bars:
1. Furnish closed or tubular mullions and transom bars where shown. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.
  2. Where installed in masonry, leave vertical mullions in frames open at the top so they can be filled with grout.
- D. Wall Anchors: Unless otherwise specified or shown, formed of not less than 16 gage galvanized steel.
1. Masonry Construction: Adjustable, corrugated or perforated T-shaped to suit frame size with leg not less than 2 inches wide by 10 inches long. Furnish at least 3 anchors per jamb up to 7'-6" jamb height; 4 anchors per jamb up to 8 foot jamb height; one additional anchor per jamb for each 24 inches or fraction thereof over 8 feet high.
  2. Steel Stud Construction: Weld-in type welded to back of frame unless otherwise indicated or approved. Furnish at least 4 anchors per jamb up to 7'-6" jamb height; 5 anchors per jamb to 8 foot jamb height; one additional anchor per jamb for each 24 inches or fraction thereof over 8 feet high.
  3. Anchors for Completed Openings: Anchorage devices designed to secure frame to in-place concrete or in-place masonry construction, as applicable. Furnish at least 5 anchors per jamb up to 7'-6" jamb height; 6 anchors per jamb to 8 foot jamb height; one additional anchor per jamb for each 12 inches or fraction thereof over 8 feet high.

- E. Floor Anchors: Furnish floor anchor for each jamb and mullion which extends to floor, formed of not less than 16 gage steel, with 2 holes to receive fasteners, welded to bottom of jamb or mullion, and galvanized if used with galvanized frames

## 2.04 FABRICATION

- A. Fabricate frame units to be rigid, neat in appearance, and free from warp, buckle and defects. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To assure proper assembly at Project site, clearly identify items that cannot be permanently factory-assembled before shipment.
- B. Exposed Fasteners: Countersunk flat, or oval head torx center pin screws and bolts. Unless otherwise indicated, locate fasteners 2 inches from ends of members and not more than 12 inches apart.
- C. Finish Hardware Reinforcements:
  - 1. Minimum 10 gage continuous reinforcement for continuous hinges.
  - 2. Install 7 gage reinforcement for butt hinges, or hinge reinforcement in door edge may be one piece 12 gage channel full door height with extruded hinge screw holes having an average minimum thread pull-out strength of 1600 pounds per hole.
  - 3. Minimum 12 gage reinforcement for other hardware.
  - 4. Weld 14 gage steel tongues, 1-1/2 inches high, inside lock mortise to keep lock body centered in door.
  - 5. Closer reinforce doors and provide full profile closer reinforcement in frames for full width of opening, whether or not closers are specified.
- D. Finish Hardware Preparation:
  - 1. Factory prepare doors and frames to receive mortised and concealed hardware, including cutouts; reinforcing; drilling and tapping, in accordance with approved Finish Hardware Schedule and templates furnished by hardware manufacturers.
  - 2. Factory reinforced doors and frames to receive surface applied hardware. Drill and tap for surface applied hardware at project site.
- E. Finish Hardware Locations: Locate hardware reinforcements and mortises so hardware locations comply with requirements of HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames", and as follows:
  - 1. Knobs, Levers, Crescents : Centerline 3'2" from finished floor.
  - 2. Mortise Deadlocks: Centerline not to exceed 48" above finished floor.

- F. Clearances: Fabricate doors for their respective frames within the following clearances:
  - 1. Jamb and Head: 3/32 to 1/8 inch.
  - 2. Meeting Edges of Pairs: 1/8 to 3/16 inch.
  - 3. Bottom (no threshold): 3/4 inch, maximum to finished surface.
  - 4. Bottom (at threshold): 3/8 inch, maximum to top of threshold or carpet.
  - 5. Fire Rated Doors: Comply with clearances specified in NFPA Standard No.80.
  - 6. Measure door clearances from stile edge to jamb.
- G. Factory Prime Painting:
  - 1. Chemically wash, rinse, and dry exposed and concealed surfaces of fabricated units.
  - 2. Apply one coat of primer with vinyl binder to surfaces and oven-bake units.
  - 3. Units shall be capable of passing the following tests:
    - a. Salt Spray Test complying with ASTM B 117-97 for 120 continuous hours.
    - b. Water Fog Test complying with ASTM D 1735-97 for 240 continuous hours.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Examine substrates, areas and conditions, with installer present under which frames are to be installed for defects that will adversely affect execution and quality of Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.02 PREPARATION

- A. Prior to installation adjust and securely brace door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16", measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 inch, measured at jamb face on a perpendicular line from head to floor.
- B. Drill and tap doors and frames to receive non-templated mortised and surface mounted hardware.

### 3.03 INSTALLATION

- A. General: Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
  - 1. Frames: Install frame of size and profile indicated. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set.
    - a) Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - b) Check plumb, squareness, and twist of frames as walls are constructed. Adjust as necessary to comply with installation tolerances.
  - 2. Installation Tolerances: Adjust door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a) Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b) Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c) Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d) Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

### 3.04 ADJUSTING AND CLEANING

- A. Final Adjustments:
  - 1. Check and readjust operating hardware items immediately before final inspection.
  - 2. Leave work in complete and proper operating condition.
  - 3. Remove and replace defective work including doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean foreign materials off steel doors and frames immediately after installation.

### 3.05 FINAL INSPECTION

- A. Upon completion of the project, schedule a final inspection to verify doors and frames are properly installed and adjusted. The contractor, door and frame installer, and design representative will attend.
- B. Upon verification, the design representative will certify in writing components are properly installed and adjusted within referenced tolerances in accordance with this specification. Include this certification in the Close-out Submittals.

++ END OF SECTION ++

## SECTION 08 14 00

### WOOD AND PLASTIC DOORS

#### PART 1 - GENERAL

##### 1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Steel Frames: Section 081102.
- B. Finish Hardware: Section 087100.
- C. Glass and Glazing: Section 088100.
- D. Painting: Section 099101.

##### 1.02 REFERENCES

- A. Standards: Unless otherwise specified, comply with the applicable requirements of the "Architectural Woodwork Standards" (First Edition-2009) (AWS).

##### 1.03 SUBMITTALS

- A. Shop Drawings: Show details, elevation, and construction for each door type, location and installation requirements for Finish Hardware (including cutouts and reinforcements), and accessory items.
  - 1. Include a schedule of doors using the same reference numbers for details and openings as those on the Contract Drawings.
- B. Product Data: Catalog sheets, specifications, and installation instructions for each type door specified.
- C. Quality Control Submittals:
  - 1. Affidavit required under Quality Assurance Article.

##### 1.04 QUALITY ASSURANCE

- A. Certifications: Affidavit by door manufacturer certifying that each door meets the specified requirements and standards.
- B. Fire Rated Doors: Carry metal label, fastened on hinge edge with drive screws, indicating fire class/rating certified by an independent testing agency.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Factory Finished Doors: Deliver doors in factory applied plastic bags or heavy paper protective cartons. Mark packaging with sufficient identification to insure proper door location.
- B. Comply with manufacturer's storage instructions.

## 1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Do not store doors within the building or install doors until after completion of cast-in-place concrete, masonry, plastering, gypsum board and tile Work, and until after the building has dried out.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Lumber: Comply with applicable AWS species requirements for door type and grade.
  - 1. Exposed Surfaces: As indicated on the Drawings or specified. Furnish matching exposed surface material on both faces and both edges of each door unless otherwise indicated.
  - 2. Fire Rated Doors: Exposed faces to match non-fire rated doors in same building area.
- B. Wood Veneers: Comply with applicable AWS species requirements for door type and grade.
- C. Glue: Type I waterproof adhesives for bonding faces and crossbands to core, for both exterior and interior door fabrication.
- D. Metal Louvers:
  - 1. Steel: 20 gage minimum; galvanized and factory primed for paint finish.
  - 2. Natural Anodized Aluminum: Extruded aluminum, with natural anodized finish complying with NAAMM AA-C22A31 (0.4 mil minimum thickness).
  - 3. Color Anodized Aluminum: Extruded aluminum, with color anodized finish complying with NAAMM AA-C22A32 (0.4 mil minimum thickness). Color as selected.
- E. Fire Rated Louvers: Door manufacturer's listed, fusible link, self-closing type.

## 2.02 FABRICATION

- A. Interior Flush Wood Doors (Non-Fire Rated): 2 or 3 ply face panel construction each side over a solid glued wood block (stave) core edge bonded to stiles and rails, complying with AWS SLC-5 or SLC-7; or 2 or 3 ply face panel construction each side over a solid wood particleboard core edge bonded to stiles and rails, complying with AWS PC-5 or PC-7.
  - 1. Exposed Surfaces for Transparent Finish: AWS Premium Grade, rotary cut, matched, natural oak veneer face panels.
  
- B. Interior Flush Wood Doors (3/4, 1, and 1-1/2 Hour Fire Rated): 2 or 3 ply face panel construction each side over fire rated solid mineral core, with hinge stile construction having equivalent stile edge split resistance and screw withdrawal resistance of one inch thick wood, and complying with applicable AWS FD for the indicated fire rating.
  - 1. Exposed Surfaces for Transparent Finish: AWS Premium Grade, rotary cut, matched, natural birch veneer face panels.
  
- C. Light and Louver Openings: Fully trimmed openings. Comply with the applicable provisions of the referenced standards for core treatment and stop application.
  - 1. Light Openings For Non-Fire Rated Doors: Factory cut openings. Trim openings with solid wood moldings.
  - 2. Light Openings For Fire Rated Doors: Factory cut and trim openings to comply with applicable codes.
  - 3. Louver Openings For Non-Fire Rated Doors: Factory cut openings for louvers specified. Factory install louvers and trim in prepared openings.
  - 4. Louver Openings For Fire Rated Doors: Cut openings and install louvers at the factory to comply with applicable codes.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Condition doors to average prevailing humidity in installation area prior to hanging.
  
- B. Prepare doors to receive scheduled mortise hardware. Coordinate doors with the finish hardware schedule and with the door frame shop drawings for proper location of mortise hardware. Machine doors for hardware.
  
- C. Touch-up cut surfaces of factory primed doors with primer compatible with primer specified for factory priming.

### 3.02 INSTALLATION

- A. Install the Work of this Section in accordance with manufacturer's printed installation instructions, except as shown or specified otherwise.
- B. Fit doors to prepared frames for proper fit. Allow 3/32 to 1/8 inch clearance at head and both jambs. Trim doors when necessary by planing. Slightly chamfer edge of lock stiles. Bevel lock stile as follows:
  - 1. Non-fire Rated Doors: 1/8 inch in 2 inches.
  - 2. Fire Rated Doors: 1/16 inch in 2 inches.
- C. Fire Rated Doors: Install doors in corresponding fire rated frames in accordance with the requirements of NFPA No. 80.

++ END OF SECTION ++



## SECTION 08 16 13

### FIBERGLASS REINFORCED PLASTIC (FRP) DOORS AND FIBERGLASS RESIN TRANSFER MOLDED DOOR FRAMES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes the following:
1. Fiberglass Reinforced Plastic (FRP) Doors
  2. Fiberglass Resin Transfer Molded Door Frames

##### 1.02 QUALITY ASSURANCE

A. Reference Standards

1. Door Properties

- a. Standard test method for steady state thermal transmission properties by means of the heat flow meter apparatus.
- b. Successfully completed 1,000,000 cycles test in accordance with:
  - 1) AAMA 920-03 – Specification for Operating Cycle Performance of Side-Hinged Exterior Door Systems.
  - 2) ANSI A250.4-2001 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings
- c. Additional Testing
  - 1) SFBC 3603.2 Forced Entry Test
  - 2) ASTM E 1886 Performance of Exterior Protective Systems
  - 3) ASTM E 1996 Impact Performance of Exterior Protective Systems
  - 4) ASTM C 518 Heat Transfer Properties of Materials
  - 5) ASTM D 1761 Mechanical Properties of Fasteners

2. Laminate Properties

Door face plate is a minimum of 0.125 inch thick fiberglass reinforced plastic molded into one continuous sheet starting with a 25 mil resin gelcoat layer resin integrally molded with multiple layers of 1.5 oz. sq. ft. fiberglass mat and one layer of 18 oz. per square yard fiberglass woven roving saturated with special resin. Door plate weight shall not be less than 0.97 lbs. per square foot at a ratio of 30/70 glass resin.

- a. ASTM D 638 Tensile Strength Properties of Plastics
- b. ASTM D 790 Flexural Strength Properties of Plastics
- c. ASTM D 2583 Indention Hardness of Plastics
- d. ASTM D 256 Izod Pendulum Impact Resistance
- e. ASTM D 792 Density/Specific Gravity of Plastics

- f. ASTM D 1761 Mechanical Properties of Fasteners
  - g. ASTM E 84 Surface Burning Characteristics of Materials
  - h. ASTM G 155 Xenon Light Exposure of Non Metallic Materials
  - i. ATSM D 635 Method For Rate of Burning
  - j. ASTM D 2843 Smoke Density
  - k. ASTM D 1929 Self Ignition Temperature Properties
  - l. SFBC PA 201 Impact Procedures for Large Missile Impact
3. Core Properties
- a. ASTM C 177 Thermal Properties of Materials
  - b. ASTM D 1622 Density and Specific Gravity
  - c. ASTM E 84 Surface Burning Characteristics of Materials
  - d. WDMA TM-10 and TM-5 Firestop ASTM E 152 U.L 10(b)
  - e. ASTM E90-04- Sound Transmission Loss
  - f. ASTM E413-04 Classification for Rating Sound Insulation
  - g. ASTM E1332-90 Standard Classification for Determination of Outdoor-Indoor Transmission Class
  - h. ASTM E2235-04 Standard Test for Determination of Decay Rates for Use in Sound Insulation Methods

B. Qualifications

1. Manufacturer Qualifications: A company specialized in the manufacture of fiberglass reinforced plastic (FRP) doors and frames as specified herein with a minimum of 30 years documented experience and with a record of successful in-service performance for the applications as required for this project.
2. Installer Qualifications: An experienced installer who has completed fiberglass door and frame installations similar in material, design, and extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.
3. Source limitations: Obtain fiberglass reinforced plastic doors and resin transfer molded fiberglass frames through one source fabricated from a single manufacturer, including fire rated fiberglass frames.
4. Source limitations: Hardware and accessories for all FRP doors as specified in Section 087100 shall be provided and installed by the fiberglass door and frame manufacturer.
5. Source Limitations: Glass for windows in doors shall be furnished and installed by door and frame manufacturer in accordance with related section, Division 8, Glazing.

1.03 SUBMITTALS

A. Product Technical Data Including:

1. Acknowledgment that products submitted meet requirements of standards referenced.

2. Manufacturer shall provide certificate of compliance with current local and federal regulations as it applies to the manufacturing process.
  3. Manufacturer's installation instructions.
  4. Schedule of doors and frames indicating the specific reference numbers used on the owner's project documents, noting door type, frame type, size, handing and applicable hardware.
  5. Details of core and edge construction, including factory construction specifications.
  6. Certification of manufacturer's qualifications.
- B. Submittal Drawings for Customer Approval shall be Submitted Prior to Manufacture and will include the following information and formatting:
1. Summary door schedule indicating the specific reference numbers as used on owner's drawings, with columns noting door type, frame type, size, handing, accessories and hardware.
  2. A drawing depicting front and rear door elevations showing hardware with bill of material for each door.
  3. Drawing showing dimensional location of each hardware item and size of each door.
  4. Individual part drawing and specifications for each hardware item and FRP part or product.
  5. Construction and mounting detail for each frame type
- C. Samples:
1. Provide one complete manufactured door sample which represents all aspects of the typical manufacturing process, including molded in gelcoat color and face plate construction. One edge should expose the interior of the door depicting the unique u-shaped continuous piece stile and rail, hardware reinforcement and core material. Custom color to be selected
- D. Operation and Maintenance Manual
1. Include recommended methods and frequency for maintaining optimum condition of fiberglass doors and frames under anticipated traffic and use condition.
  2. Include one set of final as built drawings with the same requirements as mentioned in Section B above.
  3. Include certificate of warranty for door and frame listing specific door registration numbers.
  4. Include hardware data sheets and hardware manufacturer's warranties.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Each door and frame shall be delivered individually crated for protection from damage in cardboard containers, clearly marked with project information, door location, specific reference number as shown on drawings, and shipping information. Each crate shall contain all fasteners necessary for installation as well as complete installation instructions.
  - 1. Doors shall be stored in the original container on edge, out of inclement weather for protection against the elements.
  - 2. Handle doors pursuant to the manufacturer's recommendations as posted on outside of crate.

#### 1.05 WARRANTY

- A. Warranty all fiberglass doors and frames for a period of 25 years against failure due to corrosion. Additionally, warranty all fiberglass doors and frames on materials and workmanship for a period of 10 years, including warp, separation or delamination, and expansion of the core.
- B. On site assistance available.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Chem-Pruf
  - 2. Edgewater FRP Doors
  - 3. Simon FRP Door
  - 4. Metropolitan Door Industries
  - 5. Chase Doors
- B. FRP Doors:
- C. Doors shall be made of fiberglass reinforced plastic (FRP) using Class 1 premium resin with no fillers that is specifically tailored to resist chemicals and contaminants. Doors shall be 1 ¾ inch thick and of flush construction, having no seams or cracks. All doors up to 4'0 x 8'0 shall have equal diagonal measurements. All fiberglass components including face plates, stiles and rails and frames must be fabricated by the same manufacturer.

- D. Door Plates shall be 0.125 inch thick minimum, molded in one continuous piece, starting with 25 mil gelcoat of the color specified, integrally molded with multiple layers of 1.5 ounces per square foot fiberglass mat and one layer of 18 ounce per square yard fiberglass woven roving. Each layer shall be individually laminated with resin as mentioned above. Door plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass to resin.
- E. Stiles and Rails shall be constructed starting from the outside toward the inside, with a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door. There will be no miter joints and disparate materials used to form the one-piece stile and rail.
- F. Core material to be:
  - 1. Polypropylene plastic honeycomb core with a non-woven polyester veil for unparalleled plate bonding, 180 PSI typical compression range.
- G. Internal Reinforcement shall be a dense matrix of cloth glass fibers and premium resin with a minimum hinge screw holding value of 1000 lbs per screw.
- H. Finish of door frame to be 25 mil resin gelcoat of the specified color integrally molded in at time of manufacture resulting in a fine pebble finish that is dense and non-porous. Gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Paint and/or post application of gelcoat will be deemed unacceptable. The finish of the door and frame must be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength. Color and gloss finish to be selected/ provide for custom color doors and frames
- I. Window openings shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment. Fiberglass retainers, which hold the glass in place shall be resin transfer molded with a profile that drains away from glazing. The window and window retainer must match in color and finish with 25 mil of resin-rich gelcoat integrally molded at time of manufacture. Mechanical fasteners shall not be used to attach retainers. Glass, as specified herein, shall be furnished and installed by door and frame manufacturer. Window retainers fabricated from Metal, PVC or Vinyl will not be accepted.
- J. Louver openings shall be completely sealed so that the interior of the door is not exposed to the environment. Louvers are to be solid fiberglass "V" Vanes and shall match the color and finish of the door plates.

## 2.02 FRP FRAMES

- A. Frames shall be fiberglass and manufactured using a resin transfer method creating one solid piece uniformity in color and size. Beginning with a minimum 25 mil gelcoat layer molded in and a minimum of two layers of continuous strand fiberglass mat saturated with resin, the frame will be of one-piece construction with molded stop. All frame profiles shall have a core material of 2 psf polyurethane foam. Metal frames or pultruded fiberglass frames will not be accepted.
- B. Finish of frame shall be identical to the door with 25 mil resin- gelcoat of the specified color integrally molded in at time of manufacture. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Paint and/or post application of gelcoat will be deemed unacceptable. The finish of the door and frame must be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength.
- C. Jamb/Header connection shall be mitered for tight fit.
- D. Internal Reinforcement shall be continuous within the structure to allow for mounting of specified hardware. Reinforcing material shall be a dense matrix of cloth glass fibers and premium resin with a minimum hinge screw holding value of 1000 lbs per screw. All reinforcing materials shall be completely encapsulated. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.
- E. Mortises for hardware shall be accurately machined to hold dimensions to +/- 0.010 inch in all three axis.

## PART 3 - EXECUTION

### 3.01 INSTALLATION CONDITIONS

- A. Verification of Conditions
  1. Verify openings are correctly prepared to receive doors and frames.
  2. Verify openings are correct size and depth in accordance with submittal drawings.
- B. Installer's Examination
  1. Door installer shall examine conditions under which construction activities of this section are to be performed and submit a written report to general contractor if conditions are unacceptable.

2. General Contractor shall submit two copies of the installer's report to the architect within 24 hours of receipt.
3. Installer shall not proceed with installation until all unacceptable conditions have been corrected.

### 3.02 INSTALLATION

- A. Door shall be delivered at job site individually crated. Each crate to be clearly marked with the specific opening information for quick and easy identification.
- B. All single doors to be shipped completely assembled in the frame with hardware installed. Double doors to be pre-hung at the factory to ensure a proper fit and hardware functions properly, then broken down for shipping purposes. Install door opening assemblies in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.
- C. Field alteration of doors or frames to accommodate field conditions is strictly prohibited.
- D. Site tolerances: Maintain plumb and level tolerance specified in manufacturer's printed installation instructions.

### 3.03 ADJUSTING

- A. Adjust doors in accordance with the door manufacturer's maintenance instructions to swing open and shut without binding and to remain in place at any angle without being moved by gravitational influence.
- B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instruction.

### 3.04 CLEANING

- A. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer's maintenance instructions.

### 3.05 PROTECTION OF INSTALLED PRODUCTS

- A. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

++ END OF SECTION ++

## SECTION 08 31 13

### ACCESS DOORS AND FRAMES

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Section includes: nonrated floor hatches with frames.
- B. Related Work specified elsewhere:
  - 1. Section 03 30 00, Cast-in-Place Concrete.
  - 2. Section 09 90 00, Painting.

##### 1.02 REFERENCE STANDARDS

- A. ASTM International (ASTM):
  - 1. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 2. ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 3. ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 4. ASTM A879, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
  - 5. ASTM A1008, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
  - 6. ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 7. ASTM F2329, Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- B. National Fire Protection Association (NFPA):
  - 1. NFPA 80, Standard for Fire Doors and Other Opening Protectives.
  - 2. NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
  - 3. NFPA 288, Standard Methods of Fire Tests of Horizontal Fire Door Assemblies Installed in Horizontal Fire Resistance-Rated Assemblies.
- C. Underwriters Laboratories, Inc. (UL):
  - 1. UL 10B, Standard for Fire Tests of Door Assemblies.
  - 2. UL 263, Standard for Fire Tests of Building Construction and Materials.



### 1.03 SUBMITTALS

- A. Comply with Section 01 33 00, Submittal Procedures.
- B. Action submittals:
  - 1. Product Data: Submit manufacturer's information indicating sizes, types, finishes, hardware, scheduled locations, fire resistances, and details of adjoining Work.
  - 2. Shop Drawings: Indicate exact position of access door units and any special installation conditions.
- C. Informational submittals:
  - 1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
  - 2. Manufacturer Instructions: Submit installation requirements and rough-in dimensions.

### 1.04 CLOSEOUT SUBMITTALS

- A. Comply with Section 01 77 00, Closeout Procedures.
- B. Comply with Section 01 78 23, Operation and Maintenance Data.
- C. Project Record Documents: Record actual locations of access units.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 61 00, Common Product Requirements.
- B. Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

## PART 2 – PRODUCTS

### 2.01 FLOOR HATCHES

- A. Load capacity: 300 psf, with maximum deflection of 1/150th of span.

- B. Size: as shown on the Drawings.
- C. Component fabrication:
  - 1. Access door leaf(s): 1/4-inch thick aluminum diamond pattern plate.
  - 2. Provide stainless steel safety change and attachments for end of double-leaf door assembly when open.
  - 3. Angle frame: 1/4-inch thick extruded aluminum angle frame with concrete anchors and integral neoprene gasket strip.
- D. Door hardware:
  - 1. Hinges: heavy-duty brass or stainless steel with stainless steel pins, through-bolted to cover plate with tamper-proof stainless steel bolts flush with top cover and to the outside leg of the channel frame with stainless steel bolts and locknuts.
  - 2. Lifting mechanism: stainless steel compression lift springs enclosed in telescoping vertical housing or stainless steel torsion lift springs.
  - 3. Hold-open arm:
    - a. Locks automatically in open position.
    - b. Disengages with slight pull on vinyl grip with one hand.
    - c. Door can be easily closed with one hand by pulling forward and down in vinyl grip.
  - 4. Snap lock:
    - a. Stainless steel snap lock mounted on bottom of door leaf with removable topside key wrench and inside fixed lever handle.
    - b. Threaded plug for flush outside surface with key wrench removed.
- E. Aluminum shall be mill-finished with protective coating applied to surfaces in contact with concrete, as specified in Section 09 90 00, Painting.
- F. Manufacturers and Products:
  - 1. Halliday Products.
  - 2. Bilco.
  - 3. EJ Group, Inc.
  - 4. U.S.F. Fabrications.
  - 4. Or approved equal

## PART 3 – EXECUTION

### 3.01 EXAMINATION AND VERIFICATION OF CONDITION

- A. Verify that rough openings for access doors and panels are correctly sized and located.

### 3.02 INSTALLATION

- A. Secure frames rigidly in place, plumb, and level in opening.
- B. Adjacent Surfaces:
  - 1. Align plane of door and panel face with adjacent finished surfaces.
  - 2. Set concealed-frame type units flush with adjacent finished surfaces.
  - 3. Position unit to provide convenient access to concealed Work.
- C. Verify hatches swing freely and all rack and warp that may be present.
- D. Adjust hatches and strike plates to ensure secure closure and closed hatches are free from rocking and otherwise do not create trip or other hazards.

+ + END OF SECTION + +

## SECTION 08 33 10

### OVERHEAD COILING DOORS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Specifications and Special Project Conditions apply to this Section.

##### 1.02 SUMMARY

- A. This Section includes the following types of overhead coiling doors:
  - 1. Insulated overhead coiling service doors.
- B. Related Sections include the following:
  - 1. Section 08711 - Door Hardware
  - 2. Section 09900 - Field Painting
  - 3. Section 16120 - Conductors
  - 4. Section 16442 - Disconnect and Safety Switches

##### 1.03 DEFINITIONS

- A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

##### 1.04 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
  - 1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
- B. Operation-Cycle Requirements: Design overhead coiling door components and operator to operate for not less than 10,000 cycles.

## 1.05 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:
  - 1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
  - 2. Summary of forces and loads on walls and jambs.
  - 3. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.
  - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied finishes include all standard and custom colors available for selection.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

## 1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.
  - 1. Obtain operators and controls from the overhead coiling door manufacturer.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Cornell Iron Works Inc.
2. Raynor Garage Doors.
3. Wayne-Dalton Corp.

## 2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. 18 Gauge Galvanized Door Slats- prime finish. Final finish at exterior door slats to be galvanized steel with baked enamel finish.
    - a. Provide manufacturer's standard flat-profile slats.
  2. Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indices of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces.
  3. Interior Curtain Slat Face: To be 22 gauge stainless steel:
    - a. Stainless Steel Sheet Thickness: Same thickness as outside aluminum curtain face slat.
  4. All interior components to be stainless steel or otherwise indicated in the specification. The exterior door slats to be galvanized steel with a baked enamel finish.
- B. Endlocks: Malleable-iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets, or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Windlocks: Malleable-iron castings secured to curtain slats with galvanized rivets or high-strength nylon, as required to comply with wind load.
- D. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, stainless steel to suit type of curtain slats.
1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene, between angles or fitted to shape, as a cushion bumper for interior door.
  2. Provide motor-operated doors with combination bottom astragal and sensor edge.
- E. Curtain Jamb Guides: Fabricate curtain jamb guides of steel angles, or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain

to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch- (5-mm-) thick, stainless steel sections complying with ASTM A 36 (ASTM A 36M), and ASTM A 123. Slot boltholes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain and a continuous bar for holding windlocks.

## 2.03 HOODS AND ACCESSORIES

- A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weatherseal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
  - 1. Include automatic drop baffle to guard against passage of smoke or flame.
  - 2. Fabricate stainless steel hood recommended by producer and finisher for type of use and finish indicated, and not less than 0.032 inch (0.8 mm) thick, for stainless steel doors.
  - 3. Shape: Round.
- B. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and at top of exterior doors, unless otherwise indicated. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of curtain coil hood.
  - 1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.
  - 2. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.
- C. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
  - 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- D. Where door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

## 2.04 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.05 FINISHES

- A. Baked Enamel Finish: Apply manufacturer's standard baked enamel finish consisting of primer and topcoat(s) according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.
  - 1. Color and Gloss: Match Architect's sample.

## 2.06 ELECTRIC DOOR OPERATORS

- A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operational life specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
- B. Comply with NFPA 70.
- C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.
- F. Door-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft, gear-head-type door operator unit consisting of electric motor, enclosed worm-gear running-in-oil primary drive, chain and sprocket secondary drive, and quick disconnect-release for manual operation.



- G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps (0.2 m/s) or more than 1 fps (0.3 m/s), without exceeding nameplate ratings or considering service factor.
1. Type: Polyphase, medium-induction type.
  2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
  3. Units shall accept 480- volt, 3 phase incoming power. Provide control power transformers for control power.
  4. Provide totally enclosed, non-ventilated or fan-cooled motors, fitted with plugged drain, and controller with NEMA ICS 6, Type 4 enclosure where indicated, NEMA 7 in hazardous areas.
- H. Remote-Control Station: Provide momentary-contact, 3-button control station with push-button controls labeled "Open," "Close," and "Stop."
1. Provide exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
  2. NEMA Type 7 for all hazardous areas indicated.
  3. NEMA Type 4X, non-metallic for corrosive areas.
- I. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor able to protect full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
    - a. Self-Monitoring Type: Provide self-monitoring sensor designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door operates to close only with constant pressure on close button.
  2. Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
    - a. Provide electrically actuated automatic bottom bar.
      - 1) Self-Monitoring Type: Provide self-monitoring, 4-wire configured device.
- J. Limit Switches: Limit switches shall be provided with auxiliary contacts, normally closed when the overhead door is closed. These contacts shall be pre-wired to a terminal grip inside the manufacturer's provided motor control for remote indication of door position.

- K. Provide electric operators with ADA-compliant audible alarm and visual indicator lights.
- L. Motor, limit switches, control panels and disconnects shall be suitably rated for use in Class I, Division I, Group D hazardous areas where indicated in areas noted as such on the contract drawings.
- M. Control panels and other equipment enclosures shall be constructed on non-metallic, non-corrosive materials where indicated in corrosive areas on the contract drawings.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.

### 3.02 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

### 3.03 DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:
  1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    - a. Test door closing when activated by detector or alarm connected fire-release system. Reset door-closing mechanism after successful test.
  2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.
  3. Review data in the maintenance manuals.
  4. Review data in the maintenance manuals.
  5. Schedule training with Owner with at least 7 days' advance notice.

++ END OF SECTION ++

## SECTION 08 45 23

### INSULATED TRANSLUCENT FIBERGLASS SANDWICH PANEL WALL

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section includes the insulated translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
  - 1. Thermally broken factory prefabricated structural insulated translucent sandwich panels.
  - 2. Aluminum installation system
  - 3. Aluminum sill flashing

##### 1.02 SUBMITTALS

- A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.
- B. Submit shop drawings. Include elevations and details.
- C. Submit manufacturer's color charts showing the full range of colors available for factory finished aluminum.
  - 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
    - a. Sandwich panels: 14" x 28" units
    - b. Factory finished aluminum: 5" long sections
- D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
  - 1. Reports required are:
    - a. International Code Council Evaluation Report
    - b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
    - c. Burn Extent (ASTM D 635)

- d. Color Difference (ASTM D 2244)
- e. Impact Strength (UL 972)
- f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
- g. Bond Shear Strength (ASTM D 1002)
- h. Beam Bending Strength (ASTM E 72)
- i. Insulation U-Factor (NFRC 100)
- j. NFRC System U-Factor Certification (NFRC 700)
- k. Solar Heat Gain Coefficient (NFRC or Calculations)
- l. Condensation Resistance Factor (AAMA 1503)
- m. Air Leakage (ASTM E 283)
- n. Structural Performance (ASTM E 330)
- o. Water Penetration (ASTM E 331)
- p. 1200°F Fire Resistance (SWRI)

### 1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
  - 1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
  - 2. Panel system must be listed by the International Code Council – Evaluation Service which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an approved agency.
  - 3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC04 “Sandwich Panels” AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as regulated by the ICC-ES.
- B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.
- C. Performance Requirements: The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.
  - 1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 2. Standard panel system shall have less than 0.01cfm/ft<sup>2</sup> air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and, structural testing by ASTM E 330.

3. Structural Loads: Provide system capable of handling the following loads:
  - a. Positive Wind Load: 20 PSF
  - b. Negative Wind Load: 42PSF

#### 1.04 DELIVERY STORAGE AND HANDLING

- A. Deliver panel system, components and materials in manufacturer's standard protective packaging.
- B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

#### 1.05 WARRANTY

- A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering and defects in accessories, insulated translucent sandwich panels and other components of the work.
- B. Extended Warranty : 5 years.

### PART 2 – PRODUCTS

#### 2.01 MANUFACTURER

- A. The basis for this specification is for products manufactured by Kalwall Corporation, or equal. Kalwall Corporation.
- B. Structures Unlimited Inc.
- C. Daylight Solutions

#### 2.02 PANEL COMPONENTS

- A. Face Sheets
  1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
    - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
    - b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
  2. Interior face sheets:

- a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 25 and smoke developed no greater than 250 when tested in accordance with UL 723.
  - b. Burn extent by ASTM D 635 shall be no greater than 1”.
  - 3. Exterior face sheets:
    - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5 degrees facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
    - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4” diameter, 5 lb. free-falling ball per UL 972.
  - 4. Appearance:
    - a. Exterior face sheets: Smooth, 0.70 thick and manufacturer’s full range of colors
    - b. Interior face sheets: Smooth, 0.45 thick and White or Crystal in color.
    - c. Face sheets shall not vary more than +/- 10% in thickness and be uniform in color.
- B. Grid Core
- 1. Thermally broken I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I- beam shall be no less than 7/16”.
  - 2. I-beam Thermal break: Minimum 1”, thermoset fiberglass composite.
- C. Laminate Adhesive
- 1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council “Acceptance Criteria for Sandwich Panel Adhesives.”
  - 2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
  - 3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
    - a. 50% Relative Humidity at 68° F: 540 PSI
    - b. 182° F: 100 PSI
    - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
    - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

## 2.03 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking thermally I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
  - 1. Thickness: 2-3/4"
  - 2. Light transmission: TBD%.
  - 3. Solar heat gain coefficient TBD.
  - 4. Panel U -factor by NFRC certified laboratory: .23 thermally broken grid
  - 5. Complete insulated panel system shall have NFRC certified U- factor of .29
  - 6. Grid pattern: Wall panels per architectural drawings.
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72. Maximum deflection over area is L/60.
- C. Standard panels shall withstand 1200°F fire for minimum one hour without collapse or exterior flaming.
- D. Thermally broken panels:
  - 1. Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

#### 2.04 BATTENS AND PERIMETER CLOSURE SYSTEM

- A. Closure system: Thermally broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- D. Finish
  - 1. Manufacturer's factory applied finish which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards and custom colors.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, supporting structure and installation conditions. Do not proceed with panel erection until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION:

- A. Metal Protection:
  - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
  - 2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

### 3.03 INSTALLATION:

- A. Install the panel system in accordance with the manufacturer's installation recommendations and approved shop drawings.
  - 1. Anchor component parts securely in place by permanent mechanical attachment system.
  - 2. Accommodate thermal and mechanical movements.
  - 3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.
- B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

### 3.04 CLEANING:

- A. Clean the panel system inside and outside, immediately after installation, according to manufacturer's written recommendations

++ END OF SECTION ++



## SECTION 08 51 13

### ALUMINUM WINDOWS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all aluminum windows Work.
2. Extent of the aluminum windows is shown and specified.
  - a. Custom High Performance Insulated Thermal-Barrier Aluminum Windows:
    - 1) Fixed aluminum windows.
    - 2) Gaskets, pressure plates and snap covers in conjunction with each of the above components.
    - 3) Hardware and miscellaneous materials.
    - 4) Anchors, inserts, support brackets, expansion devices, fasteners, flashings, weeps, and similar elements in conjunction with each of the above components.

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the aluminum windows Work.
2. Notify other contractors in advance of the installation of the aluminum windows to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the aluminum windows Work.

###### C. Related Sections:

1. Section 08 81 00, Glass Glazing.

##### 1.02 REFERENCES

###### A. Standards referenced in this Section are listed below:

1. American Architectural Manufacturer's Association, (AAMA).
  - a. AAMA 101, Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Doors.
  - b. AAMA 302.8, Specification for Aluminum Windows.
  - c. AAMA GS-001, Guide Specifications for Aluminum Architectural Windows.
2. American Society for Testing and Materials, (ASTM).
  - a. ASTM B 117, Practice for Operating Salt Spray (Fog) Apparatus.

- b. ASTM D 2247, Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
  - c. ASTM D 4214, Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
  - d. ASTM E 283, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
  - e. ASTM E 330, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
  - f. ASTM E 331, Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
- 3. National Association of Architectural Metal Manufacturers, (NAAMM).
    - a. NAAMM Metal Finishes Manual for Architectural and Metal Products.
  - 4. NYS Building Code

### 1.03 QUALITY ASSURANCE

#### A. Manufacturer's Qualifications:

- 1. Manufacturer shall have a minimum of five years of experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

#### B. Installer's Qualifications:

- 1. Installer shall be certified by the manufacturer of the aluminum windows to install the product accepted for this Project. Installer shall provide evidence of at least five years installing similar product to the product accepted for this Project as well as at least three references for projects where the exact product accepted for this Project has been successfully installed.
- 2. Submit name and qualifications of the installer to the ENGINEER.

#### C. Component Supply and Compatibility:

- 1. Obtain all products included in this Section regardless of the component manufacturer from a single aluminum window manufacturer.
- 2. The aluminum window manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
- 3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the aluminum window manufacturer.

## 1.04 SUBMITTALS

### A. Action Submittals: Submit the following:

#### 1. Shop Drawings:

- a. Fabrication and installation of aluminum window units and associated components of the Work. Include wall elevations at 1/4-inch scale, typical unit elevations at 1-inch scale and full-size detail sections of every typical composite member. Show anchors, hardware, operators and other components not included in manufacturer's standard data, including glazing details. Indicate clearly on the Shop Drawings, all deviations from Contract Documents.
2. Product Data:
  - a. Copies of manufacturer's specifications, recommendations and standard details for aluminum window units, including fabrication, finishing, hardware and other components of the Work. Include certified test laboratory reports as necessary to show compliance with the requirements.
  - b. Copies of manufacturers' specifications and installation instructions for required materials and components, which are not included in the other submittals, specified in other Sections of these Specifications. Coordinate the submittal of such other data with this submittal, and with the submittal of samples required by other Sections.

### B. Informational Submittals: Submit the following:

1. Test and Evaluation Reports: Certified laboratory test reports for required performance tests.
2. Qualification Statements:
  - a. Installer

### C. Closeout Submittals: Submit the following:

1. Operations and Maintenance Documentation: Upon completion of the Work, furnish five copies of detailed maintenance manual including the following information:
  - a. Product name and number.
  - b. Name, address, e-mail address and telephone number of manufacturer and local distributor.
  - c. Detailed procedures for routine maintenance and cleaning.
  - d. Detailed procedures for light repairs such as dents, scratches and staining.

## 1.05 DELIVERY, STORAGE AND HANDLING

### A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.01 EQUIPMENT PERFORMANCE

A. Design Criteria:

1. Except as otherwise shown or specified, the requirements for aluminum windows, and the terminology and standards of performance and fabrication workmanship, are those specified and recommended in AAMA 101, and the applicable general recommendations published by Architectural Aluminum Manufacturer's Association, National Association of Architectural Metal Manufacturers and Aluminum Association.
2. All custom and standard features and finishes offered by the named manufacturers shall be made available to ENGINEER from any "or equal" manufacturer submitted by CONTRACTOR.
3. Custom High Performance Insulated Thermal-Barrier Aluminum Windows:
  - a. Performance and Testing: Except as otherwise specified, comply with the air infiltration tests, water resistance tests and applicable load tests specified in AAMA 101 for the type and classification of aluminum window units required in each case.
  - b. Comply with Architectural Performance Class and Section 4 "Optional Performance Grades" of AAMA 101 Group II-Compression Seal Window Products AP-AW50, Architectural.
  - c. Design Pressure:
    - 1) Provide uniform structural test pressure of 75 pounds per square foot.
    - 2) Air Infiltration Test, ASTM E 283: Maximum infiltration 0.065 cubic feet per minute per linear foot of operating ventilator when tested at 6.24 pounds per square foot differential pressure.
    - 3) Water Penetration Test, ASTM E 331: No water penetration for 15 minutes when window is subjected to rate of flow of five gallons per hour per square foot with differential pressure across window unit of ten pounds per square foot.

- 4) Wind Load Test, ASTM E 330: Minimum 50 pounds per square foot positive and negative load for ten seconds. Maximum deformation of frame or sash member L/175 of span length.
- d. Testing: Wherever manufacturer's standard window units comply with the requirements and have been tested in accordance with the specified tests, provide certification by the manufacturer of compliance with such tests; otherwise, perform the required tests through a recognized testing laboratory or agency and provide certified test results.
- e. Provide aluminum window system, and insulated project-in windows to withstand thermal expansion and contraction movements. Limit the deflection as for wind pressure loading. Thermal movements shall not cause permanent deformation, cracking, opening of joints, undue stress on fasteners, or other effects detrimental to weathering performance.
- f. The design of the aluminum window system as shown and specified is intended to prevent excessive condensation on the indoor faces of the Work, with the heating and ventilating system in operation. Excessive condensation is defined as visible water or frost.
- g. Provide internal drainage to lead all infiltrated water to the exterior through weep slots.

## 2.02 MANUFACTURERS

- A. Manufacturers: Provide products of one of the following:
  - 1. Traco Architectural Systems, Inc.
  - 2. Or equal.

## 2.03 DETAILS OF CONSTRUCTION

- A. Aluminum Extrusions: Alloy and temper, ASTM B 221, 6063-T5 and not less than 1/8-inch thickness at any location for mainframe sash members and tube supports. Support clips as recommended by the window manufacturer.
- B. Thermal Separator: Interior and exterior aluminum frame sections shall be thermally separated by a continuous urethane connector.
- C. Fasteners: Stainless steel, guaranteed by the manufacturer to be non-corrosive and compatible with the aluminum window members, trim, hardware, anchors and other components of the window units.
  - 1. Do not use exposed fasteners, except where unavoidable for the application of hardware. Match the finish of the metal surrounding the fastener, unless otherwise specified.
  - 2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise specified.

D. Glazing Gaskets: Neoprene or EPDM.

E. Glass and Glazing Materials: Refer to Section 08 81 00, Glass Glazing.

#### 2.04 WINDOW OPERATION

A. General: The following paragraph defines the operating arrangement for the required types of sash (ventilators) in window units, and specifies minimum provisions for each type.

1. Fixed window

#### 2.05 WINDOW CLASSIFICATION (GRADE)

A. AP-AW50, Architectural Windows: Provide window units complying with the following:

1. Extruded aluminum-glazing stops of 0.062-inch minimum wall thickness, except 0.050-inch minimum for snap-on type.
2. Hardware and anchors of non-magnetic stainless steel and white bronze.
3. Fabricate units with all main corners and intersections of frame and sash mitered. Provide double tubular frame with hydraulically crimped gusset corner construction. Mortise or cope secondary members to fit, and weld in place with hairline joints.
4. Provide metal thickness as required to withstand performance requirements, but not less than 0.078-inch for frame members.
5. Provide means of drainage for water and condensation, which may accumulate in members of the window units.

#### 2.06 FABRICATION AND ACCESSORIES

A. General: Provide specified manufacturer's standard fabrication and accessories, except to the extent more specific or more stringent requirements are specified. Include complete system for assembly of components and anchorage of window units, and prepare sash for glazing.

B. Sizes and Profiles: The required sizes for window units and the profile requirements are shown. The details shown are based upon standard details by one or more manufacturers. It is intended that similar details by other manufacturers will be acceptable, provided they comply with the size requirements, and with minimum/maximum profile requirements specified.

C. Coordination of Fabrication: Wherever possible check actual window openings in the construction Work by accurate field measurement before fabrication, and show recorded measurements before fabrication, and show recorded measurements on final Shop Drawings. However, coordinate fabrication schedule with construction

progress as directed by CONTRACTOR to avoid delay of the Work. Where necessary, proceed with fabrication without field measurements, and coordinate installation tolerances to ensure proper fit of window units.

## 2.07 ALUMINUM WINDOW FINISHES

- A. Exposed Aluminum Polyvinylidene Fluoride Based Coating: Apply full strength polyvinylidene fluoride based coatings at the factory by coil coating for sheet material and spray coating for extruded or factory-fabricated material.
- B. Color:
  - 1. To be selected

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. CONTRACTOR shall examine the substrate and conditions under which custom aluminum window system Work is to be installed and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected in a manner acceptable to ENGINEER.

### 3.02 INSTALLATION

- A. Comply with manufacturer's specifications, installation manuals and recommendations for the installation of window units, hardware, operators, and other components of the Work.
- B. Erection Tolerances:
  - 1. Limit variations from plumb, level or dimensioned angle to the following:
    - a. 1/8-inch maximum deviation in story height or in 10-foot vertical or angular run, and in 20-foot horizontal runs.
    - b. 1/4-inch maximum deviation in 40 foot runs, all directions.
  - 2. Limit variations from theoretical member locations shown, based on established floor lines and column lines, including variations from plumb and level, to the following:
    - a. 3/8-inch total maximum deviation for members at all locations.
    - b. 1/8-inch maximum change in deviation for members for ten foot runs, all directions.
  - 3. Limit offsets in end-to-end and edge-to-edge alignments of adjoining and consecutive members, which form planes, continuous runs and profiles, to the following:

- a. 1/16-inch maximum offset in flush alignment, including members, which are to be 1/2-inch or less out-of-flush, and including members, which are separated 2-inches or less by a reveal or protrusion in the plane of the aluminum window wall.
  - b. 1/8-inch maximum offset in alignments, which are to be out-of-flush by more than 1/2-inch, or separated by a reveal or protrusion of more than 2- inch width.
- C. Anchor units securely in place. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- D. Refer to Section 07 92 00, Joint Sealants, for compounds, fillers and gaskets to be installed concurrently with window units.
- E. Do not install component parts, which are observed to be defective in any way, including warped, bowed, dented, abraded and broken members, and including glass with edge damage.
- F. Do not cut, or trim, component parts during erection, in a manner, which would damage the finish, decrease the strength, or result in a visual imperfection or a failure in performance of the aluminum window wall. Return component parts, which require alteration to the shop for refabrication, if possible, or for replacement by new parts.
- G. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers. Use erection equipment, which will not mar or stain finished surfaces, and will not damage the component parts.
- H. Apply a bituminous coating of approximately 30-mil dry film thickness, or other suitable permanent separator, on concealed contact surfaces of dissimilar materials before installation, wherever there is the possibility of corrosive or electrolytic action.
- I. Anchor component parts securely in place as shown, by bolting, or other permanent mechanical attachment system, which will comply with performance requirements and permit movements, which are intended or necessary. Install slip-joint linings to ensure movement as intended or necessary.
- J. Clean debris, dust and other substances from behind the aluminum window wall as it is erected, and provide temporary closures if necessary to prevent the accumulation of such substances in the void spaces behind the aluminum window walls.
- K. Install thermal barrier between pressure plate and mullion.



- L. Attach pressure plate with screws. Install snap covers over pressure plates.
- M. Install glazing using dry glazing retainers, which provide a firm but resilient clamping grip on the glazing.
- N. Refer to Section 08 81 00, Glass Glazing, for installation requirements.
- O. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage of the finish. Remove excess glazing and sealant compounds, dirt and other substances. Lubricate hardware and other moving parts.
- P. Advise CONTRACTOR of protective treatment and other precautions required through the remainder of the construction period, to ensure that window units will be without damage or deterioration, other than normal weathering, at the time of Final Completion.
- Q. Maintain the aluminum window wall in a clean condition throughout the construction period, so that it will be without any evidence of deterioration or damage, other than the effects of normal weathering, at the time of Final Completion. Select methods of cleaning which will promote the achievement of uniform appearance and stabilized colors and textures for materials that weather or age with exposure.
- R. CONTRACTOR shall advise ENGINEER, in writing, of protection and surveillance requirements that CONTRACTOR shall provide at no additional cost to the OWNER, to ensure that the aluminum windows Work will be without deterioration or damage at the time of Final Completion by OWNER.
- S. Remove and replace with new material aluminum window components, which have been damaged, including finish, beyond successful repair, as directed by ENGINEER. Repair minor damage.
- T. Immediately before the time of Final Completion, clean the aluminum windows thoroughly, inside and out. Demonstrate proper cleaning methods to OWNER'S maintenance personnel during this final cleaning.
- U. At the completion of the Work, clean or replace adjacent work, marred by the Work of this Section.
- V. Remove all materials and debris and leave the Site of the Work in clean condition.

++ END OF SECTION ++

## SECTION 08 71 00

### DOOR HARDWARE

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install door hardware. Furnish door hardware for all doors in compliance with these Specifications herein.
2. Extent of door hardware is specified. Door hardware is defined to include all items known commercially as door hardware, except special types of unique and non-matching hardware specified in the same Section as the door and door frame.
3. Types of products required include the following:
  - a. Heavy-duty pivot hinges.
  - b. Panic exit devices.
  - c. Overhead, surface-mounted, door closers.
  - d. Flush bolts and automatic flush bolts.
  - e. Coordinators.
  - f. Astragals.
  - g. Dust-proof strikes.
  - h. Door pulls, push plates and protection armor plate.
  - i. Weather stripping and seals.
  - j. Thresholds.
  - k. Silencers.
  - l. Floor stops.
  - m. Wall stops.
  - n. Miscellaneous items and accessories for a complete installation functioning in compliance with the requirements of governing authorities having jurisdiction at the Site.

###### B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the door hardware.
2. Notify other contractors in advance of the installation of the door hardware to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the door hardware.
3. Coordinate the Work of other Sections to provide clearances and accurate positioning of recessed or cast-in-place items.

##### 1.02 REFERENCES

- A. Standards referenced in this Section are listed below:
1. American National Standards Institute, (ANSI).
    - a. ANSI A117.1, Accessible and Usable Buildings and Facilities.
  2. American National Standards Institute, (ANSI), in association with Builders Hardware Manufacturers' Association, (ANSI/BHMA).
    - a. ANSI/BHMA A156.1, Butts and Hinges.
    - b. ANSI/BHMA A156.3, Exit Devices.
    - c. ANSI/BHMA A156.4, Door Controls - Closers.
    - d. ANSI/BHMA A156.6, Architectural Door Trim.
    - e. ANSI/BHMA A156.7, Template Hinge Dimensions.
    - f. ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
    - g. ANSI/BHMA A156.16, American National Standard for Auxiliary Hardware.
    - h. ANSI/BHMA A156.18, Hardware - Materials and Finishes.
    - i. ANSI/BHMA A156.21, Thresholds.
    - j. ANSI/BHMA A156.22, Door Gasketing and Edge Seal Systems.
  3. Door and Hardware Institute, (DHI).
    - a. DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
    - b. DHI, Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
    - c. DHI, Sequencing and Format for the Hardware Schedule.
  4. Underwriters' Laboratories, Inc., (UL).
    - a. UL 305, Panic Hardware.
    - b. UL, Building Materials Directory.

### 1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
1. Provide door hardware and accessories manufactured by firms specializing in the production of this type of Work and complying with specified standards of ANSI, BHMA, DHI, NFPA, HMMA, SDI and UL.
  2. Provide door hardware from manufacturers who are members of BHMA and participate in BHMA certification programs.
- B. Installer's Qualifications:
1. The door hardware installer shall have in his employ an architectural hardware consultant. The architectural hardware consultant shall be a member of the Door and Hardware Institute, (DHI), who has passed the DHI certification examine and successfully completed an apprenticeship program. The architectural hardware consultant shall be responsible for preparing door hardware schedules and Shop Drawings and be present at the Site for the purpose of checking and supervising the Work of the installer during the time of installation and adjustment of the door

hardware Work, and shall prepare a written field report on status of completed door hardware installation as specified.

2. Submit name and qualifications of the installer to ENGINEER.
- C. Requirements of Regulatory Agencies:
1. Provide only door hardware that has been tested, listed and labeled by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
  2. Modify features of door hardware items specified, and provide additional accessories and features as required to meet UL and NFPA requirements, at no additional cost to the OWNER.
- D. Codes: Comply with applicable requirements of codes.
- E. Source Quality Control:
1. Obtain each type of door hardware item from only one manufacturer.
  2. Provide door hardware schedule, for submission to, and for approval by, ENGINEER, prepared in compliance with DHI standards.
  3. Comply with specified BHMA standards.

#### 1.04 SUBMITTALS

- A. Action Submittals: Submit the following:
1. Product Data:
    - a. Copies of manufacturer's data for each item of door hardware. Include whatever information may be required to show compliance with specified requirements, and include instructions for installation and for maintenance of operating parts and exposed finishes. Include mounting heights and locations for each item of door hardware. Provide ENGINEER with latest complete technical catalogue of all available door hardware manufactured by proposed manufacturers, even if manufacturer specified by ENGINEER is submitted by CONTRACTOR to perform the Work. Furnish templates to fabricators of other Work, which is to receive door hardware.
  2. Shop Drawings:
    - a. Copies of the Door Hardware Schedule in the manner and format specified, complying with the actual construction Progress Schedule requirements (for each draft). Include explanation of abbreviations, symbols, and codes used to present scheduled information.
      - 1) Prepare and submit Door Hardware Schedule in compliance with HDI standards.
    - b. Based on the door hardware requirements specified, organize the final Door Hardware Schedule into "hardware sets," indicating complete designation of every item required for each door or opening. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of

other Work (such as hollow metal frames) which may be critical in the Project Schedule. Furnish final draft of schedule after Samples, manufacturer's data sheets, coordination with Shop Drawings for other Work, delivery schedules and similar information have been completed and accepted.

- c. Include a separate key schedule, showing clearly how OWNER'S final instructions on keying of locks have been fulfilled.
- d. Door Hardware Schedules are intended for coordination of the Work. Review and acceptance by ENGINEER does not relieve CONTRACTOR of responsibility to fulfill the requirements as shown and specified.

B. Closeout Submittals: Submit the following:

1. Operation and Maintenance Documentation: Upon completion of the Work, furnish five copies of detailed maintenance manuals, including the following information:
  - a. Product name and manufacturer.
  - b. Name, address, e-mail address and telephone number of manufacturer and local distributor.
  - c. Detailed procedure for routine maintenance and cleaning.
  - d. Detailed procedures for repairs such as dents, scratches and staining.
  - e. Parts identification manual and maintenance manuals for each piece of door hardware.

## 1.05 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
2. Deliver all items of door hardware in manufacturer's original, undamaged packages, bearing accurate representation of the item within each package.
3. Pack each piece of door hardware separately, complete with screws, keying, instructions and templates, tagged to correspond with items submitted on approved Shop Drawings and as specified.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Provide secure storage area for door hardware items, secured by locks and accessible only to door hardware installer, ENGINEER and CONTRACTOR.
3. Store door hardware in manufacturers' original packages.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Items that arrive in a damaged condition shall be removed from the Site and not offered again for acceptance. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.01 SYSTEM PERFORMANCE

#### A. Description:

1. Where the door, shape, size, fire-resistance-rating, frequency of use, or function of a member receiving door hardware is such as to prevent, or make unsuitable, the types of door hardware specified, furnish similar types having as nearly as practicable the same operation but of type or kind more appropriate to the design intension and requirements of governing authorities having jurisdiction at the Site. Clearly identify and highlight to ENGINEER all such required modifications on Shop Drawings submitted for approval.
2. If door hardware for any location is not specified, provide door hardware equal in design and quality to adjacent door hardware specified for comparable openings at no additional cost to OWNER.
3. Furnish door hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements, as necessary for proper installation and function.
4. Unless otherwise specified, comply with DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames and Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.

### 2.02 DETAILS OF CONSTRUCTION

#### A. General:

1. Hand of Door: The Drawings show the swing or hand of each door leaf (left, right, reverse bevel, etc.). Furnish each item of door hardware for proper installation and operation of the door swing as shown.

2. **Manufacturer's Name Plate:** Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with labels required by governing authorities having jurisdiction at the Site.
3. **Base Metals:** Produce door hardware units of the basic metal and forming method specified, using the manufacturer's standard metal alloy, composition, temper and hardness. Do not substitute materials or forming methods for those specified.
4. **Fasteners:** Manufacture door hardware to conform to published templates, generally prepared for machine screw installation. Do not provide door hardware, which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
5. **Furnish screws for installation, with each door hardware item. Provide Phillips flat-head screws except as otherwise specified. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces on other Work, to match the finish of such other Work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.**
6. **Provide fasteners which are compatible with both the unit fastened and the substrate, and which will not cause corrosion or deterioration of door hardware, base material or fastener.**
7. **Provide concealed fasteners for door hardware units, which are not exposed when the door is closed, except to the extent no standard manufacturer units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other Work under any condition, except where it is not possible to adequately reinforce the Work and use machine screws or concealed fasteners of another standard type to satisfactorily avoid the use of through bolts.**
8. **Tools for Maintenance:** Furnish two complete sets of specialized tools as required for OWNER'S continued adjustment, maintenance, removal and replacement of door hardware.

**B. Hinges:**

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
  - a. **Hinges:**
    - 1) Bommer Industries, Inc. (BI).
    - 2) McKinney Products Company (MCK).
    - 3) Stanley Commercial Hardware; (STH).
  - b. **Continuous Geared Hinges:**
    - 1) Hager Companies (HAG).
    - 2) McKinney Products Company; (MCK).
    - 3) Pemko Manufacturing Co., Inc. (PEM).
  - c. **Standards:** Comply with the following:
    - 1) Butts and Hinges: BHMA A156.1.

- 2) Template Hinge Dimensions: BHMA A156.7.
- 3) Self-Closing Hinges and Pivots: BHMA A156.17.
- 2. Quantity: Provide the following, unless otherwise indicated:
  - a. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
  - b. Four Hinges: For doors with heights greater than 90 inches.
- 3. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (Inches)	Hinge Height (Inches)	Standard Weight	Heavy Weight
32 by 84 by 1-3/8	3½	0.123	-
36 by 84 by 1-3/8	4	0.130	-
36 by 84 by 1-3/8	4 ½	0.134	0.180
42 by 84 by 1-3/8	4 ½	0.134	0.180

- 4. Hinge Weight: Unless otherwise indicated, provide the following:
    - a. Entrance Doors: Heavy-weight hinges.
    - b. Doors with Closers: Antifriction-bearing hinges.
    - c. Interior Doors: Standard-weight hinges.
  - 5. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
    - a. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
  - 6. Continuous-Geared Hinges: Minimum 0.120-inch- (3.0-mm) thick, hinge leaves with minimum overall width of 4 inches (100 mm); fabricated to full height of door and frame. Finish components after milling and drilling are complete. Fabricate hinges to template screw.
- C. Locks and Latch Sets:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Mechanical Locks and Latches:
      - 1) Best Lock Corporation (BLC).
      - 2) NT Falcon Lock Co.; (NTF).
  - 2. Standards: Comply with the following:
    - a. Bored Locks and Latches: BHMA A156.2.
  - 3. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
    - a. Bored Locks: BHMA A156.2.
  - 4. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
    - a. Bored Locks: Minimum 1/2-inch (12.7-mm) latchbolt throw.



5. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

D. Panic Exit Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Precision Hardware, Inc. (PH).
  - b. Sargent Manufacturing Company; (SGT).
  - c. Von Duprin; (VD).
  - d. Yale Security Inc.; (YAL)
2. Standard: BHMA A156.3.
  - a. BHMA Grade: Grade 1
3. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."
4. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
5. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

E. Cylinders and Keying System:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cylinders: Same manufacturer as for locks and latches.
2. Standards: Comply with the following:
  - a. Cylinders: BHMA A156.5.
  - b. Key Control System: BHMA A156.5.
3. Cylinder Grade: BHMA Grade 1
4. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
  - a. Number of Pins: Match existing system with owner
  - b. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
  - c. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - d. Bored-Lock Type: Cylinders with tailpieces to suit locks.
5. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
  - a. Interchangeable Cores: Core insert, removable by use of a special key, and usable with other manufacturers' cylinders. Stamp with key number.
  - b. Manufacturer: Best Access Controls
6. Construction Keying: Comply with the following:

- a. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- b. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
  - 1) Replace construction cores with permanent cores, as directed by Owner.
  - 2) Furnish permanent cores to Owner for installation.
- 7. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:
  - a. Existing System: Master key or grand master key locks to Owner's existing system.
- 8. Keys: Provide nickel-silver keys complying with the following:
- 9. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
  - a. Notation: "DO NOT DUPLICATE."
- 10. Quantity:
  - a. Key Quantity: Furnish three keys for each lock and five keys for each master and grandmaster system. Provide one extra key blank for each lock.
- 11. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, three-way visible card index, temporary markers, permanent markers and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project. Provide a hinged-panel type cabinet, for wall mounting.

F. Closers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Surface-Mounted Closers:
    - 1) Corbin Russwin Architectural Hardware; (CR).
    - 2) LCN Closers; (LCN).
    - 3) Norton Door Controls; (NDC).
    - 4) Sargent Manufacturing Company; (SGT).
    - 5) Yale Security Inc.; (YAL).
- 2. Standards: Comply with the following:
  - a. Closers: BHMA A156.4.
- 3. Surface Closers: BHMA Grade 1
- 4. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."

5. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

G. Flush Bolts and Automatic Flush Bolts:

1. Provide flush bolts on the inactive leaf of all pairs of doors, unless otherwise specified.
2. Provide flush bolts at the top and bottom of door.
3. Provide downset of 12-inches for all automatic flush bolts, and manufacturers' automatic flush bolt strikes, for the locations specified in List of Door Hardware Items at end of Part 3.
4. Comply with UL, Hardware, Automatic or Surface Bolts, and NFPA 80, for automatic flush bolt requirements.
5. Provide the following features and materials:
  - a. Automatic Flush Bolts: All parts bronze.
  - b. Flush Bolt Levers: Forged Brass.
  - c. Flush Bolt Plate: Forge Brass.
  - d. Flush Bolt Guide and Strike: Wrought Brass.
  - e. Flush Bolt Rods: 1/2-inch round rods, bronze, 12-inches minimum length.
  - f. Bolt Head: Brass.
6. Provide extension flush bolts with 3/4-inch throws and with top bolt not over 6 foot-0 inches above finished floor. Provide bottom flush bolt 12-inches long.
7. ANSI/BHMA: A156.16: L14081, L14251 and L14091.
8. Products and Manufacturers: Provide one of the following:
  - a. GJ FB6 Extension Flush Bolts by Glynn-Johnson Part of Worldwide Ingersoll-Rand.
  - b. Or equal.
9. Where required by governing authorities having jurisdiction at the Site, provide cast bronze automatic flush bolts bearing the UL label.
10. Products and Manufacturers: Provide one of the following:
  - a. GJ FB30 Automatic Flush Bolts by Glynn-Johnson Part of Worldwide Ingersoll-Rand Corporation.
  - b. Or equal.

H. Coordinators:

1. Provide coordinator device on all pairs of doors required or specified to have automatic flush bolts, or panic exit devices. Comply with UL, List of Inspected Fire Protection Equipment and Material, and NFPA 80 requirements.

2. Provide manufacturer's standard units equipped with a safety release mechanism which allows the active leaf to close if under extreme pressure and whose active door lever, located nearest the active door stop, holds the active door ajar until the trigger mechanism is released to the retracted position by the closing of the inactive leaf.
  3. Materials: Anodized aluminum.
  4. Finish: US 27 satin.
  5. ANSI/BHMA: A156.3, BHMA 5.1, Type 21A.
  6. Products and Manufacturers: Provide one of the following:
    - a. COR 1, 2 and 3 Series with FB Series by Glynn-Johnson Part of Worldwide Ingersoll-Rand.
    - b. Or equal.
- I. Astragals:
1. Provide astragal bar, not less than 1/8-inch by 2-inches, for exposed flathead screw mounting on active leaf of all pairs of doors. Comply with UL and NFPA requirements for types and locations of astragals.
  2. Provide astragal of extruded aluminum with clear anodized finish.
  3. Products and Manufacturers: Provide one of the following:
    - a. No. 357 Series by Pemko Manufacturing Company.
    - b. Or equal.
- J. Dust-Proof Strikes:
1. Provide brass dust-proof strikes, which incorporate a slotted plunger raised to flush position by spring tension for all flush bolts.
  2. Provide 5/8-inch inside diameter dust-proof strikes; threshold mounted and surface mounted.
  3. Finish: US 26D satin chrome.
  4. ANSI/BHMA: A156.16, L14011-L14012.
  5. Products and Manufacturers: Provide one of the following:
    - a. DP-1 and DP-2 by Glynn-Johnson Part of Worldwide Ingersoll-Rand.
    - b. Or equal.
- K. Stripping and Seals:
1. Provide perimeter weather stripping at all exterior doors. Provide stripping and seals for interior doors where scheduled in List of Door Hardware Items at end of Part 3.
  2. Continuity of Stripping: Except as otherwise specified, stripping at each opening shall be continuous and without unnecessary interruptions at door corners and hardware.
  3. Replaceable Seal Strips: Resilient or flexible seal strip of every unit shall be easily replaceable and readily available from stocks maintained by the manufacturer.

4. Provide bumper-type weather-stripping at jambs and head, including a resilient insert and metal retainer strip, surface-applied, of the following metal, finish and resilient bumper material:
  - a. Housing: Extruded aluminum with dark bronze anodized finish; 0.062-inch minimum thickness of main walls and flanges.
  - b. Dimensions: 1-3/8-inches by 7/8-inches, stop-mounted.
  - c. Seals: Closed-cell extruded silicone.
  - d. ANSI/BHMA: A156.22, R3E264.
  - e. Products and Manufacturers: Provide one of the following:
    - 1) No. 350DSPK and 2891 DPK (for parallel arms) by Pemko Manufacturing Company.
    - 2) Pemko – 290 APK x 2891 APK
    - 3) Or equal.

L. Thresholds:

1. All exterior doors shall be provided with thresholds.
2. Metal: Mill finish extruded bronze.
3. Surface Pattern: Fluted tread, manufacturer's standard.
4. Provide countersunk stainless steel screws and expansion shields.
5. Width: width to equal door frame and of length sufficient to span full width of rough openings, coped and scribed neatly at and around door frames.
6. Construction:
  - a. Single-piece, complying with manufacturer's recommendations.
7. Profile: Provide manufacturer's unit, which conforms to the minimum size and profile requirements specified.
  - a. Floor Drop: Except where no change in floor elevation is shown from one side of threshold to the other, provide profile that accommodates 1/2-inch drop in floor elevation, unless another dimension is shown.
  - b. For doors equipped with panic hardware, including floor bolts, provide profile with stop bar of proper size and shape to function as the strike plate for the floor bolts.
8. Thickness: 1/2-inch, minimum.
9. ANSI/BHMA: A156.21, J12100.
10. Products and Manufacturers: Provide one of the following:
  - a. 1715A by Pemko Manufacturing Company.
  - b. Or equal.

M. Silencers:

1. Provide silencers for all door frames.
2. Provide pneumatic design that, once installed, forms an air pocket to reduce noise.
3. Provide minimum of three per strike side of door jambs.
4. ANSI/BHMA: A156.16, BHMA 6.5, L03011.
5. Products and Manufacturers: Provide one of the following:
  - a. GJ 64 by Glynn-Johnson Part of Worldwide Ingersoll-Rand.

- b. Or equal.

N. Wall and Floor Stops: Provide the following where scheduled in List of Door Hardware Items at end of Part 3:

1. Dome-Type Floor Stops:

- a. Cast bronze extra heavy-duty wall mounted door stop, one per leaf.
- b. Coordinate height of dome-type floor mounted doors stops with threshold condition and undercut of door.
- c. Finish: US 26D satin chrome.
- d. ANSI/BHMA: A156.16, L12161.
- e. Products and Manufacturers: Provide one of the following:
  - 1) FB13/14R, FB17 by Glynn-Johnson Part of Worldwide Ingersoll-Rand Corporation.
  - 2) Rockwood 441 CU x 26D
  - 3) Or equal.

2. Wall Stops:

- a. Cast bronze extra heavy-duty wall mounted door stop, one per leaf.
- b. Convex rubber bumper.
- c. ANSI/BHMA: A156.16, L12101.
- d. Products and Manufacturers: Provide one of the following:
  - 1) GJ 50C by Glynn-Johnson Part of Worldwide Ingersoll-Rand Corporation.
  - 2) Rockwood 400/403 x 26D
  - 3) Or equal.

O. Sealants: Provide elastomeric sealant complying with FS TT-S-00227, Type 2 (non-sag) Class A for use with thresholds.

### 2.03 HARDWARE FINISHES

- A. Provide matching finishes for door hardware units at each door or opening, to the greatest extent possible in compliance with ANSI/BHMA A156.18.
- B. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of door hardware exposed at the same door or opening. In general, match all items to the manufacturer's standard finish for the latch and lock set for color and texture.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. CONTRACTOR shall examine the substrate to receive door hardware, and the conditions under which the Work will be performed, and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the door hardware Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

### 3.02 PREPARATION

- A. Templates: Furnish door hardware templates to each fabricator of doors, frames and other Work to be factory-prepared for the installation of door hardware. Check the Shop Drawings of such other Work, to confirm that adequate provisions are made for the proper installation of the door hardware.
- B. Prepare Work to receive door hardware Work in compliance with ANSI/DHI A115.1.

### 3.03 INSTALLATION

- A. Installer shall check and approve the installation before operation. Installer shall assure that the system operates to the OWNER'S satisfaction.
- B. Mount door hardware units at heights recommended in, Door and Hardware Institute, "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" and "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames", except as otherwise specified or required to comply with governing authorities having jurisdiction at the Site, HMMA 830 and ADAAG requirements.
- C. Install each door hardware item in compliance with the manufacturer's instructions and recommendations and approved Shop Drawings. Wherever cutting and fitting is required to install door hardware onto or into surfaces that are later to be painted or finished in another way, install each item completely, then remove, and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

- F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.
- G. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel that will not corrode in contact with the threshold metal.
- H. Set thresholds in a bead of elastomeric sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant before sealant cures to a firm set.
- I. Adjust and check each operating item of door hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with the type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.
- J. Final Adjustment: Where door hardware installation is made more than one month prior to Substantial Completion, return to the Work during the week prior to acceptance or occupancy, and make a final check and adjustment of all door hardware items in each space and area. Clean and re-lubricate operating items as necessary to restore proper function and finish of door hardware and doors. Adjust door control devices to compensate for final operating of heating and ventilating equipment.
- K. Provide manufacturer's authorized representative to instruct and train OWNER'S personnel in proper adjustment and maintenance of door hardware during the final adjustment of door hardware.
- L. Door hardware, which is blemished or defective, will be rejected even though it was set in place before defects were discovered. Remove and replace with new door hardware. Repair all resultant damage to other Work.
- M. Continued Maintenance Service: Approximately six months after the acceptance of door hardware in each area, the installer, accompanied by the representative of the latch and lock manufacturer, shall return to the Project and re-adjust every item of hardware to restore proper function of doors and door hardware. Consult with and instruct OWNER'S personnel in recommended additions to the maintenance procedures. Clean and lubricate operational items wherever required. Replace door hardware items that have deteriorated or failed due to faulty design, materials or installation of door hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance or the door hardware.



### 3.04 FIELD QUALITY CONTROL

- A. Provide a written field report, prepared by installer's architectural hardware consultant, identifying actual condition, location, manufacturer, and product designation for each item of door hardware actually present on each door at the Site, including whether door hardware is adjusted and operating properly, compared with each item referenced to approved Shop Drawings and Contract requirements.
- B. Installer's hardware consultant shall provide opinions to, and assist ENGINEER in determining, acceptability of installation as Work proceeds. All comments and discussions, conversations and meetings with ENGINEER shall be included in written field report for submission to ENGINEER for review and approval at completion of door hardware installation.
- C. As part of written field report to be submitted to ENGINEER for approval, recommend remedial actions for Work not in compliance with these Specifications. No payment for Work shall be made until remedial recommendations and actions have been approved by ENGINEER and incorporated into the Work.

### 3.05 LIST OF DOOR HARDWARE ITEMS

- A. Scheduled items for each door are generic and rely on information specified above. The listing of hardware functions and types provided are only a general guideline for the final Door Hardware Schedule. CONTRACTOR shall submit a Door Hardware Schedule acceptable to all governing authorities having jurisdiction at the Site.

#### Door Hardware Schedule:

##### Products and Specifications Basis

Hinges	McKinney
Lockset	Best/ Falcon
Panic Bolts	Corbin Russwin
Closers	Norton
Overhead Holders	Rixson
Thresholds	Pemko
Weatherstripping	Pemko
Silencers	Rockwood
Kickplates	Rockwood
Door Stops	Rockwood

Floor-441CU x 26D

Wall- 400/403 x 26D

## Hardware Groups:

### Group 1 - Door 01 / 08 / 24/ 25/ 31/ 32/ 35/ 36/ 37/ 41/ 45

#### Exterior Single Doors

1 Cont Butt	MCK-25HD x clear
1 Lockset	93K7AB-15D x S3 x 626
1 Exit Devise	ED5200 N955 CT6 626
1 Closer	7500 x 2018S x 689
1 OH Stop	8HD x 626E
1 set Weatherstrip	290 APK x 2891 APK
1 Door Sweep	18061 CNB
1 Threshold	1715A
Silencers	608 x Grey
Kickplate	050-8" x 2" LDW x US 32D

### Group 2 - Door 02/ 03/ 04/ 05/ 07/ 11/ 12/ 14

#### Interior Passage Door

1 Cont Butt	MCK-25HD x clear
1 Latch set	93KON-15D x 626
1 Closer	7500 x 689
1 Floor/Wall Stop	
Kickplate	050-8" x 2" LDW x US 32D
Silencers	608 x Grey

### Group 3 - Door 06/ 09/ 10/ 18/ 20/ 22/ 43

#### Office Doors

1 Cont Butt	MCK-25HD x clear
1 Office Lockset	93K 7AB-15D x S3 x 626
1 Closer	7500 x 689
1 Stop	Wall or Floor as required
Kickplate	050-8" x 2" LDW x US 32D

### Group 4 - Door 13/ 15/ 16

#### Privacy Set Doors

1 Cont Butt	MCK-25HD x clear
1 Privacy Lockset	93KON-15D x S3 x 626
1 Closer	7500 x 689
1 Stop	Wall or Floor as required
Kickplate	050-8" x 2" LDW x US 32D

### Group 5 - Door 21

#### Interior Double Door

1 Cont Butt	MCK-25HD x ACC12 x clear
1 Cont Butt	MCK-25HD x clear

2 Flush Bolts	555 x US26D
1 Dustproof Strike	570 x US26D
1 Latchset	93KON-15D x 626
1 Closer	7500 x 2018S x 689
2 OH Stop	8HD x 626E
1 Astragal Seal	18041 CNB
4 Kickplates	050-8" x 2" LDW x US 32D
Silencers	608 x Grey

Group 6 - Door 17/19

1-1/2 hr Fire Rated Interior Passage Door	
1 Cont Butt	MCK-25HD x clear
1 Latch set	93KON-15D x 626
1 Closer	7500 x 689
1 Floor/Wall Stop	
Kickplate	050-8" x 2" LDW x US 32D
Silencers	608 x Grey

1. Also Supply:

- a. 1 Lock Box (Municipal Fire Department)  
#164144- Location as indicated by architect and/or code enforcement  
++ END OF SECTION ++

## SECTION 08 81 00

### GLASS GLAZING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install glass glazing.
2. Extent of glass glazing is shown.
3. Types of products required include the following.
  - a. Clear, fully tempered, float glass.
  - b. Clear, insulating, float glass.
  - c. Miscellaneous glazing, spacers, tapes and other materials.

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the glass glazing Work.
2. Notify other contractors in advance of the installation of the glass glazing to provide them with sufficient time for the installation of items included in their contracts that must be installed with, or before, the glass glazing Work.

##### 1.02 REFERENCES

###### A. Standards referenced in this Section are listed below:

1. American Architectural Manufacturers Association, (AAMA).
  - a. AAMA 800, Voluntary Specifications and Test Methods for Sealants.
2. American National Standards Institute, (ANSI).
  - a. ANSI Z97.1, Safety Glazing Materials Used in Buildings.
  - b. ANSI/ASTM E 774, Specification for Classification of the Durability of Sealed Insulating Glass Units.
  - c. ANSI/ASTM E 1300, Practice for Determining Load Resistance of Glass in Buildings.
3. American Society of Civil Engineers, (ASCE).
  - a. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
4. American Society for Testing and Materials, (ASTM).
  - a. ASTM C 509, Specification for Elastomeric Cellular Performance Gasket and Sealing Material.
  - b. ASTM C 719, Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle).

- c. ASTM C 793, Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
  - d. ASTM C 794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
  - e. ASTM C 864, Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
  - f. ASTM C 920, Specification for Elastomeric Joint Sealants.
  - g. ASTM C 1021, Practice for Laboratories Engaged in Testing of Building Sealants.
  - h. ASTM C 1036, Specification for Flat Glass.
  - i. ASTM C 1048, Specification for Heat-Treated Flat Glass-Kinds HS, Kind FT Coated and Uncoated Glass.
  - j. ASTM C 1087, Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
  - k. ASTM C 1115, Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
  - l. ASTM C 1172, Specification for Laminated Architectural Flat Glass.
  - m. ASTM C 1249, Guide for Secondary Seal for Sealed Insulating Glass Units for Structural Sealant Glazed Applications.
  - n. ASTM C 1281, Specification for Preformed Tape Sealants for Glazing Applications.
  - o. ASTM C 1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
  - p. ASTM D 412, Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - q. ASTM D 624, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
  - r. ASTM D 2240, Test Method for Rubber Property-Durometer Hardness.
  - s. ASTM E 548, Guide for General Criteria Use for Evaluating Laboratory Competence.
5. Code of Federal Regulations, (CRF).
    - a. 16 CFR, Consumer Product Safety Commission, CPSC Part 1201, Safety Standard for Architectural Glazing Materials.
  6. Glass Association of North America, (GANA).
    - a. GANA, Glazing Manual.
    - b. GANA, Laminated Glass Design Guide.
    - c. GANA, Glass Tempering Division, GTA 95-1-31, Specification for Decorative Architectural Flat Glass.
  7. Lawrence Berkeley National Laboratory National Technical Information Service, (LBL).
    - a. LBL-35298 Window 4.1, "A PC Program for Analyzing the Thermal Performance of Fenestration Products."
  8. National Fenestration Rating Council, (NFRC).
    - a. NFRC 100, Procedure for Determining Fenestration Product U-Factors.

- b. NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
  - c. NFRC 300, Procedures for Determining Solar Optical Properties of Simple Fenestration Products.
9. National Glass Association, (NGA).
    - a. NGA, Glazier Certification Program.
  10. Primary Glass Manufacturers Council, (PGMC).
    - a. PGMC Specifiers' Guide to Architectural Glass.
  11. Sealed Insulating Glass Manufacturers Association, (SIGMA).
    - a. SIGMA TM-3000-90, Vertical Glazing Guidelines and TB-3001-90, Sloped Glazing Guidelines.
  12. Underwriters' Laboratories, Inc., (UL).
    - a. UL Building Materials Directory.

### 1.03 QUALITY ASSURANCE

- A. Primary Glass Manufacturer and Glazing Materials Manufacturer Qualifications:
  1. Provide glass glazing materials manufactured by firms specializing in the production of the types of glass glazing products specified, in compliance with specified standards.
  2. Provide glass from manufacturers who are members of GANA and PGMC and participate in certification programs.
  3. Obtain glass glazing materials from manufacturers who will send a qualified technical representative to the Site, for the purpose of advising the installer of proper procedures and precautions for the use of the materials and who will assist ENGINEER with opinions on the acceptability of materials and Work.
- B. Fabricator Qualifications:
  1. Provide laminated and insulating glass fabrications from fabricators who are licensed by primary glass manufacturer to produce specified units and with documented skill and successful experience in this type of Work and who agree to employ only tradesmen who are trained, skilled and have successful experience in this type of Work.
  2. Provide laminated and insulating glass fabrications from fabricators who are members of GANA or SIGMA and participate in certification programs.
  3. Obtain laminated and insulating glass fabrications from fabricators who will, if required, send a qualified technical representative to the Site, for the purpose of assisting ENGINEER with opinions on the acceptability of materials and installation methods.

- C. Source Limitation: All materials provided under this Section shall be obtained from a single supplier or manufacturer who, with CONTRACTOR, shall assume full responsibility for the completeness of the Work. The supplier or manufacturer shall be the source of information on all material furnished regardless of the manufacturing source of that material.
- D. Codes: Comply with applicable requirements of codes referenced in Section 01 42 00, References.

#### 1.04 SUBMITTALS

##### A. Action Submittals: Submit the following:

###### 1. Product Data:

- a. Copies of manufacturers' specifications, "Spec-Data" sheets, installation instructions for each type of glass, glazing sealant or compound, gasket and associated miscellaneous material and all recommended installation precautions for required materials and components, which are not included in other submittals, specified in other Sections. Coordinate the submittal of such other data with this submittal, and with the submittal of samples required by other Sections.
- b. Structural performance calculations indicating that detailing and fabrication have been based on the results of the required analysis and

##### B. Informational Submittals: Submit the following:

###### 1. Certificates:

- a. Include primary glass manufacturer's and fabricator's published data, and letters of certification, based on certified test laboratory reports, indicating that each material complies with specified requirements and is acceptable for the applications shown.
- b. Certification that fabricated products comply with manufacturer's published performance.
- c. Age of silicone sealant.

###### 2. Test Reports:

- a. Certified laboratory test reports for required performance tests in compliance with ASTM E 548.

##### C. Closeout Submittals: Submit the following:

###### 1. Warranty Documentation:

- a. Manufacturer's and fabricator's guarantees, as specified.

#### 1.05 DELIVERY, STORAGE AND HANDLING

##### A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
- B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
  2. Protect glass glazing materials according to manufacturer's and fabricator's written instructions to prevent damage to glass glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
  3. For insulating glass that will be exposed to substantial altitude changes, comply with insulating glass fabricator's written recommendations for venting and sealing to avoid hermetic seal ruptures.
- C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.01 SYSTEM PERFORMANCE

- A. Design Criteria: For glass performance, manufacture, size, type, construction and thickness, comply with the following:
1. Provide glass glazing systems capable of withstanding normal thermal movements and wind and impact loads without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants (both structural and weather-resisting) to remain watertight, airtight and to maintain structural performance characteristics specified; deterioration of glazing materials; or other defects in construction.
  2. Normal Thermal Movement: Provide glass that allows for thermal movements resulting from a maximum temperature range of 120°F in ambient and 180°F surface temperature acting on glass framing members and glazing components. Base structural performance calculations on surface temperatures of materials caused by both solar heat gain and nighttime-sky loss.
  3. Comply with requirements of Consumer Product Safety Commission, Part 1201, Safety Standards for Architectural Glazing Materials, for all the Work.



4. Structural Performance: Provide structural calculations for analysis of required glass thicknesses for glass lites shown, that are used to establish final fabricating and detailing requirements. Indicate compliance with the following minimum criteria for all glass shown:
  - a. Project Wind Speed: 70 miles per hour based on ASCE 7 and the other governing authorities having jurisdiction at the Site.
  - b. Importance Factor: Category 1;  $I_w = 1.15$ ; Design Factor: 1.15.
  - c. Exposure Category: Exposure C;  $C_e = 1.13$ .
  - d. Wind Stagnation Pressure:  $q_s = 12.6$  psf.
  - e. Long-Duration Loading: One month.
  - f. Short-Duration Loading: Sixty seconds, based on three-second gust speed.
  - g. Probability of Breakage for Vertical Glazing: Eight lites per 1,000 under wind action.
  - h. Maximum Lateral Deflection: For glass supported on all four edges, provide thickness required to limit center deflection at design wind pressure to  $1/50$  times the short side length or 1-inch, whichever is less.
5. Glass thicknesses shown are minimums. Confirm glass thicknesses by analyzing Project structural loadings and in-service conditions using glass manufacturer's recommended load tables and other structural performance criteria specified. Where manufacturer's load tables indicate acceptability of lesser thickness material than required by performance criteria specified, provide specified thicknesses and features as a minimum. Where load tables indicate the need for greater thickness, or additional features, than specified, provide greater thicknesses and features at no additional cost to OWNER. Comply with practice for determining minimum thickness and types of glass, to resist loadings required by governing authorities having jurisdiction at the Site, according to ANSI/ASTM E 1300.
6. Glazing Sealant System Compatibility:
  - a. Glazing sealants shall be compatible with the channel surfaces, joint fillers, insulating glass sealing system, laminated glass interlayer material and other materials in contact with the glazing channel in compliance with ASTM C 1087.
  - b. Provide only materials and manufacturer's recommended variation of the specified materials, which are known to be fully compatible with the actual installation conditions, as shown by manufacturer's published data or certification submitted to ENGINEER for approval.
7. Adhesion of Elastomeric Joint Sealants: Comply with ASTM C 793 and ASTM C 794.
8. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer-aided software design, expressed as Btu/square foot by height by degree F.
9. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer-aided software design.
10. Solar Optical Properties: NFRC 300.

B. Definitions:

1. Interspace: The space between lites of an insulating glass unit that contains dehydrated air or a specified gas.
2. Deterioration of Coated Glass: Defects that develop from normal use, that are attributed to the manufacturing process, and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
3. Deterioration of Laminated Glass: Defects that develop from normal use, that are attributed to the manufacturing process, and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass or structural performance or safety of units; blemishes exceeding those allowed by specified laminated glass standards; and cracking, crazing or color change of films concealed in the lamination.
4. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the fabricating process or incompatibility of sealants or mishandling during installation, and not to causes other than glass breakage and practices for maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure shall include the obstruction of vision by dust, moisture, or film on interior surfaces of insulating glass.

## 2.02 GLASS

A. Clear, Float Glass:

1. Uncoated, Monolithic, Clear, Float Glass: Provide clear glass in compliance with ASTM C 1036, Type I (transparent glass, flat), Class 1 (clear), Quality q<sup>3</sup> (glazing select); 1/4-inch thick, minimum.
2. Products and Manufacturers: Provide one of the following:
  - a. Clear Float Glass by PPG Industries, Incorporated.
  - b. Clear Float Glass by Pilkington Libbey-Owens-Ford Company.
  - c. Or equal.

B. Clear, Fully Tempered, Float Glass:

1. Uncoated, Monolithic, Clear, Fully Tempered, Float Glass: Provide clear glass, with roll-wave distortion parallel to bottom edge of glass, in compliance with ASTM C 1048, Type I (transparent glass, flat), Class 1 (clear), Quality q<sup>3</sup> (glazing select), Kind FT.
2. Provide heat-strengthened glass that has been heat-strengthened by manufacturer's special process (after cutting to final size,) to achieve a flexural strength of up to five times that of annealed glass strength; 1/4-inch thick, minimum.
3. Products and Manufacturers: Provide one of the following:
  - a. Herculite Clear by PPG Industries, Incorporated.

- b. Fully Tempered, Clear Glass by Guardian Industries, Corporation.
- c. Or equal.

C. Clear, Insulating, Float Glass Units:

1. Uncoated, Monolithic, Clear, Float Glass: Provide clear glass in compliance with ASTM C 1036, Type I (transparent glass, flat), Class 1 (clear), Quality q<sup>3</sup> (glazing select).
2. Insulating Glass Units: Provide preassembled units consisting of two lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class C units, permanently and hermetically sealed together at edges with spacers and sealant.
3. System Sealing: Dual seal with polyisobutylene primary sealant and silicone secondary sealant, complying with ASTM C 1249.
4. Overall Unit Thickness and Thickness of Each Lite:
  - a. Overall Thickness: 1-inch.
  - b. Each Lite: 1/4-inch.
5. Physical Properties:
  - a. Exterior Appearance: Clear.
  - b. Visible Light Transmittance: 78 percent, minimum.
  - c. Solar Heat Gain Coefficient: 0.70.
  - d. Outdoor Visible Light Reflectance: 15 percent.
  - e. Shading Coefficient: 0.81.
  - f. Winter Nighttime U-value: 0.48.
  - g. Summer Daytime U-value: 0.55.
6. Products and Manufacturers: Provide one of the following:
  - a. Clear Twindow by PPG Industries, Incorporated.
  - b. Clear Thermopane by Pilkington Libbey-Owens-Ford Company.
  - c. Or equal.

## 2.03 GLAZING SEALANTS, TAPES AND GASKETS

A. General:

1. Colors: Provide black or other natural color wherever no other color is available. Wherever material is not exposed-to-view, provide manufacturer's standard color, which has the best overall performance characteristics for the application shown.
  - a. Provide manufacturer's standard colors as shown or, if not shown, provide color selected by ENGINEER from manufacturer's standard colors to either blend or contrast with adjoining surfaces.
2. Provide size and shape of gaskets and preformed glazing units as recommended by the manufacturer and as indicated on approved Shop Drawings.

## 2.04 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standards, requirements of manufacturers of glass glazing materials for applications shown, and approved Shop Drawings. Provide materials with a proven record of compatibility with surfaces shown and specified.
- B. Setting Blocks: Elastomeric material, 80 to 90 Shore A durometer hardness, with proven compatibility with sealants used in the Work and as recommended by the glass manufacturer.
- C. Spacers and Edge Blocks: Elastomeric blocks or continuous extrusions, with a Shore A durometer hardness recommended by glass manufacturer to maintain lites in place and to limit lateral movement for installation shown, and with proven compatibility with sealants used in the Work.
- D. Cleaners, Primers and Sealers: Type recommended by sealant, gasket and glass manufacturer.

## 2.05 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Glass manufacturer's recommended glazing channel dimensions are intended to provide for necessary minimum bite on the glass, minimum edge clearance and adequate sealant thicknesses, with reasonable tolerances. CONTRACTOR shall be responsible for correct glass size for each opening, within the tolerances and necessary dimensions established on approved Shop Drawings.

## 2.06 TOLERANCES

- A. Allowable Tolerances: Provide fully tempered and heat-strengthened glass, formed by horizontal roller-hearth process, free of tong marks, and not exceeding the following flatness tolerances (either face, any direction, any location) based on 1/4-inch glass thickness with inversely proportionate tolerances for other thicknesses:
  - 1. For 12-inch Run: 1/16-inch bow.
  - 2. For 3-foot Run: 1/8-inch bow.
  - 3. For 7-foot Run: 1/4-inch bow.
  - 4. For 10-foot Run: 3/8-inch bow.

## 2.07 SOURCE QUALITY CONTROL

- A. To the greatest extent possible, provide each type of glass glazing materials from one manufacturer.
- B. Providing insulating glass with a certified Class A rating according to SIGMA.

- C. Obtain glass and sealant test results for product test reports from qualified testing agencies regularly engaged in the business of testing glass and sealant products.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. CONTRACTOR shall examine the framing and glazing channel surfaces, backing, removable stop design, and the conditions under which the glass glazing is to be performed, and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the glazing until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

### 3.02 PREPARATION

- A. Clean the glazing channel, or other framing members to receive glass, immediately before glazing. Remove coatings, which are not firmly bonded to the substrate. Remove lacquer from metal surfaces wherever elastomeric sealants are used.
- B. Apply primer or sealer to joint surfaces wherever recommended by sealant and glass manufacturer.

### 3.03 INSTALLATION

- A. General:
  1. Comply with combined recommendations of glass, window and glazing products manufacturers and other materials used in glazing, except where more stringent requirements are shown or specified, and as shown on approved Shop Drawings.
  2. Comply with GANA, Glazing Manual, except as shown and specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass glazing materials, as accepted by ENGINEER on approved Shop Drawings.
  3. Inspect each piece of glass immediately before installation, and remove from Site all that have observable edge damage or face imperfections.
  4. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.
  5. Cut and install tinted and reflective glass as recommended in manufacturer's technical bulletin as provided on approved Shop Drawings.
  6. Install sealants as recommended by sealant manufacturers, and as recommended on approved Shop Drawings.
  7. Do not attempt to cut, seam, nip or abrade glass on Site, which is tempered, heat strengthened, or coated.

8. Do not proceed with installation of liquid glazing sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
9. Proceed with glazing only when forecasted weather conditions are favorable to proper cure and development of high early bond strength. Wherever channel action is affected by ambient temperature variations, install glazing sealants only when temperatures are in the middle third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation or compression, and bond stress will not be excessive at extremely low or high temperatures.
10. Coordinate the installation of the glass glazing Work with the Progress Schedule in order to avoid delay of Project.

B. Tape and Sealant Glazing:

1. Place setting blocks in sill rabbets, sized and located to comply with referenced glazing publications. Set blocks in thin course of compatible sealant for heel bead. Position glass on setting blocks and press against tape for full contact.
2. Provide spacers for glass lites where the length plus width is larger than 4 foot-2 inches. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
3. Provide 1/8-inch minimum bite for spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
4. Provide edge spacers as shown on approved Shop Drawings and as required to prevent glass lites from moving sideways in glazing channel.
5. Cut glazing tape to length and set against permanent stops. Install horizontal strips first, extending over width of opening, before applying vertical strips.
6. Remove paper backing from tape. Place glazing tape on free perimeter of glass. Install tapes continuously. Do not stretch tape to make them fit openings. Place joints in tapes at corners of openings with adjoining lengths butted together, not lapped. Seal butt joints of tape with joint sealant.
7. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
8. Install removable stop, avoiding displacement of tape, and exert pressure on tape for full continuous contact. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Calk space above glazing tape to top of glazing stop. Tool exposed surfaces of sealant compounds to provide a substantial "wash" away from the glass.

9. Clean and trim excess glazing materials from the installation, and eliminate stains and discolorations.
  10. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
  11. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended on approved Shop Drawings and to prevent corners from pulling away; seal corner joints and butt joints with sealant as recommended by gasket manufacturer and as shown on approved Shop Drawings.
- C. Dry Gasket Glazing: Install glass in gaskets as recommended by the glass and window manufacturer. Refer to Section 08 11 13, Hollow Metal Doors and Frames, Section 08 51 13, Aluminum Windows, and Section 08 44 13, Glazed Aluminum Curtain Walls.
- D. The installer shall advise CONTRACTOR of procedures required for the protection of glass glazing sealants and compounds during the construction period, so that they will be without deterioration or damage, other than normal weathering, at the time of Substantial Completion.
- E. Furnish specific instructions on the precautions and provisions required to prevent glass damage resulting from the alkaline wash from concrete surfaces and similar sources of possible damage.
- F. Protect exterior glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass.
- G. Remove and replace glass, which is broken, chipped, cracked, abraded or damaged in other ways during the construction period, including natural causes, accidents and vandalism.
- H. Maintain glass in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work.
- I. Remove non-permanent labels and wash and polish glass on both faces not more than four days prior to Substantial Completion. Comply with glass manufacturer's recommendations for cleaning.

### 3.04 FIELD QUALITY CONTROL

- A. Watertight and airtight installation of each piece of glass is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and air-tight, deterioration of glazing materials and other defects in the Work.
- B. Repair glazing installation at leaks or, if leakage is excessive, replace glazing sealants as directed by ENGINEER.
- C. Wherever nature of observed leakage indicates the possibility of inadequate glazing joint bond strength, ENGINEER may direct that additional testing be performed at a time when joints have been fully cured, followed by natural exposure through both extreme temperatures, and returned to the range of temperature in which it is feasible to conduct testing. Repair or replace Work as required and directed by the ENGINEER.

++ END OF SECTION ++



## SECTION 09 21 16

### GYPSUM BOARD ASSEMBLIES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install gypsum board assemblies. The Work also includes:
  - a. Providing openings in gypsum board assemblies to accommodate the Work under this and other Sections, and building into gypsum board assemblies all items to be embedded in or penetrate gypsum board assemblies.
  - b. Providing openings in gypsum board assemblies to accommodate work under other contracts and assisting other contractors in building into gypsum board assemblies all items furnished under other contracts to be embedded in or penetrate gypsum board assemblies.
2. Extent of gypsum board assemblies as shown.
3. Types of products required include:
  - a. Various types of interior wall and ceiling gypsum board.
  - b. Joint reinforcement and finish system.
  - c. Auxiliary materials, trim, and fasteners.

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before gypsum board assemblies Work.
2. Coordinate furnishing and installing products for maintaining fire-resistance rating of gypsum board assemblies at perimeters and penetrations where built-in and recessed items and transitions with other building components occur in the Work.
3. Notify other contractors in advance of constructing gypsum board assemblies Work to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before gypsum board assemblies Work.

###### C. Related Sections:

1. Section 07 92 00, Joint Sealants.
2. Section 09 91 00, Painting.

## 1.02 REFERENCES

### A. Standards referenced in this Section are:

1. ASTM C11, Terminology Relating to Gypsum and Related Building Materials and Systems.
2. ASTM C475/C475M, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
3. ASTM C514, Specification for Nails for the Application of Gypsum Board.
4. ASTM C754, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
5. ASTM C834, Specification for Latex Sealants.
6. ASTM C840, Specification for Application and Finishing of Gypsum Board.
7. ASTM C954, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033-in. (0.84 mm) to 0.112-in (2.84mm) in Thickness.
8. ASTM C1396, Specification for Gypsum Board.
9. ASTM D3273, Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
10. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
11. ASTM E90, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
12. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
13. ASTM E413, Classification for Rating Sound Insulation.
14. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.
15. ASTM E695, Test Method of Measuring Relative Resistance of Wall, Floor and Roof Construction to Impact Loading.
16. GA-214, Recommended Levels of Gypsum Board Finish.
17. GA-216, Application of Gypsum Board.
18. GA-235, Gypsum Board Typical Mechanical and Physical Properties.
19. GA-530, Design Data.
20. UL, Fire Resistance Directory.

## 1.03 DEFINITIONS AND TERMINOLOGY

### A. Definitions: The following terms are defined for this Section and supplement the terms defined in the General Conditions:

1. Level of Finish: The designated finish of gypsum board assemblies established in ASTM C840.

### B. Terminology:

1. Terminology used in this Section is in accordance with ASTM C11, ASTM C754 and ASTM C840.

2. The following words or terms are not defined but, when used in this Section, have the following meaning:
  - a. “Drywall primer” is paint material specifically formulated to fill pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coats.
  - b. “Skim coat” is thin coat or joint compound, or material manufactured especially for this purpose, applied over the entire surface to fill imperfections in the joint Work, smooth the paper texture, and provide a uniform surface for decorating. Excess compound shall be immediately sheared off, leaving a film of skim coating compound completely covering the paper.
  - c. “Spotting” is to cover fastener heads with joint compound.
  - d. “Texture” is decorative treatment on gypsum board surface.
  - e. “Texturing” is regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with primer/sealer.

#### 1.04 QUALITY ASSURANCE

##### A. Qualifications:

1. Manufacturer:
  - a. Provide gypsum board, accessories and trim manufactured by firms specializing in production of types of products specified, in compliance with reference standards listed in this Section.
  - b. Provide gypsum board assemblies manufactured by firms that are members of the Gypsum Association (GA) and participate in GA’s certification programs.
2. Installer:
  - a. Engage a single installer that regularly performs gypsum board assemblies installation, with documented skill and successful experience in installing types of materials required; and that employs only tradesmen who are trained, skilled, and have successful experience in installing types of materials specified.

#### 1.05 SUBMITTALS

##### A. Action Submittals: Submit the following:

1. Product Data:
  - a. Manufacturer’s product data, specifications, and performance data for gypsum board assembly component required. Indicate compliance with requirements of reference standards included in this Section and requirements of authorities having jurisdiction.

- b. Include copies of certified test reports and other data as may be required to show compliance with the Contract Documents, including specified performance characteristics and physical properties.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Comply with applicable requirements of reference standards used in this Section, Section 01 65 00, Product Delivery Requirements, and Section 01 66 00, Product Storage and Handling Requirements

#### 1.07 PROJECT CONDITIONS

- A. Environmental Requirements:
  - 1. Temperature: Comply with the more stringent of ASTM C840 and manufacturer's written recommendations.
  - 2. Ventilation:
    - a. Provide ventilation during and following application of adhesives and joint treatments.
    - b. Use temporary air circulators in enclosed areas that lack natural ventilation.
    - c. Under slow drying conditions, allow additional drying time between coats of joint treatment.
    - d. Protect installed materials from drafts during hot, dry weather.
  - 3. Do not install panels that are any of the following: wet, moisture damaged, or mold damaged.
    - a. Indications that panels are wet or moisture damaged includes, but is not limited to, discoloration, sagging, or irregular shape.
    - b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

#### 1.08 SEQUENCING

- A. Prior to starting installation of gypsum board, coordinate Work requiring openings, chases, frames, access panels, support, and similar integrated requirements, including heating and ventilating and electrical work.
- B. Do not proceed with gypsum board installation until blocking, framing, bracing, and other supports for subsequently applied Work are installed.
- C. Do not install gypsum board until thermal insulation to be concealed by board has been installed.

## PART 2 - PRODUCTS

### 2.01 SYSTEM PERFORMANCE

#### A. Description:

1. Gypsum board assemblies include finishing systems for walls, columns and ceilings that consists of panels with various types of specially treated, hydrated calcium sulfate cores reinforced with paper laminated to both faces of panels and manufactured for direct application of decorative finishes, including a joint treatment system known as self-setting drywall finishing and other drywall trim system accessories, and a system of metal studs, furring and bracing.
2. Complete systems shall conform to combined performance criteria in the Contract Documents.
3. Recycled Content: Provide gypsum panel products with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes minimum of:
  - a. Gypsum: 25 percent by weight.
  - b. Paper: 100 percent.
4. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

#### B. Performance Criteria:

1. General:
  - a. Standards: Comply with GA-530 and ASTM standards specified in this Section, except when more-stringent requirements are mandated by authorities having jurisdiction.
2. Level of Finish for Gypsum Board Assemblies: In accordance with ASTM C840, provide the Level of Finish for all gypsum board assemblies indicated in Paragraph 3.6.A.5 of this Section.

### 2.02 MANUFACTURERS

#### A. Gypsum Board Products, Accessories and Trim: Provide products as manufactured by one of the following:

1. Gold Bond Building Products, by National Gypsum Company.
2. ToughRock Products, by G-P Gypsum Corporation.
3. SHEETROCK Brand Products, by United States Gypsum Company, Subsidiary of USG Corporation.
4. Or equal.

#### B. Metal Support System Components: Refer to Section 09 22 16, Non-Structural Metal Framing.

## 2.03 INTERIOR GYPSUM BOARD

- A. Exposed Gypsum Board: Provide the following types of interior gypsum board with two edge configurations where available from manufacturers specified; with 100 percent recycled paper on front, back, and long edges bonded to the core; complying with ASTM C1396:
1. Panel Size: Provide all panels in maximum lengths and widths available that minimize joints in each area and correspond with spacing of support system components.
  2. Surface Burning Characteristics, ASTM E84: Flame Spread: 15, Smoke Development: Zero.
  3. Moisture and Mold-Resistant Gypsum Board: Gypsum core wall panel with additives to enhance the mold and water resistance of the core; surfaced with moisture/mold resistant paper on front, back and long edges; ASTM C1396 (Section 5).
  4. Fire Resistant Gypsum Board: ASTM C 1396; Type X, UL listed and bearing listing marking; long edges as follows:
    1. Long Edges: Tapered.
  5. Moisture and Fire Resistant Gypsum Board: ASTM C 1396; Type X, UL listed and bearing listing mark; long edges tapered.

## 2.04 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.
- B. High-Strength Joint Reinforcing Tape for Exterior and Interior Applications: Fiberglass, self-adhering, two inches wide, in compliance with ASTM D578, ASTM D5034, and ASTM D5035.
- C. Joint Compound for Exterior and Interior Applications: Provide dry-powder, sandable, self-setting chemical hardening compounds for all gypsum board assemblies Work, recommended by manufacturer as being unaffected by humidity after hardening and drying.
1. For each coat use formulation compatible with other compounds applied previously, and compatible with successive coats.
  2. Provide special chemical-hardening-type, slow-setting, or regular-setting-type compounds for gypsum board assemblies.
    - a. Prefilling: At open joints, rounded panel edges, and damaged surface areas, use setting-type taping compound.
    - b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges use setting-type taping compound.
    - c. Fill Coat: For second coat, use setting-type, sandable topping compound.
    - d. Finish Coat: For third coat, use setting-type, sandable topping compound.

- e. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

## 2.05 TRIM ACCESSORIES

- A. General: Comply with ASTM C1047.
- B. Products: Provide manufacturer's standard trim accessories of types shown or indicated for gypsum board assemblies, formed of hot-dipped galvanized steel or zinc, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, J-type wallboard casings and one-piece control joint beads.
  - 1. Finishing Type: Manufacturer's standard trim units to be finished with joint compound.

## 2.06 GYPSUM BOARD FASTENERS

- A. Gypsum Board Fasteners: Comply with GA-216, and with gypsum board manufacturer's recommendations; choice is installer's option where more than one type is recommended for application specified.
  - 1. Steel Drill Screws: Self-drilling, self-tapping, bugle-head complying with ASTM C954 and ASTM C1002, for use with power-driven tools.
    - a. Type S for wallboard to sheet metal.
    - b. Type W for wallboard to wood.
    - c. Type G for wallboard to wallboard.

## 2.07 AUXILIARY MATERIALS

- A. Water-resistant Sealant: Type recommended by gypsum board manufacturer for sealing cut edges and holes in water-resistant gypsum board. Provide sealants that have VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## PART 3 – EXECUTION

### 3.01 INSPECTION

- A. Examine substrates and spaces to receive gypsum board assemblies, and conditions under which gypsum board assemblies will be installed, and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

### 3.02 PREPARATION

- A. Verify that spacing of installed, non-load-bearing steel framing does not exceed maximum allowable for types of gypsum board assemblies approved for the Work.
- B. Verify that doorframes are set for thicknesses of gypsum board shown on approved Shop Drawings and in the Contract Documents.
- C. Repair protrusions of framing, twisted framing members, and unaligned members before commencing gypsum board installation.
- D. Protect adjacent surfaces against damage and stains.

### 3.03 INSTALLATION OF METAL SUPPORT SYSTEMS

- A. Refer to Section 09 22 16, Non-Structural Metal Framing.

### 3.04 INSTALLATION OF GYPSUM BOARD

#### A. General:

1. Standards: Comply with ASTM C840. Comply with requirements for fire resistance-ratings and STC-ratings shown.
2. Provide gypsum panels with face side out. Butt panels together for light contact at edges and ends with not more than 1/16-inch of open space between panels. Do not force into place.
5. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Do not make joint other than control joints at corners or framed openings.
6. Attach gypsum board to steel studs and blocking so leading edge or end of panel is attached to open (unsupported) edges of stud flanges first.
7. Attach gypsum panels to framing provided at openings and cutouts.
8. Cut back paper; do not tear or snap.
9. Provide gypsum board on both faces of steel stud partition framing above ceilings and in similar concealed spaces, except in chase walls that are properly braced internally.
10. Provide perimeter isolation where non-load-bearing partitions abut structural decks or ceilings, or vertical structural elements. Allow not less than 1/4-inch, or more than 1/2-inch gap between gypsum and structure. Finish edges of face layer with J-Type (semi-finishing) casing bead. Seal space between casing bead and structure with continuous acoustical sealant bead. Attach gypsum board to studs not less than 1/2-inch below bottom edge of ceiling track flanges and to first stud adjacent to vertical tracks. Do not attach board directly to tracks.



- B. Space fasteners in gypsum panels according to manufacturer's written recommendations and reference standards used in this Section.
  - 1. Space screws maximum of 12 inches on centers for vertical applications.
  - 2. Space fasteners in panels that are ceramic tile substrates a maximum of eight inches on centers.
  
- C. Panel Installation Methods:
  - 1. General: In addition to complying with reference standards used in this Section, comply with specific requirements indicated for each type or arrangement of gypsum board assembly shown.
  - 2. Single-Layer Applications:
    - a. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible, and at right angles to framing, unless otherwise shown or indicated.
    - b. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise shown or required by fire-resistance-rated assembly, and minimize end joints.
      - 1) Stagger abutting end joints not less than one framing member in alternative courses of board.
    - c. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate end joints over furring members.
    - d. For parallel applications, locate edge joints over supports; for right angle applications, stagger end joints over supports.
    - e. Apply gypsum panels to supports with steel drill screws.
  
- D. Allowable Tolerances:
  - 1. Gypsum Board Faces: 1/8-inch offsets between planes of board faces, and 1/4-inch in eight feet for plumb, level, warp, and bow.
  - 2. Suspended Ceilings: Level main carrying channels to 1/8-inch in 12 feet measured lengthwise on each member and transversely between parallel members.

### 3.05 INSTALLATION OF TRIM ACCESSORIES

- A. General: Provide trim accessories in accordance with ASTM C840. Coordinate, and integrate where possible installation of trim accessories with installation of gypsum board. Use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports. Otherwise, fasten flanges by nailing in accordance with manufacturer's written instructions.
  
- B. Install metal corner beads at external corners of gypsum board assemblies.
  
- C. Install metal edge trim where edge of gypsum board would otherwise be exposed or semi-exposed.

1. Provide L-Type trim-beads, for joint compound, where edge is shown to be tightly fitted to abutting Work, without reveal or sealant pocket.
  2. Provide U-Type trim-beads, for joint compound, where edge is not tightly fitted to abutting Work, or is exposed, revealed with sealant pocket, gasketed, or with other separation, except as otherwise shown.
    - a. Provide special kerf-type I-trim where adjoining Work is kerfed to receive leg of trim unit.
  3. Provide J-Type semi-finishing trim, not for joint compound, at the following locations and where shown:
    - a. Edges of exterior gypsum board not covered by applied moldings.
    - b. On interior wall panels of exterior walls at juncture with ceilings.
    - c. At sealant-filled isolation joints and sound control joints, where gypsum drywall work abuts other construction including walls and ceilings.
    - d. At sealant-filled or gasket-filled building expansion joints, install back-to-back units spaced as shown or, if not shown, at 1/4-inch spacing.
- D. Miter corners of exposed molding and trim (semi-finishing) units. Align joints and support to eliminate offsets.

### 3.06 FINISHING OF GYPSUM BOARD ASSEMBLIES

#### A. General:

1. Comply with GA-214 and finishing materials manufacturer's written instructions for mixing, handling, and applying materials. Machine- or hand-application is installer's option.
2. Apply treatment at joints in both directions, flanges of trim accessories, but not semi-finishing types, gypsum board penetrations, electrical boxes, piping and similar work, fastener heads, surface defects, and elsewhere as shown or specified. Apply in manner that will result in each of these being concealed when applied decoration has been completed.
3. Where open joints of more than 1/16-inch occur, including edges of boards with rounded or beveled corners, prefill joint with chemical-hardening-type bedding compound, prior to bedding of joint tape.
4. Apply joint tape at joints between gypsum boards, except where trim accessory is shown.
5. Level of Finish for Gypsum Board: As established by ASTM C840, provide
  - a. Level 1: No taping, finishing, or accessories required. Provide for the following areas:
    - 1) At locations where FRP Panels are to be installed
    - 2) At joints that are concealed
  - b. Level 2: All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over flat joints and one separate coat of joint compound applied over interior angles. Cover fastener heads and accessories with three separate coats of joint compound.

Apply to entire joint surface a thin skim coat of joint compound, or material manufactured especially for this purpose. Surface shall be smooth and free of tool marks and ridges. Coat prepared surfaces with drywall primer prior to applying finish paint. Coordinate with Section 09 91 00, Painting. Provide for the following areas:

### 3.08 FIELD QUALITY CONTROL

- A. Before installing gypsum board ceilings, inspect ceiling support framing accompanied by ENGINEER and submit written report of deficiencies. Do not proceed with installing gypsum board on ceiling support framing until deficiencies are corrected.
  - 1. Notify ENGINEER 7 days in advance of the date and time when Work, or part of Work, will be ready for above ceiling observation.
  - 2. Before notifying ENGINEER, complete the following in areas to receive gypsum board ceilings:
    - a. Installation of 80 percent of lighting fixtures, powered for operation.
    - b. Installation of insulation, and successful testing of piping conveying fluids and automatic fire suppression system.
    - c. Installation of ventilation duct system.
    - d. Installation of air distribution devices.
    - e. Installation of ceiling support framing.

### 3.09 ADJUSTING AND CLEANING

- A. Nail Pop:
  - 1. Repair nail pop by driving new nails approximately 1.5 inches from popped nail and reseal nail.
  - 2. When face paper is punctured, drive new nail or screw approximately 1.5 inches from defective fastening and remove defective fastening.
  - 3. Fill damaged surface with self-setting joint filler compound.
- B. Ridging:
  - 1. Do not repair ridging until condition has fully developed, approximately six months after installation or one heating season.
  - 2. Sand ridges to reinforcing tape without cutting through tape.
  - 3. Fill concave areas on both sides of ridge with topping compound.
  - 4. After fill is dry, blend in topping compound over repaired area. Fill cracks with compound and finish smooth and flush.
  - 5. Installer shall advise CONTRACTOR, who shall advise ENGINEER, of required procedures for protecting completed gypsum board assemblies from damage and deterioration during remainder of construction. CONTRACTOR shall provide required protection.

++ END OF SECTION ++

## SECTION 09 22 16

### NON-STRUCTURAL METAL FRAMING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, tools, equipment, professional services, and incidentals as shown, specified, and required to furnish and install non-structural metal framing. The Work also includes:
  - a. Providing openings in non-structural metal framing to accommodate the Work under other Sections and building into non-structural metal framing items such as sleeves, anchorage devices, inserts, and all other items to be embedded in non-structural metal framing for which placement is not specifically provided under other Sections.
2. Provide the following types of products:
  - a. Runner channel ceiling suspension systems.
  - b. Interior steel stud partition systems.
  - c. Exterior steel stud partition systems.
  - d. Furring members.
  - e. Auxiliary products.

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before non-structural metal framing Work.
2. Coordinate furnishing and installing products for maintaining fire-resistance rating of non-structural metal framing at perimeters and penetrations where built-in and recessed items, and transitions with other building components, occur in the Work.

##### 1.02 REFERENCES

###### A. Standards referenced in this Section are:

1. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A366/A366M, Specification for Commercial Steel Sheet, Carbon (0.15 Maximum Percent), Cold-Rolled.
3. ASTM A510, Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
4. ASTM A570/A570M, Specification for Structural Steel, Sheet and Strip, Carbon, Hot-Rolled.

5. ASTM A641/A641M, Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
6. ASTM A645/A645M, Specification for Pressure Vessel Plates, Five Percent Nickel Alloy Steel, Specially Heat Treated.
7. ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM C645, Specification for Nonstructural Steel Framing Members.
9. ASTM C754, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
10. ASTM C840, Specification for Applying and Finishing Gypsum Board.
11. ASTM C841, Specification for Installation of Interior Lathing and Furring.
12. ASTM C955, Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
13. ASTM C1063, Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
14. ASTM D226, Specification for Asphalt-saturated Organic Felt Used in Roofing and Waterproofing.
15. ASTM E90, Test Methods for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
16. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
17. ASTM E413, Classification for Rating Sound Insulation.
18. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.
19. ISO 9002, Quality Systems – Model for Quality Assurance in Production, Installation and Servicing.
20. UL, Fire Resistance Directory.
21. USGBC, LEED-NC, LEED Reference Guide, For New Construction and Major Renovation.

### 1.03 QUALITY ASSURANCE

#### A. Qualifications:

1. Manufacturer:
  - a. Provide non-structural metal framing, furring and auxiliary products and accessories manufactured by firms specializing in producing types of products specified, in compliance with the Contract Documents.
  - b. Provide non-structural metal framing, furring and auxiliary products and accessories manufactured by firms that are members of ML/SFA and AWCI, and participate in certification programs.
  - c. Obtain materials from manufacturers who will, when required, furnish services of qualified technical representative at the Site, for purpose of advising installer of proper procedures and precautions for using the materials.

2. Installer:
  - a. Engage a single installer regularly performing non-structural metal framing and furring installation, and with documented skill and successful experience in installing types of materials required; and who employs only tradesmen who are trained, skilled, and have successful experience in installing types of materials specified.
  
- B. Component Supply and Compatibility:
  1. Furnish all components of non-structural metal framing and furring from a single manufacturer, and from a single supplier, where possible, with adequate resources to provide products of consistent performance characteristics, physical properties and appearance, without delaying the Work.
  
- C. Regulatory Requirements:
  1. Where fire-resistance classification is shown or indicated which includes non-load-bearing steel framing, provide components complying with applicable requirements for materials and installation established by UL and authorities having jurisdiction at the Site.
  2. UL Compliance: Comply with UL Fire Resistance Directory for applicable fire-resistant construction systems.

#### 1.04 SUBMITTALS

- A. Action Submittals: Submit the following:
  1. Product Data:
    - a. Manufacturer's product data and specifications for each item and each system specified.
    - b. Test Reports: Certified test reports on materials identical to those to be furnished demonstrating compliance with specified performance characteristics and physical properties.
    - c. Include reports and other data as may be required to show compliance with the Contract Documents.
  
- B. Informational Submittals: Submit the following:
  1. Certificates.
    - a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.
  2. Supplier Instructions:
    - a. Manufacturer's installation instructions for each material specified
  3. Site Quality Control Submittals:
    - a. Results of inspection upon completion of installation.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Non-Structural Metal Framing Components and Accessories: Provide products of one of the following:
1. Dietrich Metal Framing, Inc.
  2. Marino\Ware, Division of Ware Industries, Inc.
  3. Or equal.

### 2.02 MATERIALS

- A. General:
1. Manufacturer's Recommendations: Except where otherwise required to comply with requirements of authorities having jurisdiction or where more stringent requirements are shown or specified, provide type, weight, grade and finish of materials recommended by manufacturer, and include for each system clips, fasteners, ties, reinforcing, stiffeners, shoes, tracks, hangers, brackets, anchors, trim, and accessories as recommended by manufacturer for the application shown or indicated.
  2. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.
  3. Metal and Finishes: Manufacturer's standard for steel products, unless otherwise shown or indicated as solid zinc alloy or other metal. Provide manufacturer's standard galvanized finish on steel products.
- B. Ceiling Suspension/Furring Materials:
1. Wire Tires: ASTM A641, Class 1, galvanized soft steel wire, 0.0625-inch diameter wire or double strand 0.0475-inch diameter wire.
  2. Carrying Channels: cold-rolled, commercial steel sheet, with minimum base metal thickness of 0.538-inch, 1/2-inch wide flange, complying with ASTM A366.
  3. Cold-Rolled Channels: 0.0538-inch minimum base metal thickness, with minimum 1/2-inch wide flanges, 3/4-inch deep.
  4. Steel Studs: cold-rolled commercial quality steel channels.
  5. Hat-shaped, Rigid Furring Channels: 7/8-inch deep, 0.0538-inch minimum base metal thickness, screw-type commercial quality steel sections, complying with ASTM C645.
  6. Resilient Furring Channels: 1/2-inch deep, 0.0296-inch minimum base metal thickness, screw-type, hat-shaped, commercial quality steel sections, complying with ASTM C645.
  7. Hangers:

- a. Wire Hangers: Galvanized, soft-temper steel wire complying with ASTM A641, Class 1 zinc coating, pre-stretched; minimum base metal diameter of 0.162-inch, minimum.
  - b. Rod Hangers: Commercial steel complying with ASTM A510, mild carbon steel; 1/4-inch minimum base metal rod diameter; hot-dip galvanized in compliance with ASTM A153, Class B-1.
  - c. Flat Hangers: Commercial steel sheet complying with ASTM A366; base metal size of one-inch by 3/16-inch, minimum, and of lengths shown; hot-dip galvanized in compliance with ASTM A153, Class B-1.
  - d. Angle Hangers: Two-inch by two-inch by 1/4-inch, base metal size, minimum; hot-dip galvanized in compliance with ASTM A153, Class B-1.
8. Hanger Anchorages:
- a. Provide (--1--) fabricated from corrosion-resistant materials with holes or loops for attaching hangers, capable of sustaining, without failure, load equal to five times the load imposed by construction.

C. Interior Metal Stud System Materials:

- 1. Punched Steel Curtain Wall Studs: Rolled channels of 18-gage steel, with 1-3/8-inch flanges and depths as shown, ASTM A570/, Grade D steel, 40,000 psi.
- 2. Studs and Runners: ASTM C645, formed C-shaped steel channels of 0.0312-inch thick, base metal minimum, steel with 1.75-inch flange depth as shown, 40,000 psi steel complying with ASTM A653.
- 3. Slip-type Head Joints:
  - a. Single Long-Leg Runner System: ASTM C645 top runner with two-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of top of studs to provide lateral bracing.
  - b. Double-Runner System: ASTM C645 top runners, inside runner with two-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
  - c. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
  - d. Product and Manufacturer: Provide one of the following:
    - 1) VertiClip SLD and VertiTrack Series by VTD Steel Network Inc.
    - 2) Superior Flex Track System (SFT) by Superior Metal Trim.
    - 3) Or Equal.
- 4. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
  - a. Product and Manufacturer: Provide one of the following:
    - 1) Fire Trak with Fire Trak Slip Clip by Fire Trak Corporation.



- 2) The System by Metal-Lite, Inc.
  - 3) Or Equal.
  - 5. Stiffeners: 0.0538-inch minimum base metal thickness, 3/4-inch by 1/2-inch, cold-rolled channel. Provide rust-inhibitive paint finish.
  - 6. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated 0.0312-inch minimum base metal thickness.
  - 7. Cold-Rolled Channel Bridging: 0.0538-inch minimum base metal thickness, with minimum 1/2-inch- wide flanges, 1.5 inches deep.
    - a. Clip Angle: Not less than 1.5 by 1.5 inches, 0.068-inch, minimum base metal thickness, galvanized steel.
- D. Wall/Partition Metal Furring Materials:
- 1. Channel Furring: 0.0538-inch minimum base metal thickness, 3/4-inch by 1/2-inch, cold-rolled channel. Provide rust-inhibitive paint finish.
  - 2. Hat Shaped Rigid Furring Channels, ASTM C645: 0.0312-inches, minimum base metal thickness, 1.5-inches deep, screw-type hat-shaped section.
  - 3. Resilient Furring Channels, ASTM C645: 0.0312-inches, minimum base metal thickness, 1/2-inch deep, screw-type hat-shaped section.
    - a. Resilient-Type: Where shown or indicated as “resilient”, provide manufacturer’s special hat-shaped rigid furring channels designed to reduce sound transmission.
  - 4. Furring Brackets: 0.0312-inch minimum base metal thickness, serrated-arm type, adjustable from 1/4-inch to 2.25-inch wall clearance for channel furring.
  - 5. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.0625-inch minimum base metal diameter wire, or double strand of 0.0475-inch minimum base metal diameter wire.
  - 6. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1.25- inches, wall attachment flange of 7/8-inch, minimum base metal thickness of 0.0179-inch, and depth required to fit insulation thickness indicated.
- E. Auxiliary Products and Trim:
- 1. General: Provide auxiliary materials that comply with installation requirements in the Contract Documents.
    - a. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
  - 2. Isolation Strip at Exterior Walls: Provide one of the following:
    - a. Asphalt-Saturated Organic Felt: ASTM D226, Type I No. 15 asphalt felt.
    - b. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch thick, in width to suit steel stud size.

## PART 3 – EXECUTION

### 3.01 INSPECTION

- A. Examine substrates and conditions under which non-structural metal framing Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

### 3.02 PREPARATION

- A. Anchorages: Coordinate Work with structural ceiling Work to ensure that inserts and other structural anchorage provisions are installed to receive hangers.
- B. Maintain environmental conditions, including temperature, humidity, and ventilation, within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

### 3.03 INSTALLATION, GENERAL

- A. General: Comply with ASTM C754, except where framing sizes and spacing are indicated in the Contract Documents.
  - 1. Gypsum Board Assemblies: Comply with ASTM C840 relative to framing installation.
- B. Allowable Tolerances:
  - 1. For flat surfaces, do not exceed 1/8-inch in twelve feet for bow, warp, plumb and level.
- C. Isolation: Where non-structural metal framing system abuts building structure horizontally, and where partitions abuts overhead structure, isolate the Work from structural movement sufficiently to prevent transfer of loading into non-structural metal framing and support framing from the building structure. Install slip or cushion type joints to absorb deflections but maintain lateral support.
  - 1. Frame both sides of control and expansion joints independently, and do not bridge joints with non-structural metal framing or auxiliary system components.

### 3.04 SUSPENSION SYSTEMS

- A. Space runner channels as shown; if not shown space at four feet on centers.
- B. Install hangers supported only from building structural members. Locate hangers near each end and spaced four feet along each channel or direct-hung runners, unless otherwise shown or indicated.

- C. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system.
- D. Where width of ducts and other obstructions within ceiling plenum produces hanger spacing that interfere with location of hangers required to support standard suspension system members, provide supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established in reference standards and publications referred to in this Section, and designed by a professional engineer.
- E. Secure wire hangers to ceiling suspension members by looping or wire tying with minimum of three tight turns, either directly to structure or to inserts, eye screws, clips or other anchorage devices and fasteners that are secure and appropriate for substrate, and in manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- F. Do not attach hangers to steel deck tabs.
- G. Do not attach hangers to steel roof deck. Attach hangers to structural members.
- H. Do not connect or suspend steel framing from ducts, piping, or conduits.
- I. For exterior soffits, install cross-bracing and framing to resist wind uplift.

### 3.05 STUD SYSTEMS

- A. General: Comply with ASTM C645 and ASTM C754. Install steel studs with continuous runner tracks at top and bottom of each wall/partition area, and above and below each opening more than two feet wide. Anchor tracks to floor and overhead structure at each end and two feet on centers, maximum, unless otherwise shown.
- B. Terminate partition stud system at ceiling line, except extend system to structure above, where shown.
- C. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
- D. Space studs two feet on centers, including jack studs above and below openings, except as otherwise shown.
- E. Anchor light-gage screw-type partition studs to runner tracks by friction fit, except screw end studs to both tracks at both flanges.

- F. Install minimum of three studs at partition corners and intersections, spaced as recommended by stud manufacturer for the application indicated.
- G. Provide additional studs at each jamb of openings more than two feet wide, and secure jamb studs to frames of openings and to runner tracks above and below openings in manner indicated. Screw to frame anchors or directly to frames, or wire-tie or weld, if not otherwise indicated.
  - 1. Install two studs at each jamb, except as otherwise shown.
- H. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
  - 1. Firestop Track: Where shown or indicated, provide to maintain continuity of fire-resistance-rated assembly indicated.

### 3.07 AUXILIARY STEEL STUD SYSTEM COMPONENTS

- A. Anchor each flange of auxiliary non-structural metal framing system components to plaster base eight inches on centers.
- B. Miter or cope accessory corners, and install with tight joints accurately aligned.
- C. Install prefabricated control joints of one-piece design, where shown or indicated as control joint.
- D. Install prefabricated expansion joints of two-piece design, where shown or indicated as expansion joint, 1/4-inch joint width for interior Work, 3/8-inch for exterior Work.

### 3.08 FIELD QUALITY CONTROL

- A. Before installing non-structural metal framing ceilings, inspect deck accompanied by ENGINEER and prepare written report of deficiencies. Do not proceed with installation of non-structural metal framing until defective work is corrected.
- B. Special Inspections: Coordinate with the Coordinating Special Inspector. Refer to Section 01 45 33.00, Code-Required Special Inspections, for detailed requirements.

### 3.09 ADJUSTING AND REPAIR

- A. Cut, repair, and align non-structural metal framing Work as required and as necessary to accommodate other work. Repair bent and dented members. Repair or replace the Work as necessary to comply with specified tolerances.

### 3.10 CLEANING

- A. Remove temporary covering and other provisions made to minimize debris on other work. Repair surfaces that have been stained, marred or otherwise damaged during non-structural metal framing Work. When Work is completed, remove unused materials, containers, and equipment and debris.

### 3.11 PROTECTION OF EXECUTED WORK:

- A. Provide adequate precautions for protecting non-structural metal framing Work from deterioration and damage during remainder of construction.

++ END OF SECTION ++

## SECTION 09 51 13

### ACOUSTICAL PANEL CEILINGS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install acoustical panel ceilings. The Work also includes:
  - a. Providing openings in acoustical panel ceilings to accommodate the Work under this and other Sections and building into the acoustical panel ceilings all items to be embedded in, or penetrate, acoustical panel ceilings.
2. Extent of acoustical panel ceilings is shown on the reflected ceiling plans on the contract drawings.
3. Types of products include the following and are indicated on the Room Finish Schedule on the contract drawings:
  - a. 24" x 24", acoustical panel ceiling tiles.
  - b. Intermediate-duty, exposed acoustical panel suspension system.
  - c. Miscellaneous fasteners, clips, hangers, tie-wire and other accessories.

###### B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the acoustical panel ceilings work.
2. Notify other contractors in advance of the construction of the acoustical panel ceilings Work to provide other contractors with sufficient time for the installation of items included in their contracts that must be installed with, or before, the acoustical panel ceilings Work.

##### 1.02 REFERENCES

###### A. Standards referenced in this Section are listed below:

1. American Society for Testing and Materials, (ASTM).
  - a. ASTM A 153/A 153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - b. ASTM A 366/A 366M, Specification for Commercial Steel Sheet, Carbon, (0.15 maximum percent) Cold-Rolled.
  - c. ASTM A 510, Specification for General Requirements for Wire Rods and Coarse Round Wire,

- d. ASTM C 635, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- e. ASTM C 636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- f. ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials.
- g. ASTM E 119, Test Methods for Fire Tests of Building Construction and Materials.
- h. ASTM E 413, Classification for Rating Sound Insulation.
- i. ASTM E 580, Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.
- j. ASTM E 795, Practice for Mounting Test Specimens During Sound Absorption Tests.
- k. ASTM E 1264, Classification for Acoustical Ceiling Products.
- 2. Architectural Metal Products Division of the National Association of Architectural Metal Manufacturers, (AMP).
  - a. AMP, 501, Finishes for Aluminum.
- 3. Ceiling and Interior Systems Construction Association, (CISCA).
  - a. CISCA, Acoustical Ceilings: Use and Practice.
  - b. CISCA, Ceiling Systems Handbook.
- 4. Underwriters' Laboratories, Inc., (UL).
  - a. UL, Fire Resistance Directory.

### 1.03 QUALITY ASSURANCE

#### A. Installer's Qualifications:

- 1. Engage a single installer regularly performing installation of acoustical panel ceilings with documented skill and successful experience in the installation of the types of materials required; and who agrees to employ only tradesmen who are trained, skilled and have successful experience in installing the types of materials specified.
- 2. Size anchorage devices for ceiling hangers for three times supported load, except size direct-pull concrete inserts for five times supported load, for structural classification specified, complying with ASTM C 635, Table 1, Direct Hung, unless more stringent requirements are specified by governing authorities having jurisdiction at the Site and in compliance with ASTM E 488.
- 3. Attachment Devices: Size internal attachment devices within suspended ceiling system for five times the design load indicated in ASTM C 635, Table 1, Direct Hung.

#### B. Source Quality Control:

- 1. Furnish all components of each acoustical panel ceiling system from a single manufacturer and from a single supplier with adequate resources to provide products of consistent performance characteristics, physical properties and appearance, without delaying the Work.

## 1.04 SUBMITTALS

- A. Action Submittals: Submit the following:
1. Shop Drawings:
    - a. Copies of manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system. Include certified laboratory test reports and other data as required to show compliance with these Specifications.
    - b. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods, which may be detrimental to finishes and acoustical performances.
  2. Samples:
    - a. Two 4" x 4" samples for each acoustical panel specified. Samples shall show the full range of exposed color and texture to be expected in the completed Work.
    - b. 12-inch long samples of each exposed runner and molding.
    - c. ENGINEER'S review will be for color and texture only. Compliance with other requirements is the responsibility of CONTRACTOR.
- B. Informational Submittals: Submit the following:
1. Test Reports:
    - a. Certify compliance with ASTM C 635 and other specified requirements, and indicate structural classification of each type of suspension system.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded, in ample time to prevent delay of that Work.
  2. Deliver accepted materials in original, unopened, undamaged, protective packaging, with manufacturer's and testing and inspection agencies labels accurately indicating brand name, pattern, size, thickness and fire-resistance-rating of packaged materials.
  3. All markings and labels shall be legible and intact.
  4. Inspect acoustical panel ceiling materials and reject components differing from accepted Samples and Shop Drawings. Immediately remove rejected components from the Site and do not incorporate into the Work.
  5. Handle materials in a manner that avoids chipping edges or damaging units in any way and as recommended by manufacturer's approved installation recommendations and the recommendations of specified standards.



B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store materials in a fully enclosed space where they will be protected against damage and constantly within limits of manufacturer's written recommended environmental conditions.
3. Store materials in original protective packaging to prevent soiling, physical damage or wetting.
4. Store cartons open at each end to stabilize moisture content and temperature.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

## 1.06 JOB CONDITIONS

A. Environmental Requirements:

1. Before installing acoustical panels permit them to reach room temperature and a stabilized moisture content.
2. Do not install interior acoustical panel ceilings until the space has been enclosed and is weathertight, and until installation of moisture-bearing material in the space has been completed and the space is nominally dry, and until ambient conditions of temperature and humidity are continuously maintained at levels indicated for final occupancy.

B. Scheduling:

1. Do not begin installation of acoustical panel ceilings until all Work above ceilings has been completed and accepted by ENGINEER.
2. Furnish cast-in-place, and built-in-place anchors and their locations, to other trades for installation well in advance of time needed for coordinating locations of acoustical panel ceiling supports with other Work that must share plenum area above acoustical panel ceilings.

## PART 2 - PRODUCTS

### 2.01 SYSTEM PERFORMANCE

A. Performance Criteria:

1. General:

- a. Standards: Provide manufacturer's standard acoustical panel ceiling systems that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light deflections.
- b. References: In general, the recommendations of CISCA, "Acoustical Ceilings: Use and Practice" shall be considered part of this Section, unless otherwise specified.
- c. Standards for Terminology and Performance: Applicable publications by the Ceiling and Interior Systems Construction Association (CISCA), including "Ceiling Systems Handbook" and ASTM C 635.

## 2.02 CEILING PANELS

- A. General: Unless otherwise specified, provide standard lay-in panels of the type selected by ENGINEER. Provide sizes shown on reflected ceiling plans or, if not otherwise shown, 24-inch by 24-inch grid-size panels.
- B. Acoustical Panels:
  - 1. Environmental Profile:
    - a. Acoustical panels shall contain neither man-made fibers, natural mineral fibers nor inorganic binders.
    - b. Provide units that do not require the use of additives, surfacers or polyvinylchloride facers to resist the growth of bacteria or fungus and that are unaffected by water or high humidity.
  - 2. Acoustical Panels: As indicated on the contract drawings, or approved equal.
  - 3. Fire-Test-Response Characteristics of Acoustical Panels: Provide acoustical panels with surface-burning characteristics complying with ASTM E 1264 for Class A materials on face side; as determined by testing identical products in compliance with ASTM E 84.
  - 4. Physical Properties: Provide the following:
    - a. Flame Spread, ASTM E 84: 0.
    - b. Smoke Development, ASTM E 84: 0.
    - c. Fuel Contribution, ASTM E 84: 0.

## 2.03 CEILING SUSPENSION SYSTEMS

- A. General: Comply with ASTM C 635, as applicable to the type of suspension system required for the type of acoustical panel ceiling units specified.
  - 1. Structural Class, Intermediate-Duty System (Direct Hung): 12.0 minimum to 15.9 maximum, pounds per linear foot of main runners.
    - a. Main Runners: 0.015-inch thick metal, minimum.
    - b. Cross Tees: 0.015-inch thick metal, minimum.
- B. Exposed Suspension System: Manufacturer's standard, 15/16-inch wide by 1-1/2-inch high exposed runners, cross-runners and accessories, with exposed cross runners stepped to lay flush with main runners; manufactured from hot-dipped galvanized G90,

commercial steel CS Type B, complying with ASTM A 653; double-webbed construction with stainless steel clip end tap feature interlocking with cross tee slots to prevent lateral pull-out.

1. Finish of Exposed Members: Provide uniform factory-applied finish on exposed surfaces of ceiling suspension system including moldings, trim and accessories.
  - a. Finish: Manufacturer's standard baked enamel finish, white, unless otherwise selected by ENGINEER.

C. Products and Manufacturers: Provide one of the following:

1. 1200 System and Fire Front 1250 Direct Hung Suspension Systems by Chicago Metallic Corporation.
2. Or equal.

## 2.04 MISCELLANEOUS MATERIALS

A. Hangers:

1. Wire Hangers: Galvanized, soft-temper steel wire complying with ASTM A 641/A 641M, Class C zinc coating, pre-stretched; bare steel diameter of 8-gauge (0.162-inch).
2. Anchors:
  - a. Provide anchors fabricated from stainless steel components complying with ASTM F 593 and ASTM F 594, Group 1, alloy Type 316 for bolts, and anchors with holes or loops for attaching hangers.
  - b. Comply with ASTM E 488 for concrete inserts, clips, bolts, screws and other devices applicable to the indicated method of structural anchorage for acoustical panel ceiling hangers.

B. Impact Clips: Where required, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

C. Sheet Metal Edge Molding and Trim: Type and profile shown, or if not shown, manufacturer's standard metal channel molding for edges and penetrations that fit acoustical panel edge details and suspension systems specified; formed from commercial grade sheet steel of same material, color and finish as used for exposed flanges of suspension system members.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. CONTRACTOR shall examine the conditions under which the acoustical panel ceiling Work is to be performed and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

### 3.02 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling and match Reflected Ceiling Plan Layout in Contract Drawings

### 3.03 INSTALLATION

- A. General:
  - 1. As a minimum standard, unless otherwise shown, specified, required by accepted Shop Drawings, or governing authorities having jurisdiction at the Site, install acoustical panel ceilings to comply with CISCA's "Ceiling System Handbook."
- B. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers near each end and spaced four feet along each carrying channel or direct-hung runners, unless otherwise shown.
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system.
  - 2. Where width of ducts and other obstructions within ceiling plenum produces hanger spacing that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by Reference Standards and publications.
  - 3. Secure wire hangers to ceiling suspension members by looping or wire-tying with a minimum of three tight turns, either directly to structure or to inserts, eye screws, clips or other anchorage devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 4. Do not attach hangers to steel deck tabs.
  - 5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  - 6. Do not connect or suspend steel framing from ducts, pipes or conduit.
  - 7. Sway-brace suspended steel framing with hangers used for support.

8. Space hangers not more than 4 foot-0 inches on centers along each member, supported directly from hangers and provide hangers not more than 8-inches from ends of each member.
9. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from structural members as required for hangers, without attaching top permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
10. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

C. Arrange acoustical panels and orient directionally-patterned panels in the manner shown on accepted Shop Drawings.

1. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members.
2. Install acoustical panels with pattern running in one direction.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings.
5. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
6. Install hold-down clips for each panel, spaced as recommended by acoustical panel manufacturer for the application specified, except do not exceed spacing required by governing authorities having jurisdiction at the Site, or for fire-resistance-ratings.

D. Install edge moldings and trim of the type shown at edges of each acoustical ceiling area, and at locations where edge of units would otherwise be exposed after completion of the Work.

1. Secure moldings to building construction by fastening with screw-anchors into the substrate, through holes drilled in vertical leg. Space holes not more than 3- inches from each end and not more than 16-inches on centers along each molding, leveling with ceiling suspension system to tolerances specified.
2. Miter corners of moldings accurately to provide hair-line joints, securely connected to prevent dislocation.
3. Do not use exposed fasteners, including blind rivets, on molding or trim.

### 3.04 FIELD QUALITY CONTROL

A. Allowable Tolerances:

1. Surfaces to Receive Acoustical Treatment: Free from irregularities and level to within 1/4-inch in 12 feet.
2. Deflection:

- a. Suspension System Components, Hangers, and Fastening Devices Supporting Light Fixtures, Ceiling Grilles, and Acoustical Units: Maximum deflection 1/360 of the span.
- b. Deflection Test: ASTM C 635.
3. Allowable Tolerance of Finished Acoustical Ceiling System: Level within 1/8-inch in 12 feet-0 inches.
4. Accessibility Percentage: 100.

### 3.05 ADJUSTMENT AND CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings and suspension system members. Comply with manufacturer's written instructions for cleaning and touch-up of minor finish damage. Remove and replace Work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- C. Installer shall advise CONTRACTOR and ENGINEER of required protection for the acoustical panel ceilings, including manufacturer's recommended temperature and humidity limitations and dust control, so that the Work will be without damage and deterioration at the time of acceptance by OWNER. CONTRACTOR shall provide required protection.

++ END OF SECTION ++

## SECTION 09 65 19

### RESILIENT TILE FLOORING

#### PART 1 - GENERAL

##### 1.01 SUBMITTALS

- A. Product Data: Manufacturer's specifications, and surface preparation and installation instructions, for each material specified except primer.
- B. Samples:
  - 1. Resilient Tile: Full size, each type, size, and color required.
  - 2. Base: 12 inch long sections, each type, size & color required.
  - 3. Edge Strips: 12 inch long sections, each type & color required.
  - 4. Color Samples: Manufacturer's standard colors, patterns, and textures.
- C. Quality Control Submittals:
  - 1. Certificates: Certificates required under Quality Assurance Article.
- D. Contract Closeout Submittals:
  - 1. Maintenance Data: Deliver 2 copies covering the installed products

##### 1.02 QUALITY ASSURANCE

- A. Compatibility of Materials: For each type of tile specified, furnish associated materials made by or recommended by the tile manufacturer.
- B. Certifications: Furnish certification from flooring installer that the substrate surfaces have been examined and are acceptable for installation of the Work of this Section.
- C. Performance Criteria:
  - 1. The following criteria are required for products included in this section:
    - a. Adhesives must not exceed the volatile organic compound (VOC) content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1168.

##### 1.03 PROJECT CONDITIONS

- A. Environmental Requirements: Continuously heat spaces to receive flooring to a temperature of 68 degrees F for at least 48 hours prior to flooring installation, during the installation, and for 48 hours after installation.

- B. Condition flooring materials by placing them in the spaces where they will be installed for at least 48 hours prior to installation.

#### 1.04 MAINTENANCE

- A. Extra Materials:
  - 1. Furnish extra tile, equal to 2 percent of the tile installed, of each type and color of tile required. The extra tile shall be from the same run and lot number as the installed tile.
  - 2. Place extra materials in storage at the site where directed.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Vinyl Composition Tile: FS SS-T-312, Type IV, Composition 1; 12 x 12 inch size, 1/8 inch gage.
- B. Vinyl Base: FS SS-W-40, Type II; 4 inches high, 0.080 inch gage, with matching preformed external corner units.
  - 1. Style: Cove wall base with standard toe.
  - 2. Adhesive and Filler/Wall Patch: As recommended by the base manufacturer for the type of substrate indicated.
- C. Resilient Edge Strips: Homogeneous vinyl; not less than one inch wide, 1/8 inch gage; tapered bullnose edge.
  - 1. Color/Pattern: to be selected
- D. Primer for Porous or Dusty Concrete: Tile adhesive manufacturer's recommended primer for preparation of porous or dusty concrete.
- E. Tile Adhesive: Water resistant, formulated for application on type of subfloor indicated, and recommended by the tile manufacturer.
- F. Floor Finish: FS P-W-155; heavy traffic water emulsion floor wax, minimum 16 percent total solids.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION:

- A. Verification of Conditions:



1. Examine substrate surfaces to receive the Work of this Section for defects that will adversely affect the execution and quality of the Work. Do not proceed until unsatisfactory conditions are corrected, and installer's substrate surface acceptability certification has been acknowledged
2. Do not install the Work of this Section until after all other finishing operations, including painting, have been completed unless otherwise indicated or directed by the Director's Representative.

### 3.02 SURFACE PREPARATION

- A. Unless otherwise specified, follow the materials manufacturers' written instructions.
- B. Remove dirt, grease, oil, paint, varnish, wax, sealers, and other contaminants which may impair the full bonding of the materials.
- C. Concrete Subfloor:
  1. Remove trowel marks or other projections by grinding or sanding.
  2. Level uneven surfaces with smooth troweling of mastic underlayment.

### 3.03 INSTALLATION

- A. Install the flooring from center marks established with principal walls; lay out the tile field and adjust to avoid use of cut units less than one-half tile wide at perimeters. Match tile units for color and pattern by using the tile in manufactured and packaged sequence.
  1. Lay tile units in "checkerboard" pattern with grain direction reversed in alternate tiles.
- B. Install tile units in adhesive bed in compliance with manufacturer's printed instructions. Butt tile units tightly to vertical surfaces, thresholds, nosings, and edgings. Scribe tile around obstructions and openings as necessary to produce neat joints. Install tile evenly in straight, parallel lines. Extend tile into toe spaces, door reveals, closets and other similar openings.
- C. Install tile on pan type access cover plates for electrical and telephone ducts and other such items which occur within finished resilient tile floor areas. Maintain color and pattern continuity with tile installed on such areas.
- D. Install resilient edge strips at unprotected edges of flooring, unless otherwise indicated.

- E. Install resilient base in compliance with manufacturer's printed instructions. Install base on walls, partitions, columns, and permanent fixtures unless otherwise indicated. Install base in as long lengths as practicable, with preformed external corner units. Miter internal corners. Scribe and fit base to door frames and other interruptions.

#### 3.04 CLEANING

- A. Remove any excess adhesive and other surface soiling from face of installed materials with cleaning agents recommended by the manufacturer of the material being cleaned.

#### 3.05 PROTECTION

- A. Protect installed flooring from traffic and damage. Apply non-staining kraft paper covering where necessary. Maintain covering until directed to remove it by the Director's Representative.

#### 3.06 FINISHING

- A. Prior to the final inspection, thoroughly clean tile floors and accessories. Apply 2 coats of floor finish and buff to finish. Comply with the tile manufacturer's recommended cleaning, finishing, and buffing procedures.

++ END OF SECTION ++

## SECTION 09 77 20

### FIBER REINFORCED PLASTIC PANELS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to concrete block.
  - 1. PVC trim
- B. Products Not Furnished or Installed under This Section:
  - 1. Drywall substrate

##### 1.02 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
  - 1. ASTM D 256 - Izod Impact Strengths (ft #/in)
  - 2. ASTM D 570 - Water Absorption (%)
  - 3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
  - 4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
  - 5. ASTM D 2583 - Barcol Hardness
  - 6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
  - 7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

##### 1.03 SUBMITTALS

- B. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- D. Selection Samples: Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

- E. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.
  - 1. Submit complete with specified applied finish.
  - 2. For selected patterns show complete pattern repeat.
  - 3. Exposed Molding and Trim: Provide samples of each type, finish, and color.
- F. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site.

#### 1.04 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
  - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials) Wall Required Rating – Class A.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials factory packaged on strong pallets.
- B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

#### 1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work.
- B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
  - 1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

#### 1.07 WARRANTY

- A. Furnish one year guarantee against defects in material and workmanship.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Marlite; 202 Harger Street, Dover, OH 44622. 800-377-1221 Standard FRP Panels and trim.
- B. Crane Composites- Glasbord.
- C. Emco Industrial Plastics- Fiberglass Wall Boards.

### 2.02 PANELS

- A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
  - 1. Coating: Multi-layer print, primer and finish coats or applied over-layer.
  - 2. Dimensions:
  - 3. Thickness – 0.090 “ nominal
  - 4. Width - 4'-0” nominal
  - 5. Length –8'-0” nominal
  - 6. Tolerance:
  - 7. Length and Width: +/-1/8“ (3.175mm)
  - 8. Square - Not to exceed 1/8 “ for 8 foot (2.4m) panels or 5/32 “ (3.96mm) for 10 foot (2.4m) panels
- B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
  - 1. Flexural Strength -  $1.0 \times 10^4$  psi per ASTM D 790. (7.0 kilogram-force/square millimeter).
  - 2. Flexural Modulus -  $3.1 \times 10^5$  psi per ASTM D 790. (217.9 kilogram-force/square millimeter).
  - 3. Tensile Strength -  $7.0 \times 10^3$  psi per ASTM D 638. (4.9 kilogram-force/square millimeter).
  - 4. Tensile Modulus -  $1.6 \times 10^5$  psi per ASTM D 638. (112.5 kilogram-force/square millimeter).
  - 5. Water Absorption - 0.72% per ASTM D 570.
  - 6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
  - 7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256.
- C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.
- D. Front Finish: Pebble or in accordance with preapproved sample.

- E. Color: To be selected from manufacturer's standard range of colors, provide a minimum of 8 color options.
  - 1. Surface - Pebbled
  - 2. Fire - Class A (I)
  - 3. Size: 48" x 96" x .090 nom.

## 2.03 MOLDINGS

- A. PVC Trim: Thin-wall semi-rigid extruded PVC.
  - 1. Inside Corner, 8' length
  - 2. Outside Corner, 8' length
  - 3. Division, 8' length
  - 4. Edge, 8' length
  - 5. Color: Match panel color

## 2.04 ACCESSORIES

- A. Fasteners: Non-staining nylon drive rivets.
  - 1. Match panel colors.
  - 2. Length to suit project conditions.
- B. Adhesive: Either of the following construction adhesives complying with ASTM C 557.
  - 1. FRP Adhesive - Water- resistant, non-flammable adhesive.
  - 2. Construction Adhesive - Flexible, water-resistant, solvent based adhesive, formulated for fast, easy application.
  - 3. Titebond Advanced Polymer Panel Adhesive – VOC compliant, non-flammable, environmentally safe adhesive.
- C. Sealant:
  - 1. Manufacturer's recommended compatible sealant - Color Match

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
  - 1. Verify that stud spacing does not exceed 24" (61cm) on-center.
- B. Repair defects prior to installation.
  - 1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

### 3.02 INSTALLATION

- A. Comply with manufacturer's recommended procedures and installation sequence.
- B. Cut sheets to meet supports allowing 1/8" (3 mm) clearance for every 8 foot (2.4m) of panel.
  - 1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
  - 2. Pre-drill fastener holes 1/8" (3mm) oversize with high speed drill bit.
  - 3. Space at 8" (200mm) maximum on center at perimeter, approximately 1" from panel edge.
  - 4. Space at in field in rows 16' (40.64cm) on center, with fasteners spaced at 12" (30.48 cm) maximum on center.
- C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
  - 1. Install panels with manufacturer's recommended gap for panel field and corner joints.
  - 2. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
  - 3. Drive fasteners for snug fit. Do not over-tighten.
- D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
  - 1. All moldings must provide for a minimum 1/8 " (3mm) of panel expansion at joints and edges, to insure proper installation.
  - 2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

### 3.03 CLEANING

- A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.
- B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

++ END OF SECTION ++

## SECTION 09 90 00

### PAINTING

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Scope:
1. Furnish all labor, materials, equipment and incidentals required for painting as shown and specified.
  2. The extent of painting work is shown on the schedules, and as herein specified.
- B. Description:
1. The Work includes the painting and finishing of all interior and exterior items and surfaces throughout this Contract and existing items and surfaces as described herein, except as otherwise shown or specified. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under this and other sections of the Work.
  2. The term "paint" as used herein means all coating systems materials, which includes the following:
    - a. Pretreatments.
    - b. Primers.
    - c. Emulsions.
    - d. Enamels.
    - e. Stain.
    - f. Sealers and fillers.
    - g. Other applied materials whether used as prime, intermediate or finish coats.
  3. Paint all exposed surfaces whether or not designated in any schedule except where the natural finish of the material is specifically intended as a surface not to be painted.
  4. The term "exposed" as used herein means all items not covered with concrete, plaster, fireproofing or similar material.
  5. Ducts, conduits and other materials with corrosion resistant surfaces which are in chases, above finished ceilings, or other inaccessible areas do not require field painting.
  6. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.
  7. If color or finish is not designated, the Engineer will select from standard colors available for the materials systems specified.



8. Provide only a primer coat for structural and miscellaneous metals covered with concrete, plaster, and fireproofing or similar material.
9. Provide pipe markers and safety signs as shown and specified.

C. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be field painted in this Section.
2. Coordinate the painting of areas that are inaccessible once equipment has been installed.
3. Provide finish coats that are compatible with the prime paints used.
4. Primers specified under other Sections must be compatible to the finish painting.
5. Review other Sections of these Specifications to ensure compatibility of the total coatings system for the various substrates.
6. Contractor is responsible for the compatibility of all shop primed and field painted items in this Contract.
7. Furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used.
8. Provide barrier coats over incompatible primers or remove and reprime as required.
9. Notify the Engineer in writing of anticipated problems using the coating systems as specified with substrates primed by others.

D. Painting Not Included: The following categories of Work are not included as part of the field-applied finish Work:

1. Shop Priming:
  - a. Shop priming of structural metal, miscellaneous metal fabrications, other metal items and such fabricated components as shop-fabricated or factory-built equipment. However, product and preparations used for shop coatings shall be in accordance with this Section unless otherwise noted.
2. Prefinished Items:
  - a. Painting of items furnished with factory finish such as baked-on enamel, porcelain, polyvinyl fluoride or other similar finish is not required, unless otherwise shown or specified. Typical items are as follows:
    - 1) Metal toilet enclosures.
    - 2) Prefinished partition systems.
    - 3) Acoustic materials.
    - 4) Furniture.
    - 5) Finished mechanical and electrical equipment such as light fixtures and distribution cabinets.
    - 6) Elevator cars.
    - 7) Doors.

- 8) Metal building system roof and wall panels.
  - b. Touch up factory finished items with paint supplied by the item manufacturer.
  - c. Field paint damaged prefinished items as reviewed by the Engineer.
  - d. In general, valves, pumps, motors, equipment and all similar mechanical or electrical components that are furnished and installed under this Contract shall be shipped to the job with a factory applied prime coat (meeting the requirements as specified herein) only, and are intended to be finish painted after installation as described herein for reasons of painting quality control and color coding of the completed system.
    - 1) Factory finish painting by a manufacturer will be acceptable only if:
      - a) Complete paint and finish data has been submitted and approved along with the equipment submittal, and
      - b) The Owner has been given the opportunity to select the color and gloss of the finish paint, and
      - c) An acceptable color can be selected which matches the project's color coding to the satisfaction of the Engineer.
    - 2) Equipment delivered to the jobsite and installed without prior approval of the painting system and products used by the equipment manufacturer, will be required to be repainted - including any surface preparation, pretreatments, primers or barrier coatings necessary in order for the finish paints to be completely compatible with the coatings provided by the manufacturer of the equipment.
    - 3) It shall strictly be the Contractor's responsibility to coordinate all material and equipment suppliers and subcontractors in order to assure that only the correct paint coatings are used and that the color coding systems established for this Contract are completely followed.
3. Concealed Surfaces:
- a. Painting is not required on nonmetallic wall or ceiling surfaces in concealed from view areas and generally inaccessible areas, unless otherwise shown or specified. Typical areas are as follows:
    - 1) Furred areas.
    - 2) Pipe spaces.
    - 3) Duct shafts.
    - 4) Elevator shafts.

- b. Paint all piping, equipment, and other such items within these areas that have no other corrosion resistant finish.
  - 4. Concrete unless noted.
  - 5. Face brick, stone and other prefaced unit masonry unless otherwise shown or specified.
  - 6. Fiberglass items such as effluent troughs and gates unless otherwise shown or specified.
  - 7. Wood flights, wood stop logs and wood baffles.
  - 8. Metal surfaces of aluminum, stainless steel, chromium, copper, bronze, brass, monel, lead and similar materials unless shown or specified.
  - 9. Operating Parts and Labels:
    - a. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts do not require finish painting unless otherwise specified.
    - b. Paint over no labels, code stamps, equipment identification, performance rating, name or nomenclature plates.
    - c. Remove all paint, coating or splatter inadvertently placed on these surfaces.
  - 10. Existing structures and equipment unless otherwise shown or specified.
  - 11. Interior electrical conduit, unless noted.
  - 12. Flowmeters, density meters and similar electronic equipment so designated.
  - 13. Hot dip galvanized steel, unless noted otherwise.
- E. All paint products shall be supplied by the same manufacturer unless otherwise approved.

## 1.02 QUALITY ASSURANCE

- A. The specifications in this Section are subject to the administrative and procedural requirements specified in Division 1, as well as the broader requirements of the General Provisions.
- B. Reference Standards:
  - 1. ANSI A13.1, Scheme for the Identification of Piping Systems.
  - 2. OSHA 1910.144, Safety Color Code for Marking Physical Hazards.
  - 3. SSPC Volume 2, Systems and Specifications, Surface Preparation Guide and Paint Application Specifications.
  - 4. WPCF Manual of Practice No. 17, Paints and Protective Coatings for Wastewater Treatment Facilities. Guide and Paint Application Specifications.

5. Great Lakes-Upper Mississippi River Board of State Sanitary Engineers (Ten States Standards), Recommended Standards for Waste Treatment Works - Latest Edition, Recommended Color Scheme for Piping.

### 1.03 DEFINITIONS

(Not Used)

### 1.04 SYSTEM DESCRIPTION

(Not Used)

### 1.05 SUBMITTALS

#### A. Samples:

1. Comply with Section 01 33 00, Submittal Procedures.
2. Submit paint samples for review of color and texture only.
3. Provide a listing of the material and application for each coat of each finish sample.
4. Submit sample of each type of marker and sign specified.

#### B. Shop Drawings:

1. Comply with Section 01 33 00, Submittal Procedures.
2. Submit copies of manufacturer's technical information, including paint label analysis and application instructions for each material proposed for use.
3. List each material and cross-reference to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.
4. Submit copies of manufacturer's complete color charts for each coating system.
5. Provide certifications from manufacturers verifying that the factory applied prime coats are compatible with specified finish coatings.
6. Pipe Markers and Safety Signs: Submit copies of manufacturer's technical brochure, including color chart and list of standard signs.
7. Submit Pipe and Equipment Legend Schedule per 2.4.B.
8. Submit detailed and complete painting lists, per 2.3.C, along with color charts indicating, for each surface to be painted, the painting system and color(s) to be used.

#### C. Maintenance and Operating Instructions:

1. Comply with Section 01 78 00, Operation and Maintenance Data.
2. Submit a detailed maintenance manual including the following information:

- a. Product name and number.
- b. Name, address and telephone number of manufacturer and local distributor.
- c. Detailed procedures for routine maintenance and cleaning.
- d. Detailed procedures for light repairs such as scratches and staining.

## 1.06 JOB CONDITIONS

- A. Existing Conditions:
  1. Broom clean and remove all visible dust before painting is started in any area.
  2. Clean areas where painting operations have started using only commercial vacuum equipment.
- B. Environmental Requirements:
  1. Apply paints within temperature and humidity limits stated by manufacturer.
- C. Protection:
  1. Cover or otherwise protect finished Work of other trades and surfaces not being painted concurrently or not to be painted.
  2. Take precautions necessary to prevent dust and dirt from coming in contact with surfaces cleaned for painting and with surfaces freshly painted.

## PART 2 – PRODUCTS

### 2.01 MATERIAL QUALITY

- A. Provide best grade coatings suitable for use in wastewater treatment plants. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Provide primers produced by the same manufacturer as the finish coats. Use only paint manufacturer's recommended thinners to recommended limits.
- C. Provide durable and washable paints, pipe marker and safety signs. Use materials which will withstand normal washing as required to remove grease, oil, chemicals, etc., without showing discoloration, loss of gloss, staining, or other damage.

## 2.02 SUBSTITUTIONS

- A. Substitutions that decrease the film thickness, the number of coats, or the quality of the surface preparation or the generic type of coating specified will not be considered.
- B. Approved manufacturers must furnish the same color selection including accent colors in all coating systems as the manufacturers specified.

## 2.03 COLORS AND FINISHES

- A. Surface preparation and paint systems are shown under Schedule 09900-B.
- B. Color Selection: A maximum of 20 different colors shall be selected in addition to color coding of all piping and ducts. At least one accent color may be selected for one wall in each room.
- C. Prior to commencing any work under this Section, the Contractor shall submit for approval a detailed list of each and every surface to be painted. Associated with each surface shall be noted the paint system proposed for use and the color (from the manufacturer's color chart) intended. Where colors are indicated in this section (such as piping color codes), the Contractor shall fill in the proposed color. Where colors are not indicated, the Contractor shall leave blanks and the Engineer will fill in these colors. Complete color charts shall be a part of this submittal.
- D. Color Coding: Color coding of piping, ducts and equipment shall comply in general with applicable standards of ANSI A13.1 and OSHA 1910.144.
- E. Piping and Sign Color Code:
  - 1. As directed by the Engineer and/or Schedule 09900-C.
  - 2. As used for this Contract, the term "Piping Color Code" shall be interpreted as including all valves, equipment, pumps and similar items contained within the limits of the pipe and which are components of the pipe's service function.
- F. Use representative colors when preparing samples for review. Final acceptance of colors will be from samples supplied for the job.
- G. Color Pigments: Pure, nonfading, applicable types to suit the substrates and service indicated. Lead content shall not exceed amount permitted by federal, state and local government laws and regulations.

## 2.04 PIPING AND EQUIPMENT LABELING

### A. General:

1. Provide labeling for all pipelines and equipment. All labeling shall conform to ANSI A13.1 except as called for otherwise herein.
2. Legends for pipelines shall be stenciled on the pipe and readable from a normal viewing position. Where applicable, legends shall include arrows to indicate direction of flow.
3. Legends for equipment shall be stenciled on the equipment or on an adjacent wall as directed; size of lettering shall conform to ANSI A13.1, unless otherwise directed.
4. Location of Pipe Legends:
  - a. Adjacent to each valve and "T" connection.
  - b. Each branch and riser takeoff.
  - c. Each pipe passage through a wall, floor and ceiling.
  - d. Horizontal and vertical pipe runs at 25-foot intervals.
  - e. As shown on the Drawings.

### B. Pipe and Equipment Legend Schedule: Prior to the lettering of any equipment or pipelines, the Contractor shall submit for approval, a detailed pipe and equipment legend schedule which shall include the following information for each type of service:

1. Brief narrative description. Example: "MAIN CIRCULATING LOOP DIGESTER HEATING WATER."
2. Primary Name (line one). Example: "DIGESTER HEATING WATER 150 DEG F".
3. Secondary Name (line two). Example: "MAIN CIRCULATING LOOP No. 1".
4. Lettering size and line outside diameter.
5. Lettering and background colors and banding information.
6. Contents of pipe which are above ambient temperature or pressure shall be identified as such in the legend. Example: "AIR 100 PSIG".

### C. Manufacturer of Banding:

1. W. H. Brady Company.
2. Seton Name Plate Corporation.
3. Or equal.

## PART 3 – EXECUTION

### 3.01 EXAMINATION AND VERIFICATION OF CONDITION

- A. Examine the areas and conditions under which painting work is to be performed and review conditions detrimental to the proper and timely completion of the Work with Engineer.
- B. Do not proceed with Work until deficiencies have been satisfactorily corrected.
- C. Do not paint over dust, dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

### 3.02 PREPARATION

- A. Delivery of Materials:
  - 1. Deliver all materials to the job site in original, unopened packages and containers bearing manufacturer's name and label, name of material, and color name and number.
- B. Storage of Materials:
  - 1. Temperature of storage area shall be kept between 65°F and 90°F at all times.
  - 2. Comply with health and fire regulations including the Occupational Safety and Health Act of 1970.

### 3.03 SURFACE PREPARATION

- A. General:
  - 1. Perform all preparation and cleaning procedures as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.
  - 2. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Following completion of painting of each space or area, reinstall removed items by workmen skilled in the trades involved.
  - 3. Thoroughly clean surfaces to be painted before applying paint or surface treatments.
    - a. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning.
    - b. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.



4. All surfaces which were not shop painted or which were improperly shop painted, and all abraded or rusted shop painted surfaces, shall be prepared as specified below.

B. Concrete and Masonry Surfaces:

1. Prepare surfaces of concrete, precast concrete, brick and concrete block to be painted by removing all efflorescence, chalk, dust, dirt, grease, and oils with soap and water.
2. Determine the alkalinity and moisture content of the surfaces to be painted by performing appropriate tests.
  - a. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct this condition before application of paint.
  - b. Provide Engineer with suitable testing materials in order to carry out alkalinity and moisture tests.
3. Do not paint over surfaces where the moisture content exceeds 8 percent, unless otherwise permitted in the manufacturer's printed directions.
4. Acid etch submerged concrete and concrete floor surfaces with a commercial solution of 15 percent concentration muriatic acid.
5. Other surfaces that cannot be adequately cleaned by soap and water shall also be acid etched. Exceedingly dense concrete may require a second etching.
6. Flush floor with clean water to neutralize acid. Allow to dry before painting.
7. Existing surfaces shall be completely cleaned of all loose existing paint and all holes shall be patched to a smooth surface before applying new paint.

C. Wood:

1. Clean wood surfaces to be painted of all dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper. Sand smooth and dust finished surfaces exposed to view.
2. Prime, stain, or seal job painted wood immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, paneling, etc.
3. Backprime paneling or interior partitions only where masonry, plaster, or other wet wall construction occurs in backside.
4. Seal tops, bottoms and cut-outs of wood doors with a heavy coat of manufacturer's recommended sealer immediately upon delivery to job.
5. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before applying prime coat.
6. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler as recommended by the manufacturer. Sand smooth when dry and dust.

- D. Ferrous Metals:
  - 1. Blast clean in accordance with Painting Systems List.
  - 2. Blast profile shall not exceed 50 percent of total dry film thickness.
  - 3. Blasted surfaces shall be coated as soon as practical after exposure. In no case shall a blast-cleaned surface be left overnight prior to receiving a prime coat.
  - 4. Weld areas shall be washed with a mild solution of phosphoric acid prior to applying any paints.
  - 5. Remove oil, dirt, grease, mill scale and all foreign material from all surfaces in addition to all blast cleaning called for.
  
- E. Nonferrous Metal Surfaces: Clean nonferrous metal surfaces in accordance with the coating system manufacturer's instructions for the type of service, metal substrate, and application required.
  
- F. Galvanized Surfaces:
  - 1. Clean free of oil and surface contaminants with coating manufacturer's recommended non-petroleum based solvent complying with SSPC-SP 1.
  - 2. Prior to preparing the surface as described above, any damaged or missed areas of galvanized surfaces and welds to be painted shall be wire brushed and touched up using "Zincilate" by Industrial Metal Protectives, Dayton, Ohio, or equal.
  
- G. PVC Piping: Lightly sand all surfaces to be painted.
  
- H. Plaster and Dry Wall:
  - 1. Patch, sand and seal all rough spots before prime coat.
  - 2. Touch up all suction spots and hot spots with primer before applying finish coats.
  
- I. Insulated Pipe:
  - 1. Clean free of oil and surface contaminants as recommended by the coating manufacturer for substrate and application required. Cut or damage no insulation.

### 3.4 MATERIALS PREPARATION

- A. General:
  - 1. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
  - 2. Mix no coating materials produced by different manufacturers, unless otherwise permitted by the manufacturer's instructions.
  - 3. Store materials in tightly covered containers when not in actual use.

4. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
  5. Stir all materials before application and as required during the application of the materials to produce a mixture of uniform density. Remove all film which may form on the surface and, if necessary, strain the material before stirring and using.
- B. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Provide a code number to identify material tinted by the manufacturer.
- C. Split-Coats: Mix split-coats accurately in the proportions specified or recommended by the manufacturers, where enamels or high-gloss paint systems require split-coats to ensure proper bond or adhesion of the succeeding coats, or where split-coats are specified.

### 3.5 APPLICATION

- A. General:
1. Apply paint by brush, roller, air spray, or airless spray (see 3.4.J below for limits of use of mechanical applicators) in accordance with the manufacturer's directions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable.
  2. Use brushes best suited for the type of material being applied.
  3. Use rollers of carpet, velvet back, or high pile sheeps wool as recommended by the paint manufacturer for material and texture required.
  4. Use the same number of coats and paint film thickness regardless of the application method. Apply succeeding coat only after the previous coat has completely dried.
  5. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense primary accent colors.
  6. Ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that on flat surfaces.
  7. Surfaces not exposed to view require no color coding but require the same coating systems specified for exposed surfaces. "Exposed to view surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.
  8. Paint interior surfaces of ducts, where visible through registers or grilles, with flat, nonspecular black paint before final installation of equipment.

9. Paint the backs of access panels, and removable or hinged covers to match the exposed surfaces.
  10. Finish exterior doors on tops, bottoms, and side edges the same as the exterior faces, unless otherwise specified.
  11. Paint aluminum parts in contact with dissimilar materials as specified with appropriate primer.
  12. Omit field primer on metal surfaces that have been shop primed. Touch-up paint shop prime coats only as reviewed by Engineer.
- B. Existing Surfaces: When repainting existing surfaces with existing coatings in place which have not been completely removed, the CONTRACTOR shall determine whether the new coatings specified will be compatible with the existing coating. This may include an analysis of a sample of the existing coating and a letter from the manufacturer of the new coating. Any incompatibilities found shall be reported to the Engineer so that a change in type of new material called for can be made. No additional payment will be made for a change of specified material for such cause.
- C. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate to provide total dry film thickness as specified. Apply extra coat if required to obtain specified total dry film thickness.
- D. Scheduling Painting:
1. Apply the first-coat material to cleaned, pretreated or otherwise prepared surfaces as soon as practicable after preparation and before subsequent surface deterioration.
  2. Allow sufficient time between successive coatings to permit proper drying. Recoat only when paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- E. Prime Coats: Recoat primed and sealed walls and ceilings to assure a finish coat with no burn-through or other defects caused by insufficient sealing where there is evidence of suction spots or unsealed areas in first coat.
- F. Stipple Enamel Finish:
1. Roll and redistribute paint to an even fine texture.
  2. Leave no evidence of rolling such as laps, irregularities in texture, skid marks, or other surface imperfections.
- G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

- H. Transparent (Clear) Finishes:
  - 1. On exposed-to-view portions, use multiple coats to produce glass smooth surface film continuity of even luster.
  - 2. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
  - 3. Provide satin finish for final coats, unless otherwise indicated.
  
- I. Brush Application:
  - 1. Brush-out and work all brush coats onto the surfaces in an even film.
  - 2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
  - 3. Neatly draw all glass and color break lines.
  - 4. Brush apply all primer or first coats, unless otherwise permitted to use mechanical applicators.
  
- J. Mechanical Applicators:
  - 1. Use mechanical methods for paint application only when permitted by governing ordinances, paint manufacturer, and reviewed by Engineer. Limit to only those surfaces impracticable for brush applications, if permitted.
  - 2. Limit roller applications, if approved by Engineer, to interior wall and ceiling finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
  - 3. Confine spray application to metal framework, siding, decking, wire mesh and similar surfaces where hand brush work would be inferior and to other surfaces specifically recommended by paint manufacturer.
  - 4. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Avoid double back with spray equipment for the purpose of building up film thickness of two coats in one pass.
  
- K. Completed Work:
  - 1. Match approved samples for color, texture and coverage.
  - 2. Remove, refinish, or repaint work not in compliance with specified requirements as required by the Engineer.

### 3.6 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing Work. Leave all such Work undamaged.
  
- B. Correct all damages by cleaning, repairing or replacing, and repainting, as acceptable to the Engineer.

- C. Provide "Wet Paint" signs as required to protect newly painted finishes.
- D. Remove all temporary protective wrappings provided for protection of this Contract and other Contracts after completion of painting operations.

### 3.7 CLEAN-UP

- A. During the progress of the Work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
- B. Upon completion of painting work, clean window glass and all other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of Work of other trades, touch up and restore all damaged or defaced painted surfaces as determined by the Engineer.
- D. Paint pots or equipment shall not be cleaned at sinks or other drainage facilities nor shall any debris be allowed to run into drainage lines of the buildings.

**SCHEDULE 09900-A**  
**PAINTING SCHEDULE**

Except as otherwise called for in these Specifications, the following surfaces shall be painted in accordance with the appropriate exposure condition, as called for in the Painting Systems List (Schedule 09900-B):

**I. NEW SURFACES**

- A. Iron and Steel. All iron and steel pipe, fittings, valves, pumps, motors, structural steel, tanks and equipment surfaces (stainless steel and galvanized steel painting is not required unless shown or noted).
- B. Copper Pipe. All copper piping.
- C. Masonry. All interior exposed surfaces. Do not paint exposed poured concrete surfaces.
- D. Wood. All exposed interior and exterior surfaces.
- E. Plastics. All exposed plastic, PVC, and fiberglass pipe, fittings, valves, tanks and equipment, except as noted.
- F. Electrical Conduit. Interior: No painting required.

Exterior: Paint with System S8 if galvanized Paint with System P1 if PVC coated and specifically indicated to be painted.

- G. Relocated Surfaces. Relocated surfaces are included in this schedule.
- H. Gypsum Wallboard and Plaster. All locations.

**II. EXISTING SURFACES**

- A. Miscellaneous:
  - 1. All relocated pipe, valves, fittings, equipment and accessories.
  - 2. All existing surface that is modified, damaged or disturbed during the performance of work under this Contract. The Owner will determine the complete extent and limits of the repainting based on the exact nature and type of damage or modification to the equipment surface(s).

3. All existing surfaces specifically described elsewhere in these Specifications or indicated on the Drawings to be painted.

### III. SURFACES NOT PAINTED

- A. The following surfaces shall NOT be painted:
  1. Flow meters and density meters.
  2. Equipment nameplates.
  3. Any parts of stainless steel fasteners and anchor bolts.
  4. Hot dip galvanized steel unless noted otherwise.
  5. Aluminum jacket over pipe insulation.
  6. Loading Plaques and Rating Labels.
  7. PVC coated electrical conduit.
  8. Valve actuators and linkages, except for steel or galvanized steel supports, stands or braces for the actuators.
  9. Flow tubes, meters, instruments or controls mounted on piping or mounted separately.
  10. Stainless steel electrical enclosures or panels, unless otherwise specified.
- B. Should any of the above surfaces be painted, the Contractor shall remove the coating and restore the surface to original condition.

END OF SCHEDULE 09900-A



**SCHEDULE 09 90 00 - B**  
**PAINTING SYSTEMS LIST**

Exposure Description	System	Surface Prep	Pretreatment or Primer Dry MILs	Finish Coats		Total Dry Mil Thickness
				No. 1	No. 2	
				Dry MILs		
<b>IRON &amp; MILD STEEL</b>						
<b>A. SUBMERGED</b>						
1. Potable	S1	SP-5	$\frac{P-3}{6}$	$\frac{F-1}{6}$	-	12.0
2. Nonpotable <sup>(a)</sup>	S2	SP-5	$\frac{P-1}{2}$	$\frac{F-2}{8}$	$\frac{F-2}{8}$	18.0
<b>B. NOT SUBMERGED</b>						
1. New (interior and exterior)	S3	SP-10	$\frac{P-1}{2}$	$\frac{F-5}{4}$	$\frac{F-3(\text{gloss})}{2}$	8.0
2. Existing (interior and exterior)	S4	SP-1, SP-2, or SP-3, as required	$\frac{P-2^{(b)}}{2}$	$\frac{F-5^{(c)}}{4}$	$\frac{F-3(\text{gloss})}{2}$	8.0
3. Severe Exp. (existing or new, interior or exterior, only where called for)	S5	SP-10 <sup>(d)</sup>	$\frac{P-5}{3}$	$\frac{F-5}{5}$	$\frac{F-3(\text{gloss})}{2}$	10.0
4. High Temp - A (150□-250□F)	S6A	SP-10	$\frac{P-1}{2}$	$\frac{F-5}{3}$	$\frac{F-5}{3}$	8.0
5. High Temp - B (250□-750□F)	S6B	SP-10	-	$\frac{F-7}{3}$	$\frac{F-4}{1.0}$	4.0
6. High Temp - C (750□-1200□F)	S6C	SP-10	-	$\frac{F-4}{1.0}$	$\frac{F-4}{1.0}$	2.0
7. Encased <sup>(e)</sup> (in masonry, concrete or insulation)	S7	SP-6	$\frac{P-1}{2}$	$\frac{F-5}{4}$	-	6.0

- (a) Includes surfaces buried in ground or exposed to digester gas.
- (b) Spot prime only if bare metal surfaces are not covered with existing paint; otherwise, prime new metal.
- (c) Finish coat No. 1 must be fully cured prior to applying finish coat No. 2, otherwise, use primer.
- (d) Remove all existing coatings to SP-10.
- (e) To 250 degrees F.

Exposure Description	System	Surface Prep	Pretreatment or Primer Dry Mils	Finish Coats		Total Dry Mil Thickness
				No. 1	No. 2	
				Dry Mils		
8. Galvanized	S8	SP-1	<u>T-1</u> 0.3	<u>F-5</u> 4	<u>F-3(gloss)</u> 2	6.3
9. Exist. Fence	S9	SP-3 <sup>(a)</sup>	-	<u>F-8</u> 3	-	3.0
STAINLESS STEEL	S10	SP-10	<u>P-1<sup>(b)</sup></u> 2	<u>F-3(gloss)</u> 2	-	4.0
GALV. REPAIR	S11	SP-3or7	<u>T-1</u> 0.3	<u>Z-1</u> 1.5	<u>Z-1</u> 1.5	3.3
COPPER (All Exposure)	C1	SP-1	<u>P-1<sup>(b)</sup></u> 2	<u>F-3(gloss)</u> 2	-	4.0
ALUMINUM (In contact with dissimilar material)	A1	Clean	<u>P-6</u> 0.3	<u>F-5</u> 4	<u>F-5</u> 4	8.3
<b>CONCRETE &amp; MASONRY</b>						
<b>A. NOT SUBMERGED<sup>(c)</sup> (New &amp; existing repaint work)</b>						
1. Interior, porous	M1	Art. 3.03	<u>P-4</u> 10	<u>F-5</u> 4	<u>F-3(gloss)</u> 2	16.0
2. Interior, nonporous	M1	Art 3.03	-	<u>F-5</u> 4	<u>F-3(gloss)</u> 2	6.0
3. Exterior (nonporous)	M3	Art 3.03	-	<u>F-5</u> 4	<u>F-3(flat)</u> 2	6.0
4. Exterior Masonry	M4	Art 3.03	-	<u>F-6</u> 75 sf/gal	<u>F-6</u> 150 sf/gal	-
5. Floors	M5	Art 3.03	-	<u>F-5</u> 2	<u>F-5<sup>(d)</sup></u> 4	6.0

(a) Remove loose rust only, tightly adhered rust may remain.

(b) Surface shall be sandblasted or abraded to create anchor pattern sufficient to ensure bonding of primer.

(c) Pinholes shall be filled.

(d) Nonskid formulation.

Exposure Description	System	Surface Prep	Pretreatment or Primer Dry Mils	Finish Coats		Total Dry Mil Thickness
				No. 1	No. 2	
				Dry Mils		
<b>WOOD</b>						
1. Interior (color)	W1	Art. 3.03	<u>P-7</u> 1	<u>F-9</u> 3	<u>F-9</u> 3	7.0
2. Exterior (color)	W2	Art 3.03	<u>P-8</u> 1	<u>F-10</u> 3	<u>F-10</u> 3	7.0
3. Interior (clear)	W3	Art 3.03	-	V-1	V-2	-
PLASTICS (including fiberglass)	P1	Clean in accordance with mfg. recommend	-	<u>F-5</u> 2	<u>F-3(gloss)</u> 2	4.0

<b>INSULATED PIPE</b>						
A. Canvas Cover	N1	Cement coating under the pipe item	-	<u>F-5</u> 4	<u>F-3(gloss)</u> 2	6.0
B. PVC Jacket		Clean in accordance with mfg. recommend	-	<u>F-5</u> 2	<u>F-3(gloss)</u> 2	4.0
GYPSUM WALLS	D1	Clean as directed	<u>P-9</u> 1.5	<u>F-11</u> 2	<u>F-11</u> 2	5.5

SURFACE PREPARATIONS:

<u>Mark</u>	<u>Description</u>
SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-5	White Metal Blast Cleaning

SP-6	Commercial Blast Cleaning
SP-7	Brush-off Blast Cleaning
SP-8	Pickling
SP-10	Near White Blast Cleaning
SP-11	Power tool cleaning to bare metal
SP-13/NACE #6	Surface preparation of concrete

The above surface preparations shall be performed in accordance with the recommendations of the Steel Structures Painting Council (SSPC), 4400 Fifth Avenue, Pittsburgh, Pennsylvania 15213, and in accordance with Sec. 22.4.

PRETREATMENT:

<u>Mark</u>	<u>Generic Type</u>	<u>Manufacturers</u>
<u>PRIMERS:</u>		
P-1	polyamide epoxy	Tnemec: -N69-1211 Hi-Build Epoxoline II Primer Sherwin Williams Macropoxy 646 FC PPG Amerlock 2 Or equal
P-2	alkyd	Tnemec: 37H-77 Chem-Prime H.S. Sherwin Williams Kem Kromik Universal Primer PG Multprime 94-258 Or equal
P-3	polyamide epoxy (potable water)	Tnemec: N140 Pota-Pox Plus Sherwin Williams Macropoxy 646 PW PPG Amerlock 2 Or equal
P-4	Masonry Filler	Tnemec: Series 130 Envirofill Sherwin Williams Heavy Duty Acrylic Block Filler PPG Permacrete 4-100 Or equal

<u>Mark</u>	<u>Generic Type</u>	<u>Manufacturers</u>
P-5	inorganic zinc-	Tnemec: 90-97 TEME-ZINC Sherwin Williams Zinc Clad II rich primer PPG Dimecote 9 Or equal
P-6	-	Tnemec: Not Required Sherwin Williams: Not Required Or equal
P-7	enamel	Tnemec: V10-99W Sherwin Williams Pro-Block Latex Primer PPG Seal Grip 17-921 Or equal
P-8	acrylic	Tnemec: Series 1026 Enduratone Sherwin Williams DTM Primer-Finish PPG Pitt Tech 90-712 Or equal
P-9	acrylic/latex	Tnemec: Series 51 PVA-Sealer Sherwin Williams Pro Mar 200 PPG 6-2 Primer Or equal

FINISH PAINTS:

F-1	polyamide epoxy (potable water)	Tnemec: Series N140 Pota-Pox Plus 1211 RED, 1255 BEIGE, 20-2000 WHITE, WHO2 TANK WHITE, GB03 DELFT BLUE Pota-Pox Sherwin Williams Macropoxy 646 PW PPG Amerlock 2 Or equal
F-2	coal tar epoxy	Tnemec: 46H-413 H.B. Tneme-Tar Sherwin Williams Hi-Mil Sher-Tar PPG Amercoat 78HB Or equal

F-3	aliphatic	Tnemec: Endura-Shield II 1075 or 1074 Sherwin Williams Acrolon 218HS Urethane with leveling additive PPG Pitt Thane Ultra Or equal
F-4	silicone	Tnemec: Series 1501 Endura-Heat DTM To 600 deg F, Series 1525 Endura-Heat DTM to 1000 deg F aluminum Series 1525 Endura- Heat DTM to 1200 deg F Silicone aluminum Sherwin Williams HEAT-FLEX HI-TEMP 500 to 500 deg F; HEAT-FLEX HI-TEMP 1000 to 1000 deg F; HEAT-FLEX HI-TEMP 1200 to 1200 deg F. PPG Hi-Temp 500vs, 100vs, Hi-Temp 1027 Primer Or equal
F-5	polyamide epoxy	Tnemec: N69 Hi Build EPOXOLINE II Sherwin Williams Macropoxy 646 FC PPG Amerlock 2 Or equal
F-6	silicone	Tnemec: Series 633 PRIME-A- PELL H2O PPG Aqua-Pell 4-6100 Or equal
F-7	ethyl silicate inorganic zinc	Tnemec: 90-97 Tneme-Zinc Sherwin Williams Zinc-Clad II PPG Dimecote 9 Or equal
F-8	moisture cured rust inhibitive	Tnemec: Series 530 Omnithane Sherwin Williams Corothane I Mio Aluminum urethane prime PPG Amercoat 68MCZ Or equal

<u>Mark</u>	<u>Generic Type</u>	<u>Manufacturer's</u>
F-9	alkyd enamel	Tnemec: <u>2HS Low VOC Tneme-Gloss</u> <u>Sherwin Williams Industrial Enamel VOC</u> <u>PPG 7-Line</u> Or equal
F-10	acrylic	Tnemec: Series 1026 Enduratone Sherwin Williams DTM Primer-Finish PPG Pitt Tech 90-712 Or equal
F-11	acrylic epoxy	Tnemec: 113/114 H.B. Tufcoat Sherwin Williams Pro Industrial WB Epoxy PPG Pitt Glaze 16-510 Or equal
V-1	alkyd varnish	Gloss varnish reduced w/1 pt. mineral spirits per gallon PPG Deft interior/exterior Gloss
V-2	alkyd varnish	Satin Varnish PPG Deft interior/exterior Satin 226
Z-1	epoxy ester	Z.R.C.: Cold galvanizing compound. Industrial Metal Products: Zincilate 810C. PPG Cold Galv Spray 55-653

F-3 Notes:

1. Aliphatic urethane shall not be an aliphatic, polyester or acrylic resin, polyurethane. No epoxy resin based polyurethanes will be acceptable.
2. A leveling additive shall be incorporated (if not added at the factory by the manufacturer) with this finish coat and the application shall be made in such a manner as to achieve a very smooth, uniform, "automotive" or "wet-look" surface finish. Dull, orange-peel areas will not be acceptable. A sample panel, minimum 2'-0" x 3'-0" flat plate or 3'-0" long x 6" diameter shall be submitted for finish approval prior to finish painting of any surfaces for this contract.

END OF SCHEDULE 09900-B

**SCHEDULE 09900-C**

**PIPING, EQUIPMENT, AND MARKER COLOR CODE**

PIPE SYSTEM	PAINT COLOR		PIPE CODES	REMARKS
	PIPE	MARKER LETTERING		
Compressed Air	Green	White	CA	
Aeration	Light Green	Black	AIR	
Sewage	Gray	Black	DEC, EFF, MBP, MFFM, RS SSE, SEC, SEF, TEF, UVB, WGFM	See Note 3
Grit	Brown	White	GRIT GBP, GW	
Waste Activated Sludge	Brown	White	WAS	
Digested Sludge	Black	White	DS	
Filter Backwash	Brown	White	FBW	
Caustic	Light Blue	Black	NAOH	
Coagulant	Orange	Black	FECL	
Plant Water (non-potable)	Blue w/ Orange Bands	White	PSW	
Drain, Waste, Vent	Gray	Black	D, PD, V	
Valves, Pump, and other In-Line Components	Match base color of pipe flow stream, unless specified otherwise			

**NOTES:**

1. Colors and identification information not designated in this Schedule will be selected by the Owner.
2. See Exposed Piping Schedule on the Drawings.
3. Stainless Steel piping, valves and supports shall not be painted; black stencil labeling only. Hoses shall not be painted.

END OF SCHEDULE 09900-C



## SCHEDULE 09900-D

### FEDERAL STANDARDS FOR PIPING AND EQUIPMENT CODE COLORS

Reference Federal Standard 595B.

<u>COLOR</u>	<u>FEDERAL STANDARD</u>
Red	11350
Orange	12473
Yellow	13591
Light Green	24552
Green	24190
Light Blue	15200
Blue	15092
Aluminum	17178
Brown	20117
Gray	36373
Dark Gray	36122
Black	27038
White	37925

END OF SCHEDULE 09900-D

## SCHEDULE 09900-E

### DEW POINTS AT VARIOUS AIR TEMPERATURES AND RELATIVE HUMIDITIES

Air Temp °F	% RELATIVE HUMIDITY						
	30%	40%	50%	60%	70%	80%	90%
30	4	11	15	19	22	25	28
40	13	18	23	27	31	34	37
50	20	26	31	36	40	44	47
60	28	35	40	45	50	54	57
70	36	43	50	55	60	63	67
80	44	52	59	64	68	73	77
90	52	61	67	73	78	82	87
100	61	69	77	83	88	93	97

#### NOTES:

1. It is essential to ensure that no condensation occurs on blasted steel or between coats during painting.
2. The dew point is the temperature of a given air-water vapor mixture at which condensation starts, since at that temperature its maximum water content (saturation) is reached.
3. In painting practice, a safety margin must be kept, whereby the substrate temperature is at least 5 degrees F above dew point.

END OF SCHEDULE 09900-E

++ END OF SECTION ++

## SECTION 10 14 20

### INTERIOR SIGNS

#### PART 1 - GENERAL

##### 1.01 REFERENCES

- A. Americans with Disabilities Act - 1990.
- B. ICC/ANSI A-117.1 - Specifications for Sign Requirements for the Physically Handicapped.
- C. NFPA 704 – Standard System for the Identification of the Hazards of Materials for Emergency Response. National Fire Protection Association, NFPA 704.
- D. 29 CFR 1910.1200 – Worker Hazard Communication, Occupational Safety and Health Administration, U.S. Department of Labor.

##### 1.02 SUBMITTALS

- A. Shop Drawings: Show fabrication and mounting details for each sign type and copy specified. Include sign designs, dimensions, copy style, and copy heights.
  - 1. For signs supported or anchored to permanent construction provide setting drawings for anchor bolts and other anchors to be installed under other sections.
- B. Product Data: Catalog sheets, specifications, and installation instructions for each sign type and mounting type specified.
- C. Samples:
  - 1. Full size of each sign type and copy type specified including mounting accessories. These samples will be returned and, if approved, may be used in the Work.
  - 2. Color Samples: Manufacturer’s standard colors for sign material and finishes specified.
- D. Quality Control Submittals:
  - 1. Sign Fabricator Qualification Data: Certified statement from the fabricator indicating the capacity and number of years products similar to those specified for the Work have been produced.
- E. Templates: Provide full-size spacing templates for individually mounted dimensional letters and numbers.

##### 1.03 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: The firm manufacturing the signs shall have been regularly producing signs similar to those specified for the Work, for a minimum of 5 years. The firm shall also have sufficient production capacity to produce the quantity of sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

#### 1.04 PROJECT CONDITIONS

- A. Do not install the sign units until all other finishing operations, including painting, have been completed unless otherwise directed.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sign units to Site with protective covering in place.
- B. Leave protective covering on sign units until completion of installation.

### PART 2 – PRODUCTS

#### 2.01 MATERIALS

- A. Engraved Stock (ES) Plastic: Scratch-resistant, non-static, high pressure laminate with contrasting inner core color.
  - 1. Finish and Color: As selected from manufacturer's standard colors and finishes, unless otherwise indicated.
  - 2. Exposed Engraved Inner Core: To be selected from manufacture's standard colors.
  - 3. Thickness: 1/8 inch, unless otherwise indicated.
- B. Mounting Materials:
  - 1. Sealant Mounting (SM): Sign manufacturer's standard or recommended acrylic or silicone sealant type adhesive intended for substrates involved.

#### 2.02 GRAPHIC PROCESS TYPES:

- A. Engraved Process: Machine engraved letters, numbers, symbols, and other graphic devices to produce precisely formed copy indented to a uniform depth with sharply formed edges.
  - 1. ES Plastic (ESP): Engrave copy through the exposed face ply to expose the core ply.

## 2.03 PANEL CONFIGURATION

- A. Comply with requirements indicated for each sign type and copy. Produce smooth, even, level, sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
- B. Unframed Panel Signs: Fabricate sign units with edges mechanically and smoothly finished to conform with the following conditions:
  - 1. Edge Condition: Beveled.
  - 2. Edge Color: Same as copy.
  - 3. Corner Condition: Square.
- C. Copy Style:
  - 1. Style 1: Helvetica Medium, upper case, 3/4 inch height, with Grade 2 Braille below copy.
  - 2. Style 2: Helvetica Medium, upper case, 3/4 inch height, with appropriate pictogram to match lettering and Grade 2 Braille below copy.
  - 3. OSHA/NFPA signs: Arial Bold, upper case, height as required, center-justified.

## 2.04 FABRICATION

- A. Fabricate sign units of graphic process, design, copy, dimensions and color indicated or specified.
- B. Copy shall be as stated on the Signage Schedule on the construction drawings.

## 2.05 HAZARD COMMUNICATION SIGNS

- A. OSHA Sign uses:
  - 1. Where called or shown on the Drawings or specified.
  - 2. Where pertaining to safety and/or potential hazardous situations.
  - 3. Where otherwise directed by the Owner.
- B. OSHA Hazard Designations:
  - 1. DANGER: Use when there is a hazardous situation which has a high probability of death or severe injury. This hazard designation should not be considered for property damage unless personal injury risk is present.
  - 2. WARNING: Use when there is a hazardous situation which has some probability of death or severe injury. This designation should not be considered for property damage unless personal injury risk is present.
  - 3. CAUTION: Use when there is a hazardous situation which may result in minor or moderate injury. This designation should not be used when there is the possibility of death or severe injury.

4. NOTICE: Use when indicating a statement of company policy as the message relates directly or indirectly to the safety of personnel or protection of property.
  5. SAFETY: Use when indicating general instructions related to safe work practices, reminders of proper safety procedures, and location of safety equipment.
- C. OSHA Sign Colors:
1. DANGER: Red/white/black header with black letters and graphics on a white background.
  2. WARNING: Orange/black header with black letters and graphics on a white background.
  3. CAUTION: Yellow/black header with black letters and graphics on a yellow background.
  4. NOTICE: Blue/white header with black letters and graphics on a white background.
  5. Safety: Green/white header with green letters and graphics on a white background.
- D. OSHA Sign Construction:
1. Material: Tedlar-coated plastic.
  2. Thickness: 60-mil, minimum.
  3. Features:
    - a. Indoor and outdoor use.
    - b. Weather, chemical and graffiti-resistant.
    - c. Rounded corners with four corner mounting holes.
- E. OSHA Sign Size/Wording:
1. Provide standard or custom sign sizes, wording and graphics as shown and specified.
  2. Final wording and graphics shall be as approved by the Owner, on the shop drawings.
- F. NFPA 704 Diamonds:
1. Application:
    - a. Apply three (3) labels to each tank, each approximately 120 degrees apart.
    - b. Mount labels on the tank exterior, nominally 3 feet above the tank bottom, or for maximum visibility from the operating floor.
    - c. Apply one (1) label to each exterior door to building storing chemical.
    - d. Apply one (1) label adjacent to each respective fill port in the chemical unloading area.
  2. Hazard classification:

- a. Sodium Hydroxide:
      - 1) Health: "3".
      - 2) Flammability: "0".
      - 3) Reactivity: "1".
      - 4) Special Hazard: "ALK".
    - b. Ferrous Chloride:
      - 1) Health: "3".
      - 2) Fire: "0".
      - 3) Reactivity: "0".
      - 4) Special Hazard: "COR".
  - 3. Materials:
    - a. Tank and Exterior Door Application: 3.5 mil adhesive-backed vinyl.
    - b. Masonry and Concrete Exterior Mounting: 60-mil Tedlar-coated plastic.
- G. Mounting: Provide stainless steel anchors compatible with the mounting substrate.
- H. Manufacturers:
  - 1. Seton.
  - 2. Or equal.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Examine surfaces to receive the signs for defects that will adversely affect the execution and quality of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.02 INSTALLATION

- A. Install the work of this Section in accordance with the sign manufacturer's printed installation instructions, except as otherwise indicated or specified.
- B. Coordinate sign units with Signage Schedule prior to installation.
- C. Secure sign units to surfaces and locations shown on the Drawings with mounting location and mounting method specified.
- D. Mounting Locations:
  - 1. Location A: Latch side of door, sign unit center 60 inches above finished floor and near edge of sign unit 2 inches from outside edge of door frame.

3.03 CLEANING AND PROTECTION

- A. Do not remove protective coverings until directed.
- B. Clean sign units when directed.

++ END OF SECTION ++



## SECTION 10 21 13

### METAL TOILET COMPARTMENTS

#### PART 1 - GENERAL

##### 1.01 SUBMITTALS

- A. Shop Drawings: Show fabrication details and connections to adjacent work.
- B. Product Data: Catalog sheets, specifications, and installation instructions for the following:
  - 1. Panels and Doors.
  - 2. Pilasters, types specified.
  - 3. Screens, types specified.
  - 4. Hardware and accessories.
- C. Samples:
  - 1. Hardware: One, each item and type specified.
  - 2. Panels: One 12 inch square corner section.
  - 3. Pilaster Leveling Device: One complete device, including pilaster shoe.
  - 4. Overhead Bracing: One 12 inch long section.
  - 5. Bracket Fittings: One each type.
  - 6. Fasteners: One each type.
  - 7. Color Samples: Manufacturer's standard colors for specified finish.

##### 1.02 PROJECT CONDITIONS

- A. Do not install the Work of this Section until after the floors, walls, and ceilings of the spaces to receive the Work are completed.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS

- A. Sheet Steel: ASTM A 591, galvanized-bonderized, of the following minimum thicknesses.
  - 1. Pilasters (Overhead Braced): 20 gage.
  - 2. Panels (Partitions): 20 gage.
  - 3. Doors: 22 gage.
  - 4. Concealed Reinforcing for Anchorages: 12 gage.

5. Concealed Reinforcing for Tapping: 14 gage.
- B. Core Material: Corrugated paperboard formed of panels weighing approximately 34 pounds per 1000 square feet or kraft paper weighing not less than 25 pounds per 1000 square feet formed into a hexagonal honeycomb pattern containing cells of approximately one inch size.
- C. Wood Reinforcing: Continuous solid wood, minimum 4 inches wide, thickness as required to match pilaster, panel, or door thickness.
- D. Pilaster Shoes; One for each Pilaster: AISI Type 302/304, 20 gage stainless steel, 3 inches high, finish to match hardware.
- E. Stirrup Brackets: Non-ferrous alloy with satin chrome finish.
- F. Hardware and Accessories: Heavy duty operating hardware and accessories, non-ferrous cast alloy with satin chrome finish, unless otherwise specified.
- G. Fasteners: Minimum 1/4 inch diameter machine bolts with tamper resistant heads; finished to match hardware.

## 2.02 FABRICATION

- A. Panels: Pressure laminate face sheets to core, form edges by lapping or seal edges with continuous locking strip. Miter and weld corners, with welds ground smooth, or cap with stainless steel clips.
  1. Panel Thickness: One inch.
  2. Provide cut-outs, with concealed reinforcing, as required for hardware. Edge cut-outs and finish exposed edges to match remaining uncut edges.
  3. Provide concealed steel or wood reinforcing for installation of hardware, fittings, brackets, and required accessories. Spot weld steel reinforcing in place. Permanently adhere wood reinforcing in place.
  4. Where grab bars are indicated reinforce panels for attachment of grab bars.
- B. Doors: One inch thick units, size as indicated, of same construction and finish as panels.
- C. Floor-Supported Pilasters: 1-1/4 inches thick units, of same construction and finish as panels, with galvanized steel anchorage complete with threaded rods, lock washers, and leveling nuts.
- D. Overhead-Braced Pilasters: 1-1/4 inches thick units, of same construction and finish as panels, with galvanized steel floor supports and leveling bolts.

1. Overhead Brace: Continuous extruded aluminum tube, anti-grip design with clear anodized finish. Set and secure brace into top of each pilaster.
- E. Wall-Hung Screens: One inch thick units, size as indicated, of same construction and finish as panels.
- F. Hardware and Accessories; One set for each Door:
1. Hinges: Heavy duty gravity type, recessed top and bottom door assemblies and clamp flange jamb brackets thru bolted to pilaster. Stainless steel door pivot pin operating in upper hinge bronze or nylon bushing, opposing cam action unit in lower portion. Hinges adjustable to permit door to remain stationary at any desired angle.
  2. Mortise Lock: Stainless steel, thumb turn control inside, tool operated slotted rosette outside for emergency access.
  3. Combination Stop and Keeper: Clamp flange type, with securely attached rubber bumper.
  4. Combination Coat Hook and Bumper: Manufacturer's standard unit, rubber tipped.
  5. Door Pull (for doors opening out): Chrome plated or stainless steel.
  6. Wall Bumper (for doors opening out and striking adjacent wall at 90 degrees): Ives No.406 or Glynn-Johnson No. 50W rubber dome with concealed fastener.
- G. Factory Finish: One coat of rust resisting primer and two finish coats of baking enamel applied to steel surfaces.
1. Color: As selected from the manufacturer's standard colors.
- H. The following toilet partition manufacturers are acceptable:
- All American Metal Corp. (AAMCO)  
Flush-Metal Partition Corp.  
Global Steel Products Corp.  
Knickerbocker Partition Corp.  
Metpar Steel Products Corp.  
Monarch Toilet Partition, Inc.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install Work of this Section in accordance with the manufacturer's printed instructions, except as otherwise indicated or specified.

1. Position door bumpers at proper locations to prevent door from striking adjacent wall or panel.
  2. Fasten pilaster shoes to pilasters with one fastener on each side.
- B. Set units with no more than 1/2 inch between pilasters and panels, and no more than one inch clearance between panels and walls.
- C. Attach wall-mounted screens with heavy duty concealed anchoring devices, including wall channels, wall plates and studs.
- D. Tolerances: Maximum variations from plumb in the lines and surfaces of the Work of this Section shall be 1/8 inch in any 5 feet.

### 3.02 ADJUSTING

- A. Adjust leveling devices, door hardware, and other operating parts for smooth operation.
1. Set hinges of in-swing doors to hold doors open approximately 35 degrees from the closed position when unlatched.
  2. Set hinges of out-swing doors to return to the fully closed position.
  3. Lubricate hardware for proper operation.

### 3.03 CLEANING

- A. Clean exposed surfaces and touch up minor finish imperfections using materials and methods recommended by the manufacturer.

++ END OF SECTION ++

## SECTION 10 28 05

### TOILET AND BATH ACCESSORIES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install toilet and bath accessories Work.
2. Extent of toilet and bath accessories is shown and specified.
3. Types of products required include the following:
  - a. Paper towel dispensers.
  - b. Waste receptacles.
  - c. Sanitary napkin disposal units.
  - d. Toilet tissue dispensers.
  - e. Mirrors.
  - f. Soap dispensers.
  - g. Combination shelf with utility hook and mop strips.
  - i. Miscellaneous fasteners, accessories and trim as required for a complete and functioning installation.

###### B. Coordination:

1. Furnish inserts and anchoring devices to be set in concrete or built into masonry and recycled gypsum wallboard for installation of toilet and bath accessories. Refer to concrete and masonry Specifications for installation of inserts and anchorage devices.
2. Coordinate toilet and bath accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of toilet and bath accessories
3. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before toilet and bath accessories Work.
4. Notify other contractors in advance of installing toilet and bath accessories to provide other contractors with sufficient time for installing items included in their contracts to be installed with or before toilet and bath accessories Work.

##### 1.2 REFERENCES

###### A. Standards referenced in this Section are:

1. ANSI/ICC A117.1, Accessible and Usable Buildings and Facilities.
2. NFPA 70, National Electric Code.

### 1.3 QUALITY ASSURANCE

- A. Component Supply and Compatibility:
  - 1. Provide products of the same manufacturer for each type of bath accessory unit and for units exposed in the same areas.
- B. Regulatory Requirements:
  - 1. Comply with the following:
    - a. Building code specified in Section 01 42 00, References.
    - b. Requirements of authorities having jurisdiction
    - c. ANSI/ICC A117.1

### 1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
  - 1. Shop Drawings:
    - a. Schedule of toilet and bath accessories indicating proposed location for each item.
  - 2. Product Data:
    - a. manufacturer's published literature, technical data, and specifications for each toilet and bath accessory item.

## PART 2 – PRODUCTS

### 2.1 SYSTEM PERFORMANCE

- A. General:
  - 1. Components and materials shall be suitable for their intended use and environment.
  - 2. Stamped names or labels on exposed faces of units are unacceptable.
  - 3. Provide locks with the same keying for each type of toilet and bath accessory units in the Project, where possible. Furnish two keys for each lock.
  - 4. Electrical components, devices, and accessories shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.2 SURFACE-MOUNTED PAPER TOWEL DISPENSER

- A. Products and Manufacturers: Provide one of the following:
  - 1. No. 0210, by American Specialties, Inc.
  - 2. B-262, by Bobrick Washroom Equipment, Inc.
  - 3. Or equal.

- B. Requirements:
  - 1. Size to dispense not less than 400 c-fold towels with interchangeable paper drop.
  - 2. Construction: Cabinet and door not less than 22-gage stainless steel, No. 4 satin finish, all-welded construction, without mitered corners. Hang door with concealed, full-length stainless steel piano hinge
  - 3. Provide with tumbler-lockset.

### 2.3 SURFACE-MOUNTED WASTE RECEPTACLE

- A. Products and Manufacturers: Provide one of the following:
  - 1. No. 0826, by American Specialties, Inc.
  - 2. B-275, by Bobrick Washroom Equipment, Inc.
  - 3. Or equal.
- B. Construction: Fabricated from not less than 22-gage stainless steel, No. 4 satin finish, all-welded construction, without mitered corners. Top and bottom hemmed, interior liner hooks, 12-gallon capacity.

### 2.4 TOILET TISSUE DISPENSERS

- A. General: Provide toilet tissue dispensers at each water closet.
- B. Products and Manufacturers: Provide one of the following:
  - 1. No. 0697-GAL, by American Specialties, Inc.
  - 2. B-2840, by Bobrick Washroom Equipment, Inc.
  - 3. Model 5263, by Bradley Corporation.
  - 4. Or equal.
- C. Multi-roll Toilet Tissue Dispenser: Fabricate shelf of not less than 18-gage stainless steel, to store and dispense not less than two 4.5-nch by 4.5-inch core tissue rolls. Fabricate flange from a single piece, with seamless construction.

### 2.5 MIRRORS

- A. Accessible Tilt Mirrors:
  - 1. General: Provide accessible tilt mirror above each accessible lavatory.
  - 2. Products and Manufacturers: Provide one of the following:
    - a. No. 0535-B, by American Specialties, Inc.
    - b. B-293, by Bobrick Washroom Equipment, Inc.
    - c. Model 740-1836, by Bradley Corporation.
    - d. Or equal.
  - 3. Stainless Steel Frame: Fabricate frame from 20-gage, Type 304L stainless steel, welded and ground smooth, no shelf. Mirrors shall be 1.5 feet by three feet size, with tilting frame tapered from 1.5 inches at bottom to 4.5 inches at top.

## 2.6 SURFACE-MOUNTED HORIZONTAL LIQUID SOAP DISPENSER

- A. General: Provide surface-mounted liquid soap dispensers, one per lavatory.
- B. Products and Manufacturers: Provide one of the following:
  - 1. No. 0318, by American Specialties, Inc.
  - 2. B-2014, by Bobrick Washroom Equipment, Inc.
  - 3. Model 66, 1 by Bradley Corporation.
  - 4. Or equal.
- C. Liquid Soap Dispenser:
  - 1. Units shall be 20 inches long by 2.5 inches high by 4-5/10 inches wide, with one liquid soap dispensing valve
  - 2. Capacity: 80 fluid ounces.
  - 3. Fabricate units of 20-gage stainless steel, with pin-type tumbler locking device. Provide 20-gage stainless steel shelf using one-piece construction, with integral sides. Dispense liquid soap in measured quantity by pump action with stainless steel internal springs, ABS piston, stainless steel push button and internal parts. Cabinet shall have no exposed fastening devices.
  - 4. Locking: Pin-type tumbler lock.

## 2.7 MISCELLANEOUS ITEMS

- A. Combination Shelf with Utility Hook and Mop Strip:
  - 1. Products and Manufacturers: Provide one of the following:
    - a. No. 1304-A, by American Specialties, Inc.
    - b. B-239x34, by Bobrick Washroom Equipment, Inc.
    - c. Model 9934, by Bradley Corporation.
    - d. Or equal.
  - 2. Provide 18-gage stainless steel shelf with 3/4-inch lip, five 18-gage stainless steel hook strips, and four mop holders. Shelf shall be 34 inches wide and eight inches deep.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine the areas and conditions under which toilet and bath accessories will be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.



### 3.2 INSTALLATION

- A. Determine that substrates are completed and ready to accept surface-mounted accessories.
- B. Use concealed fastenings where possible.
- C. Provide anchorage devices, fasteners, and other necessary anchorages, and attach accessories securely to walls, floors, and partitions in locations as shown and as required.
- D. Install concealed mounting devices and fasteners fabricated of the same material as the accessories as recommended by manufacturer.
- E. Install exposed mounting devices and fasteners finished to match the accessories.
- G. Secure and install toilet and bath accessories in accordance with the manufacturer's instructions for each item and each type of substrate construction.

### 3.3 ADJUSTMENT AND CLEANING

- A. Adjust toilet and bath accessories for proper operation.
- B. After completion of installation, clean and polish all exposed surfaces.
- C. Deliver keys and instruction sheets to OWNER in accordance with Section 08 71 00, Door Hardware.

++ END OF SECTION ++

## SECTION 10 44 00

### FIRE EXTINGUISHERS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section includes:
  - 1. Fire extinguishers.
  - 2. Brackets for wall mounting.
  - 3. Projecting graphic identification signage.
- B. Related work:
  - 1. Section 06 10 53, Rough Carpentry.
  - 2. Section 09 90 00, Painting.
  - 3. Section 05 12 00, Structural Steel Framing.

##### 1.02 REFERENCE STANDARDS

- A. The following is a list of standards which may be referenced in this Section:
  - 1. Factory Mutual (FM).
  - 2. Mine Safety and Health Administration (MSHA).
  - 3. National Fire Protection Association:
    - a. 10, Standard for Portable Fire Extinguishers.
  - 4. National Institute for Safety and Health (NIOSH): Certification Program.
  - 5. Occupational Safety and Health Act (OSHA).
  - 6. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment List.
  - 7. ASTM International: ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

##### 1.03 SUBMITTALS

- A. Comply with Section 01 33 00, Submittal Procedures and provide the following:
  - 1. Action Submittals:
    - a. Fire Extinguishers: Submit manufacturer's product data for each item, including sizes, UL listings, or other certifications and mounting information.
    - b. Product Data: Submit extinguisher operational features, color and finish, and anchorage details.
  - 2. Informational Submittals:
    - a. Manufacturer's Installation Instructions:
      - 1) Special criteria and wall opening coordination requirements.
    - b. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

- c. Operation and Maintenance Data: Submit test, refill or recharge schedules and recertification requirements.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 61 00, Common Product Requirements.
- B. Inspection: Accept materials on Site and inspect for damage.
- C. Store and protect materials according to manufacturer's instructions.
- D. Do not install extinguishers when ambient temperature is capable of freezing extinguisher contents.

### PART 2 - PRODUCTS

#### 2.01 FIRE EXTINGUISHERS

- A. Manufacturers:
  - 1. JL Industries.
  - 2. Larsen's Manufacturing Company.
  - 3. Nystrom Products Company.
  - 4. Potter Roemer
- B. General:
  - 1. Conform to NFPA 10 for fire extinguishers.
  - 2. Furnish all fire extinguishers from one manufacturer.
  - 3. UL-listed, charged and ready for service.
  - 4. Provide ten (10) 10-lb fire extinguishers, with mounting bracket and graphic identification sign, as specified herein.
- C. Multi-Purpose Hand Extinguisher (EXT-1):
  - 1. Tri-class dry chemical extinguisher agent.
  - 2. Pressurized, red enamel steel shell cylinder.
  - 3. Activated by top squeeze handle.
  - 4. Agent propelled through hose or opening at top of unit.
  - 5. For use on A, B, and C class fires.
  - 6. Minimum UL Rating: 4A:80B:C, 10-lb capacity.

## 2.02 ACCESSORIES

- A. Extinguisher Brackets: For each extinguisher, furnish heavy-duty brackets with clip-together strap for wall-mounting formed steel, white enamel finish.
- B. Graphic Identification Sign:
  - 1. Provide projecting graphic identification sign for each fire extinguisher furnished.
  - 2. Each sign shall use photo-luminescent material to remain illuminated during a power outage and shall comply with ASTM E 2072.
  - 3. Sign shall include OSHA-approved pictorial markings to indicate the extinguisher uses and non-uses on a single label.
  - 4. Manufacturer:
    - a. GlowSmart.
    - b. Or approved equal.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install where indicated or directed and in accordance with the manufacturer's recommendations.
- B. Install brackets and graphic identification signs plumb and level on walls.
- C. Install wall brackets maximum 48 inches from finished floor to top of extinguisher handle.
- D. Secure cabinets rigidly in place.
- E. Place extinguishers on wall brackets.
- F. Position cabinet signage as required by AHJ.

++ END OF SECTION ++

## SECTION 10 51 13

### METAL LOCKERS

#### PART 1 - GENERAL

##### 1.01 SCOPE

- A. Furnish and install new steel lockers, accessories and finish metal trim as shown or indicated on drawings. Concrete or masonry bases, wood furring, blocking or trim as may be required by drawings are included in other sections of this specification.

##### 1.02 SUBMITTALS

- A. Shop Drawings: Submit drawings showing locker types, sizes and quantities, including all necessary details relating to anchoring, trim installation and relationship to adjacent surfaces.
- B. Numbering: The locker numbering sequence shall be provided by the approving authority and noted on the approved drawings returned to the locker contractor.
- C. Color Charts: Provide color charts showing manufacturer's available colors. If required by normal office procedures or in the event of non-standard color selection, request samples of paint on metal.

##### 1.03 QUALITY ASSURANCE

- A. UNIFORMITY: Provide each type of metal locker as produced by a single manufacturer, including necessary accessories, fittings and fasteners.
- B. JOB CONDITIONS: Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage and installation.

#### PART 2 - PRODUCTS

##### 2.01 MANUFACTURER

- A. Republic Storage Systems, LLC
- B. Global Industries
- C. Lyon Workspace

- D. Products by other manufacturers may be approved provided they meet the detailed specifications.

## 2.02 LOCKERS

- A. Style: Single Height
- B. Size: 12" x 18" x full height
- C. Color: to be selected
- D. No. of Locker Frames: See contract drawings for quantities

## 2.03 FABRICATION - GENERAL

- A. MATERIAL: All major steel parts shall be made of mild cold rolled steel, free from imperfections and capable of taking a high grade enamel or powder coat finish.
- B. FINISH: Surfaces of the steel shall be thoroughly cleaned, phosphatized and prepared for baked enamel or powder coat finish in accordance with paint manufacturer's instructions.
- C. CONSTRUCTION: Lockers shall be built on the unit principle - each locker shall have an individual door and frame, an individual top, bottom, back and shelves with common intermediate uprights separating units.
- D. DOOR FRAMES: Door frames shall be 16 gauge formed into 1" wide face channel shapes with a continuous vertical door strike, integral with the frame on both sides of the door opening. Double, triple or four tier locker cross frame members shall be 16 gauge channel shaped securely welded to vertical framing members to ensure a square and rigid assembly. Intermediate cross frame members are not required on box lockers.
- E. DOORS: Shall be 18 gauge steel for short or narrow doors as required by manufacturer's design, formed with a full channel shape on the lock side to fully conceal the lock bar, channel formation on the hinge side and right angle formation across the top and bottom. Single tier doors 60" and 72" in height and 18" and wider shall have a diagonal reinforcing angle welded to inner surface. Locker doors shall be ventilated by louvers on the face of each door, top and bottom.
- F. LATCHING: Latching shall be a one-piece, pre-lubricated spring steel latch, completely contained within the lock bar under tension to provide rattle-free operation. The lock bar shall be of pre-coated, double-channel steel construction. The lock bar shall be securely contained in the door channel by self-lubricating polyethylene guides that isolate the lock bar from metal-to-metal contact with the door. There shall be three latching points for lockers over 42" in height and two latching points for all tiered lockers 42" and under in height. The lock bar travel is

- limited by contacting resilient high-quality elastomeric cushioning devices concealed inside the lock bar. Frame hooks to accept latching shall be of heavy gauge steel, set close in and welded to the door frame. Continuous vertical door strike shall protect frame hooks from door slam damage. A soft rubber silencer shall be securely installed on each frame hook to absorb the impact caused by closing of the door. Box locker doors shall be equipped with a padlock hasp and a stainless steel strike plate with an integral handle pull.
- G. HANDLES: A non-protruding 14 gauge lifting trigger and slide plate shall transfer the lifting force for actuating the lock bar when opening the door. The exposed portion of the lifting trigger shall be encased in a molded ABS thermoplastic cover that provides isolation from metal-to-metal contact and be contained in a formed 20 gauge stainless steel recessed pocket. This stainless steel pocket shall contain a recessed area for the various lock types available and a mounting area for the number plate.
  - H. HINGES: Hinges shall be 2" high, 5-knuckle, full loop, tight pin style, securely welded to frame and double riveted to the inside of the door flange. Locker doors 42" high and less shall have two hinges. Doors over 42" high shall have three hinges.
  - I. BODY: The body of the locker consists of 24 gauge upright sheets, backs, tops, bottoms and shelves. Tops, bottoms and shelves are flanged on all four sides; backs are flanged on two sides. Uprights shall be offset at the front and flanged at the rear to provide a double lapped rear corner. All bolts and nuts shall be zinc plated.
  - J. INTERIOR EQUIPMENT: Single tier lockers over 42" high shall have one hat/book shelf. Other tiered lockers do not require shelves. All single, double and triple tier lockers shall have one double prong rear hook (single prong in 9" width) and two single prong wall hooks in each compartment. All hooks shall be made of steel, formed with ball points, zinc-plated and attached with two bolts or rivets. Locker openings under 20" high are not equipped with hooks.
  - K. NUMBER PLATES: Each locker shall have a polished aluminum number plate with black numerals not less than 1/2" high. Plates shall be attached with rivets to the lower surface within the recessed handle pocket.
  - L. COLOR: Doors and exposed body parts shall be finished in colors selected from standard baked enamel colors.
  - M. ASSEMBLY: Assembly of all locker components shall be accomplished by the use of zinc plated, low round head, slotless, fin neck machine screws with hex nuts, producing a strong mechanical connection.

## PART 3 - EXECUTION

3.01 INSTALLATION: Lockers must be installed in accordance with manufacturer's approved drawings and assembly instructions. Installation shall be level and plumb with flush surfaces and rigid attachment to anchoring surfaces. Space fasteners at 36" O.C. or less, as recommended by manufacturer. Use fasteners appropriate to load and anchoring substratum. Use reinforcing plates wherever fasteners could distort metal. Various trim accessories to be installed include flat tops on lockers, fillers, solid infill bases, recessed trim, etc., shall be installed using concealed fasteners. Flush, hairline joints are provided at all abutting trim parts and at adjoining surfaces.

3.02 ADJUSTMENT: Upon completion of installation, inspect lockers and adjust as necessary for proper door and locking mechanism operation.

++ END OF SECTION ++



**Notice to Bidders: Information in this specification includes performance requirements and provides the scope basis for the pre-selected equipment manufacturer and the allowance amount included in this agreement. Those requirements that are not specifically called out as the responsibility of the SBR Equipment Manufacturer shall be performed by the respective contractor.**

## SECTION 11322

### SEQUENTIAL BATCH REACTOR, SLUDGE DIGESTER AND POST-SBR EQUALIZATION BASIN EQUIPMENT PRE-SELECTION

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

1.1.1 This section includes requirements for furnishing a Sequential Batch Reactor (SBR) Treatment System (SBR System) by the SBR Manufacturer as specified in the enclosed process specification. The SBR System shall also include Sludge Digester and Post-SBR Equalization Equipment as specified herein. The SBR System shall be complete and provided by a single source supplier. The SBR Manufacturer shall be responsible for all engineering necessary in order to select, furnish, inspect the installing contractor's equipment installation and connections, calibrate, and place into operation the SBR System along with all other equipment and accessories as specified. After installation by the General Contractor, in accordance to the SBR Manufacturer's instructions, the SBR Manufacturer shall provide a fully functional treatment system.

1.1.2 This section shall be used in conjunction with the "Contract Documents and Specifications for Villages of Watkins Glen and Montour Falls Regional Wastewater Treatment Plant SBR Manufacturer Pre-Selection".

1.1.3 The SBR System shall consist of, but not necessarily be limited to, furnishing and installing the following equipment and controls necessary to provide a complete operating wastewater treatment system:

- a. SBR, Digester and Post-SBR Equalization Blowers
- b. SBR Jet or Diffused Aeration Equipment
- c. SBR Mixing Equipment
- d. Digester and Post-SBR Equalization Diffused Aeration Equipment
- e. SBR Decant Mechanisms
- f. SBR Scum Removal Mechanisms
- g. SBR Waste Activated Sludge Pumps (if required)
- h. SBR, Digester (if required), and Post-SBR Equalization Dissolved Oxygen Sensor and Analyzers
- i. SBR, Digester and Post-SBR Equalization Level Sensing Equipment

- j. SBR System Control Panel
- k. SBR and Digester System Motor Starters and Variable Frequency Drives
- l. SBR Influent and Decant Control Valves, as required
- m. SBR Influent Flow Control, as required

1.1.4 All components of the SBR System shall be provided by a single manufacturer. The manufacturer shall be responsible for the performance and compatibility of the entire system. The system shall be capable of complete automation, and all necessary components to achieve this shall be supplied by the system manufacturer and totally warranted by the manufacturer.

1.1.5 To assure proper interfacing and reliable operation of all system components, the system supplier shall assume sole responsibility for the quantity and proper functioning of all components, including those not of his manufacture.

## 1.2 RELATED SECTIONS

- a. Section 01 91 14, Equipment Testing and Facility Start-up
- b. Section 11343 – Tertiary Disk Filter Equipment Pre-Selection

## 1.3 SYSTEM SOURCE AND QUALITY ASSURANCE

1.3.1 The SBR System shall be supplied by a single company of good reputation that is regularly engaged in the manufacture and fabrication of SBR wastewater treatment systems. The manufacturer's experience shall include a minimum of ten (10) installations, each where equipment of similar size and design has been in operation successfully in a similar process for a minimum of ten (10) years. All referenced installations shall be of designs treating similar wastewater in similar climates (Northern United States) to similar effluent standards and limits.

1.3.1.1 The installation list shall include, but not be limited to, the following:

- a. Name and location of installations;
- b. Name of person in direct responsible charge of the equipment;
- c. Address and phone number of person in direct responsible charge;
- d. Month and year the equipment was placed in operation; and
- e. Brief description of equipment.

1.3.2 The General Contractor shall assign full responsibility for the functional operation of all SBR System components as specified herein to a single source supplier. This supplier shall furnish, supervise installation and connections, calibrate, and place into operation the SBR System along with all other equipment and accessories as specified herein.

## 1.4 CONTRACTUAL RESPONSIBILITIES

1.4.1 The General Contractor shall contract directly with the Owner and shall be responsible to provide the SBR System as an integrated system ready to function as intended under a contract between the Contractor and the Owner. The SBR Manufacturer shall contract directly with the Contractor. The SBR Manufacturer's terms and conditions with the General Contractor shall not be binding on the Owner.

1.4.2 The General Contractor shall construct the new SBR tank, to be designed in accordance with the selected SBR system. The installation of the equipment furnished by the SBR Manufacturer shall be the responsibility of the General Contractor in accordance with all requirements of the contract documents. All efforts have been made to adequately describe and depict the SBR system for the purposes of bidding. Changes, based on the final design by the SBR Manufacturer not in response to an Owner requested change, shall not constitute a contract change for either the SBR Manufacturer or Contractor.

1.4.3 The SBR Manufacturer shall provide the design of the SBR system, SBR process components, SBR controls, commissioning and start-up, and process guarantee.

## 1.5 QUALITY ASSURANCE

1.5.1 The SBR System shall be supplied by a company of good reputation that is regularly engaged in the manufacture and fabrication of SBR wastewater treatment systems. The SBR Manufacturer shall have a minimum of 10 operating installations for a period of at least 10 years treating similar wastewater in similar climates to similar effluent standards and limits.

1.5.2 This SBR Manufacturer shall be responsible for all engineering necessary in order to select, furnish, inspect the Contractor's equipment installation and connections, calibrate instrumentation, and place into operation the SBR System along with all other equipment and accessories as specified herein.

1.5.3 In order to establish a standard of quality, these manufacturers have been pre-qualified to submit proposals in response to the RFP. Pre-qualification does not relieve the SBR manufacturer the responsibility for demonstrating certification of compliance with these specifications without exception.

1. ISAM SBR System manufactured by Fluidyne Corp., Cedar Falls, IA
2. OmniFlow SBR System manufactured by Evoqua, Edwardsville, KS
3. Ecocycle SBR manufactured by Parkson, Fort Lauderdale, FL
4. AquaSBR System manufactured by Aqua-Aerobic Systems, Inc., Rockford, IL

## 1.6 PRE-APPROVAL SELECTION SUBMITTAL REQUIREMENTS

1.6.1 To be eligible for inclusion in the SBR Selection Process, all SBR manufacturers not pre-qualified to submit proposals and qualifications shall be pre-approved prior to the due date as shown in the RFP. The Contractor or alternative SBR manufacturer shall submit a minimum of three (3) copies of the proposed alternative SBR System data and SBR Manufacturer Information to the Engineer not later than 14 calendar days prior to the due date as shown in the RFP. Any manufacturer meeting the requirements will be notified not later than 7 calendar days prior to the bid date; following notification the SBR manufacturer shall provide all information required by 1.8. Submission of inadequate information will be cause for pre-approval rejection. As part of the Engineer's review additional information or clarifications may be requested by the Engineer.

1.6.2 SBR Manufacturer Information shall include:

- a. SBR manufacturing company certification of compliance with these specifications without exception.
- b. Proof of manufacturing and testing facilities.
- c. Installation list with contacts and phone numbers for a minimum of ten installations of similar size in operation for ten years.
- d. A field test report documenting that the proposed or similar units have been field tested and are operating within performance requirements.
- e. All other information necessary to enable the Engineer to determine whether the proposed equipment meets the specified requirements.

## 1.7 DESIGN REQUIREMENTS

1.7.1 The manufacturer of the SBR System shall be completely responsible for the proper design of their systems, including but not limited to; jet or diffused aeration equipment, decaners and controls. All equipment shall perform as specified, and the completed installation shall operate in accordance with the requirements of the Plans and Specifications.

1.7.2 The SBR process shall be designed for BOD and TSS reduction, ammonia conversion to the nitrate form, total nitrogen reduction through de-nitrification of the nitrate form, biological phosphorous removal, and chemical phosphorous reduction through metal salt precipitation.

1.7.3 The SBR System shall use a single vessel in which the activated sludge is alternately aerated and mixed over a number of pre-determined cycles. Solids-liquid separation shall occur during a settling phase of the cycle. After the settling phase, treated effluent shall be decanted or withdrawn from the liquid surface.

1.7.4 The influent waste is generally domestic in nature. The raw wastewater will be pumped to the site from two main Village pump stations and screened with 1/4 inch openings to remove the large settleable solids and de-gritted through a vortex grit chamber. The SBR System influent flow rate will vary throughout the day in response to the incoming pumped wastewater flow rate and on-site waste flow rates.

1.7.5 SBR System Design Parameters:

a. Design Flows

Average Daily Flow	1.20 MGD (833 gpm, 24-hour period)
Maximum Daily Flow	2.16 MGD (1,500 gpm, 24-hour period) <sup>(1)</sup>
Peak Hourly Flow	6.0 MGD (4,167 gpm, 1-hour period)

<sup>(1)</sup> SBR Cycles shall not be shortened until the maximum daily flow is exceeded.

b. Design Loadings and Treatment Requirements

	Design Influent Average Daily @ 1.2 MGD <sup>(1)</sup>	Design Effluent @ 1.2 MGD
BOD <sub>5</sub>	2,502 lbs/day (250 mg/l)	10 mg/l
TSS	2,502 lbs/day (250 mg/l)	10 mg/l
TN	-	10 mg/l <sup>(2)</sup>
TKN	400 lbs/day (40 mg/l)	-
NH <sub>3</sub> -N	-	1.0 mg/l
TP	60 lbs/day (6 mg/l)	0.5 mg/l <sup>(3)</sup>
DO	-	7 mg/l

<sup>(1)</sup> SBR System shall be designed to treat design influent loadings to design effluent requirements.

<sup>(2)</sup> There is no Total Nitrogen (TN) requirement in the anticipated permit however the design shall be for an effluent TN concentration of 10 mg/l.

<sup>(3)</sup> Metal salt addition to the SBRs and Effluent Filtration will be provided as a separate process to meet the Total Phosphorous limit; biological phosphorous removal shall be maximized to minimize metal salt dosing requirements.

c. Wastewater Temperature	8 C to 24 C
d. Job Site Elevation	450 feet MSL
e. Ambient Air Temperature	0 F to 90 F
f. Alpha (maximum value allowed)	Manufacturer's standard
g. Beta (maximum value allowed)	0.95
h. F/M Ratio	0.05 – 0.10 lb. BOD <sub>5</sub> /lb MLSS
i. MLSS at Low Water Level	4,500 mg/l (maximum)
j. Cycles	Manufacturer's standard – submit calculations

- k. Oxygen Requirements (average loads)
  - 1.25 lbs. O<sub>2</sub>/lb. BOD<sub>5</sub> applied
  - 4.60 lbs. O<sub>2</sub>/lb. TKN applied
  - 2.86 lbs O<sub>2</sub>/lb. NO<sub>3</sub> denitrified
  - (50% O<sub>2</sub> credit allowed for de-nitrification)
- l. Maximum Oxygen Transfer Efficiency (Standard Conditions) 2.0% per foot of diffuser submergence
- o. SBR Basin Configuration:
  - Number of Basins 3
  - Basin Width <sup>(1)</sup> 40 feet
  - Basin Length <sup>(1)</sup> 120 feet
  - Elevation at Top Water Level 448.50 feet
  - Water Depth at Top Water Level 18.0 feet

<sup>(1)</sup> Approximate basin dimensions; final basin dimension requirements shall be determined by SBR Manufacturer; however, 3:1 length/width ratio shall generally be maintained due to site constraints. No variation in top water level shall be allowed.

1.7.5.1 Summertime Peak Loading Events: The base bid for the SBR system shall be based on the design requirements listed in Articles 1.7.5.a to 1.7.5.o. There is the potential for future activities within the Villages and surrounding Towns that could result in short-term increased organic loadings to the Regional WWTP during the summer months of July and August, exceeding the values provided in Article 1.7.5.b. Based on the SBR tank sizes established in the base bid, the SBR Manufacturer shall determine the maximum organic load that can be treated during this time period, with the SBR System meeting the effluent conditions stated in Article 1.7.5.b. For the increase wastewater loading to the SBR System, the SBR Manufacturer shall assume the same BOD<sub>5</sub>:TKN:TP strength ratio as provided in Article 1.7.5.b. The SBR Manufacturer shall assume no changes are required for the Sludge Digester System. The SBR Manufacturer shall assume the following additional design requirements:

- a. Flows: In accordance with Article 1.7.5.a (No Increase).
- b. Wastewater temperature: 15° C (59° F).

The SBR Manufacturer shall provide a design summary with the Pre-Selection Submittal for the Summertime Peak Loading Events which shall include at a minimum the following information:

- a. Allowable BOD<sub>5</sub>, TSS, TKN, and TP loading to the SBR System, lbs/day.
- b. Required MLSS concentration, mg/l.
- c. Air Requirement per SBR Basin (additional SCFM increase over base bid).
- d. Blower Design Summary (additional Blower HP increase over base bid), assume one (1) blower dedicated to each SBR Basin with common spare.
- e. Aeration System Design Summary (additional jet/diffuser count over base bid).
- f. Any additional required equipment modifications

The SBR manufacturer shall provide an “adder” lump sum cost to the base bid for furnishing aeration and required supporting (VFDs, etc) equipment for the Summertime Peak Loading Events in accordance with the revised bid forms.

#### 1.7.6 Sludge Digester Design Parameters

- a. Sludge Digestion shall be provided by aerobic or low rate anaerobic digestion.
- b. Design Flows and Loadings – SBR manufacturer shall utilize their standard waste sludge production rates at a settled SBR sludge concentration not to exceed 0.65%.
- c. The sludge digestion process shall be designed to provide a minimum of 40 days of sludge retention time (SRT). SRT calculations shall be based on the SBR waste sludge applied to digesters, thickened to 2.0% solids concentration. Sludge thickening shall be accomplished by supernatant separation within the digester tanks.
- d. The sludge digestion process shall be designed to reduce the mass of volatile solids in the sludge by a minimum of 38%.
- e. Aerobic Digestion Design Parameters
  - 1. Minimum digestion volume provided at HWL 500,000 gallons
  - 2. Basin DO Requirement 2 mg/L
  - 3. Oxygen Requirements 2 lbs O<sub>2</sub> per lbs VSS destroyed
  - 4. Mixing Air Requirements 20 scfm/1,000 cf digester volume (at HWL)
- f. Low Rate Anaerobic Digestion
  - 1. Minimum digestion volume provided at HWL 500,000 gallons
  - 2. Rational design calculations shall be submitted demonstrating sludge stabilization for low rate anaerobic digestion systems. Calculations shall show conformance with the Recommended Standards for Wastewater Facilities 2014 Edition, TR-16 Guides for the Design of Wastewater Treatment Works and all applicable NYSDEC regulations. Manufacturers employing low rate anaerobic digestion shall be fully responsible for furnishing all necessary documentation to the Engineer in support of regulatory approval with the NYSDEC.
- g. Sludge Digester Basin Configuration:
 

Number of Basins	2 (minimum)
Basin Width	60 feet <sup>(1)</sup>
Basin Length	40 feet <sup>(1)</sup>
Water Depth at Top Water Level	18.0 feet (max. supernatant decant level)
Water Depth at Low Water Level	10.0 feet (min. supernatant decant level)

<sup>(1)</sup> Approximate digester dimensions; final basin dimension requirements shall be determined by SBR Manufacturer.

#### 1.7.7 Post-SBR Equalization Basin Design Parameters

a. Post-SBR Equalization Basin Configuration

Number of Basins	1
Basin Width	30 feet <sup>(1)</sup>
Basin Length	110 feet <sup>(1)</sup>
Water Depth at Top Water Level	10.0 feet <sup>(2)</sup>
Water Depth at Bottom Water Level	4.0 feet <sup>(3)</sup>
Effective Equalization Volume	148,100 gallons

<sup>(1)</sup> Approximate basin dimensions; final basin dimension requirements shall be determined by SBR Manufacturer.

<sup>(2)</sup> Top Water Level shall be coordinated with SBR manufacturer as required for proper decanter hydraulics. Basin dimensions may be adjusted as required; a greater Top Water Level may be utilized if allowable by decanter hydraulics.

<sup>(3)</sup> Bottom Water Level shall be coordinated with re-aeration requirements of the SBR effluent and proposed aeration system to be furnished by the SBR Manufacturer.

- b. Coarse bubble aeration shall be provided for re-aeration of the SBR effluent prior to tertiary filtration. Design of re-aeration system shall assume an SBR effluent dissolved oxygen concentration of 1 mg/L. SBR effluent dissolved oxygen concentration shall be increased to 7 mg/l in the Post-SBR Equalization Basin prior to tertiary filtration.

### 1.8 SBR MANUFACTURER PRE-SELECTION SUBMITTALS

#### 1.8.1 SBR Manufacturer Information shall include:

- a. SBR manufacturing company certification of compliance with these specifications without exception.
- b. Proof of manufacturing and testing facilities.
- c. Installation list with contacts and phone numbers for a minimum of ten installations of similar size in operation for ten years.
- d. A field test report documenting that the proposed or similar units have been field tested and are operating within performance requirements.
- e. All other information necessary to enable the Engineer to determine whether the proposed equipment meets the specified requirements.
- f. After the RFP's are received, the Engineer may request additional information in order to clarify a SBR manufacturer's proposal.



1.8.2 The following process and mechanical information shall be provided as part of the proposal.

a. Process Calculations

1. Include complete process calculations showing treatment of the wastewater by the aeration process based upon the influent design basis and effluent limits.
2. Include complete process calculations showing the transfer of oxygen from the compressed air to the mixed liquor based upon the process calculations.
3. Minimum static head difference between SBR low decant water level and post equalization tank high water level.
4. Include complete process calculations showing stabilization of waste sludge by aerobic or low rate anaerobic digestion.
5. Include complete process calculations showing re-aeration of SBR effluent prior to filtration.

b. Jet Aeration/Fine Bubble Diffuser System

1. Tank diffuser, header, and lateral layout.
2. Detailed layout in tank equipment and accessories.
3. Detailed listing of materials of construction.

c. Oxygen Transfer Performance Curve

1. An Oxygen Transfer Performance Curve shall be submitted. The curve shall show oxygen transfer efficiency in percent versus air flux rate defined as SCFM per active diffuser surface area in tap water at 14.7 PSIA, 20°F and zero dissolved oxygen at the specified submergence.
2. The performance curve shall be based on aeration test results from a full-scale test facility. Minimum acceptable tank size is 200 square feet.
3. The test diffuser density shall be equivalent to the actual project tank configuration and have a minimum depth of 18 feet.

d. Equipment

1. Submittal drawings showing general equipment arrangement and details in plan, elevation and cross sections of the equipment and any concrete embedments.
2. Component details of the SBR equipment.
3. Complete specifications describing the proposed system and equipment.
4. Electrical utility requirements and consumption.
5. Performance data, product data, and for process equipment including for all process, mechanical and electrical equipment, including but not limited to pump curves, motor data, blower curves, and air diffuser design criteria.
6. Influent flow control description, as required

7. Example of operator interface screen
8. Description of controls package
9. Field mixing test results for a similar sized SBR basin
10. Field clean water transfer test for a similar sized SBR basin
11. Demonstrations of SBR tank mixing design is consistent with field tests
12. Estimated installation hours for all SBR tank mounted equipment
13. Estimated aeration compressed air required inlet pressure

e. Blower Information

1. General arrangement drawings showing materials, details of construction, dimensions and connections.
2. Aeration blower performance curve showing the input brake horse power and blower speed at both maximum and average organic loadings
3. Complete Blower Performance Data including:
  - i. Quantity of Blowers
  - ii. RPM
  - iii. Volumetric Capacity – scfm and icfm
  - iv. Discharge pressure
  - v. dB(A) free noise pressure level@ 3 Ft
  - vi. Maximum gear tip speed and rotor tip speed (fpm)
  - vii. HP required at rated capacity and pressure
  - viii. Rated maximum pressure rise of blowers
  - ix. Descriptive Brochures
  - x. Performance Curves
  - xi. Motor Data

1.8.3 Written Proposal:

- a. Project narrative and written description of the process and equipment
- b. Description of provisions for Winter Time Operation
- c. Recommended Maintenance Requirements
- d. All exceptions or clarifications to the SBR Specification
- e. Recommended spare parts for one year's operation and for start-up

1.8.4 Alternative descriptions including all product information, anticipated energy savings control system descriptions, anticipated input brake horsepower variations at various organic loadings, materials of construction, and owner advantages.

1.8.5 Typical operations and maintenance manual for a similar sized project.

1.8.6 Submit written equipment warranties and process guarantees and all other confidentiality and owner executed agreements. No other submittals will be permitted after contract award to the General Contractor.

1.8.7 Submit contact information including name, address, and phone number of at least one (1) authorized service center within 200 miles of the Village of Watkins Glen and Village of Montour Falls. Authorized service centers shall include personnel trained in the maintenance and repair of the manufacturer's equipment including controls, pumps, blowers, valves and decanters. Submit a work plan illustrating how authorize service center plans to address both a major control hardware and mechanical equipment malfunction/failure.

## 1.9 CONTRACT ENGINEERING AND SHOP DRAWING SUBMITTALS

1.9.1 The following process and mechanical information shall be provided, after the award of the General Contractor's contract.

- a. Process Calculations – The calculations shall be reviewed and the submittals sealed by a Professional Engineer licensed and registered in New York State.
  1. Include complete process calculations showing treatment of the wastewater by the aeration process based upon the influent design basis and effluent limits.
  2. Include complete process calculations showing the transfer of oxygen from the compressed air to the mixed liquor based upon the process calculations.
  3. Minimum static head difference between SBR low decant water level and post equalization tank high water level.
  4. Include complete process calculations showing stabilization of waste sludge by aerobic or low rate anaerobic digestion.
  5. Include complete process calculations showing re-aeration of SBR effluent prior to filtration.
- b. Jet Aeration/Fine Bubble Diffuser System
  1. Tank diffuser, header, and lateral layout.
  2. Detailed layout in tank equipment and accessories with Bill of Materials.
  3. Detailed listing of materials of construction.
- c. Oxygen Transfer Performance Curve.
  1. An Oxygen Transfer Performance Curve shall be submitted. The curve shall show oxygen transfer efficiency in percent versus air flux rate defined as SCFM per active diffuser surface area in tap water at 14.7 PSIA, 20°F and zero dissolved oxygen at the specified submergence.
  2. The performance curve shall be based on aeration test results from a full-scale test facility. Minimum acceptable tank size is 200 square feet.

3. The test diffuser density shall be equivalent to the actual project tank configuration and have a minimum depth of 18 feet.
- d. Equipment
  1. Submittal drawings showing general equipment arrangement and details in plan, elevation and cross sections of the equipment and any concrete embedments.
  2. Component details of the SBR equipment.
- e. Process and instrumentation diagrams (P&ID) for System Controls

1.9.2 The following electrical and control information shall be provided after General Contract award:

- a. Drawings of Control Panel to include:
  1. Electrical ladder diagram showing Input/Output (I/O) and interconnections to all components.
  2. Door layout
  3. Interior layout
- b. Provide software documentation as specified in this section.
- c. Input/output (I/O) listing.
- d. Calibration and commissioning data sheets
- e. Operator Interface (OI) Screens
- f. List of components and catalog cuts fully describing each piece of equipment being furnished identifying all options being furnished. Identify each by tag number:
  1. Mechanical and structural components
  2. Instruments
  3. Programmable Logic Controller (PLC) Components
  4. Operator Interfaces
  5. Electrical and communication components
  6. PLC programming software

1.9.3 Recommended spare parts for one year's operation and for start-up.

1.9.4 Submit Operation and Maintenance manuals. The Operation and Maintenance manuals shall provide detailed operating and installation instructions. Each set of books shall be prepared especially for the type of equipment delivered, and all operating instructions shall refer only to that particular equipment. Information shall include but not be limited to:

- a. Include current ratings of the aeration system.
- b. Provide process control descriptions and instructions.
- c. Provide field testing, observation and sampling criteria

- d. Provide laboratory testing criteria.
- e. Provide guidelines for field and laboratory test result interruption.
- f. Include instructions for starting and operating system.
- g. Identify operating limits, which may result in hazardous or unsafe conditions, or in equipment damage.
- h. Include routine preventative maintenance and lubrication schedule.
- i. Trouble shooting guide.
- j. List special tools, maintenance materials, and replacement parts.
- k. Include repair instructions for procedures to check, repair, and test equipment during typical malfunctions.

1.9.5 Submit written warranties.

1.9.6 Submit these schedules to the Engineer for review and the General Contractor for inclusion in the overall project schedule.

- a. Engineering and shop drawing schedule
- b. Shop fabrication schedule
- c. Field start-up schedule

1.9.7. Documents

- a. Submit project documents for this section and all reference sections in accordance with Specification Section 01340. Shop Drawings shall be submitted for the entire system at one time to allow for proper review of the integrated system. Partial submittals for individual components of the system will not be accepted.
- b. In addition to the number of copies as specified in Section 01340, all as built record drawings are to be submitted on CD in ACAD 2006 (or later version) format.

1.9.8. Start-up and commissioning report.

1.10 PERFORMANCE GUARANTEE:

1.10.1 Bidders for General Construction Contract shall submit with their Bid a Statement of Surety's Intent executed by the SBR System Manufacturer's (SBRSM's) surety. This Statement of Surety's Intent shall be in addition to the Statement of Surety's Intent issued by the Contractor's surety, as required by the bid requirements or general requirements of the specification. Approval of the SBR System Manufacturer's proposed surety by the Owner will be a condition precedent for award of General Construction Contract. Failure to submit an acceptable SBRSM's Statement of Surety's Intent with the Bid shall render the Bid non-responsive and subject to rejection.

1.10.2 The SBR System Manufacturer selected by the General Contractor shall provide to the General Contractor a Performance Bond in the amount of 100% of the SBR Contract Value. The SBRSM's Process Performance Guarantee Bond shall name the SBR System Manufacturer as Principal and the General Contractor as Oblige. The surety company issuing the bond shall be authorized to issue such bonds in New York State, shall have a "Best's" rating of "B+" or better and shall otherwise be acceptable in form and content to the Owner. The SBRSM's Performance Bond shall be in addition to the Contractor's Performance Bond, as required in the Contract Documents. The SBRSM's Performance Bond shall serve to secure the interests of the General Contractor in the event that the SBR System fails to meet the performance requirements.

1.10.3 The General Contractor shall provide copies of the fully executed SBRSM's Performance Bond and SBRSM's Manufacturers Guarantee, for review and approval after approval and acceptance of all shop drawings for the SBR System. The SBR System shop drawings shall not be final approved until the SBRSM's Performance Bond and written Performance Guarantee has been reviewed and accepted by the Owner.

1.10.4 The SBR System Manufacturer (SBRSM) shall guarantee that the SBR System will meet the effluent limits under the design conditions specified in Article 1.7.5 a and b, for each and every composite effluent sample, for a period of 12 months starting on the first day of the month following the date of Substantial Completion for the SBR System to be accepted. During the initial 12-month monitoring period, the Owner shall conduct effluent composite sampling at the plant outfall as required by the State Pollutant Discharge Elimination System Monthly Monitoring Report. The Owner shall also conduct effluent composite sampling at the Post-SBR Equalization Basin discharge point, upstream of the effluent filters and disinfection; the SBRSM shall meet the design conditions specified in Article 1.7.5 a and b. at the Post-SBR Equalization Basin discharge sampling point. The SBRSM shall also guarantee that the Sludge Digestion System will meet the requirements of Article 1.7.6.d, for each and every sludge sample as reported in the certified State Pollutant Discharge Elimination System Monthly Monitoring Report, for a period of 12 months starting on the first day of the month following the date of Substantial Completion for the Sludge Digestion System to be accepted. These guarantees shall be the SBRSM's Process Performance Guarantee, and shall be in addition to all other guarantees required under the Contract.

1.10.5 Following Substantial Completion, the Owner, or Engineer, will provide the General Contractor and SBRSM with all monitoring data collected on a monthly basis, no later than 14 days after the completed month. In the event that the SBR System provided by the General Contractor fails to meet the SBR Process Performance Guarantee requirements based on the data provided during the 12 month guarantee period, when raw wastewater conditions do not exceed the design influent loadings specified in 1.7.6.b or have concentrations of pollutants that are inhibitory to biological treatment, or have other physical or chemical characteristics that detrimentally affect the biological process or the settleability of the waste, the General Contractor and SBRSM shall adjust or modify the SBR System as necessary to achieve the specified performance. Any additional labor shall be borne by the General Contractor at his sole expense. General Contractor and SBRSM shall be allowed a total of three (3) such periods to

address system deficiencies and retest. If, after modifying the SBR System, the SBR System continues to not meet the specified performance requirements for any three (3) consecutive months during the 12 month guarantee period, then the General Contractor shall remove the installed SBR System and replace it with an SBR System that will meet the requirements of this Section. Any and all such adjustment, modification or replacement shall be provided by the General Contractor at no cost to the Owner. In addition, the General Contractor shall be responsible for reimbursing the Owner for any and all engineering, construction observation, and other construction costs associated with any such adjustments, modifications or replacement, and for any fines imposed by the NYS DEC due to the Owner's failure to comply with the requirements of the State Discharge Pollution Elimination System (SPDES) Permit arising from the failure of the installed SBR system to meet the performance requirements.

1.10.6 Nothing contained in this Section shall relieve the Contractor of the responsibility for performing the Contract within the time specified in the Contract Documents.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS

2.1.1 Unless specified elsewhere the products in the proposals shall be the manufacturer's standard.

2.1.2 All plug valves shall be meet AWWA C517 and all electric valve actuators shall meet AWWA C542 and shall be certified for a minimum five (5) years of verifiable trouble free operation.

### 2.2 TANK AERATION

2.2.1 Jet aeration or fine bubble diffuser aeration shall be provided for the SBR tanks. Fine bubble aeration shall be provided for the Aerobic Digester tanks (if applicable). Coarse bubble diffuser aeration shall be provided for the Post-SBR Equalization Tank.

2.2.2 Jet aeration submerged aeration headers shall be 304 SS ASTM A312 or machine filament wound fiberglass reinforced thermosetting resin pipe fabricated in strict accordance with ASTM Specification D-2996-01.

2.2.3 For fine bubble aeration the diffusers shall be sized to pass the maximum calculated air flow rate with a maximum pressure drop through the diffusers shall not exceed 20" WC. Equipment components that shall be included in the fine bubble aeration system for each SBR and Aerobic Digester basin are as follows:

- a. 304 SS droplegs.
- b. 304 SS manifolds and air distributors.

- c. Stainless steel supports and anchors.
- d. Stainless steel bolts, stainless steel nuts and gaskets for aeration system flange connections.
- e. Diffusers
  - 1. Disc Diffuser
    - i. PVC diffuser holders and retainer rings.
    - ii. EPDM rubber membrane disc diffusers with integral O-ring gaskets and subplates.

2.2.4 For coarse bubble diffuser aeration diffusers shall be 304 stainless steel non-clog coarse bubble diffusers. Aeration headers shall be 304 SS ASTM A312.

2.2.5 Aeration diffuser supports, pipe supports, and anchors shall be 304 SS ASTM A276.

2.2.6 All other materials shall be the manufacturer's standard.

### 2.3 AIR DIFFUSER PIPING

2.3.1 The air diffuser piping shall include all headers, laterals, and drop pipes.

2.3.2 The piping shall be designed to transport the compressed air from the tank wall connection located above the high water elevation of the SBR to the furthest diffuser with minimal headlosses.

2.3.3 All expansion joints, pipe supports, and anchors shall be provided. Pipe supports shall be designed with sufficient anchors and guides so that the pipe system can expand and contract between the low ambient and process temperatures.

2.3.4 All non-submerged air piping and drop pipes shall 304 SS in accordance to ASTM A312/A312M Schedule 10 and ASTM A774 / A778 3/16 inch thickness.

### 2.4 TANK MIXING

2.4.1 SBR manufacturer shall provide their standard mixer(s). The mixer shall be designed to meet the mixing criteria of this section.

2.4.2 Mixer(s) shall completely mix the tank within 5 minutes after the start of the anoxic mix of the treatment cycle. Complete mix shall be defined as maintaining a uniform suspension of all biological mixed liquor suspended solids with an MLSS of 4500 mg/l within  $\pm 10$  percent of the average value or less without the introduction of air.

2.4.3 Mixer wetted parts shall be either stainless steel or FRP. For systems that utilize jet mixing, the jet mixer pumps shall be submersible located in the SBR tankage.



## 2.5 DECANTER

2.5.1 SBR manufacturer shall provide their standard decanter.

2.5.2 Decanter wetted parts shall be either 304 SS, or FRP.

2.5.3 Each decanter shall be capable of withdrawing decant fluid from 4-6 inches beneath the liquid surface, regardless of liquid depth, from the maximum water level down to the minimum allowable water level.

## 2.6 SCUM REMOVAL

2.6.1 A surface scum removal system shall be provided for each SBR tank. Manufacturer shall provide their standard scum removal system.

2.6.2 Materials of construction shall 304 SS, or FRP.

## 2.7 INFLUENT FLOW CONTROL

2.7.1 SBR manufacturer shall provide their standard flow distribution scheme. For batch filled reactor, flow control devices shall be automatic plug valves. For continuously filled reactors, the SBR manufacturer shall provide all components required to insure that flow is being continuously and evenly distributed between the reactors. Components shall include any necessary head boxes and/or flow control weirs.

2.7.2 Plug valves shall be Dezurik, or approved equal.

2.7.3 Quarter turn electric actuators shall be Rotork, or approved equal.

2.7.4 The wetted parts of the flow distribution components shall be ASTM A-126 Class B cast iron, neoprene, and 304 SS.

## 2.8 SUPPORTS

2.8.1 All necessary supports for the aeration headers, in tank liquid and air piping, manifolds, and decanters shall be provided as a part of the system. The supports shall be fabricated of Type 304 stainless steel.

2.8.2 Supports for FRP pipe shall consist of a contoured saddle and a supporting base. The base shall be anchored with anchor bolts and grouted in place, if necessary. For FRP piping, the saddle shall be provided with a Buna-N rubber pad to avoid abrasion. A contoured clamp with an accompanying Buna-N rubber pad shall hold the piping to the saddle. Fastening hardware shall be Type 18-8 stainless steel.

## 2.9 ANCHOR BOLTS

2.9.1 Anchor bolts of sufficient size and quantity shall be provided for mounting of all manufacturer supplied SBR equipment and piping in the tank. The anchor bolts shall be two part stud and acrylic resin system. The anchor system shall consist of acrylic resin and hardener contained in a dual cartridge with static dispensing nozzle. Each anchor bolt shall be supplied with a stud, flatwasher, lockwasher & nut of Type 18-8 stainless steel.

## 2.10 SBR, AEROBIC DIGESTER AND POST-SBR EQUALIZATION BLOWERS

2.10.1 Provide all labor, material and equipment to furnish and install four (4) complete positive displacement blower systems for the SBRs (3 duty and 1 spare), two (2) complete positive displacement blower systems for Aerobic Digesters (2 duty), if required, and one (1) complete positive displacement blower system for the Post-SBR Equalization Basin as specified in this section and detailed on the drawings. Piping shall be provided such that one of the SBR blowers shall serve as a common spare for both the SBRs and Aerobic Digesters.

2.10.2 Blower and accessories shall be furnished as a complete assembled package and shall include all interconnecting piping, instrumentation and supports needed to ship the assembly as a complete unit.

2.10.3 Each blower package shall include a positive displacement blower; motor with slide base; v-belt drive; flexible expansion joints; drive guard; common elevated structural steel base; inlet filter; inlet silencer; discharge silencer; pressure relief valve; check valve; discharge isolation valve; pressure gauge (inlet); pressure gauge (inlet vacuum); temperature gauge (discharge); pressure switch (discharge); vibration isolator pads; motor over-temperature switch; and spare parts.

2.10.4 The blower packages shall be:

1. Kaeser Compressors, Inc. Com-paK Plus Rotary Blower Package;
2. Aerzen Delta Blower, Generator 5 Blower Package;
3. Roots EasyAir Blower Package;
4. Gardner Denver IQ Blower Package;
5. Approved equal.

2.10.5 The General Contractor shall provide all air piping from the diffuser terminations at the basins to the blowers as shown on the Contract Drawings. Supply of electrical wiring and junction box/disconnects shall be furnished and installed by the Owner's Electrical Contractor.

2.10.6 Blower Construction:

2.10.6.1 Impellers shall be tri-lobe design and precision machined from a single piece.

2.10.6.2 Blowers shall be equipped with heavy-duty, anti-friction roller bearings. Each bearing shall have a full complement of rollers and a cage to control roller movement within the bearing races. The L10 bearing life of the input shaft bearing shall be a minimum of 100,000 hours at the design conditions.

2.10.6.3 Blowers shall be oil lubricated. Each oil chamber shall have a domed sight glass designed to allow visual inspection of oil level and oil condition from the front of the blower package.

2.10.6.4 Blower drive motor shall be 460 Volt, 60 Hz, 3 Phase, totally enclosed – fan cooled. The motor insulation shall be Class F with temperature rise limited to Class B and shall be premium efficient as defined by NEMA. Blower drive motor shall be inverter duty rated with impulse peak resistance in accordance with IEC 60034-1 for operation with an IGBT frequency converter.

2.10.6.5 Blower package enclosure ventilating fan shall be sized to provide the necessary cooling air flow at the specified blower package condition of service. The enclosure ventilating fan shall be wired to the terminal box.

2.10.6.6 The blower shall be driven by the blower drive motor through a V-belt drive assembly with a service factor of 1.5. The blower drive shall have a fully enclosed guard which protects the operator when the package enclosure is open while in operation.

2.10.6.7 A tensioning assembly shall be provided to adjust the V-belt tension to prevent belt slippage and efficiently transmit power to the blower. The tensioner assembly shall include visual indication showing whether or not the V-belt tension is within the correct belt tension range.

2.10.6.8 Inlet and discharge silencers shall be of the absorptive type to maximize noise attenuation at the pulsation frequencies of tri-lobe blowers and to minimize the package friction losses.

2.10.6.9 The blower package frame shall be formed steel construction and shall include vibration isolators to prevent transmission of vibration to the foundation.

2.10.6.10 A pressure relief valve shall be provided on the blower discharge and shall be of the spring type sized for 100% of the design blow output.

2.10.6.11 A discharge check valve shall be provided on the discharge air piping on each blower package to prevent reverse flow when the blower package is off-line. The discharge check valve shall be a full flow, non-slam spring-assisted closing, swing type.

2.10.6.12 Each blower package shall have a flexible connector installed between the discharge check valve and the discharge air piping.

2.10.6.13 Each blower package shall have a full sound attenuating enclosure designed to contain all sources of blower package noise. Sound attenuating enclosures shall be sheet steel construction with zinc-based primary treatment, powder coat finish, and multi-density sound absorbing foam insulation.

2.10.7 Blower package controls and instrumentation – It is intended that each blower package will include a set of instrumentation and controls. The blower package shall include a terminal box to provide a central connection point for all of the wiring in the blower package (except the main blower drive motor) and to facilitate integration of the blower package instrumentation into the SBR Control Panel. Each blower package shall include the instrumentation listed below wired to the terminal box.

- a. PTC thermistors embedded in the motor windings.
- b. Inlet filter differential pressure switch to monitor the pressure differential between the inlet and outlet of the inlet filter.
- c. Inlet filter differential pressure gauge to indicate when the inlet filter differential pressure exceeds manufacturer's recommendations.
- d. Enclosure safety switch to shut down the blower if the enclosure ventilating air temperature exceeds manufacturer's recommendations.
- e. Discharge temperature switch.
- f. Discharge pressure switch to shut down the blower if the discharge pressure exceeds manufacturer's recommendations.

## 2.11 SLUDGE WASTING PUMPS (IF APPLICABLE)

2.11.1 Furnish submersible non-clog sludge pumps, as required, to waste SBR sludge to the Sludge Digesters. Should other methods be furnished for wasting sludge, provide a complete description and cut sheets for proposed system. Furnish a minimum of one (1) waste sludge pump for each SBR tank. Each pump shall be equipped with a submersible electrical motor connected for 460 volt, three phase, 60 hertz operation. Pump housing shall be epoxy coated cast iron. Pump shall include an adequate length of multi-conductor chloroprene jacketed type SPC cable suitable for submersible pump applications. The power cable shall also be sized according to NEC and ICEA standards. The pump shall be supplied with a mating cast iron discharge elbow. Each unit shall be fitted with an adequate length of stainless steel lifting chain of adequate strength to permit raising and lowering the pump.

2.11.2 The sludge pumps shall be provided by Flygt; ABS, or approved equal.

2.11.3 Each pump shall include a "Seal Failure" and "Over Temperature" sensor and associated alarm system.

2.11.4 The discharge connection elbow shall be permanently installed with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the tank or pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.

2.11.5 A stainless steel upper guide bar bracket shall be provided with each pump. The entire weight of the pumping unit shall be guided by stainless steel guide bars and pressed tightly against the discharge connection elbow with metal-to-metal contact. No sealing of the discharge interface by means of a diaphragm, O-ring, or other devices shall be acceptable. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 ft.

2.11.6 Supply of all discharge piping, supports, gaskets, and hardware beyond the flanged connection of the pump discharge connection elbow shall be the responsibility of the General Contractor.

2.11.7 Each pump shall include a manually operated discharge valve to control the design waste sludge transfer flow rate. Valve shall be a Dezurik plug valve, or approved equal.

2.11.8 Each pump shall include a swing check or vertical ball check valve to prevent backflow. Swing check valves shall be as manufactured by Dezurik, Kennedy, or approved equal. Ball check valves shall be by Flygt, or approved equal. Valves shall be provided loose for installation within the discharge piping by the General Contractor. Valve gaskets and hardware shall be supplied by the Contractor.

2.11.9 Adhesive anchors of 304 stainless steel shall be provided for anchoring the pump.

## 2.12 JET MOTIVE PUMP (FOR JET AERATION)

2.12.1 Furnish submersible non-clog jet motive pump for jet aeration recirculation. Furnish one (1) pump for each SBR tank. Each pump shall be equipped with a submersible electrical motor connected for 460 volt, three phase, 60 hertz operation. Pump housing shall be epoxy coated cast iron. Pump shall include an adequate length of multi-conductor chloroprene jacketed type SPC cable suitable for submersible pump applications. The power cable shall also be sized according to NEC and ICEA standards. The pump shall be supplied with a mating cast iron discharge elbow. Each unit shall be fitted with an adequate length of stainless steel lifting chain of adequate strength to permit raising and lowering the pump.

2.12.2 The sludge pumps shall be provided by Flygt; ABS, or approved equal.

2.12.3 Each pump shall include a "Seal Failure" and "Over Temperature" sensor and associated alarm system.

2.12.4 The discharge connection elbow shall be permanently installed with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the tank or pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.

2.12.5 A stainless steel upper guide bar bracket shall be provided with each pump. The entire weight of the pumping unit shall be guided by stainless steel guide bars and pressed tightly against the discharge connection elbow with metal-to-metal contact. No sealing of the discharge interface by means of a diaphragm, O-ring, or other devices shall be acceptable. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 ft.

2.12.6 Supply of all discharge piping, supports, gaskets, and hardware beyond the flanged connection of the pump discharge connection elbow and the SBR manufacturer supplied jet aeration header shall be the responsibility of the General Contractor.

2.12.7 Each pump shall be furnished with discharge valves as recommended by the SBR Manufacturer for proper operation of the jet aeration system. Valves shall be Dezurik, or approved equal.

2.12.8 Adhesive anchors of 304 stainless steel shall be provided for anchoring the pump.

## 2.13 SLUDGE PUMP HOIST ASSEMBLY

2.13.1 Furnish two (2) stainless steel portable hoist assemblies. Hoist shall be rated to lift the heaviest pump with breakaway force considered, lift of 30 feet, 36" minimum reach and a 60" maximum reach. Hoist shall include 1/4" diameter 304 stainless steel cable, painted steel lifting hook, and 304 stainless steel snap hook.

2.13.2 For each stainless steel portable hoist assembly, furnish one electric winch assembly with push button control and automatic brake for positive load control. Motor shall be 120 volt/1 phase/60 hz.

2.13.3 Furnish a stainless steel platform socket assembly at each of the submersible pump locations. Each socket assembly shall include 304 stainless steel adhesive anchors for anchoring the platform socket to the tank walkway or concrete wall.

2.13.4 Hoists shall have adequate clearance to completely lift the pump to the walkway/landing, through a removable section of railing.

## 2.14 SPARE PARTS

2.14.1 The following spare parts, as a minimum, shall be supplied by the SBR equipment manufacturer:

<u>Qty.</u>	<u>Description</u>
(1)	Set of blower V-belts of each size
(1)	Blower filter element for each size air intake filter
(1)	Set Decanter spare parts recommended by Manufacturer
(1)	SBR Sludge Wasting Pump with Cable of Sufficient Length
(20)	Air diffuser elements and gaskets
(20)	Air diffuser holder retainer rings
(5)	Air distributor supports
(1)	Air manifold support
(2)	Air distributor sections
(5)	Air distributor repair couplings
(5)	Air fixed joint assemblies

2.14.2 Provide a list of any other recommended spare parts to Engineer/Owner for review, including price list.

## 2.15 SBR SYSTEM INSTRUMENTATION

2.15.1 Furnish one Dissolved Oxygen (DO) Sensor and Controller for each SBR, Aerobic Digester (if required) and Post-SBR Equalization tank for a total of six (6) sensors and controllers.

2.15.1.1 The instruments in the Dissolved Oxygen Control system shall consist of a single channel analyzer, Hach Model SC200 or approved equal, and a submersible sensor, Hach LDO Series, or approved equal. An analyzer and sensor shall be installed at each basin at locations as determined by the SBR manufacturer.

2.15.1.2 The dissolved oxygen analyzer shall be housed in a fiberglass NEMA 4X enclosure with brackets for wall or standard, two inch diameter round handrail installation. It shall have a digital display controlled by microprocessor circuitry. The analyzer shall NOT require any charts or manual inputs of any kind to determine the dissolved oxygen or to calibrate the system. All program memory and features of the instrument shall be unaffected by power interruptions. All run, programming, and calibration functions shall be accessible without having to open the enclosure. The analyzer shall be proven by an independent industry authority, such as Instrument Testing Association, to operate for at least three (3) months without any maintenance whatsoever.

2.15.1.3 The dissolved oxygen signal from each sensor shall be displayed at the main control panel display unit and be an input to the SBR Control Panel. The SBR Control Panel, using a PID control function shall output a 4-20ma signal to the adjustable frequency drive for PD blower applications. The control system shall control the airflow to provide only the amount of air required to maintain the dissolved oxygen set-point.

2.15.1.4 Wire termination shall be completed by the Electrical Contractor.

2.15.2 Ultrasonic Transducer:

2.15.2.1 Furnish one (1) ultrasonic transducer unit for each SBR Basin, Digester Basin and the Post-SBR Equalization Basin for a total of six (6) transducers. The transducer shall be the Siemens Multiranger 100/200. Transducer output shall be a 4-20 mA signal in direct proportion to the measured level. Sufficient length of cable per unit shall be provided for the installation. Transducers shall be furnished with a stainless steel bracket suitable for handrail mounting. Attachment of the cable and supply of junction box/disconnect at the basin wall shall be by the Electrical Contractor. 304 stainless steel hardware shall be provided for anchoring the transducer mounting bracket to the handrail.

2.15.3 High Water Level Float Switch:

2.15.3.1 Furnish one (1) non-mercury level sensor assembly for each SBR Basin, each Digester Basin and the single Equalization Basin for a total of six (6) sensors consisting of a polypropylene cased liquid level sensors with a smooth, chemical resistant polypropylene casing and 304 stainless steel mounting bracket for each basin. Float switches to be Flygt or approved equal. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the Electrical Contractor as shown on the Drawings. Adhesive anchors of 304 stainless steel shall be provided for anchoring the float switch mounting bracket.

2.15.4 Low Water Level Float Switch:

2.15.4.1 Furnish one (1) non-mercury level sensor assembly for each SBR Basin, each Digester Basin and the single Equalization Basin for a total of six (6) sensors consisting of a polypropylene cased liquid level sensors with a smooth, chemical resistant polypropylene casing and 304 stainless steel mounting bracket for each basin. Float switches to be Flygt or approved equal. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the Electrical Contractor as shown on the Drawings. Adhesive anchors of 304 stainless steel shall be provided for anchoring the float switch mounting bracket.



## 2.16 SBR CONTROL PANEL (SBRCP)

2.16.1 The SBR control system shall be designed to optimize the SBR process while minimizing operator attention. The control software program shall be factory tested prior to installation at the job site.

2.16.2 The SBR manufacturer shall furnish a complete control system. This shall include a master control panel with a Graphic Operator Interface, Programmable Logic Controller (PLC), Control Switches, and Pilot Lights.

2.16.3 The SBRCP shall interface with the variable frequency drives and motor starters furnished by the SBR Manufacturer as specified herein.

2.16.4 The PLC-based control system shall provide control, sequence, monitoring, and alarm annunciation displayed through the operator interface. The operator shall be able to access the timer values and set points through the operator interface panel to allow for adjustment of cycle times and system flexibility. The control system shall be designed to automatically accommodate the plant's full range of influent loads and flows as specified in 1.7.6.a and 1.7.6.b.

2.16.5 The SBRCP shall be located in the Filter Building Electrical Room. The SBRCP shall utilize an Ethernet connection to connect to the Filter Building SCADA Control Panel (FBCP) furnished by the General Contractors System Integrator. The FBCP shall communicate, via fiber optic network, with the Main SCADA Control Panel (MCP) located in the Control Building and Headworks/Biosolids Building SCADA Control Panel (HBCP), located in the Headworks/Biosolids Building. The MCP, HBCP and SCADA network shall be provided by the General Contractors System Integrator. The SBR Manufacturer shall provide SBRCP HMI screen data/programming to General Contractors System Integrator for integration into SCADA HMI programming.

2.16.6 All SBR System equipment shall be controlled by the SBRCP in accordance with the approved SBR manufacturer's shop drawings and shall include at a minimum, but not be limited to, the following:

### SBR EQUIPMENT DESCRIPTION

Influent and Decanter Valve Actuators  
Waste Sludge and Jet Motive Pumps (if applicable)  
Blowers w/VFDs  
D.O. Sensors/Analyzers  
Ultrasonic Level Transducers  
High Water Level Sensors  
Low Water Level Sensors

SLUDGE DIGESTER EQUIPMENT DESCRIPTION (IF APPLICABLE)

Blowers w/VFDs  
D.O. Sensors/Analyzers  
Ultrasonic Level Transducers  
High Water Level Sensors  
Low Water Level Sensors

POST-SBR EQUALIZATION BASIN EQUIPMENT DESCRIPTION

Blower w/VFDs  
D.O. Sensor/Analyzer  
Ultrasonic Level Transducer  
High Water Level Sensor  
Low Water Level Sensors

2.16.7 The SBRCF shall interface, via the SCADA network, with the following systems.

EQUIPMENT AND INSTRUMENTS BY OTHERS

Watkins Glen Pump Station Influent Flow Meter  
Montour Falls Pump Station Influent Flow Meter  
Plant Return Pump Station Flow Meter  
Metal Salt Chemical Feed System  
Alkalinity Chemical Feed System

2.16.8 The control panel enclosure shall be a heavy duty, free standing, NEMA 12, enclosure with a flange mounted disconnect for a three-phase power supply. The panel shall be made of 10-gauge steel and fully braced. The doors shall be heavy duty 3-point latching doors with a padlocking handle. The master circuit breaker disconnect shall be on the far right, and be interlocked with the doors.

2.16.9 All control panels shall be UL 508 listed. The UL 508 “sticker” shall be clearly displayed in the appropriate location within the panel. Third party substitutions of UL 508 listed equipment shall be strictly prohibited.

2.16.10 120-volt control and power shall be provided by a 480/120-240VAC isolation transformer. Isolation transformer to be adequately sized to provide control and power to all devices as shown on the contract drawings. Provide primary and secondary fusing for all isolation transformers internal to control panel. Provide 24VDC control power transformer as necessary to power devices rated at 24VDC. In addition a voltage conditioner shall be used for PLC power supply, and surge suppressers shall be used with all relays and contactors. All 120V branch feeders shall be protected by circuit breakers.

2.16.11 Control relays shall be industrial plug-in type, rated at 7 to 10 amps. Terminal blocks shall be high-density type, rated for 600 VAC, 30 amp minimum. Ten percent spare terminals shall be provided. All internal devices shall be clearly marked and identified on the outside and inside of the panel. All terminals and wires shall be clearly tagged in accordance with the schematic and wiring diagrams.

2.16.12 Push buttons and pilot lights shall be industrial Monolithic style, 22mm devices. A "Hand-Off-Auto" switch shall be provided for each motor. Selector switches shall be industrial, NEMA 4/13, 30mm, water/oil tight devices. The "Auto" position shall allow automatic PLC operation while the "Hand" position shall allow the operator to bypass the PLC when operating equipment.

2.16.13 Uninterruptible Power Supply system (UPS) shall supply power to the PLC and MMI/Display Unit. The unit shall be line-interactive, providing no breaks in output power, regardless of what happens to the input power. The power output shall be a true Sine-Wave Output with brownout boost voltage protection. The system shall have lightning and surge protection. The system shall be able to provide backup power to the PLC and MMI for minimum of 30 minutes.

2.16.14 Transient Voltage Surge Suppression (TVSS) and Lightning Protection – Data Communications and Signal Wiring: The system manufacturer shall provide transient voltage and surge suppression and lightning protection for all PLC data communication devices whenever the communications cable is located outside the building in which the panel resides. This also applies to all outdoor panels with communications cables exiting the PLC panel enclosure. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum DC operating voltage of 9.6 VDC, a clamping voltage of 81V, and an 8 x 20 US surge current rating of 1000 amps. Transient voltage and surge suppression shall also be provided for 10-32 VDC instrumentation signal systems. The TVSS units shall be employed when the signal cable extends beyond the boundaries of the building in which the PLC panel is located. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum operating voltage of 32 VDC, a clamping voltage of 100V, and an 8 x 20 US surge current capability of 1000 amps. TVSS units shall be as manufactured by Leviton, Inc., of Little Neck, New York, Model 3803-485/DHP for PLC communications and Model 3420-009/035 for 10-32 VDC signal wiring, or equal.

2.16.15 Wiring Requirements: All wiring shall be in complete conformance with the National Electrical Code, State, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required.

2.16.16 Surge Arrestor: A secondary surge arrestor shall be provided. Housing shall be Noryl and be ultrasonically sealed. Valve blocks shall be permanently crimped to the upper electrode forming part of the gap structure. Arrestors shall be UL and CSA listed Lightning Protection Devices.

2.16.17 Panel Heater: Condensation protection shall be provided. Enclosure shall have a heater which operates continuously to prevent condensation build-up.

2.16.18 Programmable Logic Controller (PLC): The Programmable Logic Controller (PLC) shall consist of an Allen Bradley Compact Logix 1769-L33ER, or approved equal, and shall consist of 750k program memory and up to 960 discrete I/O capacity. RAM memory shall be protected by a backup battery with further memory protection from a Compact Flash card. The processor shall have LED Indicators showing “Run”, “Fault”, and “Battery Low” status. Typical Scan Time shall be 1ms/1k ladder logic. The processor shall have one dedicated serial port, which supports RS232 communications. The processor shall have a built in Ethernet port for network communications. A modem with a built in four-port Ethernet switch shall be provided to allow direct access for online technical support. The Ethernet switch shall provide the network connections. The modem shall be an Allen-Bradley 9300-RADES, or approved equal.

2.16.19 Human Machine Interface: Provide a permanent interior panel mounted human machine interface (HMI) device which shall allow operators to review monitored inputs, review and change controllable set points and which shall provide visual indication of alarm conditions. Changeable set points shall be accessible by the user on a separate password protected screen. The HMI shall be the PanelView Plus 6 1500 as manufactured by Allen Bradley, or equal. All PLC inputs and outputs shall be accessible via the HMI. All PLC set points shall be adjustable via the HMI. The HMI shall be capable of sending alarm messages to the SCADA system.

## 2.17 MOTOR CONTROLLERS

2.17.1 SBR Manufacturer shall provide motor controllers, mounted in the SBRCF, for the SBR equipment to operate in a constant speed ON/OFF configuration. Horsepower ratings shall be as determined by SBR Manufacturer for submitted equipment. Motor controllers shall be furnished for the following equipment:

- a. SBR Waste Sludge Pumps (if applicable)
- b. SBR Decanters

2.17.2 Motor Controllers: Integral Self-Protected Combination Motor Controllers shall be provided for all motors. The integral starter shall combine all the functions of a disconnect, circuit breaker, contactor and overload relay in a coordinated motor controller. The starter shall be an IEC rated starter. Contactor coil voltage shall be rated for 120 VAC.

## 2.18 VARIABLE FREQUENCY DRIVES

2.18.1 SBR Manufacturer shall provide wall-mount standalone variable frequency drives (VFDs) for the SBR equipment to operate in a variable speed configuration. Horsepower ratings shall be as determined by SBR Manufacturer for submitted equipment. Variable torque VFDs shall be provided for pump applications; constant torque VFDs shall be provided for blowers. At a minimum, VFDs shall be provided for the:

- a. Jet Motive Pumps
- b. SBR Blowers
- c. Aerobic Digester Blowers (if applicable)
- d. Post-SBR Equalization Basin Blowers.

2.18.2 The VFDs shall be Fuji Electric FRENIC Series, Allen Bradley Powerflex, or approved equal.

2.18.3 The VFDs shall be sensorless vector control DTC type used to control the speed/torque of a NEMA design B induction motor. A motor parameter ID function shall automatically define the motor equivalent circuit used by the sensorless vector torque controller.

2.18.4 The VFD shall employ a full wave rectifier to prevent input line notching and operate at a fundamental (displacement) input power factor of 0.97 at all speeds and loads. The VFD efficiency shall be 98% or better at full speed and load.

2.18.5 An internally mounted AC line reactor or DC choke shall be provided to reduce input current harmonic content, provide protection from power line transients such as utility power factor correction capacitor switching transients and reduce RFI emissions. When a DC choke is utilized it shall be of swinging choke design to mitigate harmonics substantially more than conventional choke designs and shall provide a minimum of 5% impedance.

2.18.6 The VFD shall be manufactured in the United States by a firm with at least ten (10) years' experience in the production of this type of equipment.

2.18.7 The VFD manufacturing facility shall be ISO 9001 certified. The VFD shall be UL listed as an assembly.

2.18.8 The VFD shall be supplied in an engineered NEMA 12 rated enclosure. Engineered enclosure shall include power, fault, and run lights; hand/off/auto selector switch; start/stop pushbuttons; test normal selector switch and integral main disconnect.

2.18.9 The VFD shall have a current rating at least equal to the full load amps of the connected motor. The VFD shall be rated constant or variable torque, depending on application, with an overload rating of at least 110% for one minute of every ten minutes and 180% for two (2) seconds out of each minute with an instantaneous overcurrent trip at 350% or higher. Output frequency shall be adjustable between 0Hz and 500Hz. Operation above motor nameplate shall require programming changes to prevent inadvertent high-speed operation.

2.18.10 All printed circuit boards shall be completely tested and burned-in before being assembled into the completed VFD. The VFD shall then be subjected to a preliminary functional test, minimum four (4) hour burn-in and computerized final test. The burn-in shall be at 104°F (40°C), at full rated load, or cycled load. VFD input power shall be continuously cycled for maximum stress and thermal variation.

2.18.11 Static and Dynamic Performance - Open loop static speed regulation shall be 0.5% to 1% of rated motor speed. When motor speed feedback is provided from a suitable encoder, closed loop speed regulation shall be 0.01% or better. Dynamic speed accuracy shall be 3%-sec or better open loop and 0.3%-sec or better closed loop.

2.18.12 Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, field and shop labor, travel time and expenses.

2.18.13 Operator Control Panel:

- a. The VFD shall be equipped with a detachable, front mounted operator control panel consisting of a four- (4-) line by 20-character backlit alphanumeric display and a keypad with keys for Start/Stop, Local/Remote, Increase/Decrease, help, menu navigation and parameter select/save. The operator control panel shall include a real time clock that can be used for fault logging and controlling the VFD or for maintenance reminders. The standard operator panel shall provide a start-up, a maintenance and diagnostic assistant that guides a new user through initial start-up and commissioning of the VFD as well as provide indications for maintenance and help to diagnose a fault.
- b. All parameter names, fault messages, warnings and other information shall be displayed in complete English words or standard English abbreviations to allow the user to understand what is being displayed without the use of a manual or cross-reference table. A display contrast adjustment shall be provided to optimize viewing at any angle.
- c. The control panel shall include a feature for uploading parameter settings to control panel memory and downloading from the control panel to the same VFD or to another VFD.
- d. During normal operation, one (1) line of the control panel shall display the speed reference, and run/stop forward/reverse and local/remote status. The remaining three (3) lines of the display shall be programmable to display the values of any three (3) operating parameters. At least 26 selections shall be available including the following:
  1. VFD run time (in hours)
  2. Output frequency, voltage, current and torque
  3. Input voltage, power and kilowatt hours
  4. Heatsink temperature and DC bus voltage
  5. Status of discrete inputs and outputs
  6. Values of analog input and output signals
  7. Values of PID controller reference, feedback and error signals

2.18.14 The VFD shall have an RS-485 port as standard. The standard protocol shall be Modbus.

2.18.15 The VFD shall be capable of sensing a loss of load (broken belt/broken coupling) and signal the loss of load condition. The VFD shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay output shall include programmable time delays that will allow for VFD acceleration from zero speed without signaling a false underload condition

2.18.16 Two (2) analog inputs, one (1) 0 VAC – 10 VAC and one (1) 4mA – 20mA, all independently programmable with at least ten (10) input function selections. Analog input signal processing functions shall include scaling adjustments, adjustable filtering and signal inversion. Upon loss of input signal, the VFD shall be programmable to stop and display a fault message, run at a preset speed and display a warning message or display a warning message and run according to the last reference received.

2.18.17 Two (2) analog outputs providing 4mA to 20mA signals. Outputs shall be independently programmable to provide signals proportional to at least 12 output function selections including output speed, frequency, voltage, current and power.

2.18.18 Six (6) discrete inputs, all independently programmable with at least 25 input function selections. Inputs shall be designed for “dry contact” inputs used with either an internal or external 24 VDC source.

2.18.19 Three (3) form C relay contact outputs, all independently programmable with at least 30 output function selections. Relay contacts shall be rated to switch 8 Amps at 30VDC or 2 Amps at 230VAC. Function selections shall include indications that the VFD is ready, running, reversed and at set speed/torque. General and specific warning and fault indications shall be available. Adjustable supervision limit indications shall be available to indicate programmed values of operating speed, speed reference, current, torque and PID feedback.

2.18.20 Protective Functions:

- a. For each programmed warning and fault protection function, the VFD shall display a message in complete English words or Standard English abbreviations. The three (3) most recent fault messages along with time, current, speed, voltage, frequency and DI Status shall be stored in the VFD’s fault history. The last ten (10) fault names shall be stored in VFD memory.
- b. The VFD shall include internal MOV’s for phase to phase and phase to ground line voltage transient protection.
- c. Output short circuit and ground fault protection rated for 65,000 amps shall be provided per UL508C without relying on line fuses. Motor phase loss protection shall be provided.
- d. The VFD shall provide electronic motor overload protection qualified per UL508C.

- e. Protection shall be provided for AC line or DC bus overvoltage at 130% of max. Rated or undervoltage at 65% of min. rated and input phase loss.
- f. A power loss ride through feature will allow the VFD to remain fully operational after losing power as long as kinetic energy can be recovered from the rotating mass of the motor and load.
- g. Stall protection shall be programmable to provide a warning or stop the VFD after the motor has operated above a programmed torque level for a programmed time limit.
- h. Underload protection shall be programmable to provide a warning or stop the VFD after the motor has operated below a selected underload curve for a programmed time limit.
- i. Over-temperature protection shall provide a warning if the power module temperature is less than 5°C below the over-temperature trip level.
- j. Input terminals shall be provided for connecting a motor thermistor (PTC type) to the VFD's protective monitoring circuitry. An input shall also be programmable to monitor an external relay or switch contact (klixon).
- k. Options/Accessories:
  1. Each VFD shall be provided with an integrally mounted fused disconnect switch
  2. Each VFD shall be provided with one (1) set of spare input fuses
  3. Each VFD shall be provided with an externally mounted 5% input line reactor mounted in a NEMA 1 enclosure
  4. Each VFD shall be provided with an externally mounted DV/DT output filter mounted in a NEMA 1 enclosure

## PART 3 - EXECUTION

### 3.1 EXAMINATION

3.1.1 Contractor shall off-load equipment at installation site, or as otherwise directed by the Owner, using equipment of sufficient size and design to prevent injury or damage. Handle equipment in accordance with manufacturer's instructions. Immediately after off-loading, Contractor shall inspect pumps, controls and appurtenances for shipping damage or missing parts. Contractor shall be responsible for any damage that occurs during unloading of equipment.

### 3.2 FIELD PREPARATION AND PAINTING

3.2.1 Contractor shall touch-up all shipping damage to the paint and stainless steel as soon as the equipment arrives on the job site.

3.2.2 Contractor shall supply paint for field touch-up and field painting.

3.2.3 Contractor shall coat all stainless steel bolts and nut threads with a non-seizing compound prior to final assembly.



### 3.3 INSTALLATION, START-UP AND OPERATOR TRAINING

3.3.1 General Contractor shall install the equipment under the guidance of the SBR Equipment Supplier.

3.3.2 Installation of the SBR equipment shall be in strict accordance with the contract documents and the manufacturer's instructions and shop drawings. Manufacturer shall supply anchor bolts for the equipment. Contractors shall install the anchor bolts in accordance with the manufacturer's recommendations.

3.3.3 General Contractor shall provide plant start-up services in accordance with Section 11399 Startup of Activated Sludge Biological Wastewater Treatment Process.

3.3.4 Provide the services of a factory-trained representative as necessary to check initial installation and to place all components into acceptable service. Factory representative shall have complete knowledge of proper installation, operation and maintenance of equipment supplied. Representatives shall inspect the final installation and supervise a start-up test of the equipment. An additional site visit shall be provided if the Aerobic Digesters are started up separate from the SBRs.

3.3.5 Provide the services of a factory-trained representative to instruct operating personnel in proper operation and maintenance procedures of the SBR and Aerobic Digester equipment and controls. On-site process and O&M training shall consist of three (3) 8-hour days of training following successful start-up of the SBRs, Sludge Digesters and Post-SBR Equalization basin.

3.3.6 Services of a field representative to advise on the field installation shall be provided. The services of the field representative shall include seven (7) days, exclusive of travel time.

- a. Equipment shall not be energized, or "bumped" to check the electrical connection for motor rotation without the service engineer present.
- b. The service engineer shall make all necessary adjustments to the system.
- c. The service engineer shall demonstrate proper operation of the equipment before it is approved by the Engineer for startup and testing.
- d. The service engineer shall provide a minimum of two (2) days of classroom and/or field training on the Operation and Maintenance of the equipment to operator personnel. These instructions may include the use of slides, videos, literature, and/or oral presentations.

### 3.4 SBR SYSTEM START-UP REPORT

3.4.1 A start up report shall be issued by the manufacturer's representative at the initial start-up of the SBR equipment.

3.4.2 Oil and grease for initial operation shall be furnished and shall be in accordance with the manufacturer's recommendation.

### 3.5 EQUIPMENT WARRANTY

3.5.1 The Manufacturer of the equipment supplied under this specification shall provide a warranty for a period of one (1) year commencing on the date of Substantial Completion. The Manufacturer shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the Manufacturer shall, at his option, promptly repair, modify or replace the defective equipment.

3.5.2 Warranties and guarantees by the suppliers of various components in lieu of a single source responsibility by the Equipment Supplier shall not be accepted. The Equipment Supplier shall be solely responsible for the warranty of the equipment and all related components.

3.5.3 In the event a component fails to perform as specified or is proven defective in service during the warranty period, excluding items of supply normally expended during operation, the Manufacturer shall provide a replacement part without cost to the Owner.

3.5.4 Warranty periods shall not begin until acceptance of the fully operational equipment by the Owner.

++ END OF SECTION ++

**Notice to Bidders: Information in this specification includes performance requirements and provides the scope basis for the pre-selected equipment manufacturer and the allowance amount included in this agreement. Those requirements that are not specifically called out as the responsibility of the Tertiary Disk Manufacturer shall be performed by the respective contractor.**

## SECTION 11343

### TERTIARY DISK FILTER EQUIPMENT PRE-SELECTION

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

1.1.1 This section includes requirements for furnishing Tertiary Disk Filter Equipment (Filter System) as specified in the enclosed process specification. The Filter System shall be a complete system and shall be provided by a single source supplier. The Filter System Manufacturer shall be responsible for all engineering necessary in order to select, furnish, inspect the installing contractor's equipment installation and connections, calibrate, and place into operation the Filter System along with all other equipment and accessories as specified. After installation by the General Contractor, in accordance with the Manufacturer's instructions, the Filter System Manufacturer shall provide a fully functional filtration system.

1.1.2 This section shall be used in conjunction with the "Contract Documents and Specifications for Villages of Watkins Glen and Montour Falls Regional Wastewater Treatment Plant Tertiary Disk Filter Manufacturer Pre-Selection".

1.1.3 All components of the Filter System shall be provided by a single manufacturer. The manufacturer shall be responsible for the performance and compatibility of the entire system. The system shall be capable of complete automation, and all necessary components to achieve this shall be supplied by the system manufacturer and totally warranted by the manufacturer.

1.1.4 To assure proper interfacing and reliable operation of all system components, the system supplier shall assume sole responsibility for the quantity and proper functioning of all components, including those not of his manufacture.

##### 1.2 SYSTEM SOURCE AND QUALITY ASSURANCE

1.2.1 The Filter System shall be supplied by a single company of good reputation that is regularly engaged in the manufacture and fabrication of disk filter equipment. The manufacturer's experience shall include a minimum of ten (10) installations; each where filters of similar size and design has been in operation successfully in a similar process for a minimum of five (5) years. All referenced installations shall be of designs treating similar wastewater in similar climates (Northern United States) to similar effluent standards and limits.

1.2.1.1 The installation list shall include, but not be limited to, the following:

- a. Name and location of installations;
- b. Name of person in direct responsible charge of the equipment;
- c. Address and phone number of person in direct responsible charge;
- d. Month and year the equipment was placed in operation; and
- e. Brief description of equipment.

1.2.2 The General Contractor shall assign full responsibility for the functional operation of all Filter System components as specified herein to a single source supplier. This supplier shall furnish, supervise installation and connections, calibrate, and place into operation the Filter System along with all other equipment and accessories as specified herein.

### 1.3 CONTRACTUAL RESPONSIBILITIES

1.3.1 The General Contractor shall contract directly with the Owner and shall be responsible to provide the Filter System as an integrated system ready to function as intended under a contract between the Contractor and the Owner. The Filter System Manufacturer shall contract directly with the Contractor. The Filter System Manufacturer's terms and conditions with the Contractor shall not be binding on the Owner.

1.3.2 The installation of the equipment furnished by the Filter System Manufacturer shall be the responsibility of the General Contractor in accordance with all requirements of the contract documents. All efforts have been made to adequately describe and depict the Filter System for the purposes of bidding. Changes, based on the final design by the Filter System Manufacturer not in response to an Owner requested change, shall not constitute a contract change for either the Filter System manufacturer or Contractor.

1.3.3 The Filter System Manufacturer shall provide the design of the filters, controls, start-up, and process guarantee.

### 1.4 QUALITY ASSURANCE

1.4.1 In order to establish a standard of quality, these manufacturers have been pre-qualified to submit proposals in response to the RFP. Pre-qualification does not relieve the Filter manufacturer the responsibility for demonstrating certification of compliance with these specifications without exception.

1. Hydrotech Discfilter manufactured by Kruger, Inc., Cary, NC
2. AquaDisk Cloth Media Filter manufactured by Aqua-Aerobic Systems, Inc., Rockford, IL
3. Approved Equal

## 1.5 FILTER DESCRIPTION

1.5.1 Filter System Manufacturer shall furnish two (2) tertiary disk filters, factory tested and ready for operation, suitable parallel operation. Contractor shall furnish all labor, materials, equipment and incidentals required for installation of the tertiary disk filters as shown on the drawings and as specified herein.

1.5.2 Each unit shall include:

- a. Tank Assembly
- b. Maintenance Platform
- c. Cloth Media Disks with Center Tube Assembly or Support Columns and Frames, as required
- d. Backwash Pump
- e. Backwash/Sludge Discharge Assemblies
- f. Valves, as required
- g. Drive Mechanism, as required
- h. Automatic Control System

1.5.3 All motors, pumps, and bearings shall be designed for continuous duty and long operating life in a high humidity atmosphere. All motors and pumps shall be 460 volt, 60 Hz, 3-phase.

## 1.6 DESIGN BASIS

1.6.1 Each filter system shall be capable of filtering secondary effluent from a Sequencing Batch Reactor (SBR) process. The SBR process shall be designed for partial biological phosphorous removal. Provisions for metal salt addition to the SBRs during the react phase of each cycle and to the Post-SBR Equalization Basin will be provided for chemical precipitation of soluble reactive phosphorous. Additionally, provisions for polymer addition will be provided upstream of the filters.

1.6.2 The anticipated SBR effluent quality is as follows:

1. Post-SBR Equalized Average Daily Flow to Filters	1.20 MGD (833 gpm)
2. Post-SBR Equalized Peak Flow to Filters	3.23 MGD (2,243 gpm)
3. SBR Effluent TSS to Filters, Daily Average	10.0 mg/L
4. SBR Effluent TSS to Filters, Daily Maximum	20.0 mg/L
5. SBR Effluent Total Phosphorous	2.0 mg/L
6. SBR Effluent Metal Salt Dose, 48.5% $Al_2(SO_4)_3$	90 mg/L

1.6.3 The filter effluent design criteria shall be as follows:

1. Filter Effluent TSS, Daily Average	5.0 mg/L
2. Filter Effluent Total Phosphorous, 30-Day Average	0.5 mg/L

1.6.4 Each filter shall be designed at a maximum hydraulic loading rate of 5 gallons per minute per square foot of effective submerged disk area at the Post-SBR Equalized Peak Flow Rate of 3.23 MGD (2,243 gpm). Filter design shall assume all flow is sent to one filter with the other filter offline for maintenance.

## 1.7 SELECTION OF TERTIARY DISK FILTER MANUFACTURER RFP SUBMITTALS

### 1.7.1 Manufacturer Information shall include:

- a. Manufacturing company certification of compliance with these specifications without exception.
- b. Proof of manufacturing and testing facilities.
- c. Installation list with contacts and phone numbers for a minimum of ten installations of similar size in operation for five years.
- d. A field test report documenting that the proposed or similar units have been field tested and are operating within performance requirements.
- e. All other information necessary to enable the Engineer to determine whether the proposed equipment meets the specified requirements.
- f. After the RFPs are received, the Engineer may request additional information in order to clarify a manufacturer's proposal.

1.7.2 The following process and mechanical information shall be provided as part of the proposal.

- a. Process Calculations
  1. Calculations indicating hydraulic and solids loading at average and peak flow conditions based on effective submerged filter area.
- b. Equipment
  1. Submittal drawings showing general equipment arrangement and details in plan, elevation and cross sections of the equipment and any concrete embedments.
  2. Recommended operation and maintenance with service intervals
  3. Complete specifications describing the proposed system and equipment.
  4. Electrical utility requirements and consumption.
  5. Performance data, product data, and for process equipment including for all process, mechanical and electrical equipment.
  6. Influent flow control description, as required.
  7. Control description.

### 1.7.3 Written Proposal:

- a. Project narrative and written description of equipment.

- b. Recommended Maintenance Requirements.
- c. All exceptions or clarifications to the Filter Specification or RFP.
- d. Recommended spare parts for one year's operation and for start-up.
- e. Overall project schedules.
  - 1. Engineering and shop drawing schedule
  - 2. Shop fabrication and delivery schedule

1.7.4 Alternative descriptions including all product information, materials of construction, and owner advantages.

1.7.5 Typical operations and maintenance manual for a similar sized project

1.7.6 Submit written warranties and process guarantees and all other confidentiality and owner executed agreements.

## 1.8 CONTRACT ENGINEERING AND SHOP DRAWING SUBMITTALS

1.8.1 The following process and mechanical information shall be provided, after the award of the Contractor's contract, in accordance to Specification Section 01340 and as specified in other reference sections.

- a. Equipment
  - 1. Complete submittal drawings showing general equipment arrangement and details in plan, elevation and cross sections of the equipment and any concrete embedments.
  - 2. Component details of the filter equipment.
- b. Process and instrumentation diagrams (P&ID) for System Controls.
- c. Process Calculations – The calculations shall be reviewed and the submittals sealed by a Professional Engineer licensed and registered in New York State.

1.8.2 The following electrical and control information shall be provided in accordance to Specification Section 01340 after contract award:

- a. Drawings of Control Panel to include:
  - 1. Electrical ladder diagram showing Input/Output (I/O) and interconnections to all components.
  - 2. Door layout
  - 3. Interior layout
- b. Provide software documentation as specified in this section.
- c. Input/output (I/O) listing.
- d. Calibration and commissioning data sheets
- e. Operator Interface (OI) Screens

- f. List of components and catalog cuts fully describing each piece of equipment being furnished identifying all options being furnished. Identify each by tag number:
  - 1. Mechanical and structural components
  - 2. Instruments
  - 3. Programmable Logic Controller (PLC) Components
  - 4. Operator Interfaces
  - 5. Electrical and communication components
  - 6. PLC programming software

1.8.3 Recommended spare parts for one year's operation and for start-up.

1.8.4 Submit Operation and Maintenance manuals in accordance with Specification Section 01730. The Operation and Maintenance manuals shall provide detailed operating and installation instructions. Each set of books shall be prepared especially for the type of equipment delivered, and all operating instructions shall refer only to that particular equipment. Information shall include but not be limited to:

- a. Provide process control descriptions and instructions.
- b. Provide field testing, observation and sampling criteria
- c. Include instructions for starting and operating system.
- d. Identify operating limits, which may result in hazardous or unsafe conditions, or in equipment damage.
- e. Include routine preventative maintenance and lubrication schedule.
- f. Trouble shooting guide.
- g. List special tools, maintenance materials, and replacement parts.
- h. Include repair instructions for procedures to check, repair, and test equipment during typical malfunctions.

1.8.5 Submit written warranties.

1.8.6 Documents

- a. Submit project documents for this section and all reference sections in accordance with Specification Section 01340. Shop Drawings shall be submitted for the entire system at one time to allow for proper review of the integrated system. Partial submittals for individual components of the system will not be accepted.

1.8.7 Start-up and commissioning report.



## PART 2 - PRODUCTS

### 2.1 PRODUCTS

2.1.1 Unless specified elsewhere the products in the proposals shall be the manufacturer's standard.

### 2.2 MAINTENANCE PLATFORM

2.2.1 Each filter shall be supplied with a maintenance platform by the Filter Manufacturer. The walkway shall be approximately the same length as the main tank body.

2.2.2 The walkway shall be 42 inches lower than the top of the filter tank and utilize the tank wall as a handrail. Columns and joists shall be painted steel. The maintenance platform shall be accessed by a painted steel stairway. The walkway surface shall be FRP, HDG, or aluminum grating with a 4-inch toe-board. The stairway and exposed platform sides shall be protected by a welded steel handrail.

2.2.3 The platform shall be rated for 60 p.s.f. The removable handrail shall meet OSHA specification criteria. The supporting structure, handrail and stairway shall be painted steel. The paint application shall include a commercial sandblast (SSPC-SP6), 2 base coats 3-4 mils each, 1 clear finish coat 2-3 mils for 8-11 mils DFT.

2.2.4 The walkway shall be shipped loose for field assembly by the General Contractor.

### 2.3 FILTER DISK TANK

2.3.1 Each tank assembly shall be 304 stainless steel. Entire tank construction shall have a minimum thickness of 1/8". Each tank drain shall be provided with a manually operated ball valve. Valve shall be provided loose for installation by the General Contractor.

2.3.2 The filter tank shall incorporate flanged nozzles for influent, effluent, backwash, sludge removal and overflow as required for Filter Manufacturers standard design.

### 2.4 CENTER TUBE AND DRIVE ASSEMBLY (IF APPLICABLE)

2.4.1 Filters utilizing a center tube assembly shall include a 304 stainless steel center tube weldment, driven sprocket, wheel assemblies and frame and cloth assemblies. All fasteners shall be stainless steel.

2.4.2 Filters utilizing a center tube assembly shall include an adjustable drive assembly with a gearbox, drive sprocket, drive chain and a 304 stainless steel chain guard. Belt driven systems shall not be acceptable. The gearbox shall be either parallel in-line helical or helical worm gear type, AGMA class 1 with a drive motor rated for 460 volt, 3 phase, 60 Hz. Gear reducer shall be

Nord, or approved equal. Drive motor shall be Weg, Baldor, or approved equal. For internal drives, the drive sprocket shall be nylon and the chain shall be acetal with 304 stainless steel link pins. For external drives not in contact with the water, the drive sprocket shall be heat treated carbon steel, the driven sprocket shall be carbon steel, and the chain shall be carbon steel.

## 2.5 SUPPORT FRAME (IF APPLICABLE)

2.5.1 Filters utilizing fixed discs shall be furnished with a support frame to secure each disk in place in the filter tank. The disk supports shall be designed to withstand all loads of the disk and cleaning mechanism. Support frames shall be constructed of 304 stainless steel.

## 2.6 FILTER CLOTH ASSEMBLIES

2.6.1 Each tank shall include cloth disk assemblies, number as required to provide the submerged filter area as required for the specified filter loading rate. Effective submerged filtration area is defined as only the portion of the disk that is submerged during filtration. Any disk area that is not submerged shall not be considered as effective area.

2.6.2 Each cloth disk assembly shall consist of the manufacturers standard cloth filter media as required by specified filter performance. Filter media shall be supported by a 304 stainless steel or plastic frame. Cloth/frame assemblies shall be constructed such that each segment is easily removable, without special tools, to allow for removal and replacement of the cloth at the point of installation. Systems requiring special tools and/or the return of media segments to the factory for replacement will not be considered.

2.6.3 During filtration, the filter unit shall operate in a static condition with no moving parts. Filtered effluent shall be used for backwashing.

## 2.7 BACKWASH/SLUDGE DISCHARGE ASSEMBLY

2.7.1 Backwash valves shall be Dezurik, TCI, or approved equal.

2.7.2 Backwash and sludge removal assemblies shall be constructed from 304 stainless steel and/or plastics.

2.7.3 The backwash manifold shall be designed as to not inhibit the removal of filter disks for routine service or maintenance.

2.7.4 Backwash pump shall be provided with a 460 volt, 3 phase, 60 Hz motor. Operator shall have the ability to specify backwash time interval elapses through the operator interface. Backwash shall also be enabled by tank water level, timer or manual initiation.

2.7.5 Filtering shall not be interrupted during normal backwashing and sludge discharge.

2.7.6 Backwash valves shall be Dezurik, or approval equal.

2.7.7 Each filter shall include a sludge removal system. The operation of the sludge discharge system shall be automatic with user adjustable intervals and duration through the operator interface.

## 2.8 MISCELLANEOUS FILTER COMPONENTS

2.8.1 Each filter shall include one (1) influent valve. Valve shall be lugged style influent butterfly valve with a ductile iron body, aluminum bronze disk, stainless steel shaft and EPDM seat. Valve shall include lever handle. Valve shall be Dezurik, or approved equal.

2.8.2 Furnish one (1) Keller PSI Model 710, or approved equal, submersible pressure transducer unit constructed of stainless steel for each filter to monitor and report liquid level. Unit shall monitor the water level in the filter tank. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal over a 0-5 psi range. Electrical connection shall be to an attached two wire, 24 gauge polyethylene shielded cable. Pressure transducer shall be provided with a PVC stilling tube. Filter level may also be monitored via liquid level probes in combination with liquid level relays. Three probes shall be provided to indicate: 1) inlet water level requiring backwash initiation, 2) inlet high water alarm, and 3) effluent low level alarm (for dry run backwash pump protection).

2.8.3 Each filter shall have a float switch to indicate emerging overflow level. The float switch shall be Anchor Scientific Model S40N0-NC, or approved equal. The float shall contain a mercury switch, chemical resistant polypropylene casing hermetically sealed and a PVC #18 AWG three conductor cable. Switch rating shall be 4.5 amps non-inductive at 120 VAC. Systems utilizing a level probe in lieu of a float switch to monitor High Level are acceptable.

2.8.4 Backwash Pump Dry Run Protection – Each filter unit shall include a specific instrument (such as a level probe, float switch, vacuum switch) for the purpose of preventing the backwash pump from operating in a dry run condition during automatic filter operation. The instrument should provide an alarm signal when triggered and prevent dry running of the backwash pumps when the system is in auto mode.

## 2.9 SPARE PARTS

- a. Frame and cloth assemblies, number as required for one (1) complete disk
- b. (1) Backwash/Sludge valve and actuator (if required/provided with filter).
- c. (1) Set of backwash nozzles, if applicable

## 2.10 FILTER CONTROL SYSTEM

2.10.1 The automatic and manual controls for operation of the Disk Filter system shall be furnished fully assembled, wired, and pre-programmed in a NEMA rated and UL certified control enclosure. Controls shall be provided to control and monitor equipment as described in the contract documents. The control enclosure may be either mounted integral to the unit or shipped loose, suitable for wall mounting. If mounted to the filter unit, all components shall be pre-wired and the Electrical Contractor shall make one 460 volt connection and one communications connection at each control panel. If shipped loose, the Electrical Contractor shall provide, install, and terminate wiring and conduit between the control panel and the instruments and motors located on the filter unit.

2.10.2 Each Filter Control Panel (FCP-1, FCP-2) shall utilize an Ethernet connection to connect to the Filter Building SCADA Control Panel (FBCP), located in the Filter Building Electrical Room and furnished by the General Contractors System Integrator. The FBCP shall communicate, via fiber optic network, with the Main SCADA Control Panel (MCP) located in the Control Building and Headworks/Biosolids Building SCADA Control Panel (HBCP), located in the Headworks/Biosolids Building. The MCP, HBCP and SCADA network shall be provided by the General Contractors System Integrator. The Filter Manufacturer shall provide FCP-1 and FCP-2 HMI screen data/programming to General Contractors System Integrator for integration into SCADA HMI programming.

## 2.11 CONTROL PANEL QUALITY ASSURANCE

2.11.1 All control panels shall be UL certified. Testing prior to releasing for shipment shall be completed. Testing shall consist of the following:

1. Point to point testing of all wiring prior to application of power.
2. Intended supply voltage shall be applied to the enclosure.
3. All components shall be tested for proper operation and calibration.
4. The PLC and operator interface program shall be loaded and functionally checked.
5. All components shall be checked to confirm proper mounting specifications have been followed.
6. Enclosure shall be inspected for defects and repaired if necessary.
7. All labeling of wires and devices are correct, properly installed and clean.

2.11.2 The Filter manufacturer shall provide documentation that all testing described above has been completed and any rework was detected and subsequently repaired. Upon the successful completion of the control testing of the enclosure assembly, all applicable documentation (i.e. finalized drawing set, signed control checklist cover page, device data sheets, etc.) shall be placed in the drawing pocket of the enclosure.

## 2.12 CONTROL PANEL WIRING AND ASSEMBLY

2.12.1 All control enclosures shall be custom assembled and wired in an Underwriters Laboratories (UL) certified cabinet shop using quality materials and labor.

2.12.2 All control panel wire shall be 16 AWG multi-strand machine tool wire minimum, with MTW insulation.

2.12.3 All wires shall be clearly marked with an identification number consistent with the wiring schematic drawing.

2.12.4 Wiring inside the control panel shall be run in gray PVC wiring duct rated for continuous temperatures up to 122 degrees Fahrenheit. Devices mounted in the enclosure door shall have wires run in spiral wrap to avoid pinch points when opening and closing the door.

2.12.5 Control components mounted internal and external to the enclosure shall be mounted with stainless steel hardware and clearly labeled with a plastic identification nametag. The tag shall be white with black lettering.

## 2.13 CONDUIT

2.13.1 All wiring of pre-assembled and mounted external electrical components to control panels or junction boxes shall be protected with rigid PVC nonmetallic schedule 40 conduit and fittings. Conduit shall be sized for adequate spare capacity. All conduit unions and fittings shall be solvent cemented in accordance with instructions from the manufacturer. All conduit shall be supported at 3 foot intervals.

## 2.14 CONTROL ENCLOSURE COMPONENTS

2.14.1 Control Enclosure: the automatic controls shall be provide in a type 4X NEMA rated fiberglass or 304 stainless steel wall mounted enclosure that provides insulation and proection for electrical controls and components from highly corrosive environments indoors and outdoors. Enclosure shall include white polyester powder coated sub-panel mild steel (10 gauge) sub-panel mounted with collar studs. Hinges and quick-release latches shall be stainless steel. Control panel shall have a grounding lug.

2.14.2 Combination Drain and Breather: A “Combination” type stainless steel with neoprene tube drain and breather shall be hub mounted in the bottom of all control enclosures.

2.14.3 Panel Heater: Condensation protection shall be provided. Enclosure shall have a heater which operates continuously to prevent condensation build-up.

2.14.4 Main Disconnect Circuit Breaker: An automatic molded case 3-pole disconnect breaker shall be provided in the control enclosure. The primary function of the disconnect switch shall be to provide a means to manually open a circuit and automatically open a circuit under overload or short circuit conditions. The disconnect shall have a door mounted operating mechanism (painted black NEMA 4 with mild steel enclosures and chrome plated NEMA 4X with stainless steel enclosures) with trip indication. Power distribution connectors shall be mounted integrally to the circuit breaker for multiple load connections. Integral connectors shall be provided.

2.14.5 Power Distribution Fusing: Properly rated fuses and fuse blocks shall be provided for primary and secondary protection of the transformer and overload protection for each motor starter supplied in the control enclosure. Each fuse shall be equipped with a thermoplastic cover to protect against accidental contact.

2.14.6 Transformer: A step-down multi-tap transformer shall be supplied when there is a necessity to reduce incoming 3-phase power to 120 VAC single phase. The transformer power wire connections (incoming and outgoing) shall be protected with a cover to protect against accidental contact.

2.14.7 Circuit Breakers: All single phase branch or supplementary circuits shall be protected with a single-pole, B-Curve rated circuit breaker. The circuit breaker shall also provide the capability of shutting down power to a particular circuit for trouble shooting or service without shutting down the primary power to the enclosure.

2.14.8 Fuses: Properly rated fuses and fuse blocks shall be provided for protection of individual control devices (discrete and analog signals) mounted outside of the enclosure. Each fuse shall be housed in a hinged type fuse block to protect against contact with the fuse.

2.14.9 Motor Starters: An Integral Self-Protected Combination Motor Controller shall be provided for all motors. The integral starter shall combine all the functions of a disconnect, circuit breaker, contactor and overload relay in a coordinated motor controller. The starter shall be an IEC rated starter. Contactor coil voltage shall be rated for 120 VAC.

2.14.10 Terminal Blocks Standard feed-through screw terminal blocks, DIN rail mounted, shall be supplied for all point to point wiring connections. All terminals shall be numbered per the wiring schematic with printed markers.

2.14.11 Control Relays: Control relays for general control purposes shall be supplied with a pilot light to indicate when the coil is in an energized state. The relay socket shall be panel or DIN rail mounted inside the enclosure.

2.14.12 Ground Fault Duplex Receptacle: A ground fault circuit interrupter (GFCI) duplex receptacle shall be provided for instrument (i.e. programming terminal, Ethernet hub, modem, etc.) use only. The receptacle shall be protected with a 5 Amp circuit breaker to prevent usage other than instruments.

2.14.13 High Frequency Noise Filter: An active tracking filter shall be provided to protect the PLC and instrument receptacle power feed from high-frequency noise and low-energy transients.

2.14.14 Power Supply: An industrial grade, compact power supply shall be supplied to provide 24 VDC power to such rated components. The power supply shall be DIN rail mounted and functional with 120 or 230 VAC (single and three phase) incoming control power. The power supply shall have a green LED which shall be illuminated when output voltage is "OK".

2.15 OPERATOR DEVICES: Operator devices (pushbutton and selector switches) are mounted through the control enclosure door for manual operation of the control system. Transformer type push-to-test pilot lights and illuminated pushbuttons are provided for indication of an operation status. All operator devices are 30.5mm style, NEMA 4X rated with finger safe guards located on the contact blocks to prevent accidental contact with wire connections Operator device function is identified with an engraved white nameplate with black letters.

## 2.16 PROGRAMMABLE LOGIC CONTROLLER

2.16.1 Automatic operation of the Filter shall be controlled through a programmable logic controller (PLC) mounted inside the control panel. The PLC components shall consist of a panel mounted rack or chassis, power supply, CPU, discrete input and output modules and analog input and output modules. The processor unit shall include Ethernet and RS-232 communication ports. All input and output points supplied (including unused) shall be wired to terminal blocks.

2.16.2 PLC Vendor/Model: Allen Bradley MicroLogix, or approved equal.

2.16.3 Ethernet Hub: An Ethernet hub shall be provided inside the control enclosure for connectivity between the PLC, operator interface and Ethernet switch using Ethernet IP communication protocol and 10/100 BASE-T media.

## 2.17 HUMAN MACHINE INTERFACE

2.17.1 The control system shall be equipped with an operator interface that provides control display screens. These screens shall be used by the operator to monitor and control Filter status, setpoint and alarm information.

2.17.2 The Interface shall allow the Operator access to adjust the following operating parameters at a minimum:

1. Time of Day, date, year
2. Backwash interval
3. Backwash duration
4. Sludge waste interval
5. Sludge waste duration
6. Number of backwashes between sludge wasting

2.17.3 The operator interface shall provide information to assist the Operator in assessing the status of the filter system. The interface screen shall display, at minimum, the following parameters:

1. Time of Day, date, year
2. Water level in the filter
3. Time since last Backwash
4. Time since last Sludge withdrawal
5. Elapsed time on the Drive Motor
6. Elapsed time on the Backwash Pump
7. Total Backwash Time
8. Total Sludge Withdrawal Time

2.17.4 The interface shall display the alarm history. The alarm history shall include the time and date of the most recent 25 alarms along with the description of the alarm. The interface shall also display current alarms, including the date, time and a description of the alarm. As a diagnostic aid to the Operator, the interface shall display the time between backwashes for the most recent 40 backwashes. For diagnostic purposes, the display shall provide direct indication of actual analog inputs.

2.17.5 Vendor/Model: Allen-Bradley/PanelView Plus 6, or approved equal.

## PART 3 - EXECUTION

### 3.1 FACTORY TESTING

3.1.1 The Tertiary Disk Filter Equipment and all components shall be factory assembled and tested prior to shipment.

3.1.2 During the factory test period the Filter System shall be adjusted as required to assure proper operation on completion of the field installation. The Manufacturer shall supply a certification of the completion of the factory testing of the assembled Filter System and appurtenances and shall certify as to the equipment being in satisfactory operating condition at time of shipment.

3.1.3 The General Contractor is responsible for any disassembly and reassembly as required for installation of the Filter System in the Filter Building.



## 3.2 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT

3.2.1 All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.

3.2.2 The Contractor shall be responsible for unloading of the equipment and shall have equipment on-site available at the time of delivery permitting proper hoisting of the equipment. Any damage caused during unloading and handling of the equipment shall be responsibility of the Contractor.

## 3.3 FIELD PREPARATION AND PAINTING

3.3.1 Contractor shall touch-up all shipping damage to the paint and stainless steel as soon as the equipment arrives on the job site.

3.3.2 Contractor shall supply paint for field touch-up and field painting.

3.3.3 Contractor shall coat all stainless steel bolts and nut threads with a non-seizing compound prior to final assembly.

## 3.4 INSTALLATION, START-UP AND OPERATOR TRAINING

3.4.1 The General Contractor shall install the equipment under the guidance of the Equipment Supplier.

3.4.2 Installation of the equipment shall be in strict accordance with the contract documents and the manufacturer's instructions and shop drawings. Manufacturer shall supply anchor bolts for the equipment. Contractors shall install the anchor bolts in accordance with the manufacturer's recommendations.

3.4.3 Manufacturer shall furnish the services of a factory-trained service engineer for a minimum of two (2) trips, each including a minimum of one (1) 8-hour day to inspect the installation, carry-out the equipment start-up procedures, and provide training to the operators in how to effectively operate and maintain the equipment.

- a. Equipment shall not be energized, or "bumped" to check the electrical connection for motor rotation without the service engineer present.
- b. The service engineer shall make all necessary adjustments and settings to the controls.
- c. The service engineer shall demonstrate proper operation of the filters over the range of design flows. The filter shall operate automatically in all scenarios.
- d. The service engineer shall provide classroom and/or field training on the Operation and Maintenance of the equipment to operator personnel. These instructions may include the use of slides, videos, literature, and/or oral presentations.

### 3.5 EQUIPMENT WARRANTY

3.5.1 The Manufacturer of the equipment supplied under this specification shall provide a warranty for a period of one (1) year commencing on the date of acceptance by the Owner. The Manufacturer shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the Manufacturer shall, at his option, promptly repair, modify or replace the defective equipment.

3.5.2 Warranties and guarantees by the suppliers of various components in lieu of a single source responsibility by the Equipment Supplier shall not be accepted. The Equipment Supplier shall be solely responsible for the warranty of the equipment and all related components.

3.5.3 In the event a component fails to perform as specified or is proven defective in service during the warranty period, excluding items of supply normally expended during operation, the Manufacturer shall provide a replacement part without cost to the Owner.

3.5.4 Warranty periods shall not begin until acceptance of the fully operational equipment by the Owner.

++ END OF SECTION ++

SECTION 11 53 00  
LABORATORY EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
  - 1. Laboratory, sampling, and analytical equipment.
- B. Related Requirements:
  - 1. Section 03 10 00, Concrete Forming and Accessories.
  - 2. Section 26 05 03, Equipment Wiring Connections.

1.02 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA MG 1 - Motors and Generators.
- B. FCC Declaration of Conformity.
- C. UL, Underwriters Laboratories.
- D. Conformité Européenne (CE), European Conformity Standards.
- E. cTUVus, as issued by a nationally recognized testing laboratory.

1.03 COORDINATION

- A. Comply with Section 01 61 00, Common Product Requirements.
- B. Leave building openings of sufficient size to permit transport of equipment to final position.
- C. Coordinate rough-in frame and anchor placement with respective equipment's approved shop drawings.

1.04 SUBMITTALS

- A. Comply with Section 01 33 00, Submittal Procedures.

- B. Product Data:
  1. Submit equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations, and point loads.
- C. Shop Drawings:
  1. Indicate equipment locations, large-scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, and clearances required.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer Instructions: Submit special installation requirements.
- F. Source Quality-Control Submittals: Indicate results of factory tests, calibrations, and inspections.
- G. Data:
  1. Submit description of equipment operation, adjusting, and required testing.
  2. Identify system maintenance requirements, servicing cycles, required lubrication types, and spare-parts sources.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 61 00, Common Product Requirements.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store and protect materials according to manufacturer instructions.
- D. Deliver to Owner in original packaging with all manuals and written documentation.
- E. Do not deliver to Owner prior the laboratory room being substantially complete.

### PART 2 - PRODUCTS

#### 2.01 LABORATORY EQUIPMENT

- A. Quantity of each piece of equipment: one (1), unless noted otherwise herein.
- B. Benchtop pH Meter:
  1. Certifications: CE, TUV 3-1, FCC Class A.
  2. Range: -2.000 to +20.000 pH.
  3. Resolution: 0.1, 0.01, 0.001 pH.
  4. Accuracy: +/- 0.002 pH.

5. Range +/- 2000.0 mV.
6. Calibration:
  - a. Method: pH with calibration editing option, relative mV, ORP, and temperature.
  - b. Points: 1 to 5-point calibration.
7. Temperature range: -5 degrees C to +105.0 degrees C.
8. Channel quantity: 1.
9. Display type: Graphic LCD with backlight.
10. Keypad: Comprehensive with menu-specific function keys and dual purpose scroll/shortcut keys.
11. Outputs: Universal serial bus (USB) and RS-232.
12. Accessories:
  - a. Electrode stand.
  - b. Universal power adapter.
  - c. Computer interface cable.
13. Manufacturer/Model: Orion Star A211, by Thermo Fisher Scientific.

C. Benchtop pH Probe:

1. Range: 0 to 14 pH.
2. Reference cell: Ag/AgCl.
3. Connection: BNC waterproof.
4. Cable length: 5 feet.
5. Manufacturer/Model: Orion 9107BNMD, by Thermo Fisher Scientific.

D. Portable Meter Kit with Probes:

1. Single input channel for measurement of pH, conductivity, dissolved oxygen, temperature.
2. Body rating: IP67 (waterproof).
3. Display type:
  - a. 240 x 160 pixel display reading for probe.
  - b. Continuous measurement or "press-to-read" mode available for averaging.
4. Interface: keypad.
5. Compatible with digital probes.
6. Furnish each probe with 16 feet of cable.
7. Manufacturer/Model:
  - a. Meter kit: HQ30D, by Hach.
  - b. Probes:
    - 1) pH: IntelliCAL PHC10105, by Hach.
    - 2) Dissolved oxygen: IntelliCAL LDO101, by Hach.

E. Spectrophotometer:

1. General: portable spectrophotometer.
2. Detector: silicon photodiode.
3. Display: LCD graphical display 240 x160 pixel, with backlight.

4. Body rating: IP67.
5. Wavelength range: 340 nm to 800 nm.
6. Spectral bandwidth: 5 nm.
7. Electrical requirements:
  - a. Load connection: 120VAC, 60 Hz.
  - b. Battery: 4 x AA alkaline.
8. Manufacturer/Model: Hach DR1900, Portable Spectrophotometer.

F. Potentiometric Titrator:

1. General: Automatic, benchtop potentiometric titrator.
2. Certifications: Safety IEC/EN61010-1
3. Electrode: IntelliCAL (digital), analog, photometric compatible.
4. Titration modes: Potentiometric (zero and imposed current), amperometric, and colorimetric.
5. Measurement mode: end point or inflection point.
6. Sample stand: Integrated magnetic stirring beakers, up to 250 mL.
7. Pumps:
  - a. Quantity: 2.
  - b. Flow rate: 100 mL/min.
8. Enclosure material: Splash-proof design, polypropylene, silicon, and hardened glass.
9. Electrical requirements: 120VAC, 60 Hz.
10. Operating interface: silicone keypad.
11. Outputs:
  - a. Two electrode ports.
  - b. Two USB ports.
  - c. One serial (RS-232) port.
  - d. One Ethernet port.
12. Manufacturer/Model:
  - a. Titrator: TitraLab AT1122.97, by Hach.
  - b. Chlorine application package: AP0007.AT1122, by Hach.

G. Muffle Furnace:

1. Temperature Range: 100 to 1,200 degrees C.
2. Capacity: 2 L.
3. Electrical Requirements: 240V, 60 Hz, 1,000 W, 4.2 A.
4. Controller:
  - a. Digital single setpoint controller.
5. Manufacturer/Model: Thermolyne Benchtop Muffle Furnace F47910, by Thermo Fisher Scientific.

H. Digital Reactor Block:

1. Compliance Certification: CE, cTUVus.
2. Heating Rate: 20 degrees C to 150 degrees C in 10 minutes.

3. Cuvette quantity: 15 vials x 16 mm.
4. Electrical requirements: 120 VAC, 60 Hz.
5. Temperature range: 37 degrees C to 165 degrees C.
6. Manufacturer/Model: DRB200, by Hach. Part No.: LTV082.53.40001.

I. Vacuum Pump:

1. Type: Laboratory vacuum pump.
2. Free air displacement: 1.8 cfm.
3. Ultimate pressure:  $2 \times 10^{-3}$  torr.
4. Sound level: 52 dB.
5. Pump speed: 3450 rpm.
6. Electrical requirements: 120 VAC, 60 Hz.
7. Motor size: 1/4 hp, max.
8. Intake and exhaust size: 3/4-20 hose barb.
9. Tubing size: 7/16 inches diameter.
10. Manufacturer/Model: Welch 8905 direct drive pump.

J. Pipettes:

1. Type: digital, variable volume pipettes.
2. Furnish one pipette in each size listed below:
  - a. 100 – 1000 uL.
  - b. 0.5 – 5 mL
  - c. 1 – 10 mL.
3. Manufacturer/Model: Research Plus, by Eppendorf

K. Standard Jar Tester:

1. Type: six-paddle automatic jar tester.
2. Certification: CE and cTUVus.
3. Paddle size: 1”x 3”, stainless steel.
4. Electrical requirements: 120 VAC, 60 Hz.
5. Motor speed control: 5 – 300 rpm.
6. Beakers: 2L, square acrylic.
7. Floc illuminator: LED lighting.
8. Manufacturer/Model: PB-900, by Phipps & Bird.

L. Analytical Balance:

1. Capacity: 220 g.
2. Readability: 0.1 mg.
3. Repeability: 0.1 mg.
4. Minimum weight (USP): 0.16 g.
5. Weighing pan diameter: 90 mm.
6. Display: 4.5” color TFT touchscreen.
7. Interfaces: RS-232, USB device, USB host.
8. Electrical requirements: 120VAC, 60 Hz.

9. Housing: die-cast aluminum and ABS plastic.
10. Manufacturer/Model:
  - a. ML204T/00, by Mettler Toledo.
  - b. Or approved equal.

M. Drying Oven:

1. Type: General protocol drying oven.
2. Convection technology: gravity convection.
3. Controls: microprocessor-based touchscreen mounted on the door with built-in timer.
4. Alarms: Automatic over-temperature alarm.
5. Door swing: greater than 180 degrees.
6. Temperature range: 50 - 250 degrees C.
7. Footprint: 3.2 sq. ft.
8. Chamber volume: 2.3 cu. ft.
9. Number of shelves: 2.
10. Manufacturer/Model: Heratherm OGS60 oven, by Thermo Scientific.

N. Refrigerated Automatic Sampler:

1. General: Refrigerated automatic sampler, suitable for indoor or unsheltered outdoor applications.
2. Quantity:
  - a. One (1) Influent Sampler.
  - b. One (1) Effluent Sampler.
  - c. Locations and sampling points as shown on the Drawings.
3. Accessories:
  - a. Controller on a vinyl-clad refrigerated base.
  - b. Bottle kit including 2.5 gallon polyethylene bottle with extension tube, composite tube support, and full bottle shut-off.
  - c. Twenty-five (25) feet of vinyl intake tubing.
  - d. One (1) intake strainer.
4. Alarms:
  - a. Fully configurable alarms that show on status screen and are recorded in diagnostics alarm logs.
  - b. Alarms can be set for system diagnostics and logging such as “program end”, “sample complete”, “missed sample” and “full bottle”.
  - c. Channel alarms shall be setpoint alarms for the recorded measurements, such as pH, level and power supply voltage.
5. Automatic shutdown:
  - a. Multiple bottle mode: after complete revolution of the distributor arm.
  - b. Composite mode: after preset number of samples have been delivered to the composite container.
6. Body material: 22-gauge carbon steel with vinyl laminate.
7. Certifications: CE, UL.
8. Communication: universal serial bus (USB).



9. Cooling system:
  - a. 400 Btu / hr compressor.
  - b. 120 cfm condenser fan.
  - c. Three-sided plate-type evaporator.
  - d. Rigid foam insulation.
  - e. Magnetic door seal.
10. Sample collection: High-speed peristaltic dual-roller pump.
11. Vertical lift: maximum 28 feet, using 3/8-inch vinyl intake tubing at mean sea level.
12. Sample detection: ultrasonic.
13. Refrigeration requirements: maintain sample liquid at 4 degrees C in an ambient temperature of 120 degrees F.
14. Sample volume: programmable in 1-mL increments from 100 to 9,999 mL.
15. Inputs: one (1) 4-20 mA analog for flow pacing.
16. Memory:
  - a. Sample history: 4,000 records.
  - b. Data log: 325,000 records.
  - c. Event log: 2,000 records.
17. Manufacturer/Model: Model 5800 Refrigerated Sampler, by Teledyne ISCO. Or approved equal.

O. Laboratory Refrigerator:

1. Capacity: 23 cubic feet.
2. Voltage: 120V/60 Hz.
3. Interior finish: stainless steel.
4. Door: insulated glass, single leaf.
5. Number of shelves: 4.
6. Interior dimensions: 28.5" deep x 24" wide x 61.75" tall.
7. Refrigerator temperature range: 1 degree to 12 degrees C.
8. Digital temperature controller with interface.
9. Automatic defrost.
10. Manufacturer/Model:
  - a. GP Series Laboratory Refrigerator, Model MR25SS-GAEE-TS, by Thermo Scientific.
  - b. Or approved equal.

P. Vibration Isolation Table:

1. Frame: rigid aluminum extrusion, hard-anodized black for corrosion and scratch resistance.
2. Tabletop: chemically-resistant Athlon.
3. Minimum surface dimensions: 42" long x 30 inches deep.
4. Isolation surface dimensions: 14 x 25.
5. Manufacturer/Model:
  - a. Series 2500, by Vistek.
  - b. Or approved equal.

Q. Contrast Microscope:

1. Microscope:
  - a. Nosepiece: quadruple.
  - b. Head: gemel-type trinocular head, included 45 degrees.
  - c. Optical system: CSIS infinity chromatic correction.
  - d. Eyepiece: PL10X high eye-point plan eyepiece, FN 22mm.
  - e. Sample holder: Terasaki holder and petri dish holder.
  - f. Magnification: 40X – 600X phase contrast infinity plan inverted microscope with color-corrected infinity optical system.
  - g. Trinocular port for adding photo or video capability.
2. Camera specifications:
  - a. Sensor: Aptina MT9T001.
  - b. Sensor type: CMOS.
  - c. Sensor size: 6.55 mm x 4.92 mm.
  - d. Pixel size: 3.2.
  - e. Resolution: 3.1 megapixel.
  - f. Sensitivity: 1.0V/lux-second.
  - g. Compatibility: Windows (32/64-bit) XP/Vista/7/8/10.
3. Software specifications:
  - a. OS requirements: Windows (32/64-bit) XP/Vista/7/8/10.
  - b. Hardware requirements: Intel Core2 2.8 GHz or compatible processor, 2 GB RAM, USB 2.0 port.
4. Manufacturer: Amscope 40X-600X Infinity Phase Contrast Inverted Microscope.

## 2.02 ACCESSORIES

- A. Rough-in Equipment: Furnish frames, anchors, supports, accessories, and closure trim for scheduled equipment, as required.

## 2.03 SOURCE QUALITY CONTROL

- A. Furnish shop inspection and testing for all calibrated equipment items.
- B. Certificate of Compliance:
1. If fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
  2. Specified shop tests are not required for Work performed by approved fabricator.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. According to standards required by authorities having jurisdiction.
- B. Anchor equipment securely in place.
- C. Sequence installation to accommodate required utility connections.
- D. Touch up surfaces with minor damage caused during installation and replace damaged components.

### 3.02 ADJUSTING

- A. Comply with Section 01 77 00, Closeout Procedures.
- B. Adjust operating equipment to most efficient operation.

++ END OF SECTION ++

## SECTION 12 31 00

### MANUFACTURED METAL CASEWORK

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. This section specifies metal casework, standard cabinets and related accessories, including base cabinets & wall cabinets

##### 1.02 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
  - 1. Manufacturer is regularly engaged in design and manufacture of metal of scope and type similar to requirements of this project for a period of not less than five (5) years.
  - 2. Manufacturer has successfully completed at least three (3) projects of scope and type similar to requirements of this project.
  - 3. Submit manufacturer's qualifications and list of projects.
- B. Installer Qualifications:
  - 1. Installer has completed at least three (3) projects in least five (5) years in which these products were installed.
  - 2. Submit installer qualifications.

##### 1.03 SUBMITTALS

- A. Certificates:
  - 1. Manufacturer's Certificate of qualifications specified.
  - 2. Certificate of installer's qualifications specified.
- B. Manufacturer's Literature and Data:
  - 1. Brochures showing name and address of manufacturer, and catalog or model number of each item incorporated into the work.
  - 2. Manufacturer's illustration and detailed description.
  - 3. List of deviations from contract specifications.
- C. Shop Drawings (1/2 Full Scale):
  - 1. Showing details of casework construction, including kinds of materials and finish, hardware, accessories and relation to finish of adjacent construction, including specially fabricated items or components.
  - 2. Fastenings and method of installation.

D. Samples:

1. Metal plate, 6 inch square, in each color.

E. Manufacturer's warranty.

1.04 WARRANTY

- A. Manufacturer Warranty: Manufacturer shall warranty their casework for a minimum of five 5 years from date of installation and final acceptance Submit manufacturer warranty.

1.05 APPLICABLE PUBLICATIONS

A. American Society for Testing and Materials (ASTM):

- A36/A36M-14.....Carbon Structural Steel
- A240/A240M-14.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- A283/A283M-13.....Low and Intermediate Tensile Strength Carbon Steel Plates
- A568/A568M-14.....Steel, Sheet, Carbon and High-Strength, Low-Alloy Hot-Rolled and Cold-Rolled, General Requirements
- A794/A794M-12.....Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16% Maximum to 0.25% Maximum) Cold Rolled
- B456-11.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
- C1036-11(R2012) .....Flat Glass
- C1036-12e1 .....Heat-Strengthened and Fully Tempered Flat Glass
- C1172-14.....Laminated Architectural Flat Glass

B. Builders Hardware Manufacturers Association (BHMA):

- A156.1-13 .....Butts and Hinges
- A156.9-10 .....Cabinet Hardware
- A156.5-14 .....Auxiliary Locks and Associated Products
- A156.11-14 .....Cabinet Locks
- A156.16-13 .....Auxiliary Hardware

C. American Welding Society (AWS):

- D1.1/D1.1M-10.....Structural Welding Code Steel
- D1.3/D1.3M-05(R2008) .....Structural Welding Code Sheet Steel

D. National Association of Architectural Metal Manufacturers (NAAMM):

- AMP 500 Series .....Metal Finishes Manual

- E. Underwriters Laboratories Inc. (UL):
  - 325-06(R2013).....Door, Drapery, Gate, Louver, and Window Operators and Systems
  - 437-08(R2013).....Key Locks

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Sheet Steel:
  - 1. ASTM A794/A794M, cold rolled, Class 1 finish, stretcher leveled.
  - 2. Other types of cold rolled steel meeting requirements of ASTM A568/A568M are acceptable for concealed parts.
- B. Structural Steel: ASTM A283/A283M or ASTM A36/A36M.
- C. Stainless Steel: ASTM A240/A240M, Type 302B.
- D. Fasteners:
  - 1. Exposed to View: Chrome plated steel or stainless steel, or finished to match adjacent surface.
  - 2. Provide round head or countersunk fasteners where exposed in cabinets.
  - 3. Expansion Bolts: Fed Spec. A-A-55615. Do not provide lead or plastic shields.
  - 4. Nuts: Fed Spec FF-N-836. Type III, Style 15 where exposed.
  - 5. Sex Bolts: Capable of supporting twice the load.

### 2.02 MANUFACTURED PRODUCTS

- A. When two (2) or more units are required, use products of one (1) manufacturer.
- B. Manufacturer of casework assemblies is to assume complete responsibility for the final assembled unit.
- C. Provide products of a single manufacturer for parts which are alike.

### 2.03 CASEWORK FABRICATION

- A. General:
  - 1. Welding: Comply with AWS Standards D1.1/D1.1M and D1.3/D1.3M.
  - 2. Reinforce with angles, channels, and gussets to support intended loads, notch tightly, fit and weld joints.
  - 3. Constructed of sheet steel, except where reinforcing required.

B. Minimum Steel Thickness:

0.89 mm (0.035 inch) (20 gage)	Drawer fronts, backs, bodies, closure plates or scribe and filler strips less than 75 mm (3 inches) wide, sloping top, shelf reinforcement channel and shelves. Toe space or casework soffits and ceilings under sloping tops.
1.20 mm (0.047 inch) (18 gage)	Base pedestals, casework top sides, back, and bottom panels, closure scribe and filler strips 75 mm (3 inches) or more. Reinforcement for drawers with locks. Tables legs, spreaders and stretchers, when fabricated of cold rolled tubing. Metal for desks; except legs and aprons. Door exterior and interior panels, flush or glazed. Cross rails of base units. Front bottom rails, back bottom rails; rails may be 1.49 mm (0.059 inch) (16 gage) thick. Uprights or posts. Top corner gussets.
1.49 mm (0.059 inch) (16 gage)	Aprons, apron division, reinforcing gussets, table legs, desk legs and aprons, spreaders and stretchers when formed without welding. Toe base gussets, drawer slides, and other metal work. Front top rails and back rails except top back rails may be 1.2 mm (0.047 inch) (18 gage) thick.
1.88 mm (0.074 inch) (14 gage)	Drawer runners door tracks.
2.64 mm (0.104 inch) (12 gage)	Base unit bottom corner gussets and leg sockets.
3 mm (0.12 inch) (11 gage)	Reinforcement for hinge reinforcement inside doors and cabinets.

C. Casework Construction:

1. Welded assembly.
2. Fabricate with enclosed uprights or posts full height or width at front. Include sides, backs, bottoms, soffits, ceilings under sloping tops, headers and rail, assembled to form an integral unit.
3. Form sides to make rabbeted stile, 19 to 28 mm (3/4 to 1-1/8 inch) wide, closed by channel containing shelf adjustment slots.
4. Make bottom of walls units flush, double panel construction.
5. Make top and cross rails of "U" shaped channel.
6. Provide enclosed backs and bottoms in cabinets, including drawer units.
7. Provide finish panel on exposed cabinet backs.
8. Do not install screws and bolts in construction or assembly of casework, except to secure hardware, applied door stops, accessories, removable panels, and where casework is required to be fastened, end to end or back to back.
9. Fabricate casework, except benches, and desks with finished end panels.
10. Close flush exposed soffits of wall hung shelving, knee spaces in counters, and toe spaces at bases.
11. In base units with doors provide removable backs.
12. Provide reinforcing for hardware.

13. Size Dimensions:

- a. Use dimensions shown on construction documents or within tolerances specified.

D. Base Pedestals:

1. Provide adjustable leveling bolts accessible through stainless steel plugs, or notch in the base concealed when resilient base is applied.
2. Provide toe space at front recessed 3 inches.

E. Doors:

1. Hollow metal type, flush and glazed doors not less than 16 mm (5/8 inch) thick.
2. Fabricate flush metal doors of two (2) panels formed into pans with corners welded and ground smooth. Provide flush doors with a sound deadening core.
3. Provide sheet steel hinge reinforcement inside doors.
4. Doors removable without use of tools except where equipped with locks.

F. Drawers:

1. Drawer fronts to be flush hollow metal type not less than 16 mm (5/8 inch) thick with sound deadening core. Fabricate of two (2) panels formed into pans. Weld and grind smooth corners of drawer fronts.
2. Form bodies from one (1) piece of steel, weld to drawer front.
3. Provide reinforcement for locks and provide rubber bumpers at both sides of drawer head to cushion closing.
4. Equip with roller suspension guides.

G. Shelves:

1. Capable of supporting an evenly distributed minimum load of 122 kg per square meter (25 pounds per square foot) without visible distortion.
2. Flange shelves down 19 mm (3/4 inch) on edges, with front and bearing edges flanged back 13 mm (1/2 inch).
3. For shelves over 1067 mm (42 inches) in length and over 305 mm (12 inches) in depth install 38 mm by 13 mm by 0.9 mm (1 1/2 x 1/2 x 0.0359 inch) thick sheet steel hat channel reinforcement welded to underside midway between front and back and extending full length of shelf.
4. Weld shelves to metal back and ends unless shown on construction documents as adjustable.
5. Provide means of positive locking shelf in position, and to permit adjustment without use of tools.

## 2.04 HARDWARE

A. Factory installed.

- B. Exposed hardware, except as specified otherwise, satin finished chromium plated brass or nickel plated brass or anodized aluminum.



C. Cabinet Locks:

1. Provide locks on all upper and lower cabinets and drawers keyed alike

D. Cabinet Hardware: ANSI BHMA A156.9.

1. Door/Drawer Pulls: B02011.
  - a. One (1) for drawers up to 584 mm (23 inches) wide.
  - b. Two (2) for drawers over 584 mm (23 inches) wide.
  - c. Sliding door flush pull, each door: B02201.
  - d. Provide drawer and door pulls of a design that can be operated with a force of 22.2 N (5 pounds) or less, with one (1) hand and not require tight grasping, pinching or twisting of the wrist.
2. Cabinet Door Catch:
  - a. Install at bottom of wall cabinets, top of base cabinets and top and bottom of full height cabinet doors over 1220 mm (48 inches).
  - b. Omit on doors with locks.
3. Butt Hinges:
  - a. B01351, minimum 1.8 mm (0.072 inch) thick chrome plated steel leaves.
  - b. Minimum 3.5 mm (0.139 inch) diameter stainless steel pins.
  - c. Full mortise type, five (5) knuckle design with 63 mm (2 1/2 inch) high leaves and hospital type tips.
  - d. Two (2) hinges per door except use three (3) hinges on doors 1220 mm (48 inches) and more in height. Use stainless steel leaves for tilting bin doors.
  - f. Do not weld hinges to doors or cabinets.
4. Shelf Supports:
  - a. Install in casework where adjustable shelves are noted on construction documents.
5. Door silencers:
  - a. Install two (2) rubber bumpers each door.
  - b. Silencers set near top and bottom of jamb.

## 2.5 METAL FINISHES

A. Steel Cabinets including Closures and Filler Strips:

1. After fabrication of cabinet submerge in a degreasing bath, and thoroughly rinse to remove dirt and grease, and other foreign matter.
2. Apply non-metallic phosphate coating, then finish with baked-on acid resisting enamel not less than 1 mil (0.001 inch) thick.
3. Color of finish to be selected

B. Brass:

1. U.S. Standard Finish No. 26 for hardware items.
2. Other brass items: ASTM B456, chromium plated finish meeting requirements for Service Condition SCI.

C. Aluminum: Chemically etched medium matte, clear anodic coating, Class II, Architectural, 0.4 mils (0.0004 inches) thick.

D. Stainless Steel: Mechanical finish No. 4 on sheet except No. 7 on tubing.

## PART 3 - EXECUTION

### 3.1 COORDINATION

- A. Begin only after work of other trades is complete, including wall and floor finish completed, ceilings installed, light fixtures and diffusers installed and connected, and area free of trash and debris.
- B. Verify location and size of mechanical and electrical services as required and perform cutting of components of work installed by other trades.
- C. Verify reinforcement of walls and partitions for support and anchorage of casework.
- D. Coordinate with other Divisions and Sections of the specification for work related to installation of casework systems to avoid interference and completion of service connections.

### 3.2 INSTALLATION

- A. Install casework in accordance with manufacturer's written instructions
  - 1. Install in available space; arranged for safe and convenient operation and maintenance.
  - 2. Align cabinets for flush joints except where shown otherwise on construction documents.
  - 3. Install with bottom of wall cabinets in alignment and tops of base cabinets aligned level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches.
- B. Support Rails:
  - 1. Install true to horizontal at heights shown on construction documents; maximum tolerance for uneven floors is plus or minus 1/2 inch.
  - 2. Shim as necessary to accommodate variations in wall surface not exceeding 3/16 inch at fastener.
- C. Wall Strips:
  - 1. Install true to vertical and spaced as shown on construction documents.
  - 2. Align slots to assure that hanging units will be level.

D. Plug Buttons:

1. Install plug buttons in predrilled or pre-punched perforations not used.

E. Seal junctures of casework systems with mildew-resistant silicone sealants

### 3.3 FASTENINGS AND ANCHORAGE

A. Do not anchor to wood ground strips.

B. Provide hat shape metal spacers where fasteners span gaps or spaces.

C. Use 1/4 inch diameter toggle or expansion bolts, or other appropriate size and type fastening device for securing casework to walls or floor. Use expansion bolts shields having holding power beyond tensile and shear strength of bolt and breaking strength of bolt head.

D. Use 1/4 inch diameter hex bolts for securing cabinets together.

E. Use 1/4 inch by minimum 1-1/2 inch length lag bolt anchorage to wood blocking for concealed fasteners.

F. Anchor floor mounted cabinets with a minimum of four (4) bolts through corner gussets. Anchor bolts may be combined with or separate from leveling device.

G. Secure cabinets in alignment with hex bolts or other internal fastener devices removable from interior of cabinets without special tools. Do not use fastener devices which require removal of tops for access.

H. Where units abut end to end, anchor together at top and bottom of sides at front and back. Where units are back to back, anchor backs together at corners with hex bolts placed inconspicuously inside casework.

I. Where type, size, or spacing of fastenings is not shown or specified on construction documents, show on shop drawings proposed fastenings and method of installation.

### 3.4 ADJUSTMENTS

A. Adjust equipment to insure proper alignment and operation.

B. Replace or repair damaged or improperly operating materials, components or equipment.

### 3.5 CLEANING

- A. Immediately following installation, clean each item, removing finger marks, soil and foreign matter resulting from work of this section.
- B. Remove from job site trash, debris and packing materials resulting from work of this section.
- C. Leave installed areas clean of dust and debris resulting from work of this section.

++ END OF SECTION ++

## SECTION 12 35 30

### MANUFACTURED WOOD CASEWORK

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Manufactured wood cabinets.
  - 2. Finish hardware.

##### 1.2 REFERENCES

- A. American National Standards Institute/Kitchen Cabinet Manufacturers Association (ANSI/KCMA)
  - 1. 161.1 - Minimum Construction and Performance Standards for Kitchen and Vanity Cabinets.
  - 2. Environmental Stewardship Program (ESP).
- B. National Kitchen and Bath Association (NKBA) - Kitchen and Bath Planning Guidelines with Access Standards.

##### 1.3 SUBMITTALS

- A. Submittals for Review:
  - 1. Shop Drawings:
    - a. Prepare in accordance with NKBA Guidelines at minimum 1/2 inch per foot scale.
    - b. Include plans, perspectives, elevations, and details of walls, obstacles and openings, cabinetry, appliances, countertops, backsplashes, rough-in locations, work spaces, walkways, dimensions, tolerances, and required clearances.
  - 2. Product Data: Manufacturer's data showing construction details, configurations, materials, hardware, and accessories.
  - 3. Samples: 12 x 12 inch door samples showing construction and finish.
- B. Closeout Submittals:
  - 1. Maintenance Data: Maintenance instructions for finishes, including recommended cleaning methods and materials and list of detrimental agents.

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Minimum 2 years' experience in work of this Section.
  - 2. Successful completion of minimum 3 projects of similar scope and complexity within past 2 years.
  - 3. Equipped with sufficient staff and tools to complete cabinet installation in accordance with requirements of Contract Documents.

## 1.5 PROJECT CONDITIONS

- A. Building:
  - 1. Substantially water and weather tight prior to delivery or installation of cabinets.
  - 2. Plumbing, mechanical, and electrical work in or adjacent to cabinets complete.
  - 3. Walls, ceilings, and openings in areas to receive cabinets complete and finished.

## 1.6 WARRANTIES

- A. Furnish manufacturer's 5 year warranty providing coverage against defects in materials and workmanship.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Contract Documents for cabinets at Laundry and Break Room are based on products by:
  - Merrillatt- Masterpiece Epic - Oak
  - Kraftmaid- Ferguson - Oak

### 2.2 MATERIALS

- A. Exposed Solid Wood: Solid Oak kiln-dried.
- B. Plywood: Plywood core with Oak facings where exposed.
- C. Engineered Wood: Medium density fiberboard consisting of recycled fiber, recovered fiber, or combination of both
- D. Hardware:
  - 1. Door pulls- To be selected from manufacturer's full range of selections.
  - 2. Drawer pulls:[To be selected from manufacturer's full range of selections.
  - 3. Glides: Side-mounted type.

4. Door hinges: Steel with nickel-plated finish, six-way adjustable, self-closing with cushioning feature.
5. Adjustable shelf rests: Nickel plated steel.
6. Base locking shelf rests: Molded polycarbonate.
7. Mullion shelf rest: Metal, six position adjustable.

## 2.3 FABRICATION

- A. Fabricate casework in accordance with ANSI/KCMA 161.1.
- B. Fabricate casework utilizing following fabrication requirements for wall, base, tall, and vanity cabinets. Specialty cabinets may vary from specified requirements, using manufacturer's standard fabrication processes.
- C. Shop assemble cabinets in units of sizes and configurations indicated.
- D. Fabricate corners and joints without gaps and inaccessible spaces.
- E. Fabricate each unit to be rigid, not dependent on adjacent units for stability.
- F. Form edges smooth.
- G. Attach corner blocks to cabinet corners to ensure cabinet squareness.
- H. Cabinets:
  1. Face frames: Solid hardwood, 3/4 x 1-5/8 inches, pressure fitted, glued, double doweled and stapled.
  2. Cabinet backs: 1/8 inch thick hardboard, tongue-and-groove construction.
  3. Cabinet side panels: 1/2 inch thick, captured into grooved front frame, glued and mechanically fastened.
  4. Cabinet tops, bottoms, and floors: 1/2 inch thick engineered wood, fitted and glued into cabinet front frame grooves and captured into side panel grooves.
- I. Doors:
  1. Type and style: Full overlay solid slab.
  2. Provide resilient door bumpers mounted on backs of doors.
- J. Drawers: 1/2 inch thick finished engineered wood.
- K. Shelves:
  1. Wall cabinet shelves: 3/4 inch thick, engineered wood, fully adjustable.
  2. Base cabinet shelves: 1/2 inch thick, half depth, fully adjustable.
  3. Band front edges with color-matched melamine or PVC edge bands.

- L. Hanging Rails:
  - 1. Base and vanity cabinets: 3/4 inch thick solid wood, mortise-and-tenon joined and glued to cabinet side panels.
  - 2. Wall cabinets: 1/2 inch thick engineered wood, glued and pinned to cabinet back, cabinet side panels, and cabinet top or bottom.
- M. Toe Kicks: Inset type, 1/2 inch thick unfinished engineered wood, recessed 3-1/2 inches.

## 1.6 FINISHES

- A. Exterior Surfaces:
  - 1. Type: Oak
  - 2. Color: To be selected from manufacturer's full color range.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install casework in accordance with manufacturer's instructions.
- B. Provide shims and blocking necessary to install cabinetry.
- C. Use anchoring devices suited to site conditions.
- D. Set level, plumb, and square, securely anchored to adjacent construction.
- E. Use scribe molding where cabinetry abuts other components with more than 1/8 inch gap. Use filler strips to conceal larger voids.
- F. Install decorative moldings. Countersink nails used in molding and putty holes.
- G. Adjust doors and drawer fronts before installing pulls.

### 3.2 ADJUSTING

- A. Adjust doors and drawers to operate smoothly.
- B. Touch up minor scratches and abrasions to match original finish.

++ END OF SECTION ++



## SECTION 12 36 61

### SOLID SURFACING COUNTERTOPS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. Solid surface material countertops.
  - 2. Solid surface material backsplashes.
  - 3. Solid surface material end splashes.

##### 1.02 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
  - 1. Show locations and details of joints.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
  - 1. Countertop material, 4 inches square.

##### 1.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

##### 1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

##### 1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

## 1.06 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

## 1.07 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Source Limitations: Obtain solid surface material from single source from single manufacturer.

### 2.02 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin -
  1. Basis-of-Design Product: Subject to compliance with requirements
    - a. Avonite Surfaces
    - b. E. I. du Pont de Nemours and Company
    - c. Corian
    - d. Nevamar
    - e. Wilsonart
  2. Collection Description
    - a. Material: Acrylic and polyester blend.
    - b. Sheet Dimensions; 30 inches by 120 inches by 1/2 inch thick
    - c. Colors and Patterns: to be selected.
- B. Composite Wood Products: Products shall be made without urea formaldehyde.

### 2.03 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
  1. Grade: Custom.
- B. Configuration:
  1. Front: slightly eased at top ,Radius edge with apron, 1-1/2-inch laminated bullnose
  2. Backsplash: Straight, slightly eased at corner
  3. End Splash: Matching backsplash.

- C. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch-thick, solid surface material.
- E. Fabricate tops- Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  - 1. Fabricate with loose backsplashes for field assembly.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
  - 1. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

## 2.04 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
  - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

++ END OF SECTION ++

## SECTION 13 34 19

### PREENGINEERED METAL BUILDINGS (RIGID FRAME)

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Preengineered Metal Buildings (Rigid Frame), as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

##### 1.2.1 American Architectural Manufacturers Association (AAMA) Publication:

101	Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Doors
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##### 1.2.2 American Institute of Steel Construction (AISC) Publication:

SCM	Steel Construction Manual
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##### 1.2.3 American Iron and Steel Institute (AISI) Publication:

SG671	Design of Cold-Formed Steel Structural Members
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##### 1.2.4 American National Standards Institute, Inc. (ANSI) Publication:

A58.1	Minimum Design Loads for Buildings and Other Structures
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##### 1.2.5 American Society for Testing and Materials (ASTM) Publications:

A463	Steel Sheet, Cold-Rolled, Aluminum-Coated, Type 1 and Type 2
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A755	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process and Coil-Coated for Roofing and Siding, General Requirements
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A792M	Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot Dip Process, General Requirements (Metric)
B209	Aluminum and Aluminum-Alloy Sheet and Plate
C236	Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box
C991	Flexible Glass Fiber Insulation for Metal Buildings
D828	Tensile Breaking Strength of Paper and Paperboard
D3841	Glass-Fiber-Reinforced Polyester Plastic Panels
E84	Surface Burning Characteristics of Building Materials
E96	Water Vapor Transmission of Materials

1.2.6 Uniform Fire Prevention and Building Code of New York State (UFP&BC)  
Publications:

BCNYS	Building Code of New York State
ECCCNYS	Energy Conservation Construction Code of New York State
FCNYS	Fire Code of New York State

1.2.7 Building Hardware Manufacturers Association, Inc. (BHMA) Publications:

101	Butts and Hinges
301	Door Controls - Closers
601	Bored and Preassembled Locks and Latches
701	Exit Devices

1.2.8 Federal Specifications (FS):

RR-D-575	Door, Metal, Sliding and Swinging: Door Frame, Metal (Flush and Semiflush)
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TT-C-520 Coating Compound, Bituminous, Solvent Type, Underbody  
(For Motor Vehicles)

TT-C-1796 Caulking Compounds, Metal Seam and Wood Seam

1.2.9 Metal Building Manufacturers Association (MBMA) Publication:

LRMBSM Low Rise Metal Building Systems Manual

1.2.10 Steel Window Institute (SWI) Publication:

RSSW Steel Windows

1.2.11 North American Insulation Manufacturers Association (NAIMA) Publications:

MB304 ASHRAE 90.1 Compliance For Metal Buildings

MB311 202-96 Standard For Flexible Fiber Glass Insulation to be  
Laminated for Use in Metal Buildings

1.2.12 National Insulation Association (NIA) Publication:

NIA 404 Certified Faced Fiber Glass Insulation for Metal Buildings

1.3 DESIGN REQUIREMENTS: PEMB and supporting foundations shall be designed in accordance with the Building Code of New York State, MBMA, LRMBSM, AISI SG671, and the foundation design parameters as provided in the geotechnical report titled "Preliminary Foundation Design and Cost Estimate Seneca Regional Wastewater Treatment Facility Watkins Glen, NY", dated May 29, 2015 and written by Brierley Associates. Design loads shall be as indicated and as specified herein. PEMB foundations shall be designed using building frame reactions and baseplate information provided by the PEMB manufacturer.

1.3.1 Snow Loads: Loads shall be applied on the horizontal projection of the roof structure. The minimum design snow loads and adjustment factors shall be as follows:

Ground Snow Load,  $p_g = 40$  psf  
Snow Load Importance Factor,  $I_s = 1.1$   
Exposed Roof  
Exposure Factor,  $C_e = 0.8$   
Thermal Factor,  $C_t = 1.0$   
Flat Roof Snow Load,  $p_f = 24.64$  psf

1.3.2 Wind Loads: The minimum design wind loads and adjustment factors shall be as follows:

Basic Wind Speed (3-second gust) = 120 Vult.

Exposure Category D

Wind Load Importance Factor,  $I_w = 1.00$

1.3.3 Seismic Design: The Equivalent Lateral Force procedure shall be utilized for the seismic design. The following site specific parameters shall be utilized for the seismic design:

Site Class E

Design Spectral Response Acceleration,  $S_{ds} = 0.211$

Design Spectral Response Acceleration,  $S_{d1} = 0.129$

Seismic Design Category IV

Seismic Importance Factor,  $I_E = 1.25$

1.3.4 Deflection: The maximum deflection of main framing members shall not exceed 1/240th of their respective spans. The maximum deflection due to live, snow or wind load in roof panels and purlins not supporting a ceiling shall not exceed 1/180th of their respective spans. The maximum deflection due to live, snow or wind load on roof members supporting a non-plaster ceiling shall not exceed 1/240th of their respective spans. The maximum deflection due to live, snow or wind load on roof members supporting a plaster ceiling shall not exceed 1/360th of their respective spans. The maximum deflection due to wind on wall panels and girts shall be limited to 1/120th of their respective spans except that when brittle finishes are used the maximum allowable deflection shall be limited to 1/240th of their respective spans.

1.3.5 Description of Building: Rigid frame type, similar to AISC SCM, Type I construction, utilizing tapered and uniform depth columns and beams with connections as necessary to maintain original angles between intersecting members after erection and loading. Provide bypass girts. Provide rigid frames where indicated. Spacing of frames and columns shall be as indicated. End walls shall be of beam and column design. Roof slope shall be as indicated. Provide cross bracing rods; cable is not permitted. Provide portal frames where proposed cross bracing interferes with all openings. Provide full depth girts on top of masonry bond beams.

1.3.6 Fasteners: Design fastening system to withstand the design loads specified.

1.4 SUBMITTALS: The following shall be submitted to RPE.

1.4.1 Design Data:

- a. Rigid frame
- b. Purlins
- c. Girts



- d. End frame
- e. Statement and Schedule for Special Inspection
- f. Pre-engineered Metal Building Foundations

Submit for each component, and stamp with the seal of a Professional Engineer licensed in New York State.

#### 1.4.2 Manufacturer's Catalog Data:

- a. Preengineered metal building materials

Submit sufficient data indicating conformance to specified requirements on materials provided under this Section.

#### 1.4.3 Drawings:

- a. Anchor bolt layouts and sizes
- b. Structural connections
- c. Roofing and siding connections
- d. Joint sealing and caulking
- e. Door and window frame installation
- f. Flashings
- g. Accessory installation

Submit as necessary to erect the building and install components.

#### 1.4.4 Manufacturer's Standard Color Charts:

- a. Factory-finished components

Submit one sample of each color indicated for verification that the color matches the colors indicated. Where colors are not indicated, submit not less than four different samples of manufacturer's standard colors for selection by the Owner.

**1.5 DELIVERY, STORAGE, AND HANDLING:** Deliver, store, and handle manufactured items so that materials remain dry and undamaged. Do not store in contact with materials that might cause staining.

## PART 2 - PRODUCTS

**2.1 MATERIALS:** MBMA LRMBSM except as specified otherwise herein. Design roof and wall panels, accessories, and flashings to be completely weathertight and free of abrasions, loose fasteners, and deformations.

2.1.1 Minimum Thickness: As required to conform to design requirements but not less than the following:

<u>Items</u>	<u>Minimum Thickness (Uncoated)</u>
Steel Structural Members Other Than Roof and Wall Panels	18 Manufacturer's Standard (MFG STD) gauge
Steel Roof Panels	24 MFG STD
Steel Wall Panels	26 MFG STD gauge
Steel Liner Panels	26 MFG STD gauge
Trim	26 MFG STD gauge

Gable and Eave Trim, Fascia Closure Strips, Rake Flashings, Copings, and Liner Panels

Steel	26 MFG STD gauge
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2.1.2 Steel Framework: Structural members having cross sectional areas other than those indicated and connections that differ from the connections indicated may be used, provided they conform to design requirements, and provided drawings indicating such changes are submitted and approved.

2.1.4 Roof and Wall Panels:

- a. Fabricated of zinc-coated steel.
- b. Performed with sheet designed to overlap adjacent panel a minimum of one configuration.

2.1.5 Zinc-Coated Steel Sheet: ASTM A755, Coating Class G-90.

2.1.6 Aluminum-Coated Steel Sheet: ASTM A463, Type 1 or Type 2.

2.1.7 Aluminum/Zinc-Coated Steel Sheet: ASTM A792M. Total coating weight shall be not less than 0.50 ounces per square foot.

2.1.8 Perforated Aluminum Sheet: Alloy 3004 Alclad conforming to ASTM B209.

2.1.9 Liner Panels: Formed of same type material as used for wall panels to closely approximate configuration of panels indicated.

2.1.10 Sheet Metal Accessories: Of same material and finish as used for adjacent wall or roof panels, except as specified otherwise herein.

2.1.10.1 Caps, Strips, and Plates: Form ridge caps, eave and edge strips, fascia strips, miscellaneous flashings, and miscellaneous sheet metal accessories, unless specified otherwise herein, from the same material and gauge as the roof panels. Wall plates, base angles or base channels, and other miscellaneous framing members may be standard structural steel shapes, or may be formed from steel not lighter than 18-gauge.

2.1.10.2 Roof structure shall be designed to support the mechanical equipment that is submitted and approved for the project.

2.1.10.3 Fixed Blade Louvers: Provide louver wall openings of the sizes indicated on contract documents and specifications.

2.1.11 Closure Strips: Formed of approved compressed rubber, synthetic rubber, bituminous impregnated materials, or metal of the same respective type as the roof and wall panels, and as standard with the manufacturer. Molded closure strips shall be free of open voids and shall not absorb or retain water. Form closure strips to match the corrugations or configurations of the roofing or siding used. Provide closure strips where indicated and where necessary to ensure weathertight construction.

2.1.12 Joint Sealing Material: Seal side and end laps with Type II, Class B ribbon form sealant conforming to FS TT-C-1796, except that bituminous type materials shall not be used. Minimum sizes of ribbons shall be 3/32 by 1/2 inch or 3/16 by 1/4 inch for rectangular areas and 1/4 inch diameter for circular areas. Seal joints at doors, windows, accessories, and flashings.

2.1.13 Plastic Wall Lights: ASTM D3841, Type II, Grade 1, standard with the manufacturer with size indicated. Provide wall lights of the same configuration as the metal wall panels.

2.1.14 Fasteners: Fasteners for attachment to structural supports and to adjoining panels shall be as approved, and in accordance with the manufacturer's recommendation.

- a. Either self-tapping screws, self-drilling screws, bolts and nuts, self-locking rivets, self-locking bolts, end-welded studs, bolted or riveted studs, or step rivets held by aluminum straps unless specified otherwise herein.
- b. Stainless steel, zinc-coated steel, cadmium-plated steel, aluminum, or coated steel which has comparable corrosion-resistant properties as found in zinc coating.

Other types of fasteners of the building manufacturer's standard type may be used if prior approval is obtained from the RPE. The fastening system shall be fabricated to withstand the design loads specified herein. Fasteners, with the exception of those having integral hex washer

heads or aluminum drive caps, shall have composite metal and EPDM washers. Fasteners having integral hex washer heads or aluminum drive caps shall have EPDM washers. Side laps of roofing panels having configurations 3/4 inch deep or less shall be fastened at a maximum spacing of 12 inches on center. Heads of screws or bolts exposed on exterior face of factory-finished wall panels shall be nylon or shall be provided with plastic color caps to match color of panels.

2.1.15 Insulation: Provide blanket type .6-pound fiberglass having a factory applied facing on one side, except where two layers are used, the second layer shall be unfaced. The insulation shall conform to the NIA 404 standard. The insulation shall have a permeance rating of .05 or less when tested in accordance with ASTM E96. The facing on the insulation shall be vinyl-scrim foil. The vinyl-scrim foil facing shall have a tensile strength of not less than 40 pounds machine direction and 30 pounds cross machine direction when test in accordance with ASTM D828. The insulation shall conform to the ASTM 991 and NAIMA 202-96 standards. The insulation, including facings, shall have a flame spread rating of 25 or less and a smoke development factor of 50 or less when tested in accordance with ASTM E84. The minimum thermal resistance of the insulation shall be R13 for the walls and R30 for the roof. The roof insulation will require two layers to achieve R30, one faced layer and one unfaced layer.

2.1.16 Doors and Windows: Doors and windows are specified in other sections. Provide framing members and flashings as necessary for installation of the doors and windows.

2.1.17 Cross Bracing: Shall be steel rod; cable is not acceptable. Provide portal frames where cross-bracing would interfere with openings.

2.1.18 Canopies: Of same materials and finish as the building.

2.1.19 Snow Jacks: Cast polycarbonate, approximately 3 inches in height and 5 inches in length with flange for snow attachments to roof panels. Provide snow jacks along full length of eaves of building. Locate between standing seams in multiple staggered rows as per manufacturer approved shop drawing.

2.1.20 Gutters and Downspouts: Form from not less than 26 gauge sheet steel. Gutters shall be nominally 4-1/2 inches wide x 5 inches high. Provide die form stainless steel strap designed to be attached to the top of each standing seam at roof edge. Downspouts shall be nominally 5 inches wide x 4 inches deep. Terminate downspouts which discharge at grade with a 45 degree elbow. Terminate downspouts which discharge into an underdrain with a plastic transition piece matching the diameter of the underdrain.

#### 2.1.21 Finish:

2.1.21.1 Shop Painting: Ferrous metal work, except factory-finished work, zinc-coated work, aluminum-coated work, and work specified to be painted herein, shall be (1) cleaned of dirt, rust, scale, loose particles, grease, oil, and other deleterious substances; (2) phosphate treated; and (3) then be given one coat of an approved rust-inhibiting primer paint of the type standard with the metal building manufacturer.

#### 2.1.21.2 Factory Finishing:

2.1.21.3 Organic Finish: Exterior exposed surfaces of metal roof and wall panels shall have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. The finish coating dry-film thickness shall be 0.8 to 1.3 mils. Interior exposed surfaces shall receive baked-on enamel finish as specified herein.

### PART 3 - EXECUTION

3.1 ERECTION: Erect in accordance with the manufacturer's approved erection instructions and diagrams, except as specified otherwise. Correct defects and errors in the fabrication of building components in a manner approved by the RPE. If defects or errors in fabrication of components cannot be corrected, remove and provide non-defective components. Plumb, guy, and stay columns and rigid frames in both directions, and accurately space framing elements to ensure proper fit of prefabricated wall and roof panels. When installing wall and roof systems, install closure strips, flashing, sealing material, and other accessories in a manner approved by the RPE so that the systems are weathertight, free of abrasions, loose fasteners, and deformations. After erection is complete, repair and coat abraded and damaged, primed or factory-finished surfaces to match adjacent surfaces.

3.1.1 Dissimilar Materials: Prevent direct contact between aluminum surfaces, and ferrous or other incompatible metals, by one of the following methods:

- a. Paint the incompatible metal with a coating of heavy-bodied bituminous paint conforming to FS TT-C-520.
- b. Paint the incompatible metal with a prime coat of corrosion inhibitive primer followed by one or two coats of aluminum metal-and-masonry paint, or other suitable protective coating, excluding products containing lead and chromium pigmentation.
- c. Provide an approved nonabsorptive gasket.
- d. Apply an approved caulking between the aluminum and the incompatible metal.

If drainage from incompatible metal passes over aluminum, paint the incompatible metal by method (a) or (b). Paint aluminum surfaces in contact with concrete or masonry materials by method (a). Paint green or wet wood, or wood treated with incompatible wood preservatives, by method (a) or use two coats of aluminum paint.

3.1.2 Rigid Frames, Bases, and Sill Members: Set accurately, using a nonshrinking grouting mortar to obtain uniform bearing on the concrete and to maintain a level base line elevation. Anchors and anchor bolts for securing rigid frames, columns, or sill members to foundations shall be unpainted steel, set accurately to templates, and of proper size to adequately resist applicable design loads at the base. Clean surfaces to receive the mortar and thoroughly moisten immediately before placement of mortar. Water cure exposed surfaces of mortar with wet burlap for 7 days.

3.1.3 Wall Construction: Apply panels with the ribs in a vertical position. Apply panels in the longest obtainable lengths. Seal side and end laps with the joint sealing material specified herein as recommended by the manufacturer. Flash or seal walls at the base, at the top, around windows, door frames, framed louvers, and other similar openings. Flashing will not be required where approved "self-flashing" panels are used. Minimum end laps for all types of panels shall be 2-1/2 inches. Minimum side laps for all types of panels shall be one corrugation, one rib, or an interlocking joint. Provide liner panels from finished floor to eave.

3.1.4 Roof Construction: Install clips on purlins. Apply roofing panels with the configurations parallel to the slope of the roof. Apply the roofing panels in full lengths from ridge to eaves with no transverse joints. Flash and seal the roof at the ridge, at eaves and rakes, at projections through the roof, and elsewhere as necessary. Interlock panels and machine seam. The only exposed fasteners permitted are at the eaves and around roof penetrations.

#### 3.1.5 Installation of Insulation:

3.1.5.1 Roof Insulation: Install over purlins before roof coverings are applied. Install roof insulation by draping faced layer loosely over purlins to form a cavity for the second unfaced layer. Install the second layer parallel to the purlins. Hold insulation rigid until secured in place. Insulation facing shall be exposed on the interior side of the building. Fold and staple facing tabs of insulation on 6-inch centers to completely seal joints. If folding and stapling is accomplished from the inside, push the tabs neatly up between the edges of adjoining blankets. Cover side laps of insulation with metal strips formed for this purpose and paint to match the facing material. Install the strips spanning from purlin to purlin and in accordance with the metal building manufacturer's recommendations.

3.1.5.2 Wall Insulation: Install over girts before wall coverings are applied. Hold insulation rigid until secured in place. Expose facing toward the interior side of the building. Fold and staple facing tabs of insulation on 6-inch centers to completely seal joints. If folding and stapling is accomplished from the inside, push the tabs neatly up between the edges of adjoining blankets.

Cover side laps of insulation with metal strips formed for this purpose and paint to match the facing material. Install the strips spanning from girt to girt and in accordance with the metal building manufacturer's recommendations.

++ END OF SECTION ++

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Wet-Pipe Sprinkler Systems as shown on the Plans, as specified, and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American Society For Testing and Materials (ASTM) Publications:

A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A795	Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Fire Protection Use

1.2.2 American Water Works Association, Inc. (AWWA) Publications:

C104	Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water
C110	Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in., for Water and Other Liquids
C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
C500	Gate Valves, 3 Through 48 in. NPS, for Water and Sewage Systems
C601	Disinfecting Water Mains

1.2.3 Factory Mutual System (FM) Publication:

P7825	Approval Guide
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1.2.4 Federal Specifications (FS) Publications:

TT-E-489	Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces)
TT-P-645	Primer, Paint, Zinc Chromate, Alkyd Type

1.2.5 Military Specifications (MIL) Publication:

DOD-P-15328	Primer (Wash), Pretreatment (Formula No. 117 for Metals) (Metric)
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1.2.6 National Fire Protection Association (NFPA) Publications:

13	Sprinkler Systems
24	Private Fire Service Mains and Their Appurtenances
25	Inspection, Testing and Maintenance of Water-Based Fire Protection Systems
70	National Electrical Code
291	Fire Flow Testing and Marking of Hydrants
1963	Fire Hose Connections

1.2.7 New York State Uniform Fire Prevention and Building Code

2015	International Building Code
2015	International Fire Code
2016	Uniform Code Supplement

1.2.8 Underwriters Laboratories, Inc. (UL) Publications:

262	Gate Valves for Fire-Protection Service
789	Indicator Posts for Fire-Protection Service
FPED	Fire Protection Equipment Directory

1.3 QUALIFICATIONS OF INSTALLER: Prior to installation, submit data for approval showing that the Contractor has successfully installed automatic fire extinguishing sprinkler systems of the same type and design as specified herein, or that Contractor has a firm contractual

agreement with a subcontractor having such required experience. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. The Contractor shall indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months.

1.4 GENERAL REQUIREMENTS: Section 230501, "Mechanical General Requirements", applies to this section, with the additions and modifications specified herein.

1.5 DESCRIPTION OF WORK: The work includes designing and providing new automatic wet pipe fire extinguishing sprinkler systems for uniform distribution of water by hydraulic design to afford complete fire protection coverage of the Biosolids Room 301 of the Headworks Building. The work also includes designing and providing new automatic wet pipe fire extinguishing sprinkler systems for uniform distribution of water by hydraulic design as an Add Alternate to afford complete fire protection coverage throughout of the Administration building, the Headworks building, and the Effluent Filter/Ultraviolet Disinfection building. The design, equipment, materials, installation, workmanship, examination, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 13, except as modified herein. Each system shall include all materials, accessories, and equipment inside and outside the building to provide each system complete and ready for use. Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ductwork, and other construction and equipment in accordance with detailed drawings to be submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and supply air diffusers. Devices and equipment for fire protection service shall be UL FPED listed or FM P7825 approved for use in wet pipe sprinkler systems. In the NFPA publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the Engineer Division, Naval Facilities Engineering Command, Fire Protection Engineer.

## 1.6 SUBMITTALS

### 1.6.1 Manufacturer's Data:

- a. Pipe, fittings, and mechanical couplings
- b. Alarm valves
- c. Valves, including gate, check, and globe
- d. Water motor alarms
- e. Sprinkler heads
- f. Pipe hangers and supports
- g. Pressure switch
- h. Fire department connection

#### 1.6.2 Shop Drawings:

- a. Sprinkler heads and piping system layout
- b. System calculations

1.6.3 Fabrication/Erection/Installation Drawings: Partial submittals will not be acceptable. Annotate descriptive data to show the specific model, type, and size of each item the Contractor proposes to provide. Prepare working drawings on sheets not smaller than 30 inches by 42 inches, in accordance with the requirements for "Working Drawings (Plans)" as specified in NFPA 13; include data for proper installation of each system. The Engineer, will review and approve submittals. Before any work is commenced, submit the design, manufacturer's data, system calculations, and complete sets of working drawings for each system.

#### 1.6.4 Certificates of Compliance:

- a. Contractor's material and test certificate
- b. Pipe and fittings

#### 1.6.5 Operation and Maintenance Manuals:

- a. Alarm valves

1.7 QUALIFICATIONS OF INSTALLER: After completion, but before final acceptance of the work, furnish a complete set of drawings of each system for record purposes. Drawings shall not be smaller than 30 inches by 42 inches reproducible drawings on Mylar film with title block (8 inches by 4 inches) similar to full size Contract Drawings. Furnish the as-built (record) working drawings in addition to the as-built Contract Drawings required by Division 1, "General Requirements".

1.8 ELECTRICAL WORK: Provide electrical work associated with this section under Section 260520, "Wiring Systems", except for control and fire alarm wiring. Provide fire alarm system under Section 283100, "Interior Fire Alarm System". Provide control and fire alarm wiring, including connections to fire alarm systems, under this section in accordance with NFPA 70. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.

1.9 EXCAVATION, BACKFILLING, AND COMPACTING: Provide under this section as specified in Section 312301, "Excavation, Backfill and Compaction".

## PART 2 - PRODUCTS

2.1 DESIGN OF SPRINKLER SYSTEMS: NFPA 13 and requirements specified herein. Design of automatic wet pipe fire extinguishing sprinkler systems shall be by hydraulic calculations for uniform distribution of water over the design area.

2.1.1 Water Distribution: Distribution shall be uniform throughout the area in which it is assumed the sprinkler heads will open. Variation in discharge from individual heads in the hydraulically most remote area shall be between 100 and 120 percent of the specified density.

2.1.2 Density of Application of Water: Size pipe to provide the specified density when the system is discharging the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be as indicated on contract drawings and in accordance with NFPA 13.

2.1.3 Sprinkler Discharge Area: Area shall be the hydraulically most remote square feet area as indicated on contract drawings and in accordance with NFPA 13.

2.1.4 Outside Hose Allowances: Hydraulic calculations shall include an allowance as indicated on contract drawings for outside hose streams and in accordance with NFPA 13.

2.1.5 Friction Losses: Calculate losses in piping in accordance with the Hazen-Williams formula with "C" value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping and asbestos cement piping.

2.1.6 Location of Sprinkler Heads: Heads in relation to the ceiling and the spacing of sprinkler heads shall not exceed that permitted by NFPA 13 and for the hazard occupancy indicated on the contract drawings.. Uniformly space sprinklers on the branch piping.

2.1.7 Water Supply: Base hydraulic calculations on a static pressure of 81 psig with 1,700 gpm available at a residual pressure of 20 psig at the junction with the water distribution piping system. Perform NFPA 291 flow test to confirm water supply prior to submission of installation drawings.

2.2 SPRINKLER HEADS: Heads shall have nominal 0.50-inch orifice. Release element of each head shall be of the intermediate temperature rating or higher as suitable for the specific application. Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings. Sprinkler heads shall be permanently marked to identify manufacturer, K-factor or orifice shape, deflector characteristics, pressure rating and thermal sensitivity in accordance with NFPA 13.

2.3 CABINET: Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. The number and types of extra sprinkler heads shall be as specified in NFPA 13. List of sprinklers installed shall be posted in the cabinet in accordance with NFPA 13.

2.4 ALARM VALVE: Provide variable pressure type alarm valve complete with retarding chamber, alarm test valve, alarm shutoff valve, drain valve, pressure gauges, accessories, and appurtenances for the proper operation of the system and in accordance with NFPA 13.

2.5 WATER MOTOR ALARM: Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in each corresponding sprinkler system. Mount alarms on the outside of the outer walls of each building at a location as directed.

2.6 PRESSURE SWITCH: Provide switch with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system. Connect into the building fire alarm system. Alarm actuating device shall have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle.

2.7 ABOVEGROUND PIPING SYSTEMS: Inspect, test, and approve piping before covering or concealing. Provide fittings for changes in direction of piping and for all connections. Make changes in piping sizes through tapered reducing pipe fittings; bushings will not be permitted. Perform welding in the shop; field welding will not be permitted. Conceal piping in areas with suspended ceiling.

2.7.1 Sprinkler Pipe and Fittings: NFPA 13, except as modified herein. Welded or roll-grooved steel piping shall be Schedule 10 for sizes less than 6 inches, and Schedule 30 for sizes 6 inches and larger. Threaded or cut-grooved steel pipe shall be Schedule 40 for sizes less than 8 inches, and Schedule 30 for sized 8 inches and larger. Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 1.5 inches and larger. Fittings shall be UL FPED listed or FM P7825 approved for use in wet pipe sprinkler systems. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer.

2.7.2 Pipe Hangers and Supports: Provide in accordance with NFPA 13.

2.7.3 Valves: NFPA 13. Provide valves of types approved for fire service. Gate valves shall open by counterclockwise rotation. Provide an OS&Y valve beneath each alarm valve in each riser when more than one alarm valve is supplied from the same water supply pipe. Check valves shall be flanged clear opening swing-check type with flanged inspection and access cover plate for sizes 4 inches and larger.

2.7.4 Identification Signs: NFPA 13. Attach properly lettered and approved metal signs to each valve and alarm device. Permanently affix hydraulic design data nameplates to the riser of each system.

2.7.5 Inspector's Test Connection: Provide test connections approximately 6 feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the hydraulically most remote part of each system. Provide test connection piping to a location where the discharge will be readily visible and where water may be discharged without property damage.

2.7.6 Main Drains: Provide drain piping to discharge at safe points outside each building or to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. Provide auxiliary drains as required by NFPA 13.

2.8 PIPE SLEEVES: Provide where piping passes through walls, floors, roofs, and partitions. Grout sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide clearance between exterior of piping and interior of sleeve in accordance with NFPA 13. Firmly pack space with noncombustible insulation. Caulk both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.

2.8.1 Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide ASTM A53 or ASTM A120, hot-dip galvanized steel pipe sleeves. Extend sleeves 3 inches above the finished floor.

2.8.2 Sleeves in Partitions, Non-Masonry Walls, Floors, and Roofs: Provide hot-dip galvanized steel sheet having a nominal weight of not less than 0.90 psf.

2.9 ESCUTCHEON PLATES: Provide one piece or split hinge type metal plates for piping passing through floors, walls, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on plates in unfinished spaces. Secure plates in proper position.

2.10 FIRE DEPARTMENT CONNECTIONS: Provide connections approximately 3 feet above finish grade, of the approved two-way type with 2.5-inch National Standard female hose threads with plug and chain, in accordance with NFPA 13.

2.11 BURIED WATER PIPING SYSTEMS: Provide outside-coated, AWWA C104 cement-mortar lined, AWWA C151 ductile-iron pipe, and AWWA C110 fittings conforming to NFPA 24 for piping under the building and less than 5 feet outside of building walls. Anchor joints in accordance with NFPA 24. Provide concrete thrust block at the elbow where the pipe turns up toward the floor, and restrain the pipe riser with steel rods from the elbow to the flange

above the floor. Minimum pipe size shall be 6 inches. Minimum depth of cover shall be 4 feet at finish grade. Piping more than 5 feet outside of building walls shall be provided under Section 331116, "Site Water Utility Distribution Piping".

2.11.1 Valves: Provide as required by NFPA 24. Gate valves shall conform to AWWA C500 or UL 262 with cast-iron body and bronze trim and shall open by counterclockwise rotation.

2.11.2 Post Indicator Valves: Provide with operating nut located about 3 feet above finish grade. Gate valves for use with indicator post shall conform to UL 262. Indicator posts shall conform to UL 789. Provide each indicator post with one coat of primer and two coats of red enamel paint.

2.12 Double Check Valve (DCV) Assembly, 2-1/2" and Larger: Shall be of epoxy coated cast iron body and bronze seats, and include two positive seated check modules with captured springs and rubber seat discs. Service of all internal components shall be through a single access cover secured with stainless steel hardware. Seats shall be replaceable without special tools. Assembly shall be a complete unit, including UL/FM OS&Y gate valves, test cocks, and flanged end connections. All components shall be suitable for potable water and approved for vertical flow installation. The assembly shall be approved by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (FCCCHR). Manufacture shall be as by Watts, Series 709, or approved equal.

### PART 3 - EXECUTION

3.1 INSTALLATION: Equipment, materials, installation, workmanship, examination, inspection, and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Keep the interior and ends of new piping and existing piping affected by Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position.

3.2 DISINFECTION: Disinfect the new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C601. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with clean water until maximum residual chlorine content is not greater than 0.2 parts per million. Exercise caution when mixing chlorine disinfection solutions.

3.3 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS: Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around the main piping; bolt valve conforming to AWWA C500 or UL 262 to the branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Engineer in writing at least 15 days prior to connection date; receive approval before any service is interrupted. Furnish materials required to make connections into existing water supply systems, and perform all excavating, backfilling, and other incidental labor as required. Furnish the labor and the tapping or drilling machine for making the actual connections to existing systems.

3.4 FIELD PAINTING: Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat of DOD-P-15328 pretreatment primer applied to a minimum dry film thickness of 0.3 mil, and one coat of FS TT-P-645 primer applied to a minimum dry film thickness of 1.0 mil. Shield sprinkler heads with protective covering while painting is in process. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

3.4.1 Systems in Unfinished Areas: Unfinished areas are defined as attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, and spaces where walls or ceiling are not painted or not constructed of a pre-finished material. Provide primed surfaces with one coat of FS TT-E-489 red enamel applied to a minimum dry film thickness of 1.0 mil.

3.4.2 Systems in Other Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of FS TT-E-489 red enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2-inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20-foot intervals. In finished areas such as offices, the red bands may be omitted.

### 3.5 FIELD TESTING AND FLUSHING:

3.5.1 Preliminary Tests: Hydrostatically test each system at 200 psig for a 2-hour period with no leakage or reduction in gauge pressure. Flush piping with potable water in accordance with NFPA 13. Piping above suspended ceilings shall be inspected, tested, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. When tests are completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13, with a request for formal inspection and tests.



3.5.2 Formal Inspection and Tests: The Engineer, will witness formal tests and approve all systems before acceptance. Submit the request for formal inspection at least 15 days prior to inspection date. An experienced technician regularly employed by the system installer shall be present during the inspection. During the inspection, repeat any or all of the required tests as directed. Correct defects in work provided by the Contractor and make additional tests until the systems comply with all contract requirements. Furnish appliances, equipment, water, electricity, instruments, connecting devices, and personnel for the tests.

++ END OF SECTION ++

SECTION 22 15 00

GENERAL SERVICE COMPRESSED AIR SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for General Service Compressed Air Systems, as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American National Standards Institute, Inc. (ANSI) Publications:

B2.1	Pipe Threads (Except Dryseal)
B16.5	Steel Pipe Flanges and Flanged Fittings
B16.11	Forged Steel Fittings, Socket-Welding and Threaded
B31.1	(Addenda 1981-1982) Power Piping
B36.10	Welded and Seamless Wrought Steel Pipe
Z49.1	Safety in Welding and Cutting

1.2.2 Air-Conditioning and Refrigeration Institute (ARI) Publication:

520	Positive Displacement Refrigerant Compressors, Compressor Units and Condensing Units
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1.2.3 American Society of Mechanical Engineers (ASME) Publication:

BPV	Boiler and Pressure Vessel Code and Interpretations
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1.2.4 American Society for Nondestructive Testing, Inc. (ASNT) Publication:

SNTTC-1A	(Supp. A-D) Personnel Qualification and Certification in Nondestructive Testing
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#### 1.2.5 American Society for Testing and Materials (ASTM) Publications:

A53	Pipe Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
A182	Forged or Rolled Alloy - Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service
A193/A193M	Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service
A194/A194M	Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
A269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A351	Austenitic Steel Castings for High-Temperature Service
A380	Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
A403/A403M	Wrought Austenitic Stainless Steel Piping Fittings

#### 1.2.6 American Welding Society, Inc. (AWS) Publications:

A3.0	Welding Terms and Definitions
D10.9	Specification for Qualification of Welding Procedures and Welders for Piping and Tubing
QC1	Standard for Qualification and Certification of Welding Inspectors

#### 1.2.7 Code of Federal Regulation (CFR):

29-1910.219	Mechanical Power-Transmission Apparatus
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#### 1.2.8 Federal Specifications (FS):

GG-G-76	Gage, Pressure and Vacuum, Dial Indicating (For Air, Steam, Oil, Water, Ammonia, Chlorofluoro Hydro-Carbon Gases, and Compressed Gases)
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WW-P-521	Pipe Fittings, Flange Fittings, and Flanges, Steel and Malleable Iron (Threaded and Butt Welding), 150-Pound
WW-T-696	Traps, Steam and Air
WW-U-516	Unions, Brass or Bronze, Threaded Pipe Connections or Solder-Joint Tube Connections
WW-U-531	Union, Pipe, Steel or Malleable Iron, Threaded Connections, 150 lb. and 250 lb.
WW-V-51	Valves, Bronze; Angle, Check and Globe (125, 150 and 200 Pound, Screwed and Flanged, for Land Use)
WW-V-54	Valve, Gate, Bronze (125, 150 and 200 Pound, Screwed, Flanged, Solder-End, For Land Use)
PPP-T-66	Tape, Packaging, Vinyl Plastic Film

#### 1.2.9 Military Specifications (MIL):

S-16293	Strainers, Sediment, Pipeline, Water, Air, Gas, Oil, or Steam
V-18434	Valves, Gate, Globe, and Angle, Steel
V-18436	Valves, Check, Bronze-, Cast Iron-, and Steel Body
V-18500	Valves, Reducing Compressed Gas
V-18634	Valve, Safety, Relief, and Safety-Relief
G-23652	Gasket and Packing Material Petroleum and Phosphate Ester Fluid Resistant
V-24109	Valve, Globe, Angle, Quick Change Cartridge Trim, High Pressure (HP) Hydraulic and Pneumatic (Sizes 1/8 - 1-1/4 inches)
T-27730	Tape, Antiseize, Tetrafluoroethylene, with Dispenser

1.2.10 Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)  
Publications:

SP 58	Pipe Hangers and Supports - Materials, Design, and Manufacture
SP 69	Pipe Hangers and Supports - Selection and Application

1.2.11 National Electrical Manufacturers Association (NEMA)  
Publications:

ICS2	Industrial Control Devices, Controllers and Assemblies
ICS6	Enclosures for Industrial Controls and Systems
MG1	Motors and Generators

1.3 GENERAL REQUIREMENTS: Design, fabrication, and installation of general service compressed air systems shall conform to ANSI B31.1 and the ASME BPV, except as specified otherwise. In ANSI B31.1 and the ASME BPV, the advisory provisions shall be considered mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" and "owner" shall be interpreted to mean the Engineer. Section 230501, "Mechanical General Requirements", applies to this Section except as specified otherwise.

#### 1.4 SUBMITTALS

1.4.1 Manufacturer's Data: Submit manufacturer's standard drawings or catalog information for the following items, except where both are specified:

- a. Pipe
- b. Fittings
- c. Valves
- d. Condensate traps
- e. Filters
- f. Hangers and supports
- g. Strainers
- h. Flexible connections
- i. Quick disconnect couplings
- j. Air Compressor

## 1.5 SAFETY PRECAUTIONS

1.5.1 Temperature Restriction: Compressors or other equipment shall not discharge compressed air to the piping systems above 100 degrees F unless approved by the Engineer. Aftercoolers or other devices shall be provided to comply with the temperature restriction.

1.5.2 Rotating Equipment: Fully guard couplings, motor shafts, gears and other exposed rotating or rapidly moving parts in accordance with OSHA 29 CFR 1910.219. Provide rigid and suitably secured guard parts readily removable without disassembling guarded unit.

1.5.3 Welding: Safety in welding and cutting of pipe shall conform to ANSI Z49.1.

## PART 2 - PRODUCTS

2.1 COMPRESSED AIR PIPING AND ACCESSORIES: Low Pressure Compressed Air Piping and Accessories: Conform to the following:

### 2.1.1 Steel Piping:

- a. Pipe: ASTM A120 or ASTM A53, seamless carbon steel, Schedule 40, black.
- b. Fittings, Size 1-1/2 Inches and Smaller: ANSI B16.3, threaded malleable iron, Class 150, or ANSI B16.11.
- c. Flat-faced Steel Flanges: Where connections are made to 125-pound cast iron flanges with steel flanges, use only flat-faced Class 150 steel flanges.

### 2.1.2 Valves

#### 2.1.2.1 Gate Valves:

- a. Bronze Gate Valves: FS WW-V-54, 2 inches and smaller, wedge disc, rising stem, inside screw type, with brazed joints ends when used with copper tubing, 150 pound class.
- b. Steel Gate Valves: MIL-V-18434, outside screw and yoke type with solid wedge or flexible wedge disc, as recommended by the manufacturer for the conditions indicated.

#### 2.1.2.2 Globe and Angle Valves:

- a. Bronze Globe and Angle Valves: FS WW-V-51, 2 inches and smaller, 200-lb. class, except that 150 lb. class valves with brazed ends may be used for copper tubing. All valves shall have renewable seats and discs except brazed-end valves which shall have integral seats.
- b. Steel Globe and Angle Valves: MIL-V-18434, as recommended by the manufacturer for the conditions indicated.

2.1.2.3 Filter/Regulators: High flow, balanced valve diaphragm type valve with zinc body, nitrile diaphragm, zinc bowl, polyethylene filter element and 0-125 psig adjustability. Flow capacity shall be 42 SCFM with maximum operating pressure of 250 psig and temperature of 150°F. Ports shall be fitted with NPT threaded adapters as necessary. Manufacture shall be as by Wilkerson or approved equal.

2.1.3 Pressure Gages: FS GG-G-76, Class 1, Style X, Type I, with steel or brass case, and nonshatterable safety glass, and a pressure blowout back to prevent glass from flying out in case of an explosion. Gages shall have a 3-1/2-inch minimum diameter dial and a dial range of approximately twice working pressure.

2.1.4 Hangers and Supports: Provide pipe hangers and supports conforming to MSS SP 58, MSS SP 69, and ANSI B31.1, except as specified or indicated otherwise. Furnish zinc plated pipe hangers and supports except for copper plated inserts for copper piping. Provide tubing supports of U-shaped steel bolts and nuts firmly secured to adequately support structures such as walls, columns, floors, or brackets. Clips shall fit closely around piping but shall have sufficient clearance to permit longitudinal movement of piping during normal expansion and contraction. Provide supports at valves, fittings, branch lines, outlets, changes in direction, equipment, and accessories.

2.1.5 Quick Disconnect Couplings: All brass and suitable for a working pressure of not less than indicated system pressure. Female side of coupling (fixed end) shall have male thread connection with automatic shutoff. Provide male side of coupling with hose stem and ball check to bleed pressure from hose and prevent hose whipping.

2.1.6 Coalescing Filter: High flow, zinc body type with zinc bowl, nitrile seals, nylon sight gauge and automatic mechanical drain. Filter element shall be of Borosilicate cloth and be capable of removing 0.01 micron particles in accordance with ISO Class 1 requirements. Flow capacity shall be 48SCFM at 150 psig maximum operating pressure and 150°F maximum operating temperature. Manufacture shall be as by Wilkerson, or approved equal.

2.1.7 Lubricators: High flow, zinc body type with zinc bowl, nitrile seals, polycarbonate site dome and sintered bronze pick-up filter. Unit shall be provided with quick disconnect bowl and be capable of filling while under pressure. Flow capacity shall be 57 SCFM at 250 psig maximum operating pressure and 150°F maximum operating temperature. Manufacture shall be as by Wilkerson, or approved equal.

2.1.8 Flexible Connections: Vibration isolation, wire braid reinforced corrugated metal hose type, line-sized, with bronze end connections, suitable for pressure indicated. Length as recommended by manufacturer but not less than 18 inches.

2.1.9 Dielectric Unions: Steel female pipe thread end and copper solder-joint ends, conforming to dimensional, strength and pressure requirements of FS WW-U-531, Class 1. Steel parts shall be galvanized or plated. Union shall have a water-impervious insulation barrier capable of limiting galvanic current to one percent of the short-circuit current in a corresponding bimetallic joint. When dry, it shall also be able to withstand a 600-volt breakdown test.

2.1.10 Tetrafluoroethylene Tape: MIL-T-27730 for screw-jointed pipe.

## 2.2 SLEEVES

2.2.1 Partitions: Galvanized sheet steel, 26 gauge or heavier, of sufficient length to completely extend through partition thickness with sleeve ends flush with partition finished surface.

## 2.3 AIR COMPRESSORS:

### 2.3.1 Compressor:

- a. 5 Horse Power, 230V 2-stage air compressor - no starter required
- b. 175 psig maximum operating pressure and 80 gal. ASME tank
- c. 15.8 CFM @ 90 PSI
- d. Durable cast iron design for 100% continuous duty application
- e. Individually cast cylinders, overhung crankshaft and one piece connecting rod for ease of maintenance and service
- f. Extended design life lasts 15,000+ hrs.
- g. One year industrial grade warranty on complete machine
- h. Ingersoll Rand - 80 Gallon Reciprocating Air Compressor - TS4N5 Two-Stage Compressors or approved equal

## PART 3 - EXECUTION

3.1 INSTALLATION: Install materials and equipment as indicated and in accordance with manufacturer's recommendations. Coordinate with Electrical Contractor regarding power and wiring requirements and locations of equipment.



3.1.1 Piping: Unless specifically stated to the contrary, fabrication, assembly, welding, and brazing shall conform to ANSI B31.1 for all piping of the air system. Piping shall follow the general arrangement shown. Cut piping accurately to measurements established for the work. Work piping into place without springing or forcing, except where cold-springing is specified. Piping and equipment within buildings shall be entirely out of the way of lighting fixtures and doors, windows, and other openings. Locate overhead piping in buildings in the most inconspicuous positions. Do not bury or conceal piping until it has been inspected, tested, and approved. Where pipe passes through building structure, pipe joints shall not be concealed, but shall be located where they may be readily inspected and building structure shall not be weakened. Avoid interference with other piping, conduit, or equipment. Except where specifically shown otherwise, vertical piping shall run plumb and straight and parallel to walls. Piping connected to equipment shall be installed to provide flexibility for vibration. Adequately support and anchor piping so that strain from weight of piping is not imposed on the equipment.

3.1.1.1 Fittings: Use long radius ells where appropriate to reduce pressure drops. Pipe bends in lieu of fittings may be used for low and medium pressure piping where space permits. However, ASTM A120 pipe shall not be used for bending. High pressure pipe shall not be bent unless requirements for bending high pressure pipe are met. Pipe bends shall have a uniform radius of at least five times the pipe diameter and must be free from any appreciable flattening, wrinkling, or thinning of the pipe. Mitering of pipe to form elbows, notching straight runs to form full sized tees, or any similar construction shall not be used. Make branch connections with welding tees, except factory made forged welding branch outlets or nozzles having integral reinforcements conforming to ANSI B31.1 may be used.

3.1.1.2 Clearances for Welding: Provide clearances from walls, ceilings, and floors to permit the installation of joints. The clearances shall be at least 6 inches for pipe sizes 4 inches and less, and sufficient in corners. However, the specified clearances shall not waive requirements for welders to be qualified for the positions to be welded.

3.1.1.3 Cleaning: Before jointing and erection of piping or tubing, thoroughly clean interiors of pipe sections, tube, and components. In steel pipe, loosen scale and other foreign matter by rapping sharply and expel by wire brush and swab. Blow out both steel pipe and copper tube and components with compressed air at 100 psig or more. Maintain cleanliness by closure of pipe/tube openings with caps or plugs. Before making final terminal connections, blow out complete system with compressed air at 100 psig or more.

3.1.1.4 Changes in Pipe Size: Use reducing fittings for changes in pipe size. The use of bushings will not be permitted.

3.1.1.5 Drainage and Flexibility: Compressed air piping shall be free of unnecessary pockets and pitched approximately 3 inches per 100 feet in the direction of flow to low points. Where pipes must be sloped so that condensate flows in opposite direction to airflow, slope 6 inches per 100 feet or greater. Provide flexibility by use of fittings, loops, and offsets in piping. Install branches at top of a main to prevent carryover of condensate and foreign matter.

3.1.2 Threaded Joints: Where possible use pipe with factory cut threads, otherwise cut pipe ends square, remove all fins and burrs, and cut taper pipe threads per ANSI B2.1. Threads shall be smooth, clean, and full cut. Apply thread tape to male threads only. Work piping into place without springing or forcing. Backing off to permit alignment of threaded joints will not be permitted. Engage threads so that not more than three threads remain exposed.

3.1.3 Valves for Low Pressure Systems: Install valves in conformance with ANSI B31.1 at the locations indicated and elsewhere as required for the proper functioning of the system.

3.1.3.1 Gate Valves: Gate valves shall be used unless otherwise directed. Valves shall be installed in positions accessible for operation and repair. Install valve with stem horizontal or above.

3.1.3.2 Globe Valves: Globe valves shall be installed so that the pressure shall be below the disk. Globe valves shall be installed with the stems vertical.

3.1.4 Hangers and Supports: Selection, fabrication and installation of piping hangers and supports shall conform to MSS SP 58 and MSS SP 69 except that spacing of the hangers and supports shall be as per Table I.

TABLE I MAXIMUM SPAN FOR PIPE	
STD. WT. SCHEDULE 40 STEEL PIPE	
DIAMETER (INCHES)	DISTANCE
1/2	5'-0"
3/4	5'-9"
1	6'-6"
1-1/2	7'-6"
2	8'-6"

3.1.5 Pressure Gages: Pressure gages shall have a shut-off valve or petcock installed between the gage and the line.

3.1.6 Strainers: Strainers with meshes suitable for the services shall be provided where indicated, or where dirt might interfere with the proper operation of valve parts, orifices, or moving parts of equipment.

3.1.7 Cleaning of System: As installations of the various system components are completed, they shall be adequately cleaned before final closing. All foreign matter shall be removed from equipment and surrounding areas. Preliminary or final tests will not be permitted until the cleaning is approved by the Engineer.

3.1.8 Pipe Sleeves: Pipe sleeves shall be provided where pipes and tubing pass through masonry or concrete walls, floors, roofs, and partitions. Sleeves shall be held securely in proper position and location before and during construction. All sleeves shall be of sufficient length to pass through entire thickness of walls, partitions, or slabs. Sleeves in floor slabs shall extend 2 inches above the finished floor. Space between the pipe or tubing and the sleeve shall be firmly packed with oakum and calked on both ends of the sleeve with elastic cement.

3.1.9 Floor, Wall, and Ceiling Plates: Plates on pipes passing through floors and partitions of finished rooms shall be chromium-plated steel or nickel-plated cast iron; all other plates shall be painted cast-iron, malleable iron, or steel.

3.1.10 Unions and Flanges: Unions and flanges shall be placed where necessary to permit easy disconnection of piping and apparatus, and as indicated. Each connection having a screwed-end valve shall have a union. Unions or flanges shall be placed as indicated. Unions shall be used on piping under 2 inches in diameter, and flanges shall be used on piping 2 inches and over in diameter. Dielectric unions or flanges shall be installed between ferrous and nonferrous piping, equipment, and fittings; except that bronze valves and fittings may be used without dielectric couplings for ferrous-to-ferrous or nonferrous to nonferrous connections.

3.1.11 Painting of Piping and Equipment: Piping and equipment shall be painted in accordance with Section 099000, "Painting".

## 3.2 TESTING:

3.2.1 General Requirements, Testing: Perform testing after cleaning and acceptance of cleanness. Contractor shall furnish equipment and apparatus necessary for tests. Tests shall be subject to the approval of the Engineer. The Owner will furnish water and electric current for tests in accordance with the General Provisions. Pressurize each piping system individually and check to assure that there are no cross-connections between different systems prior to operational tests.

### 3.2.2 Hydrostatic and Leak Tightness Tests:

3.2.2.1 Preliminary Preparation: Remove or isolate from the system the compressor, air dryer, filters, instruments, and equipment which would be damaged by water during hydrostatic tests and reinstall after successful completion of tests.

3.2.2.2 Performance of Hydrostatic Tests: Hydrostatically test piping systems for 30 minutes with water at one and one-half times design working pressure.

3.2.2.3 Compressed Air Test: After satisfactory completion of hydrostatic pressure test, blow systems dry with clean, oil-free compressed air, and test with clean, dry air at design working pressure. Brush joints with soapy water solution to check for leaks. Install a calibrated test pressure gage in piping system to observe any loss in pressure. Calibrate the test pressure

gage with a dead weight tester within 15 days before use and certify by initial and date on a sticker applied to dial face. Maintain required test pressure for a sufficient length of time to enable an inspection of joints and connections.

3.2.3 Operational Tests: Test equipment as in service to determine compliance with contract requirements and warranty. During the tests, test equipment under every condition of operation. Test safety controls to demonstrate performance of their required function. Completely test system for compliance with specifications.

++ END OF SECTION ++

SECTION 22 42 00

COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Commercial Plumbing Fixtures, as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 Federal Specifications (Fed. Spec.):

L-P-387A	Plastic Sheet, Laminated, Thermosetting (For Designation Plates)
W-H-196J	Heater, Water, Electric, and Gas Fired, Residential
QQ-C-390B	Copper Alloy Castings (Including Cast Bar)
TT-P-645A	Primer, Paint, Zinc Chromate, Alkyd Type
WW-H-191C	Heater, Fluid, Industrial (Instantaneous, Steam, Water Convertor Type)
WW-N-351C	Nipples, Pipe, Threaded
WW-U-516B	Unions, Brass or Bronze, Threaded Pipe Connections, and Solder Joint Tube Connections
WW-V-35C	Valve, Ball

1.2.2 Military Specifications (Mil. Spec.):

MIL-G-1086E	Gasket Material, Synthetic Rubber (For Bolted Steel Tanks)
MIL-T-12295E	Tanks, Hot Water Storage

MIL-H-12322D	Heaters, Water, Steam-Hot-Water Heated
MIL-V-13612E	Valves, Relief, Pressure and Temperature (For Hot Water Supply Systems)
MIL-P-16077C	Pumps, Centrifugal, Water Circulating, Electric-Motor Driven
MIL-S-16293G	Strainers, Sediment: Pipeline, Water, Air, Gas, Oil or Steam
MIL-P-17552E	Pump Units, Centrifugal, Water, Horizontal; General Service and Boiler Feed: Electric Motor or Steam Turbine Driven
MIL-V-18433B	Valves, Temperature-Regulating (Thermostatically Controlled)
MIL-V-18436E	Valves, Check; Bronze, Cast-Iron, and Steel Body
MIL-P-21214B	Pump Unit Centrifugal, Vertical Sump, Electric Motor Driven, Automatic, Wet-Pit-Type
MIL-P-22561C	Pipe and Pipe Fittings, Acid Resistant

#### 1.2.3 Air-Conditioning and Refrigeration Institute (ARI) Publication:

1010	Drinking-Fountains and Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers
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#### 1.2.4 American National Standards Institute (ANSI) Publications:

A112.6.1M	Supports for Off-the-Floor Plumbing Fixtures for Public Use
A112.18.1M	Finished and Rough Brass Plumbing Fixture Fittings
A112.19.1M	Enameled Cast Iron Plumbing Fixtures
A112.19.2M	Vitreous China Plumbing Fixtures
A112.19.3	Stainless Steel Plumbing Fixtures (Designed for Residential Use)

A112.19.4M	Porcelain Enameled Formed Steel Plumbing Fixtures
A112.19.5	Trim for Water-Closet Bowls, Tanks, and Urinals
A112.21.1M	Floor Drains
A112.21.2M	Roof Drains
A112.26.1M	Water Hammer Arresters
A112.36.2M	Cleanouts
B16.1	Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800
B16.3	Malleable-Iron Threaded Fittings
B16.12	Cast-Iron Threaded Drainage Fittings
B16.18	Cast Copper Alloy Solder Joint Pressure Fittings
B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
B16.23	Cast Copper Alloy Solder Joint Drainage Fittings -DWV
B16.24	Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300
B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes
B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
B16.32	Cast Copper Alloy Solder Joint Fittings for Solvent Drainage Systems
B16.39	Malleable-Iron Threaded Pipe Unions, Class 150, 250 and 300
B40.1	Gauges, Pressure Indicating Dial Type, Elastic Element
Z124.1	Plastic Bathtub Units

Z124.2 Gel-Coated Glass-Fiber Reinforced Polyester Resin  
Shower Receptors and Shower Stall Units

Z358.1 Emergency Eye Wash and Shower Equipment

1.2.5 American Society for Testing and Materials (ASTM) Publications:

A47 Ferritic Malleable-Iron Castings

A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded  
and Seamless

A74 Cast-Iron Soil Pipe and Fittings

A120 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated  
(Galvanized) Welded and Seamless for Ordinary Uses

A183 Carbon Steel Track Bolts and Nuts

A536 Ductile-Iron Castings

B32 Solder Metal

B61 Steam or Valve Bronze Castings

B62 Composition Bronze or Ounce Metal Castings

B88 Seamless Copper Water Tube

B306 Copper Drainage Tube (DWV)

C564 Rubber Gaskets for Cast-Iron Soil Pipe and Fittings

D2000 Classification System for Rubber Products in Automotive  
Applications

D2661 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Drain,  
Waste, and Vent Pipe and Fittings

D2564 Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic  
Pipe and Fittings

D2665 Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent  
Pipe and Fittings



D2846	Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot-and Cold-Water Distribution Systems
F439	Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
F441	Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
F493	Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

1.2.6 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Publication:

90A	Energy Conservation in New Building Design
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1.2.7 American Society of Sanitary Engineering (ASSE) Publications:

1003	Water Pressure Reducing Valves for Domestic Water Supply Systems
1010	Water Hammer Arresters
1019	Wall Hydrants, Frost Proof Automatic Draining, Anti-backflow Types

1.2.8 American Water Works Association (AWWA) Publications:

C104	Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fitting for Water
C105	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
C110	Gray-Iron and Ductile-Iron Fittings, 3 in. Through 48 in. for Water and Other Liquids
C111	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
C115	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges

C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids
C500	Gate Valves, 3 Through 48 inch NPS, for Water and Sewage Systems
C504	Rubber Seated Butterfly Valves
C651	Disinfecting Water Mains
C700	Cold-Water Meters, Displacement Type
C701	Cold-Water Meters, Turbine Type for Customer Service
C702	Cold-Water Meters, Compound Type

1.2.9 Cast Iron Soil Pipe Institute (CISPI) Publications:

301	Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
310	Patented Joint for Use in Connection with Hubless Cast-Iron Sanitary System
HSN	Neoprene Rubber Gaskets for Hub and Spigot Cast Iron Soil Pipe and Fittings

1.2.10 Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Publications:

SP 58	Pipe Hangers and Supports - Materials, Design and Manufacture
SP 67	Butterfly Valves
SP 69	Pipe Hangers and Supports - Selection and Application
SP 70	Cast Iron Gate Valves, Flanged and Threaded Ends
SP 80	Bronze Gate, Globe, Angle and Check Valves
SP 85	Cast Iron Globe and Angle Valves, Flanged and Threaded Ends

1.2.11 National Fire Protection Association (NFPA) Publications:

54	National Fuel Gas Code
211	Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances

1.2.12 Plumbing and Drainage Institute (PDI) Publications:

G101	Testing and Rating Procedure for Grease Interceptors
WH201	Water Hammer Arresters

1.2.13 National Association of Plumbing-Heating-Cooling Contractors (PHCC) Publication:

National Standard Plumbing Code

1.2.14 Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (FCCCHR) Publication:

List of Approved Backflow Prevention Assemblies (Obtain current date from NAVFAC HQ, Code 04)

11330.11D	Backflow Preventers, Reduced Pressure Principle Type
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1.3 GENERAL REQUIREMENTS: Section 230501, "Mechanical General Requirements", applies to this Section, with the additions and modifications specified herein. Plumbing systems including fixtures, equipment, materials, installation, and workmanship shall be in accordance with the NYS Plumbing Code, except as modified herein. In the Plumbing Code referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for the word "should" wherever it appears. Capacity of equipment shall be not less than that indicated.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements

1.4.1 Manufacturer's Data:

- a. Pipe and fittings
- b. Valves
- c. Plumbing fixtures
- d. Pipe supports (hangers)
- e. Gauges and thermometers
- f. Strainers

- g. Drains
- h. Water hammer arresters
- i. Electric water heaters
- j. Pre-fabricated trench drain
- k. Safety station with Eyewash
- l. Instantaneous Hot Water Heater
- m. Mixing Valve

1.4.2 Certificates of Conformance:

- a. Pipe and fittings
- b. Valves
- c. Instantaneous water heaters

1.4.3 Operation and Maintenance Manuals:

- a. Instantaneous water heaters

1.4.4 Posted Operating Instructions:

- a. Instantaneous water heaters

1.4.5 Certified Data:

- a. Instantaneous water heaters

## PART 2 - PRODUCTS

2.1 DWV (DRAIN, WASTE, AND VENT) PIPING: Fittings shall be long radius fittings, except fittings in vent piping may be short radius fittings. Minimum size piping shall be 2 inches for buried piping and 1.5 inches for aboveground piping.

- A. Buried Piping: Buried piping includes piping up to but not more than 6 inches aboveground or floor slab on grade. Buried piping below grade outside of the building shall be by contract 2A.
- B. Cast-Iron Hub and Spigot Pipe and Fittings: ASTM A74 with ASTM C564 or CISPI HSN 85 rubber compression gasket joints, or calked and leaded joints.

2.1.1 Aboveground Piping:

2.1.2 Cleanouts: ANSI A112.36.2M; provide threaded bronze or thermoplastic cleanout plugs.

2.1.2.1 Wall Cleanouts: Provide polished stainless steel or chromium-plated bronze cover plate and secure to cleanout plug with countersunk screw.

2.1.3 Drains: ANSI A112.21.1M; provide cast-iron drains and clamping rings for use with membrane waterproofing.

## 2.2 DOMESTIC WATER PIPING:

2.2.1 Aboveground Piping: All piping shall be insulated per specification 230701 and labeled per specification 230553.

2.2.1.1 Polyvinyl Chloride (PVC) Pipe and Fittings: Pipe and fittings shall be manufactured from rigid PVC (polyvinyl chloride) vinyl compounds in accordance with ASTM D1784. PVC pipe and fittings shall be Iron Pipe Size (IPS) conforming to ASTM D2665 (DWV pipe and fittings), ASTM D1785 (Sch 40 and Sch 80 Pipe), ASTM D2466 (Sch 40 fittings) and ASTM D2467 (Sch 80 fittings). Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.

NOTE: Provide metal piping where the piping passes through the fire wall between the garage exterior wall and administration office. Caulk and seal metal piping with fire calk and oakum.

2.2.2 Water Valves: Provide valves suitable for minimum of 125 psig and minimum of 180 degrees F hot water. Valves shall have threaded end connections with a union on all but one side of the valve, or solder end connections between bronze valves and copper tubing. Copper alloy and bronze valve body shall be ASTM B61 or ASTM B62 copper alloy. Ball valves may be provided in lieu of gate valves.

2.2.2.1 Gate Valves 2-1/2" and Larger: Class 125 iron body, bronze mounted, ASTM A126 Class B cast iron body and bonnet, flanged ends, teflon-impregnated packing and two-piece packing gland. Manufacture shall be as by Stockham, Crane, Powell, or equal.

2.2.2.2 Gate Valves 2" and Smaller: Class 125, ASTM B62 cast bronze composition body and bonnet, threaded or soldered ends, solid disc, copper-silicon alloy stem, brass packing gland, teflon-impregnated packing and malleable hand wheel. Manufacture shall be as by Stockham, Crane, or equal.

2.2.2.3 Ball Valves 2" and Smaller: 600 psi cwp, cast brass bodies, two-position hand levers, replaceable reinforced teflon seats, conventional port, blow-out proof stems, chrome-plated brass ball, threaded or soldered ends with extended solder cups. Manufacture shall be as by Stockham, Crane, Apollo, or equal.

2.2.2.4 Globe Valves 2" and Smaller: Class 125, ASTM B62 cast bronze composition body and bonnet, threaded or soldered ends, copper silicon alloy stem, brass packing gland, teflon-impregnated packing and malleable hand wheel. Manufacture shall be as by Stockham, Crane, Powell, or equal.

2.2.2.5 Butterfly Valves 2-1/2" and Larger: Wafer type, 200 psi cwp, ASTM A126 Class B cast iron body, replaceable EPDM sleeve, ductile nickel-plated disc, 410 stainless steel stem and EPDM O-ring stem seals. 2-1/2"-6" sizes - lever operated; 8"-24" - gear operated. Manufacture shall be as by Stockham, Crane, or equal.

2.2.2.6 Check Valves 2" and Smaller: Class 125, threaded or soldered ends, ASTM B62 cast bronze composition bodies and caps and swing disc type. Manufacture shall be as by Stockham, Crane, Powell, or equal.

2.2.2.7 Hose Bibbs: Provide angle type copper alloy hose bibb with lockshield and hand wheel. Inlet shall have internal threads. Outlet shall have vacuum breaker with 0.75-inch external hose threads.

2.2.2.8 Nonfreeze Wall Hydrant: ASSE 1019, cast bronze, with lockshield and hand wheel, one-inch external thread inlet, 0.75-inch external hose thread outlet with automatic draining vacuum breaker. Hydrant shall be of sufficient length to extend through walls and place the valve seat inside the building or in the crawl space. Bonnet and valve stem shall be removable from outside of the building. Manufacture shall be as by Watts, or equal.

2.2.2.9 Combination Pressure and Temperature Relief Valves: Mil. Spec. MIL-V-13612 with pressure relief set at not less than 25 psi above maximum system pressure, not to exceed maximum working pressure, temperature relief set not to exceed 210°F. Provide with test lever.

2.2.3 Strainers: Class 125, Style Y, cast bronze body, 20 mesh stainless steel screen and shall have blow off outlet with pipe nipple and gate valve. Manufacture shall be as by Watts, Sarco, or equal.

2.2.4 Gauges: ANSI B40.1, single style pressure gauge for water with 4-inch dial, brass or aluminum case, bronze tube, gauge cock, pressure snubber, and syphon. Provide scale range suitable for the intended service.

2.2.5 Thermometers: Provide bi-metal dial type thermometers with stainless steel case, stem, and fixed thread connection; 5-inch diameter dial with glass face gasketed within the case; accuracy within 1.0 percent of scale range. Provide scale range suitable for the intended service.

2.2.6 Dielectric Connections: Provide at connections between copper and ferrous metal piping materials. ASTM F441, Schedule 80, CPVC threaded pipe nipples, 4-inch minimum length, may be provided for dielectric connections in pipe sizes 2 inches and smaller.

2.2.7 Water Hammer Arresters: PDI WH201, ANSI A112.26M.1, or ASSE 1010, elastomer bellows or plunger type with stainless steel or copper shell. Manufacture shall be as by Josam, Zurn, Watts, or equal. Provide at all bathroom fixtures and where shown on details.

2.2.8 Flow Control Devices: Provide nonadjustable flow control device to limit the maximum water flow to 3.5 gpm at supply pressure of 40 psig in each supply to lavatory faucets

2.2.9 Backflow Preventers: Proof shall be furnished that each make, model/design, and size of backflow preventer being furnished for the project is approved by and has a current "Certificate of Approval" from the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (FCCCHR). Listing of the particular make, model/design, and size in NAVFACINST 11330.11D or in the current FCCCHR List of Approved Backflow Prevention Assemblies will be acceptable as the required proof. Reduced pressure principle type shall be Watts Model 009, or equal. Double check valve (DCV) type shall be Watts 007, Watts 709, or equal.

### 2.3 MISCELLANEOUS PIPING MATERIALS

2.3.1 Pipe Nipples: Fed. Spec. WW-N-351, copper alloy for use in copper tubing and hot-dip galvanized Schedule 80 steel pipe for use in steel piping.

2.3.2 Unions: Fed. Spec. WW-U-516 for use in copper tubing; ANSI B16.39 hot-dip galvanized steel for use in steel piping.

2.3.3 Flanges: ANSI B16.1, Class 125, for use in ferrous piping; ANSI B16.22 or ANSI B16.24 for use in copper tubing; with Mil. Spec. MIL-G-1086 full face flat type synthetic rubber gaskets.

2.3.4 Escutcheon Plates: One piece or split hinge type metal plates for piping passing through floors, walls, and ceilings in exposed spaces, chromium-plated finish on plates in finished spaces, paint finish on plates in unfinished spaces, and with setscrews or other approved positive means to anchor plates in place securely.

#### 2.3.5 Pipe Sleeves:

2.3.5.1 Sleeves in Masonry and Concrete Walls, Floors, and Roofs: ASTM A53 or ASTM A120, Schedule 40 or Standard Weight, hot-dip galvanized steel pipe sleeves.

2.3.5.2 Sleeves in Partitions and Other Than Masonry and Concrete Walls, Floors, and Roofs: Hot-dip galvanized steel sheet having a nominal weight of not less than 0.90 pounds per square foot.

2.3.6 Pipe Hangers and Supports: Provide MSS SP 58 and MSS SP 69, Type 1 or 6, of the adjustable type, except as modified herein or indicated otherwise. Attachments to steel W or S beams shall be with Type 21, 28, 29, or 30 clamps. Attachments to steel angles and channels (with web vertical) shall be with Type 20 clamp with a beam clamp channel adaptor.

Attachments to steel channel web horizontal) shall be with drilled hole on center line and double nut and washer. Attachments to concrete shall be with Type 18 insert or a drilled hole with expansion anchor. Attachments to wood shall be as indicated. Hanger rods and attachments shall be full size of the hanger threaded diameter. Provide Type 40 insulation protection shields for insulated piping. Provide steel support rods. Provide nonmetallic, hair felt, or plastic piping isolators between copper tubing and the hangers.

2.4 FIXTURES, FITTINGS, ACCESSORIES, AND SUPPLIES: Provide control-stop valves in each supply to each fixture. The finish of fittings, accessories, and supplies exposed to view shall be chromium-plated per ANSI A112.18.1M. Center set faucets shall be top-mounted with inlets on not greater than 4-inch centers.

2.4.1 Tank Type Water Closets: ANSI A112.19.2M, close-coupled, white vitreous china, water conservation type, floor-mounted, floor outlet, siphon jet or reverse trap, elongated bowl, white solid plastic elongated open-front seat with cover, and ANSI A112.19.5 trim. Nonfloat swing type flush valves are not acceptable. The water flushing volume shall not exceed 3.5 gallons per flush. Astute Vormax HET right height elongated complete toilet as manufactured by American Standard, or approved equal

2.4.2 Mop Sink: One piece, precast terrazzo made of black and white marble chips in gray Portland cement to produce a compressive strength of 3000 psi seven days after casting. Terrazzo surface shall be ground and polished with all air holes or pits grouted and excess removed. Shoulders shall be not less than 12" high outside and 10" inside at lowest wall. Shoulder width not less than 1-1/2" on all sides with a 1/4" pitch towards the inside. Standard drain body shall be stainless steel cast integrally and provides for a caulked seal. Curved front terrazzo mop service basin as manufactured by FIAT, or approved equal.

2.4.2.1 Mop Sink faucet: 8" wall mounted service sink faucet, eternal cartridges w/spring checks, lever handles, upper support rod, garden hose male outlet, polished chrome finish, 1/2" NPT vacuum breaker, built-in stops & 1/2" NPT female inlets. Model B-0667-POL as manufactured by T&S Brass and Bronze Works, Inc., or approved equal.

2.4.3 ADA Shower:

2.4.3.1 Standard Features:

- a. Code compliant when fully equipped and installed according to guidelines
- b. 4" simulated smooth tile
- c. Pre-leveled base
- d. Center drain location
- e. Slip resistant, textured bottom [ASTM F-462]



#### 2.4.3.2 Configuration:

- a. Fully equipped with seat — ADA/ANSI
- b. Seat location - RH
- c. Includes one 20" x 1 1/2" diameter grab bar located on the side wall;
- d. One 30" x 1 1/2" diameter grab bar located on the back wall; white-cushioned, L-shaped fold-up seat; pressure balancing mixing valve and hand-held shower assembly (on back wall offset seat), per ADA/ANSI guidelines.

#### 2.4.3.3 Custom Options:

- a. Powder-coated white (1 1/4" dia.) M LH M RH
- b. Hand-held shower assembly with 30" slide bar and 60" hose
- c. Pressure balancing mixing valve

#### 2.4.3.4 Optional Accessories:

- a. Soap dish
- b. Curtain rod
- c. Shower curtain
- d. Vinyl flexible dam
- e. Removable threshold
- f. Brass drain
- g. Standard colors: Almond

### 2.5 ELECTRIC WATER HEATER

#### 2.5.1 Efficiency:

- a. .95 EF for 50-gallon model
- b. Single resistored stainless steel heating element

#### 2.5.2 Features:

- a. High efficiency heating element
- b. Over-temperature protector cuts off power in excess temperature situations
- c. Automatic thermostat keeps water at desired temperature
- d. Wall bracket
- e. 1/4 turn drain valve included with
- f. 2.5 gallon model
- g. Temperature and pressure relief valve
- h. Meets or exceeds National Appliance Energy Conservation Act (NAECA) requirements

- i. These units are U.L. listed and comply with Underwriter's Laboratories Specifications 174
- j. Low lead compliant

### 2.5.3 Warranty:

- a. 6-Year limited tank and parts warranty

2.5.4 Units shall meet or exceed ANSI requirements and have been tested according to D.O.E. procedures. Units meet or exceed the energy efficiency requirements of NAECA, ASHRAE standard 90, ICC Code and all state energy efficiency performance criteria.

### 2.5.5 Manufacturer:

- a. A.O. Smith Voltex Hybrid Electric Heat Pump Water Heater, or approved equal, meeting scheduled and specified criteria.

### 2.5.6 Piping Insulation:

2.5.6.1 Fibrous Glass (Mineral Fiber) Insulation: Composed principally of fibers manufactured from rock, slag, or glass, with or without binders, and asbestos free.

- a. Preformed Pipe Insulation: Minimum density 3 pcf; ASTM C 547:
  - i. Class 1 (Suitable for Temperatures Up to 450 degrees F): K of 0.26 at 75 degrees F.
- b. Premolded Fitting Insulation: Minimum density 4.0 pcf, K of 0.26 at 75 degrees F; ASTM C 547, Class 1.
- c. Insulation Inserts for PVC Fitting Jackets: Minimum density 1.5 pcf, K of 0.28 at 75 degrees F; ASTM C 553, Type III.
  - i. Suitable for temperatures up to 450 degrees F.

### 2.5.7 Insulation Jackets:

2.5.7.1 Laminated Vapor Barrier Jackets for Piping: Factory applied by insulation manufacturer, conforming to ASTM C 1136, Type I.

- a. Type I: Reinforced white kraft and aluminum foil laminate with kraft facing out.
  - i. Pipe Jackets: Furnished with integral 1-1/2 inch self sealing longitudinal lap, and separate 3 inch wide adhesive backed butt strips.
- b. Laminated vapor barrier jackets are not required for flexible elastomeric foam insulation.

### 2.5.8 Adhesives, Mastics, and Sealers:

2.5.8.1 Vapor Barrier Mastic (Fibrous Glass Insulation): Permeance shall be .03 perms or less at 45 mils dry per ASTM E 96. Childers' CP-34, Epolux's Cadalar 670, Foster's 30-65.

2.5.9 Trench Drains: Furnish high density polyethylene (HDPE) molded, 0.75% pre-sloped, heavy duty trench drain system to contract 3A for installation. Trench drain shall be comprised of 80" long by 12" wide modules, 3-1/2-inch radiused self-cleaning bottom, positive mechanical connection at joints, rebar clips, and 4" non-hub molded end outlet connection. Trench drains will include manufacturer's heavy duty ductile iron with continuous concrete anchoring bars and ten (10) 4-inch concrete anchors per module. Grates to be special duty, and shall be secured to frame with integral grate locking bars. Frames and grates shall be Load Class F for special duty, ASTM A36 ductile iron and galvanized conforming to ASTM A123, with load capacity exceeding 200,000 pounds and load bearing area of 45 square inches per foot, H-20 and FAA load rated for extra-heavy loads, slow wide of 3/8 inches and an open area of 20.5 inches/foot. Manufacture of trench drain and grate shall be as by Zurn, or approved equal.

2.5.10 Sink Faucets: Automatic-type, Solar (photovoltaic) powered with battery backup, electronic-sensor-operated, integrated mixing valve.

- a. Basis-of-Design Product: Subject to compliance with requirements, provide Sloan Valve Company; BASYS® EFX-275 Faucet, or approved equal.
- b. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
- c. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- d. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor. Body Type: Single hole.
- e. Body Material: Commercial, chrome plated constructed metal.
- f. Finish: Polished chrome plate.
- g. Maximum Flow Rate: 0.5 gpm.
- h. Mounting Type: Deck, concealed.
- i. Spout: Rigid type.
- j. Spout Outlet: Laminar flow.
- k. Drain: Not part of faucet.

2.5.11 Sacristy Sinks: Stainless steel, single or two bowl, counter mounted.

- a. Fixture:
  - i. Standard: ASME A112.19.3/CSA B45.4.
  - ii. Type: Self-rimming.
  - iii. Material: Stainless steel.
  - iv. Nominal Size: Approximately 22 by 42 inches.
  - v. Cover: Hinged with lock on left bowl.
- b. Supply Fittings: Comply with requirements in "Supply Fittings" Article.

- c. Waste Fittings:
  - i. Standard: ASME A112.18.2/CSA B125.2.
  - ii. Left Bowl:
    - a) Drain: Cup with stopper and NPS 1-1/2 (DN 40) tailpiece.
    - b) Drain Piping: NPS 1-1/2 (DN 40) chrome-plated, tubular-brass direct waste without trap, separate waste piping, and wall flange.
  - iii. Opposite Bowl:
    - a) Drain: Grid with stopper and NPS 1-1/2 (DN 40) tailpiece.
    - b) Trap:
      - i. Size: NPS 1-1/2 (DN 40).
      - ii. Material: Comply with requirements in "Waste Fittings" Article.
- d. Supply Fittings:
  - a) Standard: ASME A112.18.1/CSA B125.1.
  - b) Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.
    - i. Operation: Loose key.
    - ii. Risers: NPS 1/2 (DN 15), chrome-plated, soft-copper flexible tube.
- e. Waste Fittings:
  - a) Standard: ASME A112.18.2/CSA B125.2.
  - b) Trap(s):
    - i. Size: NPS 1-1/2
    - ii. Retain one of two "Material" subparagraphs below. First subparagraph is for NPS 1-1/2 or NPS 2 (DN 40 or DN 50) traps.
    - iii. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
    - iv. Retain "Material" Subparagraph below only for NPS 1-1/2 (DN 40) traps.
    - v. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- (0.30-mm-) thick stainless-steel tube to wall; and stainless-steel wall flange.
- f. Continuous Waste:
  - a) Size: NPS 1-1/2.
  - b) Material: Chrome-plated, 0.032-inch thick brass tube.

#### 2.5.12 Safety Station With Eyewash:

- a. Combination eye wash/shower safety station with ABS plastic shower head (optional stainless steel shower head "SSH"), ABS plastic bowl, powder coated cast aluminum flag handle and floor flange, 1 1/4" IPS Schedule 40 galvanized pipe and fittings, 1" IPS and 1/2" IPS U.S. made chrome plated brass stay open ball valves, and polished stainless steel pull rod. Unit shall have (2) polypropylene 'GS Plus' spray

heads with integral “flip-top” dust covers, filters, and 1.8-GPM flow control orifices mounted on a chrome plated brass eyewash assembly. Unit shall include ANSI compliant sign.

- b. Performance: Unit shall meet or exceed ANSI Z358.1 – 2009, and come with a full 2-year warranty.
- c. Fixture: Guardian Equipment G1902P and G1902P-SSH, or approved equal.

#### 2.5.13 Instantaneous Hot Water Heater:

- a. Manufacturer: Haws model 9327, or approved equal
- b. Construction: NSF-61 listed materials
- c. Modular Heating Chamber Assembly: 6 heating chartridge and 12 heating elements with molded-in termination rods. Flow, fault, codes and system status displayed on LCD
- d. Disconnect
- e. Power: 72 KW, 480V, 3 phase
- f. Rated Pressure: 150 PSI
- g. Standard Temp Setting: 90 Deg F
- h. Temp Accuracy: +/- 1Deg F
- i. Max Flow Rate: 40 GPM

#### 2.5.14 Mixing Valve:

- a. Thermostatic mixing valve (factory set to 85 degrees) for single emergency eye wash. Unit shall include a built-in cold water by-pass, rough bronze finish, solid bimetal thermostat, locking temperature regulator with limit stop factory set for 90 degrees, integral check stops, and dial thermometer.
- b. Performance: Unit shall have a flow range of 0.5-GPM to 5-GPM with a maximum pressure loss of 20-PSI and come with a full 1-year warranty.
- c. Quality Assurance: Unit shall be certified to ASSE 1071. Unit shall be certified to meet Low Lead requirements of wetted surface area containing less than 0.25% lead by weight.
- d. Fixture: Guardian G3600LF, or approved equal.

### PART 3 - EXECUTION

3.1 INSTALLATION: Installation of plumbing systems including fixtures, equipment, materials, and workmanship shall be in accordance with the BOCA National Plumbing Code, except as modified herein. When fixtures require both hot water and cold water supplies, provide the hot water supply to the left of the cold water supply. Plastic piping shall not penetrate fire walls or fire floors and shall be used on one side of fire walls and fire floors not closer than 6 inches to the penetration.

3.1.1 Threaded Connections: Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape, pipe cement and oil, or PTFE powder and oil; apply only on male threads. Provide exposed ferrous pipe threads with one coat of Fed. Spec. TT-P-645 primer applied to a minimum dry film thickness of 1.0 mil.

3.1.2 Solder End Valves: Remove stems and washers and other item subject to damage by heat during installation. Reassemble valve after soldering is completed. Valves without heat sensitive parts do not require disassembly but shall be opened at least two turns during soldering.

3.1.3 Pipe Supports (Hangers): Provide additional supports at the concentrated loads in piping between supports, such as for in-line water pumps and flanged valves.

3.1.3.1 Piping to Receive Insulation: Provide temporary wood spacers between the insulation protection shield and the pipe in order to properly slope the piping and to establish final elevations. Temporary wood spacers shall be of the same thickness as the insulation to be provided under Section 230701, "Insulation of Mechanical Systems".

3.1.3.2 Maximum Spacing Between Supports:

- a. Vertical Piping: Support metal piping at each floor, but at not more than 10-foot intervals.
- b. Horizontal Piping: Support cast-iron piping at 5-foot intervals, except for pipe exceeding 5-foot length, provide supports at intervals equal to the pipe length but not exceeding 10 feet. Support steel piping and copper tubing as follows:

MAXIMUM SPACING (FEET)										
Nominal Pipe Size (Inches)	One and Under	1.25	1.5	2	2.5	3	3.5	4	5	6
Steel Pipe	7	8	9	10	11	12	13	14	16	17
Copper Tube	6	7	8	8	9	10	11	12	13	14

3.1.4 Ductile Iron Pipe Aboveground: Provide flanged joints.

3.1.5 Installation of Pipe Sleeves: Provide pipe sleeves where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 0.25-inch space between exterior of piping or pipe insulation and interior of sleeve. Firmly pack space with insulation, and calk at both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal. Seal both ends of penetrations through fire walls and fire floors to maintain fire

resistive integrity with UL listed fill, void, or cavity material. Extend sleeves in floor slabs 3 inches above the finished floor, except sleeves are not required where DWV piping passes through concrete floor slabs located on grade.

3.2 NAMEPLATES: Provide laminated plastic nameplates for equipment, gauges, thermometers, and valves; stop valves in supplies to fixtures will not require nameplates. Laminated plastic shall be 0.125-inch thick melamine plastic conforming to Fed. Spec. L-P-387, black with white center core. Surface shall be a matte finish. All corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 1.0 inch by 2.5 inches. Lettering shall be minimum of 0.25-inch high normal block lettering. Key the nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule. Each inscription shall identify its function. Equipment nameplates shall show the following information.

- a. Manufacturer, type, and model number
- b. Contract number and accepted date
- c. Capacity or size
- d. System in which installed
- e. System which it controls

3.3 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS: Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around mains; bolt valve conforming to AWWA C500 to the branch. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Owner or Municipality in writing at least 15 days prior to the date the connections are required; receive approval before any service is interrupted. Furnish all materials required to make connections into the existing water supply systems and perform all excavating, backfilling, and other incidental labor as required. Furnish the labor and the tapping or drilling machine for making the actual connections to the existing systems.

3.4 FIELD TESTING: Before final acceptance of the work, test each system as in service to demonstrate compliance with the contract requirements. Perform the following tests in addition to the tests specified in the National Standard Plumbing Code, except as modified herein. Correct all defects in the work provided by the Contractor, and repeat the tests until the work is in compliance with contract requirements. Furnish water, electricity, instruments, connecting devices, and personnel for the tests.

3.4.1 Domestic Water Piping: Before insulation is applied, hydrostatically test each piping system at not less than 100 psig with no leakage or reduction in gauge pressure for 2 hours.

3.5 DISINFECTION: Thoroughly flush entire system prior to disinfection. Disinfect the new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C601. Fill the piping systems with solution containing minimum of 50 parts per

million of available chlorine and allow solution to stand for minimum of 24 hours. Maintain a minimum of 25 ppm during retention period. Repeat chlorination as required to achieve 25 ppm minimum. Flush the solution from the systems with clean water until maximum residual chlorine content is not greater than 0.2 parts per million.

3.6 EYEWASH: Install per manufacturers written instructions.

### 3.7 HEAT TRACE CABLE INSTALLATION

#### 3.7.1 Installation:

3.7.1.1 The system shall be installed per manufacturers engineering details, isometric drawings, line lists and other pertinent data.

3.7.1.2 The installing contractor shall have a minimum of 5 years experience installing industrial electric heat trace systems as demonstrated by a manufacturer approved experience list

3.7.1.3 Installation techniques shall be governed by the manufactures installation instructions, and the NEC202-2013 Installing and Maintaining Industrial Heat Trace Systems document. In event of conflict the order or precedence is manufacturers design details, manufactures installation instructions and then the NEC202-2013 document.

3.7.1.4 The Installation contractor shall maintain licensed, trained and qualified personnel on site throughout the installation process.

3.7.1.5 Installation schedule shall be defined and agreed to by all parties prior to contractor mobilization

3.7.1.6 Installer shall provide weekly updates on job completion status including both physical install details and financial reporting.

3.7.1.7 Installer shall conform to all site safety requirements and provide site safety documentation as required.

3.7.1.8 Installer shall keep records of all heating cable installed on site per job requirements – at a minimum circuit number corresponding with heat trace isometric drawing with model number, batch number, reel number and actual footage installed shall be documented on provided heat trace isometrics. Actual location of power connection, end seals and splice/tee boxes shall be indicated on isometric drawings as well. This documentation is required prior to final payment for install services.

#### 3.7.2 System Commissioning

3.7.2.1 System commissioning shall be performed by manufacturer, or approved manufacturer's representative.



3.7.2.2 System commissioning testing and documentation shall conform to manufacturers standard procedures and at a minimum confirm

- a. Correct cable model number installed on each circuit per circuit isometric drawings
- b. Circuit electrical data conforms to heat trace isometric data including Circuit current, Circuit insulation resistance, Circuit voltage
- c. Location and coordinates of power connection kits, end seals, splice/tee kits for each circuit

3.7.2.3 Documentation of commissioning activities and test results shall be provided per contract requirements, manufacturer's instructions, and NEC202-2013 document.

++ END OF SECTION ++

## SECTION 23 05 01

### MECHANICAL GENERAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

1.1.1 All controls, wiring, equipment and systems installed in an area that are Class 1 Division 1 shall be rated for such.

1.1.2 Under this Section, the Contractor shall furnish all labor, materials and equipment for Mechanical General Requirements, as shown on the Plans, as specified and/or directed. This is to include all materials, mechanical equipment, step-down transformers for controls, controls, control wiring (regardless of voltage) and conduit to provide for a fully operational mechanical system. All conduit and wiring shall conform to Division 16 specifications and Contract Drawings. The conduit and wiring up to but not including the unit starter (starter = line voltage thermostat or another means to close a contact and start the unit operation) shall be the electrical contractors. The starter (i.e. the line voltage thermostat or another means to close a contact and start the unit operation) and all conduit and wiring between the starter and to the unit shall be by the mechanical contractor and shall conform to Division 16 specifications and Contract Drawings.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 Code of Federal Regulations (CFR) Publications:

29-1910-SUBPART O Machinery and Machine Guarding

29-1910.219 Mechanical Power-Transmission Apparatus

1.3 RELATED REQUIREMENTS: This Section applies to certain sections of Division 01, "General Requirements", Division 02, "Site Work", and all sections of Division 23, "Mechanical" of this Project Specification, unless specified otherwise in the individual section.

1.4 SUBMITTALS: Submit to RPE. Submit shop drawings, manufacturer's data, publication compliance, certified test reports, and manufacturer's certificates of compliance for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication or delivery of the items to the job site. Shop drawings shall be accompanied by a letter of transmittal in duplicate, and all shop

drawings shall be suitably identified with the name of the project, contract number, Contractor's name, date and initials indicating approval of such submittal by the Contractor under the applicable specification. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and the specific technical paragraph reference which specifies each item, applicable industry and technical society publication references, and other information necessary to establish contract compliance of each item to be furnished.

1.4.1 **Manufacturer's Data:** Submit to RPE Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts.

1.4.2 **Shop Drawings:** Submit to RPE Drawings shall be a minimum of 8.5 inches by 11 inches in size, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams, and installation details of equipment. Drawings shall also include equipment spaces identifying and indicating proposed location, layout and arrangement of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

1.4.3 **Manufacturer's Certificates of Compliance:** Submit to RPE Submit certification from manufacturer attesting that materials and equipment to be furnished for this project comply with the requirements of this Specification and of the reference publications. Pre-printed certifications will not be acceptable; certifications shall be the manufacturer's original; certifications shall be not more than one year old. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to the requirements specified. Certificates shall be signed by the manufacturer's official authorized to sign certificates of compliance.

1.4.4 **Reference Standards Compliance:** Where equipment or materials are specified to conform to industry and technical society reference standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), American Society of Mechanical Engineers (ASME), American Gas Association (AGA), American Refrigeration Institute (ARI), and Underwriters' Laboratories (UL), proof of such conformance shall be

submitted. If an organization uses a label or listing to indicate compliance with a particular reference standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections.

1.4.4.1 Independent Testing Organization Certificate: In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing and approved by the Designer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.5 OPERATION AND MAINTENANCE MANUAL: Furnish an operation and maintenance manual for each item of equipment. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual to the Owner's Representative for review and approval not more than 90 calendar days after an item is approved, but at least 60 calendar days prior to field acceptance testing of the item. Furnish the remaining manuals at least 60 days prior to contract completion. Inscribe the following identification on the cover: the words "OPERATION AND MAINTENANCE MANUAL", the name and location of the equipment or the building, the name of the Contractor, and the contract number. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing equipment, and of the local representatives for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shut-down; description of the function of each principal item of equipment; the procedure for starting; the procedure for operating; shut-down instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency; safety precautions, diagrams, and illustrations; test procedures; performance data; and parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

1.6 POSTED OPERATING INSTRUCTIONS: Provide for each system and principal item of equipment as specified in the technical sections for the use of the operation and maintenance personnel. The operating instructions shall include the following:

- a. System Descriptive Information: Wiring diagrams, control diagrams, piping diagrams, control sequence and operating points for each principal system and item of equipment. Post instructions where directed.
- b. Equipment Instructions: Attach to or post adjacent to each principal item of equipment and include directions.

- (1) Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - (2) Safety precautions, procedure in the event of equipment failure.
  - (3) Other areas as recommended by the manufacturer of each system or item of equipment.
- c. Print or engrave, and frame under glass or in approved laminated plastic. Operating instructions exposed to the weather shall be made of weatherproof materials or enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.7 CATALOGED PRODUCTS: Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's name, address, model number and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.8 LAYOUT OF THE WORK: Coordinate the proper relation of the work to the building structure, existing utilities and to the work of all trades. Visit the premises and become familiar with the dimensions in the field, and advise the Owner's Representative of any discrepancy before performing any work.

1.8.1 Contract Drawings: The Contract Drawings represent the general intent as to piping, duct and equipment arrangements. All locations and dimensions shown shall be field verified and minor alterations made if so required. Where dimensions are not given for the location and arrangement of mechanical systems, locations may be assumed to be approximate, and may be altered if required. Major modifications to the indicated arrangements shall be approved by the Owner's Representative prior to the installation of mechanical systems. Schematic diagrams represent the overall system requirements and do not necessarily indicate the physical orientation, location or dimensions of that system.

1.8.2 Record Drawings: The Contractor shall maintain a record of the progress of the work and shall submit three (3) sets of As-Built Drawings upon completion of the project. Drawings shall be produced in AutoCAD format and submitted on CD with the Operations and Maintenance manuals.

1.9 MANUFACTURER'S RECOMMENDATIONS: Unless otherwise stated in the Contract Specifications, all new equipment items, and specialties shall be installed in strict accordance with the recommendations of the manufacturer of the items being installed. Prior to the installation of new items, the Contractor shall submit to the Owner's representative printed copies of the manufacturer's installation recommendations. Installation of the item will not be allowed

to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material. Failure to install items in accordance with manufacturer's recommendations can be cause for rejection of the work items installed.

1.10 DELIVERY, STORAGE, AND HANDLING: Properly store, adequately protect, and carefully handle equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Designer. Replace damaged or defective items.

### 1.11 SAFETY REQUIREMENTS

1.11.1 Equipment Safety: Provide positive means of locking out equipment so that equipment cannot be accidentally started during maintenance procedures. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of the type specified. Provide catwalks, maintenance platforms, and guardrails where required for safe operation and maintenance of equipment. Provide ladders or stairways to reach catwalks and maintenance platforms. Ensure that access openings leading to equipment are large enough to carry through routine maintenance items such as filters and tools.

1.11.2 Warning Sign: Provide a permanent placard or sign at the entrance to confined spaces contained in or associated with the equipment supplied as a part of the Contract work.

1.12 ELECTRICAL REQUIREMENTS: Furnish motors, controllers, disconnects and contactors with their respective pieces of equipment. Motors, controllers, disconnects and contactors shall conform to and have electrical connections provided under Division 16 - Electrical. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contactors shall have a maximum of 120 volt control circuits, and shall have auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work shall be included under this Section. Power wiring and conduit for field installed equipment shall be provided under and conform to the requirements of Division 16- Electrical.

1.12.1 ELECTRICAL REQUIREMENTS: Motors, controllers, contactors, and disconnects shall conform to Division 16 - Electrical. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Power wiring and conduit for field installed equipment shall conform to the requirements under Division 16 - Electrical. All motors shall be equipped with built-in thermal overload protection. All relays and control devices, utilized to start equipment (i.e., thermostats, switches, etc) shall be rated for the HP of the interconnected equipment and conform to NEC.

1.13 SPECIAL CONDITIONS: When performing work within areas of active use, the Contractor shall be responsible to coordinate with the Owner regarding planned interruptions to mechanical and electrical services. The Contractor shall minimize disruption of existing non-contract work areas as much as possible.

1.13.1 Protection of Buildings from the Weather: The interior of the buildings and all materials and equipment shall be protected from the weather at all times.

1.13.2 Protection of Personnel: Where the safety of non-contractor personnel is endangered in the area of the work, barricades shall be used. Additional protection shall be provided, if required, to preserve the safety of non-contractor personnel in the immediate area of the work.

1.14 INSTRUCTION TO OWNER'S PERSONNEL: When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Owner's personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. The number of days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the Contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

1.15 INSPECTIONS AND CERTIFICATIONS: The Contractor shall provide and pay for any third party inspections or certifications required by applicable regulatory agencies for boilers and other mechanical equipment components modified, or furnished and installed as a part of the Contract work.

## PART 2 – PRODUCTS

Not Used.

## PART 3 - EXECUTION

3.1 FIELD PAINTING: Conform to Section 099000, "Painting".

3.1.1 Painting Schedule: In addition to other painting requirements in the Specifications, Plans and manufacturer's recommendations, the following items are to be painted as specified, unless indicated otherwise.

- a. Uninsulated ferrous piping
- b. Steel supports and structures
- c. Pipe insulation installed outdoors, above grade
- d. Plastic piping installed outdoors, above grade

3.1.2 Painted Insulation: Apply two coats of satin finish latex enamel. Colors shall be in accordance with the Attachment to this Specification Section. Prepare to paint each piping loop a different color, as selected by Owner. Paint manufacture shall be as by Sherwin Williams, Model Metalatex, or approved equal.

### 3.2 LOOP FLUIDS

3.2.1 The Contractor is responsible to completely fill and vent air out of all systems after all equipment has been installed and tested in accordance with the manufacturer's instructions. After testing for leaks, the loops shall be flushed and cleaned as detailed below.

- a. Completely flush all loops with clean water. Clean all strainers.
- b. Drain all loops and refill with water/detergent mixture. Detergent shall be Garrett Callahan Formula 248, or approved equal. Quantity of detergent and flush period as recommended by manufacturer. Clean all strainers.
- c. Drain all loops and refill with clean water. Circulate all loops with clean water to rinse. Clean all strainers.
- d. Drain all loops and refill with clean water or with specified loop fluids. Water to be tested and treated appropriately.

### 3.3 FINAL TEST

3.3.1 The Contractor is responsible to startup, adjust and test all installed equipment and systems, in accordance with manufacturer's instructions, the Contract documents and generally accepted industry practices. The final result must be a complete operable test system.

3.4 IDENTIFICATION: Conform to Division 23 - Mechanical.

++ END OF SECTION ++



## SECTION 23 05 29

### HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT

#### PART 1 - GENERAL

##### 1.01 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Companion high density filler pieces for installation over the top 180 degree surface of pipe or tubing, at points of support where a combination clevis hanger, insulation shield and high density insulating saddle are installed.

##### 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Piping Insulation: Section 230701.

##### 1.03 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements":

- A. Shop Drawings:
  - 1. Details of trapeze hangers and upper hanger attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.
  - 2. Details of pipe anchors.
  - 3. Details and method of installing restraints, anchors, and supports for grooved end piping systems
  - 4. Drawings identifying seismic locations with corresponding details of pre-approved seismic restraints, with seismic loads and seismic force level (Fp) calculations; pre-engineered and stamped by a NYS Licensed Professional Engineer experienced in seismic restraint systems.
- B. Product Data: Submit to RPE. Catalog sheets, specifications and installation instructions for each item specified except fasteners.

#### PART 2 - PRODUCTS

##### 2.01 PIPE HANGERS AND SUPPORTS

- A. Combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddle with companion high density filler piece.

1. Insulating saddles and filler pieces shall be of the same thickness and materials as the adjoining pipe insulation. Saddles shall cover the lower 180 degrees of the pipe or tubing, and companion filler pieces shall cover the upper 180 degrees of the pipe or tubing. Physical sizes, gages, etc. of the components of insulated hangers shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAGE	SADDLE LENGTH (Inches)	VAPOR BARRIER JACKET LENGTH (Inches)
Up to 2-1/2	4	16	6	10
3 to 6	4	14	6	10
8 to 14	10	12	12	16
16 and up	10	10	12	16

- B. Pipe Insulation Shields: Fabricated of steel, with a minimum arc of 180 degrees, unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

PIPE OR TUBING SIZE (Inches)	SHIELD LENGTH (Inches)	SHIELD GAGE
Up to 2-1/2	8	18
3 to 8	10	16
10 to 14	12	12
16 and up	18	10

- C. Pipe Covering Protection Saddles: 3/16 inch thick steel, of sufficient depth for the insulation thickness specified, notched so that saddle contact with the pipe is approximately 50 percent of the total axial cross section. Saddles for pipe 12 inches in size and larger shall have a center support.
- D. Pipe Hangers: Height adjustable standard duty clevis type, with cross bolt and nut.
  1. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping 10 inches in size and larger.
- E. Adjustable Floor Rests and Base Flanges: Steel.
- F. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two nuts at each end for positioning rod and hanger, and locking each in place.
- G. Riser Clamps: Malleable iron or steel.

- H. Restraints, Anchors, and Supports for Grooved End Piping Systems: As recommended by the grooved end fitting manufacturer, and as required for seismic restraints.

## 2.02 ANCHORS AND ATTACHMENTS

- A. Sleeve Anchors (Group II, Type 3, Class 3): Molly's Div./USM Corp. Parasleeve Series, Ramset's Dynabolt Series, or Red Head/Phillips AN, HN, or FS Series.
- B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti's Kwik Bolt Series, Molly's Div./USM Corp. Parabolt PB Series, Ramset's Trubolt T Series, or Red Head/Phillips WS Series.
- C. Non-Drilling Anchors (Group VIII, Type 1): Not permitted.
- D. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS Series.
- E. Beam Clamps: Forged steel beam clamp, with weldless eye nut (right hand thread), steel tie rod, nuts, and washers, Grinnell's Fig No. 292 (size for load, beam flange width, and rod size required).
- F. Continuous Slotted Type Concrete Insert, Galvanized:
  - 1. Load Rating 800 lbs/ft: Kindorf's D-986.
  - 2. Load Rating 1500 lbs/ft: Kindorf's D-980.
  - 3. Load Rating 3000 lbs/ft: Hohmann & Barnard's Inc. Type CS-H.
  - 4. Load Rating 4500 lbs/ft: Hohmann & Barnard's Inc. Type CS-HD.
- G. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive 3/4 inch diameter machine bolts.
- H. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept 3/4 inch diameter bolts having special wedge shaped heads.

## 2.03 FASTENERS

- A. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.04 SHOP PAINTING AND PLATING

- A. Hangers, supports, rods, inserts and accessories used for pipe supports, unless chromium plated, cadmium plated or galvanized shall be shop coated with metal primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper pipe or copper tubing.
- B. Hanger supports for chromium plated pipe shall be chromium plated brass.

PART 3 – EXECUTION

3.01 PREPARATORY WORK

- A. Place inserts into construction form work expeditiously, so as not to delay the Work.

3.02 INSTALLATION

- A. Do not hang or support one pipe from another or from ductwork.
  - 1. Do not bend threaded rod.
- B. Support all insulated horizontal piping conveying refrigerants or other fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.
- C. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.
  - 1. For Steel, Alloy Steel, Threaded Brass Pipe and Fibrous Glass Reinforced Plastic Pipe (FRP):

PIPE SIZE (Inches)	MAXIMUM SPACING (Feet)
1 and under	8
1-1/4 and 1-1/2	9
2	10
2-1/2 and up	12

2. For Grooved End Steel Pipe:

PIPE SIZE (Inches)	MAXIMUM SPACING (Feet)
1-1/2 and under	7
2 through 4	10
5 and over	12

No pipe length shall be left unsupported between any two coupling joints.

3. For Copper Pipe and Copper Tubing:

PIPE OR TUBING SIZE (Inches)	MAXIMUM SPACING (Feet)
1-1/2 and under	6
2 and over	10

4. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.
5. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.
6. For Branch Piping Runs and Runouts Over 5 feet In Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.
7. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material being used.

D. Size hanger rods in accordance with the following:

PIPE OR TUBING SIZE (Inches)	SINGLE ROD HANGER SIZE (Inches)		DOUBLE ROD HANGER SIZE (Inches)	
	PIPE	TUBING	PIPE	TUBING
1/2 to 2	3/8	1/4	3/8	1/4
2-1/2 and 3	1/2	3/8	3/8	1/4
4 and 5	5/8	1/2	1/2	3/8
6	3/4	1/2	5/8	1/2
8, 10 and 12	7/8	5/8	3/4	5/8

1. Size hanger rods, for piping over 12 inches in size and multiple line supports, based on a safety factor of five for the ultimate strength of the materials being used.
  2. Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each rod, two at upper hanger attachment and two at hanger.
- E. Vertical Piping:
1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.
  2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.
  3. Install intermediate supports between riser clamps on maximum 6 foot centers, for copper tubing risers 1-1/4" in size and smaller, installed in finished rooms or spaces other than mechanical equipment machine or steam service rooms, or penthouse mechanical equipment rooms.
- F. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

### 3.03 UPPER HANGER ATTACHMENTS

- A. General:
1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
  2. Do not attach hangers to steel decks that are not to receive concrete fill.
  3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
  4. Do not use flat bars or bent rods as upper hanger attachments.
- B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.

1. Do not use drive-on beam clamps.
  2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
  3. Do not drill holes in main structural steel members.
  4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer's recommended limits.
- C. Attachment to Concrete Filled Steel Decks:
1. Existing Construction: Install welding studs (except at roof decks). Do not support a load in excess of 250 lbs from any single welded stud.
  2. Do not attach hangers to decks less than 2-1/2 inches thick.
- D. Attachment to Cast-In-Place Concrete: Secure to overhead construction by means of cast-in-place concrete inserts.
- E. Attachment to Existing Cast-In-Place Concrete:
1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.
  2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.
- F. Attachment to Cored Precast Concrete Decks (Flexicore, Dox Plank, Spancrete, etc.): Toggle bolts may be installed in cells for the support of piping up to a maximum of 2-1/2 inches in size.
- G. Attachment to Hollow Block or Hollow Tile Filled Concrete Decks:
1. Existing Construction: Break out block or tile to access, and install machine bolt anchors at highest practical point on side of web.
- H. Attachment to Waffle Type Concrete Decks:
1. Existing Construction: Install machine bolt expansion anchors at highest practical point on side of web.
- I. Attachment to Precast Concrete Tee Construction:
1. Existing Construction: Dual unit expansion shields in webs of tees. Install shields as high as possible in the webs.
    - a. Exercise extreme care in the field drilling of holes to avoid damage to reinforcing.
    - b. Do not use powder driven fasteners.

### 3.04 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS AND SWAY BRACES

- A. Install pipe anchors, restraints and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner that will not affect the structural integrity of the building.
- B. In grooved end piping systems, install restraints, and rigid supports as recommended by the manufacturer of the grooved end fittings to ensure proper support and alignment of the piping under operating and testing pressures (maximum hanger or support spacing shall be as previously specified).
  - 1. Horizontal piping shall maintain a constant pitch without sags, humps, or lateral deflections.
  - 2. Branch piping shall remain perpendicular to main piping and/or risers.
  - 3. Vertical piping shall remain plumb without deflections.
  - 4. Vertical piping shall be rigidly supported, or anchored at both top and bottom, and wherever necessary to prevent movement and/or shearing forces at branch connections.

### 3.05 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

- A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180 degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

### 3.06 PIPE INSULATION SHIELDS

- A. Unless otherwise specified, install a pipe insulation shield per detail on Contract Drawings and at all points of support. Center shields on all hangers and supports outside of high density insulation insert, and install in such a manner so as not to cut, or puncture jacket.

### 3.07 PIPE COVERING PROTECTION SADDLES

- A. Install pipe covering protection saddles at all points of support, for steel piping 6 inches in size and larger, insulated with hot service insulation. Weld saddles to piping to insure movement with pipe.



3.08 FIBROUS GLASS REINFORCED PLASTIC PIPE (FRP) SUPPORTS: (Provide in areas where explosion proof equipment is installed.)

A. Provide inserts between supports and FRP as detailed on Contract Drawings.

++ END OF SECTION ++

## SECTION 23 05 53

### IDENTIFICATION FOR HVAC PIPING & EQUIPMENT

#### PART 1 – GENERAL

1.1 DESCRIPTION: Under this Section, the Contractor shall furnish all labor, materials and equipment for identification of mechanical equipment including all pumps, fans, piping and valves using color bands, lettering, flow direction arrows, and related permanent identification devices for Identification For HVAC Piping & Equipment, as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American National Standards Institute, Inc. (ANSI) Publications:

A13.1	Scheme for the Identification of Piping Systems
Z535.1	Safety Color Code

1.3 GENERAL REQUIREMENTS: The following related sections shall be referenced for further information: Section 230501, “Mechanical General Requirements”, Section 230701, “Insulation of Mechanical Systems”, and Section 233113, “Ductwork and Ductwork Accessories”.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, “Mechanical General Requirements”:

- a. Label, Tag and Nameplate materials
- b. List of wording, symbols, letter size, and color coding to be used
- c. Valve chart
- d. Accessory materials

#### PART 2 - PRODUCTS

2.1 MANUFACTURERS: Pipe labels, valve tags and equipment nameplates shall be as manufactured by Marking Services Incorporated, or equal.

2.1.1 NAMEPLATES: Three-ply laminated phenolic plastic at least 1/16" thick with black surfaces and white core. Engraving shall be minimum 1/2" high with appropriate spacing. Text shall be white on black background. Nomenclature shall match the equipment designation as indicated on the Plans and Schedules.

2.1.2 VALVE TAGS: Three-ply laminated phenolic plastic at least 1/16" thick with black surfaces and white core. Engraving shall be minimum 1/2" high with appropriate spacing. Text shall be white on black background. Valve tag shall be minimum 1-1/2" diameter with smooth edges.

2.1.3 PIPE MARKERS: Color, text and size shall conform to ASME/ANSI Standard A13.1.

- a. Plastic Pipe Markers: Strap-type labels shall be factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering with flow direction arrows and identification of fluid being conveyed. Straps shall be self locking nylon ties.
- b. Plastic Tape Pipe Markers: Self adhesive flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings with flow direction arrows and identification of fluid being conveyed.

2.1.4 DUCT MARKERS: Color, text and size shall conform to ASME/ANSI Standard.

- a. Plastic Tape Pipe Markers: Self adhesive flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings with flow direction arrows and identification of air being conveyed (ie SA, RA, OA, EA).

2.1.5 VALVE CHART: Valve chart(s) shall be printed on 8-1/2"x11" white paper with typewritten black text, minimum 12 point character size. Information to be provided shall be, at a minimum, the number, location, size and function of each line valve installed under this Contract. Chart shall be installed in a glazed frame and permanently mounted to wall in mechanical room or other suitable location coordinated with the Owner.

## PART 3 - EXECUTION

3.1 PREPARATION: Degrease and clean surfaces to receive adhesive for identification materials.

3.2 GENERAL: All markers shall be installed in accordance with manufacturer's printed instructions, and shall be neat and uniform in appearance. All tags or markers shall be oriented such that they are readily visible from all normal working locations. All equipment above lift-out ceilings or made accessible by access doors shall be labeled in the same manner as that of exposed equipment.

3.3 NAMEPLATES: Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. Equipment to be labeled shall include but not be limited to the following items: pumps, exhaust fans, air handling units, fan coil units, condensing units, chillers, heat exchangers, hot water heaters, boilers, storage tanks, water treatment equipment, air compressors, HVAC control devices and dampers, switches, control panels and other related devices.

3.4 VALVE TAGS: Install valve tags on all valves except simple service and drain valves located within 10 feet and sight distance of the device or equipment served. For example, it would not be expected that strainer blow-down valves in a machine room would be tagged. Each tag shall be attached to its valve with copper clad annealed iron wire, corrosion resistant chain, or other approved material.

3.5 PIPE MARKERS: Exposed piping shall be identified at intervals of 20 feet and at least one time in each room. Provide a pipe marker at each valve. Provide arrow markers at each pipe marker with arrows pointing away from the pipe marker to indicate direction of flow. Provide pipe and arrow marker at every point of pipe entry or exit where line penetrates a wall or service chase. Self-adhesive labels shall be used to identify piping under 6 inches in diameter when insulated and covered. For finished pipe sizes 6 inches and larger, strap type markers with self-locking nylon ties shall be utilized.

3.6 MISCELLANEOUS EQUIPMENT: Small items such as inline pumps shall be identified with tags in lieu of nameplates. Submit labeling plan to Engineer for devices and equipment not otherwise specified herein.

++ END OF SECTION ++

SECTION 23 05 93

TESTING AND BALANCING AIR AND WATER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Testing and Balancing Air and Water Systems as shown on the Plans, as specified, and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 Associated Air Balance Council (AABC) Publication:

National Standards for Total System Balance (NSFTSB)

1.2.2 National Environmental Balancing Bureau (NEBB) Publication:

Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems

1.2.3 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Publication:

ASHRAE Handbook of Fundamentals

1.3 GENERAL REQUIREMENTS: The provisions of Section 230501, "Mechanical General Requirements", apply to this Section.

1.3.1 Definitions:

1.3.1.1 Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment, (e.g., reduce fan speed, throttling, etc.)

1.3.1.2 Procedure: Standardize approach and execution of sequence of work operations to yield reproducible results.

1.3.1.3 Report Forms: Test data sheets arranged for collection of test data in logical order to submission and review. This data should also form the permanent record which shall be used as the basis for any future testing, adjusting, and balancing required.

1.3.1.4 Test: To determine quantitative performance of equipment.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements

1.4.1 Standards Compliance:

- a. Testing Agency
- b. Testing Agency Personnel
- c. Professional Engineers
- d. Instrument Calibration

1.4.2 Schedules:

- a. Testing Agenda

1.4.3 Reports:

- a. Preliminary Report
- b. Certified Report

1.5 TESTING AND BALANCING AGENCY

1.5.1 Air and Water Systems Testing and Balancing: Upon completion of the installation and field testing, performance test and adjust the supply, return, make-up, and exhaust air systems, and heating systems to provide the air volume and water flow quantities indicated. Accomplish all work in accordance with the agenda and procedures specified and AABC NSFTSB and standards of the National Environmental Balancing Bureau (NEBB). Correct water system performance deficiencies disclosed by the test before balancing the systems.

1.5.2 Agency Qualifications: The Contractor, as part of this Contract shall obtain the services of a qualified testing organization to perform the testing and balancing work as herein specified. Prior to commencing work under this Section of Specifications, the testing organization shall have been approved by the Engineer. The criteria for determining qualifications shall be membership in the Associated Air Balance Council (AABC), or certification by the National Environmental Balancing Bureau.

1.5.3 Owner Selection: If the Contractor fails to submit the name of an acceptable agency, the Engineer may select a firm to accomplish the work, and the selection shall be binding upon the Contractor at no additional cost to the Owner.

## 1.6 TESTING AGENDA

1.6.1 Preliminary Report: Review Plans and Specifications prior to installation of any of the affected systems. Submit a written report to the Engineer indicating any deficiencies in the system that would preclude the proper adjusting, balancing, and testing of the systems.

1.6.2 Submittal: An agenda shall be submitted and approved by the Engineer prior to start of testing and balancing work. Include the following:

- a. General description of each air and water system with its associated equipment, and operation cycles for heating, intermediate and cooling. Where different cycles are used for day and night, they shall be described independently.
- b. A complete listing of all air and water flow and air terminal measurements to be performed.
- c. Specific test procedures and parameters for determining specified quantities; e.g., flow drafts, sound levels, etc., from the actual field measurements to establish compliance with Contract requirements.
- d. Samples of forms showing applications of procedures and calculations to typical systems.

1.6.3 Procedure Reporting: Provide specific test procedures for measuring air quantities at terminals. Specify type of instrument to be used, method of instrument application (by sketch), and factors for:

- a. Air terminal configuration
- b. Flow direction (supply or exhaust)
- c. Velocity corrections
- d. Density corrections (unless applicable data are covered elsewhere)

## 1.7 PROCEDURES AND INSTRUMENTS, GENERAL

1.7.1 Requirements: Adjust systems and components thereof that perform as required by Drawings and Specifications.

1.7.2 Test Duration: Operating tests of heating coils, fans and other equipment shall be of not less than four hours duration, after stabilized operating conditions have been established. Capacities shall be based on temperatures and air and water quantities measured during such tests.

1.7.3 Instrumentation: Method of application of instrumentation shall be in accordance with the approved agenda. Furnish all personnel, instruments and equipment for tests specified herein.

1.7.3.1 Accuracy of Instruments: Instruments used for measurements shall be accurate. Provide calibration histories for each instrument for examination. Calibrate each test instrument by an approved laboratory or by the manufacturer. The Engineer has the right to request instrument recalibration, or the use of other instruments and test methodology, where accuracy of readings is questionable.

1.7.3.2 Application of Instruments: Comply with manufacturer's certified instructions.

1.7.3.3 Permanently-Installed Instruments: Do not install permanently-installed equipment used for the tests, e.g., gages, thermometers, etc., until just prior to the tests to avoid damage and changes in calibration.

1.7.3.4 Accuracy of All Thermometers: Plus or minus 1 graduation at the temperatures to be measured. Gradations shall conform with the following schedule:

<u>Medium</u>	<u>Design Temperature Differential (°F)</u>	<u>Maximum Graduation (°F)</u>
Air	10 or less	1/2
Air	over 10	1
Water	10 or less	1/10
Water	10-20	1/2
Water	over 20	1

## PART 2 - PRODUCTS

(NOT USED)

## PART 3 - EXECUTION

### 3.1 AIR SYSTEM PROCEDURES

3.1.1 Adjustments: Adjust all air handling systems to provide the required design air quantity to, or through, each component. Conduct adjusting and balancing of systems during periods of the year approximating maximum seasonal operation.



3.1.2 Equalizers: Adjust equalizing devices to provide uniform velocity across the inlets (duct side for supply of terminals, prior to measuring flow rates).

3.1.3 Balance: Use flow adjusting (volume control and pulley/belt combination) devices to balance air quantities only, i.e., proportion flow between various terminals comprising system, and only to the extent that their adjustments do not create objectionable air motion or sound, i.e., in excess of specified limits.

3.1.3.1 Balancing between runs (submains, branch mains, and branches): Use flow regulating devices at, or in, the divided - flow fitting. Minimize restriction imposed by flow regulating devices in or at terminals.

3.1.3.2 Final Measurements of Air Quantity: Make final measurements of air quantity, after the air terminal has been adjusted to provide the optimum air patterns of diffusion.

3.1.4 Fan Adjustment: Total air system quantities, generally, shall be varied by adjustment of fan speeds, or axial-flow fan wheel blade pitch. For systems with direct-connected fans (without adjustable pitch blades), damper restrictions of a system's total flow may be used, only if system pressure is less than 1/2-inch w.g. and sound level criteria is met.

#### 3.1.5 Air Measurements and Balancing:

3.1.5.1 Pitot Tube: Except as specifically indicated herein, make pitot tube traverses of each duct to measure air flow therein. Pitot tubes, associated instruments, traverses, and techniques shall conform with the ASHRAE Handbook Fundamentals.

3.1.5.2 Pitot Tube Traverse: Except for ducts serving modular office area with movable partitions, which are subject to change, pitot-tube traverse may be omitted if the duct serves only a single room or space and its design volume is less than 200 cfm. In lieu of pitot-tube traverse, determine airflow in the duct by totaling volume of individual terminals served, measured as described herein.

3.1.5.3 Test Holes: Test holes, specified in Section entitled Ductwork and Accessories, shall be in a straight duct, as far as possible downstream from elbows, bends, take-offs, and other turbulence generating devices, to optimize reliability of flow measurements.

3.1.5.4 Air Terminal Balancing: Measurement of flow rates by means of velocity meters applied to individual terminals, with or without cones or other adapters, shall be used only for balancing. Measurement of air quantities at each type of air terminal (inlet and outlet) shall be determined by the method approved for balancing agenda. Conduct laboratory tests to prove accuracy of methodology when so directed by the Engineer. Perform such tests in conformance with ASHRAE Standards.

3.1.5.5 Air Motion and Distribution: As indicated. The Contractor, in addition to air motion measurements, shall make smoke tests wherever requested by the Engineer, to demonstrate the air distribution from air terminals.

## 3.2 WATER SYSTEM PROCEDURES

3.2.1 Adjustment: Adjust heating, water systems to provide required quantity to, or through, each component.

3.2.2 Metering: Measure water quantities and pressures with calibrated meters.

3.2.3 Water Measurements and Balancing: Use venturi tubes, orifices, or other metering fittings and pressure gages. Adjust systems to provide the approved pressure drops through the heat transfer equipment (coils (except room units), converters, etc.), prior to the capacity testing. Where flow metering fittings are not installed, determine flow balance by measuring temperature differential across the heat transfer equipment. Perform measurement of temperature differential with the air system, adjusted as described herein, in operation.

3.2.4 Automatic Controls: Position automatic control valves for full flow through the heat transfer equipment of the system during tests.

3.2.5 Flow: Flow through bypass circuits at three-way valves shall be adjusted to balance that through the supply circuit.

3.2.6 Distribution: Adjust distribution by means of balancing devices (cocks, valves and fittings) and automatic flow control valves. Do not use service valves for adjustment. Where automatic flow control valves are utilized in lieu of venturi tubes, record only pressure drop across the valve if said pressure drop is within the pressure drop rating on the valve tag.

3.3 AIR SYSTEM DATA: The certified report shall include for each air-handling system the data listed below:

- a. Equipment (fan or factory-fabricated station unit):
  - (1) Installation Data:
    - (a) Manufacturer and Model
    - (b) Size
    - (c) Arrangement, Discharge, and Class
    - (d) Motor H.P., Voltage, Phase, Cycles, and Full Load Amps
    - (e) Location and Local Identification Data
  - (2) Design data: Data listed in schedules on Drawings and Specifications.

- (3) Fan Recorded (Test) Data:
  - (a) C.F.M.
  - (b) Static Pressure
  - (c) R.P.M.
  - (d) Motor Operating Amps
  - (e) Motor Operating B.H.P.

3.4 WATER SYSTEM DATA: Report to include data listed below:

a. Pumps:

- (1) Installation Data:
  - (a) Manufacturer and Model
  - (b) Size
  - (c) Type Drive
  - (d) Motor HP, Voltage, Phase, Frequency and Full Load Amps
- (2) Design Data:
  - (a) Fluid Type
  - (b) Fluid Flow (G.P.M.)
  - (c) Head
  - (d) Motor R.P.M.
  - (e) Brake HP and Amps
- (3) Recorded Data:
  - (a) Discharge Pressures (Full-Flow and No-Flow)
  - (b) Suction Pressures (Full-Flow and No-Flow)
  - (c) Operating Head
  - (d) Operating G.P.M. (From pump curves if metering is not provided)
  - (e) No-Load Amps (Where possible)
  - (f) Full-Flow Amps
  - (g) No-Flow Amps
  - (h) Fluid Temperature

3.5 FIELD TEST

3.5.1 General: Make tests to demonstrate that capacities and general performance of air and water systems comply with Contract requirements.

3.5.1.1 Final Inspection; At the time of final inspection, the Contractor shall recheck, in the presence of the Engineer, random selections of data water and air quantities, air motion and sound levels recorded in the Certified Report.

3.5.1.2 Points and areas for recheck: As selected by the Engineer.

3.5.1.3 Measurement and Test Procedures: As approved for work forming basis of Certified Report.

3.5.1.4 Selections for Recheck (Specific Plus Random): In general, selections for recheck will not exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

3.5.2 Retests: If random tests elicit a measured flow deviation of ten percent or more from that recorded in the Certified Report listings, at ten percent or more of the rechecked selections, the report shall be automatically rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Reports submitted, and new inspection tests made.

3.5.3 Marking of Settings: Following final acceptance of Certified Reports by the Owner, the settings of all valves, and other adjustment devices shall be permanently marked by the Contractor, so that adjustment can be restored if disturbed at any time. Do not mark devices until after final acceptance.

++ END OF SECTION ++

SECTION 23 07 01

INSULATION OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Insulation of Mechanical Systems as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American Society for Testing and Materials (ASTM) Publications:

A167	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
C177	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus, Test Method
C195	Mineral Fiber Thermal Insulating Cement
C533	Calcium Silicate Block and Pipe Thermal Insulation
C534	Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
C547	Mineral Fiber Preformed Pipe Insulation
C552	Cellular Glass Block and Pipe Thermal Insulation
C553	Mineral Fiber Blanket and Felt Insulation (Industrial Type)
C592	Mineral Fiber Blanket Insulation and Blanket Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
C612	Mineral Fiber Block and Board Thermal Insulation

C795	Wicking-Type Thermal Insulation for Use Over Austenitic Stainless Steel
C916	Adhesives for Duct Thermal Insulation
C921	Properties of Jacketing Materials for Thermal Insulation
D227	Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing
E84	Surface Burning Characteristics of Building Materials
E96	Water Vapor Transmission of Materials

1.2.2 Manufacturers Standardization Society of the Valves and Fittings Industry (MSS) Publications:

SP58	Pipe Hangers and Supports - Materials, Design, and Manufacture
SP69	Pipe Hangers and Supports - Selection and Application

1.2.3 National Fire Protection Association (NFPA) Publication:

255	Surface Burning Characteristics of Building Materials
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1.2.4 Underwriters Laboratories, Inc. (UL) Publication:

723	Tests for Surface Burning Characteristics of Building Materials
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1.3 GENERAL REQUIREMENTS: Section 230501, "Mechanical General Requirements", with the additions and modifications specified herein applies to this Specification.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements"

1.4.1 Manufacturer's Data:

- a. Insulation
- b. Jackets
- c. Casings

- d. Vapor-barrier materials
- e. Accessory materials

1.4.2 Standards Compliance: Standards compliance labels are required on each container or package:

- a. Insulation
- b. Jackets
- c. Casings
- d. Vapor-barrier materials
- e. Accessory materials

## 1.5 DEFINITIONS

1.5.1 Finished Spaces: Spaces used for habitation or occupancy where rough surfaces are plastered, paneled, or otherwise treated to provide a pleasing appearance.

1.5.2 Unfinished Spaces: Spaces used for storage or work areas where appearance is not a factor, such as unexcavated spaces and crawl space.

1.5.3 Concealed Spaces: Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

1.5.4 Exposed: Open to view. For example, pipe running through a room and not covered by other construction.

1.5.5 Fugitive Treatments: Treatments subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, and heat. Fugitive materials are entrapped materials that can cause deterioration, such as solvents and water vapor.

1.5.6 Outside: Open to view up to 5 feet beyond the exterior side of walls, above the roof, and unexcavated or crawl spaces.

1.6 MANUFACTURER'S STAMP OR LABEL: Every package or standard container of insulation, jackets, cements, adhesives, and coatings delivered to the project site for use must have the manufacturer's stamp or label attached giving name of manufacturer, brand, and description of material. Insulation packages and containers shall be asbestos-free.

1.7 FLAME SPREAD AND SMOKE DEVELOPED RATINGS: In accordance with NFPA 255, ASTM E84 or UL 723, the materials shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.

1.7.1 Materials Tests: Test factory-applied materials as assembled. Field-applied materials may be tested individually. Use no fugitive or corrosive treatments to impart flame resistance. UL label or satisfactory certified test report from a testing laboratory will be required to indicate that fire hazard ratings for materials proposed for use do not exceed those specified. Flame-proofing treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

1.7.2 Materials Exempt From Fire-Resistant Rating: Nylon anchors.

1.7.3 Materials Exempt from Fire-Resistant Rating When Installed In Outside Locations, Buried, or Encased In Concrete: PVC casing and glass-fiber-reinforced plastic casing.

## PART 2 - PRODUCTS

2.1 PIPING SYSTEMS INSULATION: Piping systems (except buried pipe) requiring insulation, types of insulation required, and insulation thickness shall be as listed in Tables I and II herein. Except for flexible unicellular insulation, insulation thicknesses as specified in Table II shall be one inch greater for insulated piping systems located outside. Unless otherwise specified, insulate all fittings, flanges, and valves, except valve stems, hand wheels, and operators. Use factory premolded, precut, or field-fabricated insulation of the same thickness and conductivity as used on adjacent piping. Insulation exterior shall be factory cleanable, grease resistant, non-flaking and non-peeling. Pipe insulation shall conform to the referenced publications in Table I.

2.1.1 Flexible Unicellular Insulation: ASTM C534. The minimum density limit of 4.5 pounds per cubic foot may be waived if all other characteristics of the standard are met.

2.1.2 Piping Insulation Finishes:

2.1.2.1 All-Purpose Jacket: Except calcium silicate and unicellular insulation, provide a factory applied all-purpose jacket with or without integral vapor barrier as required by the service. Provide jackets in exposed locations with a white surface suitable for field painting. Allow a maximum water vapor permeance of 0.05 perm per ASTM E96, a puncture resistance of not less than 50 Beach units, and a minimum tensile strength of 35 pounds-force per inch of width.

2.1.2.2 Vapor-Barrier Material: Resistant to flame, moisture penetration, and mold growth. Provide vapor-barrier material on pipe insulation as required in Table I.

2.1.2.3 Metal Jackets: Provide a moisture-barrier lining for metal jackets located outside.



2.1.2.3.1 Piping, Fittings, Flanges, and Valves in Outside Locations: Finish elbows and curved piping with factory-fabricated metal covers. Finish tees, flanges, and valves with metal covers. Covers shall be same thickness and material as jackets on adjacent piping.

2.1.2.4 Vinyl Lacquer: Two coats of vinyl lacquer finish or equivalent according to the manufacturer's recommendations for unicellular insulation located outside.

2.2 EQUIPMENT: Insulate all equipment and accessories as specified in Table III. In outside locations, provide insulation one inch thicker than specified. Increase the specified insulation thickness for equipment only where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Additional insulation is not required for factory-insulated equipment.

### 2.3 ADHESIVES, SEALANTS, AND COATING COMPOUNDS

2.3.1 Adhesive for Securing Insulation to Metal Surfaces and Vapor Barrier Lap Adhesive (For Use in Building Interior Only): ASTM C916, Type I (an adhesive in which the vehicle is nonflammable in liquid (wet) state and which will pass the edge-burning test), or Type II (An adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will not pass the edge-burning test).

2.3.2 Mineral Fiber Insulation Cement: ASTM C195, thermal conductivity 0.85 maximum at 200 degrees F mean when tested per ASTM C177.

2.3.3 Weatherproof Coating: For outside applications use a weatherproof coating recommended by the manufacturer of the insulation and jackets.

### 2.4 ACCESSORIES

2.4.1 Staples: ASTM A167, Type 304 or 316 stainless steel outside-clinch type.

2.4.2 Insulation Bands: 3/4-inch wide; 0.021-inch galvanized steel or 0.018-inch stainless-steel or 0.20-inch aluminum.

2.4.3 Bands for Metal Jackets: 3/8-inch minimum width; 0.01-inch stainless-steel or 0.020-inch aluminum.

2.4.4 Anchor Pins: Provide anchor pins and speed washers recommended by the insulation manufacturer.

2.4.5 Glass Cloth and Tape: Tape shall be 4-inch wide rolls. Class 3 tape shall be 4.5 ounces per square yard. In lieu of glass cloth and tape, open weave glass membrane may be used.

2.4.6 Coal-Tar-Saturated Organic Felt: ASTM D227, minimum weight of 13 pounds per 100 square feet.

2.4.7 Wire: Soft annealed stainless steel, 0.047-inch nominal diameter.

2.5 Duct Insulation: ducts shall be insulated per Section 233113

TYPE	SERVICE AND TEMPERATURES	INSULATION MATERIAL	PIPE SIZES (INCHES)	MINIMUM (NOMINAL) INSULATION THICKNESS (INCHES)
A & B	Refrigerants	Flex. Elastomeric	1 & less	1
		Foam	1-1/4 and Up	1-1/2

- A. Fibrous Glass (Mineral Fiber) Insulation: Composed principally of fibers manufactured from rock, slag, or glass, with or without binders, and asbestos free.
1. Preformed Pipe Insulation: Minimum density 3 pcf; ASTM C 547:
    - a. Class 1 (Suitable for Temperatures Up to 450 degrees F): K of 0.26 at 75 degrees F.
    - b. Class 2 (Suitable for Temperatures 451 to 650 degrees F): K of 0.46 at 300 degrees F.
    - c. Class 3 (Suitable for Temperatures 651 to 1200 degrees F): K of 0.56 at 300 degrees F.
  2. Premolded Fitting Insulation: Minimum density 4.0 pcf, K of 0.26 at 75 degrees F; ASTM C 547, Class 1.
  3. Insulation Inserts for PVC Fitting Jackets: Minimum density 1.5 pcf, K of 0.28 at 75 degrees F; ASTM C 553, Type III.
    - a. Suitable for temperatures up to 450 degrees F.
  4. Block or Board Insulation: Minimum density 3.0 pcf and 6.0 pcf as specified; ASTM C 612:
    - a. Type IA or IB (Suitable for Temperatures Up to 450 degrees F): K of 0.26 at 75 degrees F.
    - b. Type II (Suitable for Temperatures 451 to 850 degrees F): K of 0.44 at 300 degrees F.
    - c. Type III (Suitable for Temperatures 851 to 1000 degrees F): K of 0.44 at 300 degrees F.

- d. Type IV (Suitable for Temperatures 1001 to 1200 degrees F): K of 0.37 at 300 degrees F.
- e. Type V (Suitable for Temperatures 1201 to 1800 degrees F): K of 0.42 at 300 degrees F.
- 5. Thermal and Acoustic Board Insulation: Minimum density 3.0 pcf, K of 0.27 at 75 degrees F; ASTM C 1071, Type II.
  - a. Air Stream Side: Erosion, temperature, and fire resistant type; NFPA 90-A and 90-B.
- 6. Blanket Insulation:
  - a. For Ductwork (Suitable for Temperatures Up to 450 Degrees F): Minimum density 1.0 pcf, K of 0.31 at 75 degrees F; ASTM C 553, Type II.
  - b. For Breeching (Suitable for Temperatures up to 1200 degrees F): Minimum density 8 pcf, K of 0.55 at 400 degrees F, metal mesh faced one side; ASTM C 553, Type VII.
- B. Flexible Elastomeric Foam Insulation:
  - 1. FM tested and approved, meeting the following:
    - a. Maximum Water Vapor Transmission: 0.10 perm - inch based on ASTM E 96, Procedure A.
    - b. K of 0.27 at 75 degrees F based on ASTM C 518 or C 177.
    - c. Fire Spread/Smoke Developed Rating: 25/50 or less based on ASTM E 84.
  - 2. Pipe Insulation: ASTM C 534, Type I.
  - 3. Sheet Insulation for Ductwork and Equipment: ASTM C 534, Type II, smooth skin one side.
  - 4. Polyethylene and polyolefin insulation is not acceptable.

## PART 3 - EXECUTION

3.1 PREPARATION: Do not insulate materials until all system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and dried. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction with valve handle, safety relief, etc. Allow adequate space for pipe expansion. Conditioned space shall be defined as an area, room or space normally occupied and being heated or cooled for human habitation by any equipment. Install insulation with jackets drawn tight and cement down on longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems. Extend all surface finishes to protect all surfaces, ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Provide a moisture and vapor seal where insulation terminates against metal hangers, anchors and other projections through the insulation on

surfaces for which a vapor seal is specified. Keep insulation dry during the application of any finish. Bevel and seal the edges of exposed insulation. Unless otherwise indicated, do not insulate the following:

- a. Vibration isolating connections.
- b. Adjacent insulation.
- c. ASME stamps.
- d. Fan nameplates.
- e. Access plates in fan housings.

### 3.2 PIPING INSULATION

3.2.1 Pipe Insulation (Except Unicellular and Calcium Silicate Insulation): Place sections of insulation around the pipe and joints tightly butted into place. The jacket laps shall be drawn tight and smooth. Secure jacket with fire resistant adhesive, factory applied self sealing lap, or stainless steel outward clinching staples spaced not over 4 inches on centers and 1/2 inch minimum from edge of lap. Cover circumferential joints with butt strips, not less than 3-inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1-1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps. Apply staples to both edges of the butt strips. When a vapor barrier jacket is required, as indicated in TABLE I, or on the ends of sections of insulation that butt against flanges, unions, valves, and fittings, and joints, use a vapor-barrier coating or manufacturer's weatherproof coating for outside service. Apply this vapor barrier coating at all longitudinal and circumferential laps. Patch damaged jacket material by wrapping a strip of jacket material around the pipe and cementing, stapling, and coating as specified for butt strips. Extend the patch not less than 1-1/2 inches past the break in both directions. At penetrations by pressure gauges and thermometers, fill the voids with the vapor barrier coating for outside service. Seal with a brush coat of the same coating. Do not use staples to secure jacket laps on pipes carrying fluid medium at temperatures below 35 degrees F. Where penetrating roofs, insulate piping to a point flush with the top of the flashing and seal with the vapor barrier coating. Butt tightly the exterior insulation to the top of the flashing and interior insulation. Extend the exterior metal jacket 2 inches down beyond the end of the insulation. Seal the flashing and counterflashing underneath with the vapor barrier coating. In chilled and cold water piping in high humidity areas, use cellular glass, or flexible unicellular insulation.

3.2.2 Flexible Unicellular Insulation: Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Where pipes penetrate fire walls, provide mineral-fiber insulation inserts and sheet-metal sleeves. Insulate flanges, unions, valves, and fittings in accordance with manufacturer's published instructions. Apply two coats of vinyl lacquer finish to flexible unicellular insulation in outside locations.

3.2.3 Calcium Silicate Pipe Insulation: Secure insulation with stainless steel metal bands on 12-inch maximum centers. For high temperature piping (above 600 degrees F); unless single layer insulation is recommended by the manufacturer, apply insulation in two layers with the joints tightly butted and staggered a minimum of 3 inches. Secure the inner layer of insulation with 14 gauge soft annealed stainless steel wire on 12-inch maximum centers. The outer layer shall be secured with stainless steel metal bands on 12-inch maximum centers. Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface. At Contractors option secure 0.016 metal jacket to surface of insulation in accordance with paragraph titled "Metal Jackets for Outside Ductwork".

3.2.4 Hangers and Anchors: Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide MSS SP58, Type 40 galvanized steel shields or MSS SP58, Type 39 protection saddles conforming to MSS SP69. Where shields are used on pipes 2 inches and larger, provide insulation inserts at points of hangers and supports. Insulation inserts shall be of calcium silicate, cellular glass (minimum 8 pcf), molded glass fiber (minimum 8 pcf), or other approved material of the same thickness as adjacent insulation. Inserts shall have sufficient compressive strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Insulation inserts shall cover the bottom half of the pipe circumference 180 degrees and be not less in length than the protection shield. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation with vapor barrier coating, or for exterior work, manufacturers recommended weatherproof coating, as applicable. Where protection saddles are used, fill all voids with the same insulation material as used on the adjacent pipe. Where anchors are secured to chilled piping that is to be insulated, insulate the anchors the same as the piping for a distance not less than four times the insulation thickness to prevent condensation. Vapor seal insulation around anchors.

3.2.5 Sleeves and Wall Chases: Where penetrating interior walls, extend a metal jacket 2 inches out on either side of the wall and secure on each end with a band. Where penetrating floors, extend a metal jacket from a point below the back-up material to a point 10 inches above the floor with one band at the floor and one not more than one inch from end of metal jacket. Where penetrating exterior walls, extend the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall.

### 3.3 EQUIPMENT INSULATION

3.3.1 General Procedures: Apply equipment insulation suitable for temperature and service in rigid block or semirigid board or flexible form to fit as closely as possible to equipment. Groove or score insulation where necessary to fit the contours of equipment. Stagger end joints where possible. Bevel the edges of the insulation for cylindrical surfaces to provide tight joints. Join

sections of cellular glass insulation with bedding compound. After the cellular glass insulation is in place on areas to be insulated, except where metal-encased, fill joints, seams, chipped edges, or depressions with bedding compound to form a smooth surface. Fill mineral fiber joints with insulating cement conforming to ASTM C195. Bevel insulation around nameplates, ASME Stamp, and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Protect exposed insulation corners with corner angles under wires and bands.

3.3.2 Pumps: Insulate pumps used for hot service with 2-inch thick rigid mineral fiber insulation as follows: Insulate pumps by forming a box around the pump housing, drive shaft, and piping. Apply insulation to inside surfaces of 20-gauge galvanized sheet-metal boxes having openings for drive shaft and pipes. Construct the box by forming the bottom and sides using joints which do not leave raw ends of insulation exposed. Band bottom and sides to form a rigid housing that does not rest on the pump. Between top cover and sides, fit joints tightly forming a female shiplap joint on the side pieces and a male joint on the top cover to make the top cover removable. Secure insulation to the box with adhesive. Allow clearance for draining and adjustment of pump shaft seal.

3.4 PAINTING AND IDENTIFICATION: Paint in accordance with Section 09910, "Painting of Buildings". Piping identification shall be as specified in Section 230553, "Identification for HVAC Piping & Equipment".

3.5 FIELD INSPECTION: Visually inspect to ensure that materials used conform to specifications. Inspect installations progressively for compliance with requirements.

<b>TABLE I INSULATION MATERIAL FOR PIPING</b>					
<b>SERVICE</b>	<b>MATERIAL</b>	<b>SPEC.</b>	<b>TYPE</b>	<b>CLASS</b>	<b>VAPOR BARRIER REQUIRED</b>
Domestic Hot Water	Mineral Fiber	ASTM C547		1	No
Boiler Water Piping	Mineral Fiber	ASTM C547		1	No

<b>TABLE II PIPING INSULATION WALL THICKNESS</b>					
<b>SERVICE</b>	<b>MATERIAL</b>	<b>TUBE AND PIPE SIZE (INCHES)</b>			
		<b>£ 1-1/2</b>	<b>2 - 3</b>	<b>3-1/2 - 5</b>	<b>6 - 10</b>
Domestic Cold Water Piping	Mineral Fiber	1	1-1/2	1-1/2	1-1/2
Domestic Hot Water	Mineral Fiber	1-1/2	2	2	2
Boiler Water Piping	Mineral Fiber	1-1/2	2	2	2

<b>TABLE III INSULATION FOR EQUIPMENT</b>				
<b>MATERIAL</b>	<b>SPEC</b>	<b>TYPE</b>	<b>CLASS</b>	<b>VAPOR BARRIER REQUIRED</b>
Rigid Mineral Fiber or Cellular Glass	ASTM C612		2	No
	ASTM C552	I		No

<b>EQUIPMENT</b>	<b>RECOMMENDED WALL THICKNESS</b>	<b>VAPOR BARRIER REQUIRED</b>
Air Separators	2"	For Hot Water Systems
All Pumps	2"	For Hot Water Systems

++ END OF SECTION ++

SECTION 23 11 23

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Facility Natural-Gas Piping, as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American Gas Association (AGA) Publications:

B109.1	Diaphragm Type Gas Displacement Meters (500 Cubic Feet Per Hour Capacity and Under)
B109.2	Diaphragm Type Gas Displacement Meters (Over 500 Cubic Feet Per Hour Capacity)
B109.3	Rotary Type Gas Displacement Meters

1.2.2 American National Standards Institute, Inc. (ANSI) Publications:

B1.1	Unified Screw Threads
B1.20.1	Pipe Threads, General Purpose (Inch)
B16.3	Malleable Iron Threaded Fittings
B16.5	Pipe Flanges and Flanged Fittings
B16.9	Factory-Made Wrought Steel Butt Welding Fittings
B16.11	Forged Steel Fittings, Socket-Welding and Threaded
B16.33	Manually Operated Metallic Gas Valves for use in Gas Piping Systems up to 125 psig (Sizes 1/2 through 2)



B16.38	Large Metallic Valves for Gas Distribution (Manually Operated, NPS 2-1/2 to 12, 125 psig Maximum)
B16.39	Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300
B16.40	Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
B18.2.1	Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws
B18.2.2	Square and Hex Nuts (Inch Series)
B31.8	Gas Transmission and Distribution Piping Systems
Z21.41	Quick-Disconnect Devices for Use with Gas Fuel
Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances
Z21.69	Connectors for Movable Gas Appliances
Z21.70	Earthquake Actuated Automatic Gas Shutoff Systems

1.2.3 American Society for Testing and Materials (ASTM) Publications:

A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A193	Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
A194	Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
D2513	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
D2683	Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

1.2.4 American Society of Mechanical Engineers (ASME) Publication:

BPVSEC8	Boiler and Pressure Vessel Code, Division 1 Rules for Construction of Pressure Vessels
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1.2.5 Code of Federal Regulations (CFR) Publications:

49 PT 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Supply Standards
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49 PT 195	Transportation of Hazardous Liquids by Pipeline
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1.2.6 Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Publications:

SP 58	Pipe Hangers and Supports - Materials, Design, and Manufacture
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SP 69	Pipe Hangers and Supports - Selection and Application
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SP 89	Pipe Hangers and Supports - Fabrication and Installation Practices
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1.2.7 Military Standard (MIL-STD):

101	Color Code for Pipelines and for Compressed Gas Cylinders
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1.2.8 National Fire Protection Association (NFPA) Publications:

54	National Fuel Gas Code
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58	Storage and Handling of Liquefied Petroleum Gases
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1.3 RELATED REQUIREMENTS: Section 230501, "Mechanical General Requirements", applies to this Section, with additions and modifications specified herein.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements"

1.4.1 Manufacturer's Catalog Data:

- a. Pipe and fittings
- b. Valve boxes

- c. Hangers and supports
- d. Pressure regulator
- e. Gas equipment connectors
- f. Valves
- g. Warning tape
- h. Risers
- i. Transition fittings
- j. Gas meter

#### 1.4.2 Manufacturer's Instructions:

- a. PE pipe and fittings

Submit manufacturer's installation instructions and manufacturer's visual joint appearance chart.

#### 1.4.3 Statements:

- a. Welders' qualifications
- b. PE welders' qualifications
- c. Welders' identification symbols

Submit a copy of a certified ANSI B31.8 qualification test report for each welder and welding operator. Submit the assigned number, letter, or symbol that will be used in identifying the work of each welder.

#### 1.4.4 Certificates of Compliance:

- a. PE pipe and fittings
- b. Transition fittings

### 1.5 QUALITY ASSURANCE

1.5.1 Welder's Qualifications: Comply with ANSI B31.8. The steel welder shall have a copy of a certified ANSI B31.8 qualification test report. The PE welder shall have a certificate from a PE pipe manufacturer's sponsored training course. Contractor shall also conduct a qualification test. Submit each welder's assigned number, letter, or symbol used to identify work of the welder. Affix symbols immediately upon completion of welds. Welders making defective welds after passing a qualification test shall be given a requalification test and, upon failing to pass this test, shall not be permitted to work this Contract.

1.5.2 PE Piping Installers' Qualifications: Prior to installation, Contractor shall have supervising and installing personnel trained by a PE pipe manufacturer's sponsored course of not less than one week duration, or present proof satisfactory to the Engineer that personnel are currently working in the installation of PE gas distribution lines.

1.5.3 Safety Standards: 49 CFR PT 192 and 49 CFR PT 195.

1.6 DELIVERY, STORAGE, AND HANDLING: Handle, transport, and store plastic pipe and fittings carefully. Plug or cap pipe ends during transportation or storage to minimize dirt and moisture entry. Do not subject to abrasion or concentrated external loads. Discard PE pipe sections and fittings that have been damaged.

## PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT: Conform to NFPA 54 and with requirements specified herein. Supply piping to appliances or equipment shall be at least as large as the inlets thereof.

### 2.2 PIPE AND FITTINGS:

#### 2.2.1 Below Ground:

##### A. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
  - a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
  - b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering
  - c. Aboveground Portion: PE transition fitting.
  - d. Outlet shall be threaded or flanged or suitable for welded connection.
  - e. Tracer wire connection.
  - f. Ultraviolet shield.
  - g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.
  - a) Underground Portion: Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
    - a. Outlet shall be threaded or flanged or suitable for welded connection.
    - b. Bridging sleeve over mechanical coupling.
    - c. Factory-connected anode.
    - d. Tracer wire connection.
    - e. Ultraviolet shield.
    - f. Stake supports with factory finish to match steel pipe casing or carrier pipe.
  
5. Plastic Mechanical Couplings, NPS 1-1/2 (DN 40) and Smaller: Capable of joining PE pipe to PE pipe.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Lyall, R. W. & Company, Inc.
    - 2) Mueller Co.; Gas Products Div.
    - 3) Perfection Corporation; a subsidiary of American Meter Company.
  - b. PE body with molded-in, stainless-steel support ring.
  - c. Buna-nitrile seals.
  - d. Acetal collets.
  - e. Electro-zinc-plated steel stiffener.
  
6. Plastic Mechanical Couplings, NPS 2 (DN 50) and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Lyall, R. W. & Company, Inc.
    - 2) Mueller Co.; Gas Products Div.
    - 3) Perfection Corporation; a subsidiary of American Meter Company.
  - b. Fiber-reinforced plastic body.
  - c. PE body tube.
  - d. Buna-nitrile seals.
  - e. Acetal collets.
  - f. Stainless-steel bolts, nuts, and washers.
  
7. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) Dresser Piping Specialties; Division of Dresser, Inc.

- 2) Smith-Blair, Inc.
  - b. Steel flanges and tube with epoxy finish.
  - c. Buna-nitrile seals.
  - d. Steel bolts, washers, and nuts.
  - e. Factory-installed anode for steel-body couplings installed underground.

2.2.2 Riser: Manufacturer's standard riser, transition from plastic to steel pipe with 7-to-12 mil thick epoxy coating. Use swaged gas-tight construction with O-ring seals, metal insert, and protective sleeve. Provide wall-mounted riser supports.

### 2.3 SHUTOFF VALVES, BELOW GROUND

2.3.1 Metallic Ball Valves: ANSI B16.33 or ANSI B16.38 corrosion-resisting steel, with threaded or flanged ends. Provide polytetrafluoroethylene (PTFE) seats.

### 2.4 VALVES, ABOVEGROUND

2.4.1 Shutoff Valves, Sizes 2 Inches and Smaller: Bronze body ball valve in accordance with ANSI B16.33, full port pattern, reinforced PTFE seals, threaded ends, and PTFE seat.

2.4.2 Pressure Regulator: Self-contained with spring-loaded diaphragm pressure regulator, psig to inches water reduction, pressure operating range as required for the pressure reduction indicated, volume capacity not less than indicated, and threaded ends for sizes 2 inches and smaller, otherwise flanged.

2.5 GAS METER: By Utility provider.

### 2.6 GAS EQUIPMENT CONNECTORS:

- a. Flexible Connectors: ANSI Z21.45.
- b. Quick Disconnect Couplings: ANSI Z21.41.
- c. Semi-Rigid Tubing and Fittings: ANSI Z21.69.

2.7 VALVE BOX: Provide rectangular concrete valve box, sized large enough for removal of valve without removing box. Cast the word "Gas" into the box cover. Use valve box for areas as follows:

- a. Roads and Traffic Areas: Heavy duty, cast iron cover.
- b. Other Areas: Standard duty, concrete cover.

2.8 BURIED UTILITY WARNING AND IDENTIFICATION TAPE: Provide detectable aluminum-foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3-inch minimum width, color-coded yellow for natural gas, with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall be "CAUTION BURIED GAS PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2.9 HANGERS AND SUPPORTS: MSS SP58, as required by MSS SP69.

2.10 WELDING FILLER METAL: ANSI B31.8.

2.11 PIPE-THREAD TAPE: Anti-seize and sealant tape of polytetrafluoroethylene (PTFE).

2.12 BOLTING (BOLTS AND NUTS): Stainless steel bolting; ASTM A193, Grade B8M or B8MA, Type 316, for bolts; and ASTM A194, Grade 8M, Type 316, for nuts. Dimensions of bolts, studs, and nuts shall conform with ANSI B18.2.1 and ANSI B18.2.2 with coarse threads conforming to ANSI B1.1, with Class 2A fit for bolts and studs and Class 2B fit for nuts. Bolts or bolt-studs shall extend through the nuts and may have reduced shanks of a diameter not less than the diameter at root of threads. Bolts shall have American Standard regular square or heavy hexagon heads; nuts shall be American Standard heavy semi-finished hexagonal.

2.13 GASKETS: Fluorinated elastomer, compatible with flange faces.

2.14 IDENTIFICATION FOR ABOVEGROUND PIPING: MIL-STD-101 for legends and type and size of characters. For pipes 3/4-inch od and larger, provide printed legends to identify contents of pipes and arrows to show direction of flow. Color code label backgrounds to signify levels of hazard. Make labels of plastic sheet with pressure-sensitive adhesive suitable for the intended application. For pipes smaller than 3/4-inch od, provide brass identification tags 1-1/2 inches in diameter with legends in depressed black-filled characters.

2.15 DIELECTRIC FITTINGS

2.15.1 General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined

2.15.2 Unions in first paragraph below are available in at least NPS 1/2 to NPS 2 (DN 15 to DN 50).

2.15.3 Dielectric Unions:

2.15.3.1 Basis-of-Design Product: Subject to compliance with requirements, provide Wilkins; a Zurn company; Model DUBI or comparable product by one of the following:

- a. Capitol Manufacturing Company
- b. Central Plastics Company
- c. Hart Industries International, Inc.
- d. Jomar International Ltd.
- e. Matco-Norca, Inc.
- f. McDonald, A. Y. Mfg. Co.
- g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2.15.3.2 Description:

- a. Standard: ASSE 1079.
- b. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F.
- c. End Connections: Solder-joint copper alloy and threaded ferrous.

## 2.16 ABOVE-GROUND PIPING

2.16.1 Above ground Piping: Steel pipe: to ASTM A 53/A53M, Schedule 40, seamless as follows:

- a. NPS 1/2 to 2 1/2, screwed.

2.16.2 Jointing Material: Screwed fittings: pulverized lead paste

2.16.3 Steel pipe fittings, screwed:

- a. Malleable iron: screwed to ANSI B16.3, Class 150 for service pressures up to and including 861 kPa.
- b. Unions: malleable iron, brass to iron, ground seat, to ASTM A47M.
- c. Nipples: schedule 40, to ASTM A53.

2.16.4 Manual Shut-Off Valves: NPS 4 and under, full port, forged brass ball valve for two piece body construction complete with the following:

- a. Blowout-proof stem.
- b. Adjustable packing gland.
- c. Chrome-plated ball.
- d. Class 150 WSP, 600 WOG.
- e. CGA 3.16 approved.
- f. Provide complete with CRN.
- g. Lever handle.
- h. ANSI B1.20.1 NPT end connections.



## PART 3 - EXECUTION

3.1 INSTALLATION: Install gas piping, appliances, and equipment in accordance with NFPA 54.

3.1.1 Excavating and Backfilling: Perform excavating and backfilling of pipe trenches as specified in "Excavation, Backfilling and Compacting for Utilities" section. Place pipe directly in trench bottom and cover with minimum 3 inches of sand to top of pipe. If trench bottom is rocky, place pipe on a 3-inch bed of sand and cover as above. Provide remaining backfilling. Coordinate provision of utility warning and identification tape with backfill operation. Bury utility warning and identification tape with printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

3.1.2 Piping: Cut pipe to actual dimensions and assemble to prevent residual stress. Within buildings, run piping parallel to structure lines and conceal in finished spaces. Terminate each vertical supply pipe to burner or appliance with tee, nipple and cap to form a sediment trap. To supply multiple items of gas-burning equipment, provide manifold with inlet connections at both ends.

3.1.2.1 Cleanliness: Clean inside of pipe and fittings before installation. Blow lines clear using 80 to 100 psig clean dry compressed air. Rap steel lines sharply along entire pipe length before blowing clear. Cap or plug pipe ends to maintain cleanliness throughout installation.

3.1.2.2 Aboveground Steel Piping: Determine and establish measurements for piping at the job site and accurately cut pipe lengths accordingly. For 2-inch diameter and smaller, use threaded or socket-welded joints. For 2-1/2 inch diameter and larger, use flanged or butt welded joints.

- a. Threaded Joints: Where possible, use pipe with factory-cut threads, otherwise cut pipe ends square, remove fins and burrs, and cut taper pipe threads in accordance with ANSI B1.20.1. Provide threads smooth, clean, and full-cut. Apply anti-seize paste or tape to male threads portion. Work piping into place without springing or forcing. Backing off to permit alignment of threaded joints will not be permitted. Engage threads so that not more than three threads remain exposed. Use unions for connections to valves and meters for which a means of disconnection is not otherwise provided.
- b. Welded Joints: Weld by the shielded metal-arc process, using covered electrodes and in accordance with procedures established and qualified in accordance with ANSI B31.8.

- c. Flanged Joints: Use flanged joints for connecting welded joint pipe and fittings to valves to provide for disconnection. Install joints so that flange faces bear uniformly on gaskets. Engage bolts so that there is complete threading through the nuts and tighten so that bolts are uniformly stressed and equally torqued.
- d. Pipe Size Changes: Use reducing fittings for changes in pipe size. Size changes made with bushings will not be accepted.
- e. Painting: Paint new ferrous metal piping, including supports, in accordance with "Painting" Section. Do not apply paint until piping tests have been completed.
- f. Identification of Piping: Identify piping above ground in accordance with MIL-STD-101, using adhesive-backed or snap-on plastic labels and arrows. In lieu of labels, identification tags may be used. Apply labels or tags to finished paint at intervals of not more than 50 feet. Provide two copies of the piping identification code framed under glass and install where directed.

## 3.2 OUTDOOR PIPING INSTALLATION

### 3.2.1 Comply with NFPA 54 for installation and purging of natural-gas piping.

3.2.2 NFPA 54 requires a minimum of 18 inches (450 mm) of cover over buried natural-gas piping, or 12 inches (300 mm) with shielding. Pipe with less than 12 inches (300 mm) of cover must be installed in a containment conduit.

3.2.2.1 If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

### 3.2.3 Copper Tubing with Protective Coating:

- a. Apply joint cover kits over tubing to cover, seal, and protect joints.
- b. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

3.2.3.1 Connections to Existing Pipeline: When making connections to live gas mains, use pressure tight installation equipment operated by workmen trained and experienced in making hot taps. For connections to existing underground pipeline or service branch, use transition fittings for dissimilar materials.

3.2.3.2 Wrapping: Where connection to existing steel line is made underground, tape wrap new steel transition fittings and exposed existing pipe having damaged coating. Clean pipe to bare metal. Initially stretch first layer of tape to conform to the surface while spirally

half-lapping. Apply a second layer, half-lapped and spiraled as the first layer, but with spirals perpendicular to first wrapping. Use 10-mil minimum thick polyethylene tape. In lieu of tape wrap, heat shrinkable 10-mil minimum thick polyethylene sleeve may be used.

3.2.4 Valves: Install valves approximately at locations indicated. Orient stems vertically, with operators on top, or horizontally. Provide support for valves to resist operating torque applied to PE pipes.

3.2.4.1 Pressure Regulator: Provide plug cock or ball valve ahead of regulator. Install regulator outside of building and 18 inches above ground on riser. Install gas meter in conjunction with pressure regulator. On outlet side of regulator, provide a union and a 3/8-inch gauge tap with plug.

3.2.4.2 Stop Valve and Shutoff Valve: Provide stop valve on service branch at connection to main and shut-off valve on riser outside of building.

3.2.5 Pipe Sleeves: Where piping penetrates concrete or masonry wall, floor or firewall, provide pipe sleeve poured or grouted in place. Make sleeve of steel or cast-iron pipe of such size to provide 1/4-inch or more annular clearance around pipe. Extend sleeve through wall or slab and terminate flush with both surfaces. Pack annular space with oakum, and caulk at ends with silicone construction sealant.

3.2.6 Piping Hangers and Supports: Selection, fabrication, and installation of piping hangers and supports shall conform with MSS SP 69 and MSS SP 89, unless otherwise indicated.

3.2.7 Final Connections: Make final connections to equipment and appliances using rigid pipe and fittings, except for the following:

3.2.7.1 Modular Boiler: Connect with AGA-approved semi-rigid tubing and fittings.

### 3.3 FIELD QUALITY CONTROL

3.3.1 Metal Welding Inspection: Inspect for compliance with NFPA 54 and ANSI B31.8. Replace, repair, and then reinspect defective welds.

3.3.2 Pressure Tests: Use test pressure of 1-1/2 times maximum working pressure, but in no case less than 50 psig. Do not test until every joint has set and cooled at least 8 hours at temperatures above 50 degrees F. Conduct testing before backfilling; however, place sufficient backfill material between fittings to hold pipe in place during tests. Test system gas tight in accordance with NFPA 54. Use clean dry air or inert gas, such as nitrogen or carbon dioxide, for testing. Systems which may be contaminated by gas shall first be purged as specified. Make tests on entire system or on sections that can be isolated by valves. After pressurization, isolate entire piping system from sources of air during test period. Maintain test pressure for at least 8 hours

between times of first and last reading of pressure and temperature. Take first reading at least one hour after test pressure has been applied. Do not take test readings during rapid weather changes. Provide temperature same as actual trench conditions. There shall be no reduction in the applied test pressure other than that due to a change in ambient temperature. Allow for ambient temperature change in accordance with the relationship  $PF + 14.7 = (P1 + 14.7) (T2 + 460) / T1 + 460$ , in which "T" and "PF" represent Fahrenheit temperature and gauge pressure, respectively, subscripts "1" and "2" denote initial and final readings, and "PF" is the calculated final pressure. If "PF" exceeds the measured final pressure (final gauge reading) by 1/2 psi or more, isolate sections of the piping system, retest each section individually, and apply a solution of warm soapy water to joints of each section for which a reduction in pressure occurs after allowing for ambient temperature change. Repair leaking joints and repeat test until no reduction in pressure occurs. In performing tests, use a test gauge calibrated in one-psi increments and readable to 1/2 psi.

3.3.3 System Purging: After completing pressure tests, and before testing a gas contaminated line, purge line with nitrogen at junction with main line to remove all air and gas. Clear completed line by attaching a test pilot fixture at capped stub-in line at building location and let gas flow until test pilot ignites. Procedures shall conform to NFPA 54.

-CAUTION-

Failure to purge may result in explosion within  
line when air-to-gas is at correct mixture.

### 3.4 SERVICE-METER ASSEMBLY INSTALLATION

3.4.1 Service meters are often installed by utility. Retain this article to require Contractor to install service meter. Install meter assemblies in heated spaces if natural gas contains moisture.

3.4.2 Install service-meter assemblies aboveground on concrete bases.

3.4.3 Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

3.4.4 Install strainer on inlet of service-pressure regulator and meter set.

3.4.5 Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

3.4.6 Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

3.4.7 Install service meters downstream from pressure regulators.

3.4.8 Install metal bollards to protect meter assemblies.

### 3.5 VALVE INSTALLATION

3.5.1 Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

3.5.2 Install underground valves with valve boxes.

3.5.3 Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.5.4 Install earthquake valves aboveground outside buildings according to listing.

3.5.5 Install anode for metallic valves in underground PE piping.

### 3.6 PIPING JOINT CONSTRUCTION:

3.6.1 Ream ends of pipes and tubes and remove burrs.

3.6.2 Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3.6.3 Threaded Joints:

- a. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
- b. Cut threads full and clean using sharp dies.
- c. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
- d. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.

3.6.3.1 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.6.4 Welded Joints:

- a. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
- b. Bevel plain ends of steel pipe.
- c. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.6.5 Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

3.6.6 Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not over tighten.

3.6.7 Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

- a. NPS 1 and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch.
- b. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
- c. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

3.6.8 Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:

- a. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
- b. NPS 1/2 and NPS 5/8: Maximum span, 72 inches; minimum rod size, 3/8 inch.
- c. NPS 3/4 and NPS 7/8: Maximum span, 84 inches; minimum rod size, 3/8 inch.
- d. NPS 1: Maximum span, 96 inches; minimum rod size, 3/8 inch.

### 3.7 CONNECTIONS:

3.7.1 Connect to utility's gas main according to utility's procedures and requirements.

3.7.2 Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

3.7.3 Install piping adjacent to appliances to allow service and maintenance of appliances.

3.7.4 Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

3.7.5 Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

### 3.8 PAINTING:

3.8.1 Comply with requirements in Section 09 90 00 "Painting".

3.8.2 Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

### 3.8.2.1 Alkyd System: MPI EXT 5.1D.

- a. Prime Coat: Alkyd anticorrosive metal primer.
- b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
- c. Topcoat: Exterior alkyd enamel flat.
- d. Color: Gray.

3.8.2.2 Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

### 3.8.2.3 Latex Over Alkyd Primer System: MPI INT 5.1Q.

- a. Prime Coat: Alkyd anticorrosive metal primer.
- b. Intermediate Coat: Interior latex matching topcoat.
- c. Topcoat: Interior latex flat.
- d. Color: Gray.

3.8.3.4 Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

## 3.9 OUTDOOR PIPING SCHEDULE

3.9.1 Underground natural-gas piping shall be the following:

### 3.9.1.1

Steel pipe with malleable-iron fittings and threaded joints.

3.9.2 Aboveground natural-gas piping shall be the following:

3.9.2.1 PE pipe is available in NPS 1/2 to NPS 16 (DN 15 to DN 400), maximum NPS 2 (DN 50) in 1000-foot (305-m) rolls.

## 3.10 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

3.10.1 Aboveground, branch piping NPS 1 and smaller shall be the following:

- a. PE pipe is available in NPS 1/2 to NPS 16 (DN 15 to DN 400), maximum NPS 2 (DN 50) in 1000-foot (305-m) rolls.

3.10.2 Aboveground, distribution piping shall be the following:

- a. PE pipe is available in NPS 1/2 to NPS 16 (DN 15 to DN 400), maximum NPS 2 (DN 50) in 1000-foot (305-m) rolls

++ END OF SECTION ++



SECTION 23 21 13

HYDRONIC PIPING

PART 1 - GENERAL

1.1 DESCRIPTION:

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Mechanical Piping Systems as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American National Standards Institute (ANSI) Publications:

15	Safety Code for Mechanical Refrigeration
17	Capacity Rating of Thermostatic Refrigerant Expansion Valves, Method of Testing
B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
B1.20.1	Pipe Threads, General Purpose, Inch
B16.3	Malleable Iron Threaded Fittings Class 150 and 300
B16.5	Pipe Flanges and Flanged Fittings
B16.9	Factory-Made Wrought Buttwelding Fittings
B16.10	Face-to-Face and End-to-End Dimensions of Ferrous Valves
B16.11	Forged Fittings, Socket Welding and Threaded
B16.18	Cast Copper Alloy Solder-Joint Pressure Fittings
B16.21	Nonmetallic Flat Gaskets for Pipe Flanges
B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

B16.24	Cast Copper Alloy Pipe: Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500, and 2500
B16.34	Valves-Flanged and Buttwelding End
B18.2.1	Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws
B18.2.2	Square and Hex Nuts
B31.1	Power Piping
B31.5	Refrigeration Piping
B31.9	Building Services Piping
B40.100	Pressure Gauges and Gauge Attachments
Z49.1	Safety In Welding, Cutting and Allied Processes

1.2.2 American Society for Testing and Materials (ASTM) Publications:

A53/A53M	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
A194	Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
A307	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
A525	Sheet Steel, Zinc-Coated (Galvanized) by the Hot-Dip Process
B32	Solder Metal
B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
D1654	Painted or Coated Specimens Subjected to Corrosive Environments
D2657	Heat Fusion Joining of Polyolefin Pipe and Fittings

D2683	Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
D3035	Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
D3261	Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
D3350	Polyethylene Plastic Pipe and Fittings Material
F714	Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

1.2.3 American Welding Society, Inc. (AWS) Publication:

A5.8	Brazing Filler Metal
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1.2.4 The Copper Development Association, Inc., Publication:

Copper Tube Handbook

1.2.5 Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Publications:

SP58	Pipe Hangers and Supports - Materials, Design and Manufacture
SP69	Pipe Hangers and Supports - Selection and Application
SP70	Cast Iron Gate Valves, Flanged and Threaded Ends
SP80	Bronze Gate, Globe, Angle and Check Valves
SP83	Carbon Steel Pipe Unions Socket-Welding and Threaded

1.3 GENERAL REQUIREMENTS: Section 230501, "Mechanical General Requirements", applies to this Section with additions and modifications specified herein.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements

#### 1.4.1 Manufacturer's Data:

- a. Piping and Fittings
- b. Gaskets
- c. Valves
- d. Piping Accessories
- e. Hangers and Supports
- f. Sight Glass
- g. Filter Driers
- h. Control Valves and Accessories
- i. Pressure Gauges
- j. Strainers
- k. Thermal Expansion Valves
- l. Thermometers

1.4.2 Welding Submittals: As required by ANSI B31.9 and ANSI B31.5.

1.4.3 Polyethylene Pipe Submittals: (In addition to manufacturer's data called out in 1.4.1.)

1.4.3.1 Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage, and repair of pipe and fittings damaged.

1.4.3.2 Certification of workmen training for installing pipe.

1.4.3.3 The manufacturer of the HDPE pipe shall certify and submit that the materials used to manufacture pipe and fittings meet or exceed the requirements of this Specification.

#### 1.5 WELDING REQUIREMENTS

1.5.1 Welding Procedure: Before any welding is performed, the Contractor shall submit to the Owner's Representative three copies of welding procedure specification for all metals included in the work, together with proof of its qualifications in accordance with ANSI B31.9 and ANSI B31.5.

1.5.2 Performance Qualification Record: Before any welder or operator performs any welding, the Contractor shall also submit to the Owner's Representative three copies of the Welder's Performance Qualification Record in conformance with ANSI B31.9 and ANSI B31.5 showing that the welder was tested under the approved procedure specification submitted by the Contractor. In addition, the Contractor shall submit the assigned number, letter, or symbol used to identify the work of the welder, and affix it immediately upon completion of the weld. Give welders making defective welds, after passing a qualification test, a requalification test, and do not permit them to work under this Contract if they fail the requalification test.

1.5.3 Previous Qualifications: Welding procedures, welders, and welding operators previously qualified by test may be accepted for this Contract without requalifying subject to the approval of the Owner's Representative and provided that all the conditions specified in ANSI B31.9 and ANSI B31.5 are met before a procedure is used.

## 1.6 CPVC PIPE JOINTING REQUIREMENTS

1.6.1 CPVC pipe jointing shall be performed by personnel trained in the use of butt-fusion, saddle-fusion and socket-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall receive training in the proper methods for handling and installing the CPVC pipe. Training shall be performed by a qualified representative.

## 1.7 SAFETY PRECAUTIONS

1.7.1 Refrigerant Piping Safety: ANSI 15.

1.7.1.1 Refrigerant Handling: Follow safety regulations and refrigerant manufacturer's instructions to prevent hazardous exposure to personnel.

1.7.2 Rotating Equipment Safety: Fully guard couplings, motor shafts, gears and other exposed rotating or rapidly moving parts in accordance with ASME B15.1. The guards shall be cast iron or expanded metal. Guard parts shall be rigid, secured, and readily removable without disassembling the guarded unit.

1.7.3 Welding and Cutting Safety: ANSI Z49.1.

## PART 2 - PRODUCTS

2.1 PIPING SCHEDULE: Piping shall be provided in accordance with the following schedule unless specified or indicated otherwise.

SERVICE	SIZES	PIPE	JOINT
Refrigerant Piping, Make-up Water Piping	2-1/2 Inches and Larger (NPS)	Schedule 40, Seamless, ASTM A53 Grade B	Butt Welded or Flanged, ANSI B16.9 or ANSI B16.5, Class 150
	2 Inches and Smaller (NPS)	Schedule 40, Seamless, ASTM A53 Grade B	Threaded, ANSI B16.3, Class 150, Malleable Iron
Heating Glycol	All Sizes (IPS)	Schedule 80 CPVC pressure pipe as described in ASTM F-441. MATERIAL: CPVC used is of type 4, grade 1 compound as stated in ASTM D-1784	Threaded, socket joints or Butt-Fusion

## 2.2 VALVES

2.2.1 Control Valves: Provide globe type or butterfly type (as indicated), cast iron body, 3-way mixing valves with flanged connections and electric actuators as scheduled. Valves shall be spring return to normally open position, equal percentage. Valve shall be as manufactured by Johnson Controls, or equal, with appropriate actuator for service.

2.2.2 Gate Valves 2-1/2 Inches and Larger: Valves shall be of ASTM A126, Class B cast iron, flanged, Class 125, OS&Y with rising stem, bolted bonnet and ASTM B62 bronze disc and seat. Manufacture shall be as by Stockham (Figure G-623), or equal.

2.2.3 Gate Valves 2 Inches and Smaller: Valves shall be of ASTM B62 bronze, screwed, Class 150, rising stem, union bonnet with solid bronze disc and threaded ends. Manufacture shall be as by Stockham (Fig. B-120), or equal.

2.2.4 Globe Valves 2 Inches and Smaller: Valves shall be of ASTM B62 bronze, screwed, Class 150, union bonnet, with renewable ASTM A276, Type 420 stainless steel seat and disc and threaded ends. Manufacture shall be as by Stockham (Fig. B-29), Crane, Powell, or equal.

2.2.5 Hose Valves: Valves shall be bronze, 3/4-inch angle type with standard threaded connection inlet and threaded hose connection outlet. Provide valves with threaded cap for hose connection. Valves shall be as manufactured by Conbraco, 31 Series, Watts Regulator Model HB-1, or equal.

2.2.6 Butterfly Valves 2 Inches and Larger: Valves shall be resilient seated butterfly valves with ductile iron bodies and discs, lug body, drilled and tapped, pressure Class 200 per MSS SP67 with lever actuator. Furnish with handwheel, chainwheel, or lockable actuators where indicated. Shut off shall be bubble-tight at 200 psig. Manufacture shall be as by Stockham (Fig. LD-712), or equal.

2.2.7 Pressure Relief Valve: Valve shall be diaphragm assist-operated bronze body ASME Safety Relief Valve. Inlet size shall be minimum 3/4 inch with a relief setting as shown on Plan. Manufacture shall be as by Bell and Gossett, Kunkle, or approved equal.

2.2.8 Triple Duty Valve: Straight pattern, flanged cast-iron valve body with built on bonnet for 175 psig operating pressure, non-slam check valve with spring loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation. Manufacture shall be as by Bell and Gossett, or equal.

2.2.9 Ball Valves: 2-1/2 Inches and Smaller: 600 psi CWP, cast bronze bodies, two-position levers, replaceable reinforced Teflon seats, full-port, blow-out proof stems, chrome plated brass ball and threaded connections. Manufacture shall be as by Stockham, Crane, Apollo, or equal.

2.2.10 Balancing Valves 2 Inches and Smaller:

2.2.10.1 Manufacturers: Flow Design Inc., or approved equal.

2.2.10.2 Design:

- a. Approved shut-off valves shall be provided on the inlet and outlet of the coil. All equipment to be serviced or components with a potential leak path shall be on the coil side of these valves.
- b. A Y-strainer with a 20 mesh strainer element shall be provided on the inlet side of the coil. It shall have a brass hose-end drain valve with a cap and retainer strap. When piped directly to a drain line a 1/2" ball drain valve shall be used.
- c. Unions shall be provided for coil and ATC valve removal.
- d. Pressure/Temperature ports shall be provided on each side of the coil, the ATC valve, and the Y-strainer.
- e. Manual air vent shall be installed on the inlet and outlet sides of the coil.
- f. At the coil design flow the following pressure drops shall not be exceeded (pressure drops are in feet of water column): Coil - 10', Strainer (clean) - 1', Manual balancing valve - 2'. In the case of automatic balance valves the drop shall not exceed 7'.
- g. The balancing valve shall be located on the return side of the coil immediately before the service shut-off valve.

#### 2.2.10.3 Material and Construction:

- a. All equipment and components including the shut-off service valves shall be copper and/or DZR brass construction.
- b. If steel pipe is used for the run-outs, a dielectric nipple shall be used at the dissimilar metal junction.

#### 2.2.10.4 Testing and Ratings:

- a. All equipment and components shall be suitable for 250 psi and 250° F operation.
- b. All hook-up coils shall be leak proof and tested at 100 psi of air.
- c. Where automatic balancing valves are used, the factory must test at least ten percent of each batch for correct rate of flow over the entire range of rated differential pressure.

#### 2.2.10.5 Installation:

- a. All equipment and components shall be serviceable and usable.
- b. All joints shall be leak tested.
- c. Where applicable, factory assembled and tested combination valves and components are acceptable.
- d. The hook-up coil components shall be placed in such a manner that the coil can be removed without dismantling or cutting coil hook-up piping.
- e. When insulation exceeds 1", all valve handles, air vents, P/T ports and drains shall be extended an additional 1 1/2" to clear insulation. Also, all these components shall be visible and accessible. Do not insulate heating hook-up components.
- f. All equipment shall be installed in accordance with manufacturer's instructions.

#### 2.2.10.6 Packaging:

- a. All fittings needed for each individual coil shall be shipped from the factory in a single container which shall be labeled to indicate the appropriate terminal.
- b. The packages for individual terminals shall further be grouped according to individual floors or regions of the building for easy routing to the appropriate location.

#### 2.2.10.7 Quality Assurance:

- a. The producer of automatic or manual balancing fittings shall have current ISO 9000 certification.

2.2.11 Check Valve: 3 Inches and Larger: Swing type check valves shall be ASTM A126B cast iron body flanged, Class 125, bolted cap with bronze trim. Manufacture shall be as by Stockham (Fig. G-932), or equal.



2.2.12 Check Valve 2-1/2 Inches and Smaller: Swing type check valves shall be ASTM B62 bronze body, threaded, Class 125, threaded cap with bronze trim. Manufacture shall be as by Stockham (Fig. B319), or equal.

2.2.13 Suction Diffusers: Provide size and type noted on the drawings. Unit shall consist of angle type body with inlet vanes and combination diffuser-strainer-orifice cylinder with 3/16-inch diameter openings for pump protection. A permanent magnet shall be located within the flow stream and shall be removable for cleaning. The orifice cylinder shall be equipped with a disposable fine mesh strainer which shall be removed after system start-up. Orifice cylinder shall be designed to withstand a pressure differential of 75 psi and shall have a free area equal to five times the cross section area of the pump suction opening. Vane length shall be no less than 2-1/2 times the pump connection diameter. Maximum pressure drop of unit shall be 1.7 psig. Unit shall be provided with an adjustable support foot to carry the weight of the suction piping. Body shall be of cast iron construction with ANSI 150 lb., flanged ends. Manufacture shall be as by Bell and Gossett, Armstrong Pumps, or equal.

2.2.14 Strainers 2-1/2 Inches and Larger: Strainers shall be Y-pattern type, cast iron body, flanged, Class 125 with 20 mesh Monel screen. Provide all strainers with bronze blow-down valve. Provide hose connection on strainer blow-down. Manufacture shall be as by Muessco, Crane, or equal.

2.2.15 Strainers 2 Inches and Smaller: Strainers shall be Y-pattern type, bronze body, screwed, Class 125, with 20 mesh Monel screen. Provide all strainers with bronze blow-down valve. Provide hose connection on strainer blow-down. Manufacture shall be as by Muessco, Crane, or equal.

2.2.16 Pressure Gauges: Furnish pressure gauges with black phenol cases constructed of glass filled polypropylene. Gauge face shall have a diameter of 4-1/2 inches. Gauges shall be stem mounted with phosphor bronze bourdon tubes. Manufacture shall be as by Ashcroft (Model 1279), or equal. Furnish with bronze 1/4 turn ball valve. Pressure range shall be 0-100 psig.

2.2.17 Thermometers: Thermometers for sensing liquid temperatures shall be vertical scale immersion type furnished with a brass temperature well. Thermometers shall have a hinge assembly permitting adjustment for scale readability. Temperature ranges for chilled and condenser water shall be 0 to 180°F. Manufacture shall be as by Weksler Instruments, or equal.

2.2.18 Thermowell: Reduced tip stainless steel thermowells to accept temperature sensing devices. Immersion length shall be as required and connections shall be 3/4-inch NPT. Manufacture shall be as by Burns Engineering, or equal.

2.2.19 Flexible Connection: Connector shall be of nylon cord fabric bonded to neoprene elastomer reinforced with spring steel wire. Flanges shall be zinc-coated plate steel with drilled bolt holes of ANSI 150 lb. class. Body shall be rated for 3 times the system working pressure as well as 26-inch Hg vacuum. Adjacent piping/equipment shall be anchored and supported to eliminate dead weight loading of the connector. Manufacture shall be Flex-Hose Co., Model Flezorber NNS, or equal.

2.2.20 Manual Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

2.2.21 CPVC Piping: Corrosion resistant pressure pipe, IPS sizes 1/4" through 24", for use at temperatures up to and including 200°F. Pressure rating (130 psi to 1130 psi) varies with schedule, pipe size, and temperature. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens. Chemical resistance data is available and should be referenced for proper material selection. Pipe exhibits excellent physical properties and flammability characteristics. Typical applications include: chemical processing, plating, high purity applications, hot and cold potable water systems, water and wastewater treatment, and other applications involving hot corrosive fluid transfer.

2.2.22 Scope: This pipe is intended for use in applications where the fluid conveyed does not exceed 200°F. This pipe meets and or exceeds the industry standards and requirements as set forth by the American Society for Testing and Materials (ASTM) and the National Sanitation Foundation (NSF).

2.2.23 CPVC Materials: The material used in the manufacture of the pipe shall be a rigid chlorinated polyvinyl chloride (CPVC) compound, Type IV Grade 1, with a Cell Classification of 23447 as defined in ASTM D1784. This compound shall be light gray in color as specified, and shall be approved by NSF use with potable water.

2.2.24 Dimensions: CPVC Schedule 80 pipe shall be manufactured in strict accordance to the requirements of ASTM F441 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to this standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM F441. All belled-end pipe shall have tapered sockets to create an interference type fit, which meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672. This pipe shall have a flame spread rating of < 25 and a Smoke Development rating of < 50 when tested for surface burning characteristics in accordance with CAN/ULC-S102-2-M88 or equivalent.

## PART 3 - EXECUTION

3.1 INSTALLATION: Install piping and piping components to ensure proper and efficient operation of the equipment and controls and in accordance with manufacturer's printed instructions. Provide proper supports for the mounting of vibration isolators, stands, guides,

anchors, clamps and brackets. Arrange piping connections to equipment so that removal of equipment or components of equipment including tube withdrawal from chillers, pump casing, shaft seals and similar work can be accomplished with the least amount of disassembly or removal of the piping system. Provide piping connected to equipment with vibration isolators with flexible connections which shall conform to vibration and sound isolation requirements for the system. Electric isolation shall be provided between dissimilar metals to reduce the rate of galvanic corrosion.

#### 3.1.1 Water Piping: ANSI B31.9.

3.2 PIPING SYSTEMS: Cut to the measurements established at the site and work into place without springing or forcing. Install piping with line flexibility included to absorb the expansion and contraction due to temperature changes of the piping systems. Piping line flexibility shall be achieved by the use of pipe bends or loops.

3.2.1 Flanged Joints: Faced true, square, tight and used as indicated and where necessary for normal maintenance. Mate with valves and the various equipment connections. Remove the raised faces when used with flanges having a flat face.

3.2.2 Reducing Fittings: Use to connect changes of sizes in piping lines. Make branch connections with tees except that factory-made, forged-steel welding branch outlets or nozzles having integral reinforcements and conforming to ANSI B31.9 may be used if the nominal diameter of the piping system branch does not exceed one nominal pipe size less than the nominal size of the piping segment containing the fitting. Reducer bushing shall not be used.

3.2.3 Insulation: Piping insulation shall be in accordance with Section 230701, "Insulation of Mechanical Systems", with enough clearance allowed between pipes to permit application of the insulation.

#### 3.2.4 Brazing and Soldering:

3.2.4.1 Brazing and Brazing Procedure Qualification for refrigerant piping systems shall conform to ANSI B31.5. Brazing procedure for joints shall be in accordance with the procedure as outlined in the "Copper Tube Handbook" published by the Copper Development Association, Inc., except that during the brazing operation the tubing shall be protected from forming an oxide film on the inside of the tubing by slowly flowing dry nitrogen to expel the air.

3.2.4.2 Soldering: The preparation and procedures for the soldering of joints shall conform to ANSI B31.9 and ANSI B31.5 and shall be in accordance with the procedure as outlined in the "Copper Tube Handbook" published by the Copper Development Association, Inc.

3.2.5 Dielectric Unions or Flanges: Provide between ferrous and nonferrous piping, equipment, and fittings; except that bronze valves and fittings may be used without dielectric couplings for ferrous-to-ferrous or nonferrous-to-nonferrous connections. Flanges and unions shall conform to the requirements of ANSI B16.10.

3.2.6 Pipe Hangers and Supports: Where not shown, design and fabrication of pipe hangers, supports, and welding attachments shall conform to MSS SP58. Hanger types and supports for bare and covered pipes shall conform to MSS SP69 for the system temperature range. Unless otherwise indicated, horizontal and vertical piping attachments shall conform to MSS SP58. Provide metal protection shields and inserts for insulated piping in accordance with Section 230701, "Insulation of Mechanical Systems".

3.2.6.1 Maximum Spacing Between Supports:

- a. Vertical Piping: Support cast-iron, copper tube, PVC pipe, and steel pipe at not more than 10-foot intervals.
- b. Horizontal Piping: Support cast-iron piping at 5-foot intervals, except for pipe exceeding 5-foot length, provide supports at intervals equal to the pipe length but not exceeding 10 feet. Support copper tubing, PVC pipe, and steel pipe as follows:

MAXIMUM SPACING (FEET)						
Nominal Pipe Size (Inches)	One and Under	1.25	1.5	2	2.5	3 and Over
Copper Tube	6	6	8	8	9	10
PVC	4	4	4	4	4	4
CPVC	3	4	4	4	4	4

3.2.7 Pipe Sleeves: Provide pipe sleeves for pipes and tubing which penetrate the building structures as shown. Securely retain sleeves in position and location before and during construction. Space between pipe and sleeves shall be not less than 1/4 inch or greater than 1 inch between outside of pipe, and inside wall of sleeves. Fill the annular space with silicone sealer as shown. Seal terminal ends of pipe insulation with mastic where required.

3.3 COOLING TOWER GLYCOL PIPING, SUBFLOOR HEATING GLYCOL PIPING (IN MECHANICAL ROOM), BRINE COOLANT PIPING (IN MECHANICAL ROOM), AND REFRIGERANT RELIEF PIPING

3.3.1 Fabrication and Assembly of Piping and Components: Welding, heating, and soldering shall conform to ANSI B31.9 and as specified herein. Provide sufficient pitch to assure adequate drainage and venting throughout system. Provide drain valves at low points of piping system, and air vent valves at high points where air pockets would occur. All piping shall follow the general arrangement shown, cut accurately to measurements established for the work by the Contractor, and worked into place without springing or forcing, except where cold-springing is indicated. All piping and equipment within buildings shall be entirely out of the way of adjacent

utilities. Provide adequate clearance from walls and floors to permit the welding of joints; at least 6 inches for pipe sizes 4 inches and less, 10 inches for pipe sizes over 4 inches, and in corners provide sufficient clearance to permit the welder to work between the pipe and one wall. Provide for expansion and contraction of pipelines. Make changes in size of waterlines with reducing fittings. Reducer bushings shall not be used. Do not bury, conceal, or insulate piping until inspected, tested, and approved. Protect materials and equipment from the weather. Do not miter pipe to form elbows, or notch straight runs to form full-sized tees, or utilize any similar construction. Except where shown otherwise, run vertical piping plumb and straight and parallel to walls. Thoroughly clean each section of pipe, fittings, and valves to be free of all foreign matter before erection. Prior to erection, hold each piece of pipe in an inclined position and thoroughly tap to loosen sand, mill scale, and foreign matter. Before all final connections are made to apparatus, wash the interior of all piping thoroughly with water. Blow out piping with high pressure steam or compressed air to remove rust scale, oil, and debris. Plug or cap open ends of mains during all shutdown periods. Do not leave lines open at any place where foreign matter might accidentally enter.

3.3.1.1 Valves: Install at equipment to allow maintenance or isolation, and to establish proper and sequential operation of the complete system. Shell and tube liquid coolers shall have fluid valves installed so that tubes are accessible for cleaning or replacing. Provide globe valves or plug cocks where required to regulate flow to obtain equal distribution of the gas or fluid handled. Remove valve bonnets, where valve construction permits removal, when connecting valves by brazing to copper tubing. Install globe and angle valves with stems horizontal where necessary to avoid trapping of fluid. Provide unions on one side of all valves to facilitate servicing.

#### 3.4 POLYETHYLENE PIPING

3.4.1 The polyethylene pipe shall be assembled and joined at the site using the butt-fusion method, the socket-fusion method or the saddle-fusion method, as indicated, to provide a leak proof joint. Jointing shall comply with ASTM D2657. All joints shall be made with mechanical fusion equipment, hand jointing is not permitted. Threaded or solvent-cement joints and connections shall not be permitted. All equipment and procedures used shall be used in strict compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of polyethylene pipe and/or fusing equipment.

3.4.2 The fusion joints shall be true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All joints shall be subject to acceptance by the Engineer prior to installing. All defective joints shall be cut out and replaced at no cost to the Owner. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the wall thickness shall not be used and must be removed from the site. However, a defective area of the pipe may be cut out and the joint fused in

accordance with the procedures stated above. In addition, any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, manufacturing or handling as determined by the Engineer shall be discarded and not used.

3.4.3 The Contractor shall restrain the ductile iron pipe from each HDPE/DI mechanical connection in accordance with the Plans, or as directed by the Engineer.

3.5 CONNECTIONS TO EXISTING SERVICES: Provide connections, splices, and branches at the locations shown. When new fittings are installed into an existing pipeline for the purpose of a branch or splice, the new fittings shall be of the same diameter as the existing pipeline. New branch lines off existing pipelines may be of reduced diameter.

3.6 CLEANING OF SYSTEMS: When installations of the various components of the piping systems are completed, clean before final closing. Clean all piping and components of scale and thoroughly flush out all foreign matter. Provide temporary bypasses for all water coils to prevent flushing water from passing through coils. Clean all strainers and valves thoroughly. Wipe equipment clean, removing all traces of oil, dust, dirt, or paint spots. Maintain the system in this clean condition until final approval. Clean and paint piping and equipment, as required.

3.6.1 Safety Procedure: Ventilate work area, avoiding skin contact by using solvent resistant gloves. Observe precautions and warnings on the manufacturer's product labels.

3.7 IDENTIFICATION AND PAINTING OF PIPING: Identification to be in accordance with Specification Section 23 05 53, "Identification For HVAC Piping & Equipment". Provide painting in accordance with Section 09 90 00, "Painting".

3.8 FIELD TESTS: After completion of the piping installation and prior to initial operation, conduct tests on the piping system. Furnish materials and equipment required for tests. Correct defects disclosed by the test. Perform test after installation and prior to acceptance in the presence of the Owner's Representative and subject to his approval.

3.8.1 Glycol and Brine: Hydrostatically test in accordance with the requirements of ANSI B31.9. Test piping system at one and one-half times system pressure but at least 100 psig with water not exceeding 100 degrees F. Before tests, remove or isolate gauges, traps, and other apparatus in the new system which may be damaged. Repair leaks. Do not caulk joints. Install a calibrated test pressure gauge in the system to observe loss in pressure. Maintain the required test pressure for a sufficient amount of time to enable an inspection of joints and connections, a minimum of 3 hours. Correct defects disclosed by the test.

3.8.1.1 Prior to beginning a test, the Contractor shall take measures to bleed all air from the pipeline under test.

3.8.1.2 Appropriate allowances for expansion of the polyethylene pipe must be taken. The following table consists of makeup water allowances while under test pressure.

<b>ALLOWANCE FOR EXPANSION UNDER TEST PRESSURE</b>			
<b>ALLOWANCE FOR EXPANSION (US Gal./100 Ft. of Pipe)</b>			
<b>NOMINAL PIPE SIZE (IN.)</b>	<b>1-HOUR TEST</b>	<b>2-HOUR TEST</b>	<b>3-HOUR TEST</b>
1	0.06	0.09	0.16
1-1/4	0.06	0.10	0.16
1-1/2	0.07	0.10	0.17
2	0.07	0.11	0.19
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.3	0.6	0.9
8	0.5	1.0	1.5
10	0.8	1.3	2.1
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5

3.8.1.3 Maximum Test Duration: The total test time including initial pressurization, initial expansion, and time at test pressure, must not exceed eight (8) hours. If the pressure test is not completed due to leakage, equipment failure, etc., the test section should be depressurized, and allowed to “relax” for at least (8) hours before bringing the test section up to test pressure again.

3.9 STARTUP AND OPERATIONAL TESTS: Start up and initially operate the system. During this time, periodically clean the various strainers until no further accumulation of foreign material occurs. Exercise care so that minimum loss of refrigerant occurs when strainers are cleaned. Adjust safety and automatic control instruments as necessary to place them in required operation and sequence.

++ END OF SECTION ++

## SECTION 23 25 15

### WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

1.1.1 Cleaning of piping systems.

1.1.2 Chemical treatment of piping systems.

1.1.3 Chemical feed pumps, storage tanks and controllers for cooling tower.

1.2 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements

1.2.1 Product Data: Provide chemical treatment equipment, materials and chemicals.

1.2.2 Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements. Provide wiring diagrams and complete control scheme.

1.2.3 Water Analysis and Treatment Plan: Provide existing make-up water chemistry, a list of treatment chemicals to be added for new system, the proportion of chemicals to be added and the final treated water control levels.

1.2.4 Health and Safety: Furnish MSDS sheets and a description of all health, safety and environmental concerns for handling of all chemicals.

1.2.5 Experience List: Provide minimum of two references for current customers. Provide documented experience indicating qualifications of Article 1.4 are met.

##### 1.3 OPERATION AND MAINTENANCE DATA

1.3.1 Provide complete operation and maintenance manuals for the system and all supplied components and equipment.

1.3.1.1 Include step by step instructions on treatment and test procedures including target concentrations.

1.3.1.2 Include wiring diagrams for all supplied components.



## 1.4 QUALIFICATIONS

1.4.1 Manufacturer: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

1.4.2 Water Treatment Specialist: Company specializing in performing the work of this section, including installation of water treatment equipment and treatment of the fluid systems, with minimum ten years of documented experience and approval by the manufacturer of the equipment. Company must have a minimum five years of documented experience in the treatment of ice rink fluid systems. Company shall have local representatives with water analysis laboratories and full time service personnel.

## 1.5 REGULATORY REQUIREMENTS

1.5.1 Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and to public sewage systems.

## 1.6 MAINTENANCE SERVICE

1.6.1 Include a four-hour training course for operating personnel, instructing them on installation, care, maintenance, testing, and operation of water treatment systems. Arrange course at start up of systems.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 System Cleaners:

2.1.1.1 All system cleaners and chemicals shall be supplied by the water treatment specialist or the water treatment system manufacturer, with qualifications as defined in this section.

#### 2.1.2 Treatment Chemicals:

2.1.2.1 Furnish 15 gallon drums of biocide, scale inhibitor and corrosion inhibitor. Chemical selections to be performed by the water treatment specialist after analyzing water sample from site.

### 2.2 EQUIPMENT

2.2.1 BYPASS POT FEEDERS: Bypass filter feeders to be supplied and installed in the following systems:

- a. Hot water heating system (space heating)
- b. Maximum working pressure: 1378 kPa
- c. Tank Shell: 10 gauge steel
- d. Tank Head: 9 gauge steel
- e. Cap: Cast iron with Buna 'N' square O-ring seal. Cap to have wide mouth, easy open-easy close.
- f. Vertical style with bottom dished in
- g. NPT female  $\frac{3}{4}$  connections
- h. Provide each bypass feeder with a 30 micron filter bag to filter chemical before injection into closed loop heating systems
- i. Capacity: 38 L
- j. Manufacturer:
  - i. NEPTUNE
  - ii. B&G
  - iii. Taco

### 2.3 CHEMICAL FEED PIPING

2.3.1 Schedule 80 CPVC with solvent welded joints.

### 2.4 CLOSED LOOP HOT WATER SYSTEMS CHEMICAL TREATMENT

2.4.1 Prior to chemical treatment all closed looped heating piping systems to be mechanically cleaned in accordance with the requirements of Specifications.

2.4.2 Chemical treatment to consist of a molybdate based closed system treatment which shall protect the piping system by forming a thin film on the internal piping surfaces.

2.4.2.1 Closed system chemical(s) also to consist of 50% by volume Propylene glycol for both the Digester and influent buildings.

2.4.3 Solution(s) to be added through bypass filter feeder specified previously.

2.4.4 Provide one (1) Molybdenum test kit to verify water treatment performance.

2.4.4.1 Provide one (1) Propylene glycol test kit to verify water/chemical concentrations.

2.4.5 Recommended start-up dosage to be in accordance with federate as determined by water treatment system supplier. For purpose of tendering consider 75-100 ppm of Molybdate.

2.4.6 Solution to arrive on site in sealed drums in liquid form. Contractor responsible to store the chemical in a cool, dry, well ventilated area.

#### 2.4.7 Product Data:

- a. Liquid
- b. Clear pale yellow color
- c. Zero degree Celsius freeze point
- d. pH of 11.2
- e. Specific gravity of 1.132

2.4.8 Provide one (1) year supply of chemical(s) to protect systems from corrosion and freezing.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

3.1.1 Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

3.1.2 Place terminal control valves in open position during cleaning.

3.1.3 All circulating fluid loops shall be cleaned and treated per this specification.

#### 3.2 CLEANING SEQUENCE

3.2.1 Flushing and Cleaning: All heating lines and related equipment shall be thoroughly flushed and cleaned with treatment systems, as recommended by the feedwater treatment system manufacturer. These products are pre-cleaning chemicals designed to remove deposition from construction, such as pipe dope, oils, most loose mill scale, and other extraneous materials. These products shall contain sequestrates, cleaners and corrosion inhibitors, for control of corrosion of various system metallurgy. Products shall be neutral to alkaline pH and shall be safe to handle and use. Effectiveness of products shall be such that the water need only be at ambient temperatures. Add recommended dosages of products and circulate 6-8 hours or as recommended by the water treatment specialist. System shall then be drained and flushed until the total alkalinity of the rinse water is equal to the total alkalinity of the make-up water.

3.2.2 Treatment: Refill with clean water and recommended chemicals. Treat with the appropriate scale and corrosion inhibitor during operation of the water systems. Treatment shall be that recommended by the water treatment specialist, based on samples taken from each fluid system. The water treatment specialist shall perform the cleaning procedures and shall provide a written field report on completion of the cleaning procedures.

### 3.3 WATER TREATMENT SERVICE

3.3.1 Provide for 12 months of water treatment service as a part of this Contract. Service for water treatment shall include minimum monthly service calls to review the treatment control test results and the current operating conditions and to make recommendations for changes and/or improvements in the water treatment program when necessary.

3.3.2 Tests of all systems will be conducted on the plant site during each service visit.

3.3.3 A written report will be submitted for each service visit and will consist of comments and recommendations resulting from the evaluation of plant logs plus test data and observations at the time of each visit. Recommendations shall include, but are not limited to, adjustment of treatment dosages and bleedoff rates.

3.3.4 Any other water or deposit samples necessary to achieve the objectives of the water treatment program will also be analyzed at no additional cost to the facility.

3.3.5 The Contractor shall also train all appropriate facility personnel to administer, control, adjust and test the chemical parameters of the system.

++ END OF SECTION ++

SECTION 23 30 00

MECHANICAL EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for HVAC Air Distribution as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 Air Movement and Control Association, Inc. (AMCA) Publications:

99	Standards Handbook
201	Fans and Systems
204	Balance Quality and Vibration Levels for Fans
210	Laboratory Methods of Testing Fans for Rating
300	Test Code for Sound Rating Air Moving Devices
301	Methods for Calculating Fan Sound Ratings from Laboratory Test Data
302	Application of Some Loudness Ratings for Nonducted Air Moving Devices
303	Application of Sound Power Level Ratings for Fans
500	Test Methods for Louvers, Dampers and Shutters

1.2.2 American National Standards Institute (ANSI) Publications:

B31.1	Power Piping
Z49.1	Safety in Welding and Cutting

1.2.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard:

15 Safety Code for Mechanical Refrigeration

1.2.4 American Society of Mechanical Engineers (ASME) Publication:

Section VIII Pressure Code

1.2.5 American Society for Testing and Materials (ASTM) Publications:

A123/A123M	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A167	Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
A653/653M	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
A1011/A1011M	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
B117	Salt Spray (FOG) Testing

1.2.6 National Electrical Manufacturers' Association (NEMA) Standards:

ICS 1	Industrial Control and Systems
ICS 2	Standards for Industrial Control Devices, Controllers and Assemblies
ICS 6	Enclosures for Industrial Controls and Systems
MG 1	Motors and Generators

1.2.7 National Fire Protection Association (NFPA) Standard:

70 National Electrical Code (NEC)

1.2.8 Underwriters Laboratories, Inc. (UL) Publications:

508C Power Conversion Equipment

1.2.9 U.S. Department of Labor Occupational Safety and Health Administration (OSHA) Standard:

1910.219

Mechanical Power-Transmission Apparatus

1.3 GENERAL REQUIREMENTS: Section 230501, "Mechanical General Requirements", with the additions and modifications specified herein, applies to this Specification.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements

1.4.1 Manufacturer's Data: Submit shop drawings and schematics for the following:

- a. Expansion Tanks
- b. Fans
- c. Pumps
- d. Air Control
- e. Fan explosion proof motors & fans
- f. Louvers
- g. Unit Heaters
- h. Fin Tube Radiation
- i. Coatings
- j. Explosion Proof Thermostat
- k. Thermostats
- l. Temperature Sensors
- m. Dampers
- n. High Volume, Low Speed Fans
- o. Welding Source Capture
- p. Air Handlers
- q. Air Cooled Condensing Unit
- r. Electric Wall Heaters
- s. Gas Detection System
- t. Air Handling Units
- u. Air Cooled Condensing Unit
- v. Sequence of Operation

1.4.2 Standards of Compliance and Manuals: Submit standards compliance information as well as operation and maintenance manuals for the following:

- a. Expansion Tanks
- b. Fans
- c. Pumps

- d. Air Control
- e. Fan explosion proof motors & fans
- f. Unit Heaters
- g. Fin Tube Radiation
- h. Coatings
- i. Explosion Proof Thermostat
- j. Thermostats
- k. Temperature Sensors
- l. Dampers
- m. High Volume, Low Speed Fans
- n. Welding Source Capture
- o. Air Handlers
- p. Air Cooled Condensing Unit
- q. Variable Air Volume Box (VAV)
- r. Electric Wall Heaters
- s. Gas Detection System
- w. Air Handling units
- x. Air Cooled Condensing Unit
- y. Sequence of Operation
- z. Differential Pressure Fan Controller

1.4.3 Work Schedule: Submit a schedule of work for the start-up of all new equipment items.

1.4.4 Certified Test Reports:

- a. Fan data, including sound power level data
- b. System test reports

## PART 2 - PRODUCTS

2.1 EXPANSION TANKS: Provide pre-charged, diaphragm-type pressure vessel expansion tanks. Tanks shall be designed, constructed and stamped in accordance with ASME Section VIII, Division I. Shell shall be carbon steel and shall have forged steel system connection fittings. Diaphragm shall be heavy-duty butyl rubber. Tank to be cleaned, prime coated and supplied with steel support legs. Tank to include 302-32 charging valve connection, precharged to pressure indicated on schedule. Furnish tank with automatic air vent. Tank shall be rated for maximum working pressure of 125 psig and maximum working temperature of 240°F. Expansion tank characteristics shall be as scheduled. Manufacture shall be as by Bell & Gossett, Series D, or equal.



## 2.2 INLINE FAN

2.2.1 Description: Fan shall be ceiling, wall, or inline mounted, direct drive, centrifugal exhaust fan.

2.2.2 Certifications: Fan shall be manufactured by an ISO 9001 certified company. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA Certified Ratings Seal for sound and air performance.

2.2.3 Construction: Fan housing shall be minimum 20 gauge galvanized steel and acoustically insulated. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel and shall be easily removable from the housing. Motor shall be mounted on vibration isolators. Unit shall be supplied with integral wiring box and disconnect receptacle shall be standard. Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and nylon bushings. To accommodate different ceiling thickness, an adjustable pre-punched mounting bracket shall be provided. A white, non-yellowing, high impact styrene injection molded grille shall be provided as standard on 200 and 300 series. A powder painted white steel grille shall be provided as standard on 800-900 series. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

2.2.4 Wheel: Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMA Standard 204-05, Balance Quality and Vibration Levels for Fans.

2.2.5 Motor: Motor shall be open drip proof type with permanently lubricated sealed bearings, built-in thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage.

2.2.6 Product: Fan shall be model GC as manufactured by Loren Cook Company of Springfield, Missouri, or approved equal.

2.3 PRODUCT: Fan shall be a wall / duct mounted, belt driven Aluminum propeller exhaust fan Model as scheduled and as manufactured by Loren Cook Company of Springfield, Missouri, Penn or Greenheck. Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

2.3.1 Construction: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The motor, bearings and drives shall be mounted on a 14 gauge steel power assembly. The power assembly shall be bolted to a minimum 14 gauge wall panel with continuously welded corners and an integral vent. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

2.3.2 Coating: All steel fan components shall be Lorenized™ with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

2.3.3 Propeller: Propeller shall be a high-efficiency fabricated steel design with blades securely fastened to a minimum 7 gauge hub. The hub shall be keyed and locked to the fan shaft utilizing two setscrews. Propeller shall be balanced in accordance with AMCA Standard 204-05, Balance Quality and Vibration Levels for Fans.

2.3.4 Motor: Motor shall be NEMA design B with Class B insulation rated for continuous duty at the specified voltage, phase and enclosure. Unit and all components of the system, shall be explosion proof and rated for Class 1 Division 1 areas. Refer to Contract Drawing schedules

2.3.5 Bearings: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

2.3.6 Belts and Drives: Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

## 2.4 UTILITY SET FAN

2.4.1 Utility Set Fan: Fan shall be a single width, single inlet, backward inclined airfoil, belt driven centrifugal vent set featuring spark resistant AMCA Type A construction.

2.4.2 Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL/cUL 705) for US and Canada. For restaurant applications, fan shall be listed by Underwriters Laboratories (UL/cUL 762) for US and Canada. Fan shall bear the AMCA certified ratings seal for sound and air performance.

2.4.3 Construction: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The scroll wrapper shall be a minimum 0.100" aluminum and the scroll side panels shall be a minimum 0.100" aluminum. The entire fan housing shall have continuously welded seams for leakproof operation. A performance cutoff shall be furnished to prevent the recirculation of air in the fan housing. The fan housing shall be field rotatable to any one of eight discharge positions and shall have a minimum 1-1/2 inch outlet discharge flange. Bearing support shall be minimum 10 gauge welded steel. Side access inspection ports shall be provided with quick release latches for access to the motor compartment without removing the weather

cover. Lifting lugs shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

2.4.4 Coating: Steel fan components shall be Lorenized TM with an electrostatically applied, baked polyester powder coating. Each powder coated component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

2.4.5 Wheel: Wheel shall be aluminum centrifugal airfoil blade type. Blades shall be continuously welded to the backplate and deep spun inlet shroud. Wheel hub shall be keyed and securely attached to the fan shaft. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, Balance Quality and Vibration Levels for Fans.

2.4.6 Motor: Motor shall be NEMA Design B with Class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure. Motors shall be suitable for Class 1 Div 1 / Explosion Proof where indicated on schedules.

2.4.7 Motors and Motor Starters (where called for on schedules): Conform to NEMA MG 1 and NEMA ICS-1 and NEMA ICS-2. Motors shall not exceed 1800 rpm, unless otherwise indicated, and shall be explosion proof type. Motor starters shall be magnetic across the linetype with moisture and dust-tight NEMA 12 enclosure in accordance with NEMA ICS-6. Provide single-phase motors with inherent thermal overload protection with manual reset. Provide three-phase motors with thermal overload protection. Provide motor starter and disconnect.

2.4.8 Explosion-Proof: Construct fans to AMCA Standard 99-0401-82, Type C spark-resistant requirements where explosion-proof electrical components are specified or indicated to conform to NFPA 70, Class 1 Group D, Division 1 requirements.

2.4.9 Bearings: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball or roller type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

2.4.10 Blower Shaft: Blower shaft shall be Type 316 stainless steel accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM.

2.4.11 Belts and Drives: Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

2.4.12 Product: Fan shall be model CPA-A as manufactured by Loren Cook Company or approved equal.

2.5 INLINE BUILDING/BOILER CIRCULATING PUMP (P-1 & BCP-1): Furnish and install in-line pump as illustrated on the plans and schedules and in accordance with the following specification. Manufacture shall be shall be B&G; ECOCIRC XL, Taco, GRUNDFOSS, or approved equal.

2.5.1 The pumps shall be a wet rotor inline pump, in cast iron or lead free bronze body construction specifically designed for quiet operation. Suitable standard operations at 230° F and 175 PSIG working pressure. The pump internals shall be capable of being serviced without disturbing piping connections.

2.5.2 The pump internals shall be capable of being serviced without disturbing piping connections.

2.5.3 Pump shall be equipped with a watertight seal to prevent leakage.

2.5.4 Pump volute shall be of a cast iron design for heating systems or lead free bronze for domestic water systems. The connection style on the cast iron and bronze pumps shall be flanged.

2.5.5 Flange to Flange dimension shall be standard Bell & Gossett booster sizes such as 6-3/8", 8-1/2", 11-1/2", and 12". Flange dimensions shall be HVAC industry standard 2 or 4 bolts sizes.

2.5.6 Motor shall be a synchronous, permanent-magnet (PM) motor and tested with the pump as one unit. Conventional induction motors will not be acceptable.

2.5.7 Each motor shall have an Integrated Variable Frequency Drive tested as one unit by the manufacturer.

2.5.8 Integrated motor protection shall be verified by UL to protect the pump against over/under voltage, over temperature of motor and/or electronics, over current, locked rotor and dry run (no load condition).

2.5.9 Pump shall have MODBUS or BACnet connections built into the VFD as standard options.

2.5.10 Analog inputs, such as 0-10V and 4-20mA, are standard inputs built into the VFD.

2.5.11 Pumps shall be UL 778 listed and bear the UL Listed Mark for USA and Canada with on-board thermal overload protection. Pumps shall be UL 778 listed and bear the UL Listing Mark for USA and Canada with on-board thermal overload protection.

2.5.12 Each pump shall be factory performance tested before shipment.

## 2.6 PUMP OPERATING MODES (P-1 & BCP-1)

2.6.1 Proportional Pressure: The differential pressure will continuously increase or decrease along a linear curve based on the flow demand.

2.6.2 Constant Pressure: The pump maintains a constant differential pressure set by the user at any flow demand until the maximum speed is reached.

2.6.3 Constant Speed: The pump maintains a constant speed at any flow rate.

2.6.4 Night Set Back: The pump will recognize a 10°C water temperature reduction and will switch to nighttime operation.

2.6.5 T-Constant: This control will use a PI algorithm to vary the speed of the pump in order to maintain a constant temperature of the fluid media.

2.6.6 Delta-T Constant: This control mode will use a PI algorithm to vary the speed of the pump in order to maintain a constant differential temperature between the built-in temperature sensor and external temperature sensor.

2.6.7 Delta-P-T: This control mode is paired with proportional or constant pressure mode. The nominal differential pressure setpoint will vary according to the fluid temperature.

2.6.8 Delta-P-Delta-T: This control mode is paired with proportional or constant pressure mode. The nominal differential pressure setpoint will vary according to the differential temperature between the built-in temperature sensor and external temperature sensor.

2.7 AIR CONTROL: Furnish and install, as shown on plans, a centrifugal type air separator. The unit shall have “line” sized inlet and outlet npt or flanged connections tangential to the vessel shell. Air scoop Model 432 as manufactured by TACO, or equivalent, as manufactured by B&G or GRUNFOSS.

2.7.1 A blowdown shall be provided to facilitate routine cleaning of the strainer and the separator.

2.7.2 The air separator must be designed, constructed and stamped for 125 psig @ 350 Deg F in accordance with section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, and registered with the National Board of Boiler and Pressure Vessel Inspectors. The air separator(s) shall be painted with one shop coat of light gray air dry enamel.

2.7.3 A Manufacturer's Date Report for Pressure Vessels, form U-1 as required by the provisions of the ASME Boiler and Pressure Vessel Code, shall be furnished for each air separator upon request.

## 2.8 FANS EXPLOSION PROOF MOTORS & FANS (WHERE CLASS 1 DIVISION 1 / EXPLOSION PROOF IS INDICATED ON PLANS/SCHEDULES)

2.8.1 Motors and Motor Starters: Conform to NEMA MG 1 and NEMA ICS-1 and NEMA ICS-2. Motors shall not exceed 1800 rpm, unless otherwise indicated, and shall be explosion proof type. Motor starters shall be magnetic across the line with moisture and dust-tight NEMA 12 enclosure in accordance with NEMA ICS-6. Provide single-phase motors with inherent thermal overload protection with manual reset. Provide three-phase motors with thermal overload protection.

2.8.2 Explosion-Proof: Where indicated on schedules and contract drawings, construct fans to AMCA Standard 99-0401-82, Type C spark-resistant requirements where explosion-proof equipment and components are specified or indicated on drawings to conform to NFPA 70, Class 1 Group D, Division 1 requirements.

2.9 LOUVERS: Fixed type, performance based on testing in accordance with AMCA Standard 500. Fold or bead the edges of the louver blades to exclude driving rain. Louver blades shall be oriented at an angle to minimize the entrainment of rainwater. Louver frames to be constructed of extruded aluminum and shall include extended sills. Provide bird/insect screen of same type metal as the louvers in a removable, rewirable frame. All louver components to be factory assembled. All performance and size characteristics shall be as scheduled. Manufacture shall be as by Ruskin, or equal.

## 2.10 UNIT HEATERS

2.10.1 Hydronic Unit Heater: Furnish and install, where indicated or scheduled on plans Model S horizontal steam/hot water unit heaters as manufactured by Trane, Greenheck or Sterling. Unit shall be equipped as specified herein. All units shall be installed in a neat and workmanlike manner in accordance with this specification and the manufacturer's installation instructions.

2.10.2 Fan Guards: Fan guards shall be welded steel, zinc plated or painted. To meet CSA and OSHA requirements, units mounted below 8 feet from floor must be equipped with an OSHA fan guard.

2.10.3 Casing: Casings shall be fabricated from 20 gauge die-formed steel. Casing substrates are prepared for finishing with a hot wash iron phosphatizing clear rinse, chromic acid rinse and oven drying. Paint finish is lead free, chromate free, alkyd melamine resin base and applied with an electrostatic two-pass system. Finish is baked at 350°F.

2.10.4 Air Deflection Louvers: Units shall be equipped with horizontal, adjustable louvers.

2.10.5 Fans: Fans shall be aluminum blade hub type designed and balanced to assure maximum air delivery, low motor horsepower requirements and quiet operation. Blades are spark proof.

2.10.6 Coils: Coil shall be a serpentine design with seamless copper tubing. Aluminum fins have drawn collars to assure permanent bond with expanded tubes. Tubing connection are 3/8" copper tubing Type "M" (500 O.D.). Coils are factory-tested at 250 P.S.I.

2.10.7 The motor shall be open drip-proof, sleeve-bearing, quiet operation, rubber mounted construction. Motors shall have built-in thermal overload protectors. Unit and all components of the system, shall be explosion proof and rated for Class 1 Division 1 areas where indicated on Contract Drawing schedules

2.10.8 Unit Heater Control: The unit heater fan shall cycle "ON" when there is a call for heat and the control valve shall modulate to maintain space temperature.

2.11 GAS FIRED UNIT HEATERS: Provide gas fired unit heaters, sized as scheduled on the contract drawings, model UDAS as manufactured by REZNOR, or approved equal. The units shall be equipped with the following features:

- a. Certified for commercial/industrial heating application
- b. 82-83% Thermal efficient
- c. 50-60°F Rise range
- d. Titanium stabilized aluminized steel heat exchanger
- e. Single burner combustion system including a one-piece burner assembly
- f. 115/1/60 Supply voltage
- g. 115 Volt open fan motor with internal overload protection
- h. Transformer for 24-volt controls
- i. Integrated circuit board with diagnostic indicator lights
- j. Multi-try direct ignition with timed lockout
- k. Fan relay (included on the circuit board)
- l. Vibration/noise isolated fan and venter motors
- m. Sealed control compartment houses all electrical components
- n. 4-pt Suspension
- o. Built-in disconnect switch (20A @ 115V Rating)
- p. External terminal strip for 24-volt wiring
- q. Sealed junction box for supply wiring
- r. External gas connection
- s. Fully gasketed door panel with safety door switch
- t. Full fan guard
- u. Single-stage, propane gas valve
- v. Horizontal or Vertical Combustion Air/Vent Kit including concentric adapter

- w. Thermostat
- x. Thermostat guard with locking cover
- y. Gas conversion kits (natural and propane)
- z. Manual shutoff valves

#### 2.11.1 COATINGS

2.11.2 Finish all surfaces which are not constructed of corrosion-resistant material (such as polyester reinforced fiberglass) with a factory applied corrosion-resistant finish such as polyamid epoxy, Kynar, Aluma-Glas, or other finishes suitable for the project conditions.

#### 2.12 EXPLOSION PROOF THERMOSTATS

2.12.1 Explosion Proof Thermostats: Provide Explosion-proof, heavy duty, the Model 862E Thermostat as manufactured by Dwyer, or approved equal. Provide thermostats with the following characteristics:

2.12.2 Service: Compatible gases.

2.12.3 Temperature Limit: -49 to 176°F (-45 to 80°C).

2.12.4 Enclosure Rating: Explosion-proof NEMA 7 & 9, Class I, Divisions 1 & 2, Groups C & D; Class II, Division 1, Groups E, F & G; Class II, Division 2, Groups F & G; Class III; Class I, Zones 1 & 2, Groups IIA & IIB.

2.12.5 Switch Type: SPDT snap action switch.

2.12.6 Electrical Connection: Screw terminal.

2.12.7 Conduit Connection: 3/4" female NPT.

2.12.8 Set Point Adjustment: External knob.

2.12.9 Adjustable Range: 36 to 82°F (2 to 28°C).

2.12.10 Deadband: 2.5°F (1.5°C).

#### 2.13 LINE-VOLTAGE ZONE TEMPERATURE SENSOR

2.13.1 Line-Voltage Space Thermostats: Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 55°F-85°F setpoint range, 2°F maximum differential, and vented ABS plastic cover.



## 2.14 TEMPERATURE SENSORS

2.14.1 Temperature Sensors: Provide analog sensors as specified or indicated. Sensors shall provide an output signal that varies linearly and continuously with the sensed temperature, within a specified range, and shall be thermistor, resistance, thermocouple, or pneumatic type.

Thermocouples shall be restricted to temperature ranges of 250 degrees F and above.

Temperature sensors for binary control shall provide an output signal that is accurate at the selected operating point and shall be pneumatic or electronic type. Sensors of a particular category in each building shall be of the same type and manufacturer. Temperature sensors shall be suitable for one or more of the following mounting styles: room (space) type, insertion (air duct) type, or immersion (liquid) type. Room type sensor shall have covers with Allen head screws. Temperature sensors shall include the following:

- a. Insertion Type: Stem or extended surface sensitive type as indicated;
- b. Immersion Type: Stem or tip sensitive type only, unless otherwise indicated;
- c. Sensing Elements: Hermetically sealed, except for bimetal type for room thermostats, and rod and tube type for pneumatic sensors;
- d. Stem, Tip, or Extended Element Construction: Type 304 stainless steel;
- e. External Trim Material: Completely corrosion resistant to media in which it is inserted or immersed, with parts assembled into a watertight (except room type), vibration-proof, heat-resistant assembly; and
- f. Sensor Wells: Stainless steel materials; thermal transmission material shall be compatible with the immersion sensor. Provide heat-sensitive transfer agent between exterior sensor surface and interior well surface.

### 2.14.2 Outdoor Temperature Sensor:

- a. Operating Ambient Temperature Range: -40 to 120°F (-40 to 49°C).
- b. Display Range: -40 to 127°F (-40 to 53°C).
- c. Sensor Accuracy: +/-1.5°F at 70°F (+/- .84 at 21°C)
- d. Operating Relative Humidity: 5% to 95% non-condensing.
- e. Dimensions in (mm): 2-1/4 (57) x 3/8 (10) with 60 (1524) lead wires.
- f. Manufacturer: Honeywell model C7089 or approved equal

## 2.15 MOTORIZED CONTROL DAMPERS (AAD)

2.15.1 Type: Control dampers shall have linear flow characteristics and shall be opposed-blade type. Dampers to be constructed in accordance with SMACNA low pressure duct construction standards. Damper operators shall have power to limit air leakage to the specified rate. Select dampers to provide correct flow characteristics as required by each application.

2.15.2 Frame: Damper frames shall be 13 gauge galvanized steel channel or 1/8 inch extruded aluminum with reinforced corner bracing.

2.15.3 Blades: Damper blades shall not exceed 8 inches in width or 48 inches in length. Blades shall be suitable for medium velocity 2000 fpm performance. Blades shall be not less than 16 gauge.

2.15.4 Shaft Bearings: Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.

2.15.5 Seals: Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 0.5 percent damper volume based on 2,000 fpm velocity when closed against a 4-inch water gauge static pressure.

2.15.6 Sections: Damper sections shall not exceed 125 cm - 150 cm (48 in. - 60 in.). Each section shall have at least one damper actuator.

2.15.7 Linkages: Dampers shall have exposed linkages.

2.15.8 Electric Operators: Provide hydraulic or gear type electric operators. When operated at rated voltage, each operator shall be capable of delivering the torque required for continuous uniform movement of the valve or damper and shall have end switch to limit travel or shall withstand continuous stalling without damage. Operators shall be quiet operating, function properly with range of 85 to 110 percent of line voltage. Provide gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torques less than 16 lb.-in. Provide hardened steel running shafts in sleeve bearings of copper alloy, hardened steel, nylon, or ball bearings. Enclose operators and gear trains totally in dustproof metal housings with rigid conduit connections. Gear trains shall be oil immersed or continuously lubricated. Provide two-position operators of the single direction, spring return, or reversing type. Provide proportioning operators capable of stopping at all points in the cycle and starting in either direction, from any point. Provide reversing and proportioning operators with limit switches to limit travel in either direction, unless operator is stall type. Equip valve operators with a force limiting device such as spring yield so that, when in a relaxed position, the device shall maintain a pressure on the valve disc equivalent to the system pressure at the valve. Provide reversible shaded pole or split capacitor type electric motors.

2.15.9 Spring-return Mechanism: Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS) so that, in the event of power failure, operators shall FAIL SAFE in either the normally open or normally closed position as indicated or specified.

2.15.10 Signal and Range: Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range.

2.15.11 Wiring: 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring. Note when damper is associated / interconnected to a system indicated to be Explosion Proof and serving a Class 1 Division 1 area ALL components of the system, including actuators, wiring, conduit, etc shall be furnished and installed by the mechanical contractor and be suitable for the application.

2.15.12 Manual Positioning: Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

## 2.16 HIGH VOLUME, LOW SPEED FANS

2.16.1 Regulatory Requirements: The entire fan assembly shall be Intertek/ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2.

2.16.1.2 Sustainability Characteristics: The fan shall be designed to move an effective amount of air for cooling and destratification in industrial applications over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.

2.16.1.3 Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.

### 2.16.2 Airfoil System:

2.16.2.1 The fan shall be equipped with six (6) Powerfoil airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.

2.16.2.2 The fan shall be equipped with six (6) Powerfoil winglets on the ends of the airfoils. The winglets shall be molded of a polypropylene blend. The standard color of the winglet shall be "Safety Yellow." The fan shall have an overall Dia of 10'-0".

### 2.16.3 Motor:

2.16.3.1 The fan motor shall be an AC induction type inverter rated at 1725 RPM, 200–240/400–480 VAC, 50/60 Hz, three-phase.

2.16.3.2 The motor shall be totally enclosed, fan cooled (TEFC) with an IP56. A B5 standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in -30o F to 122o F (-34o C to 50o C) ambient conditions.

#### 2.16.4 Gearbox:

2.16.4.1 The gearbox shall be a helical gear reducer, precision finished from hardened steel for low noise and long service life with double lip seals to retain oil and prevent contamination. The gearbox shall be lubricated for life. The gear reducer shall have a standard backlash of less than 25 arc minutes and be equipped with a 17-4 stainless steel shaft of 1-1/4" (3.2 cm) diameter.

#### 2.16.5 Motor Frame:

2.16.5.1 The motor frame and mount shall be constructed of steel and powder coated for corrosion resistance and appearance. Non-visible, steel, threaded rods in each structural member of the motor frame shall provide a redundant safety feature in the event of a catastrophic event.

#### 2.16.6 Mounting System:

2.16.6.1 The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The mounting yoke shall be of ASTM A-36 steel, welded construction, at least 3/16" thick, and powder coated for appearance and corrosion resistance. No mounting hardware or parts substitutions, including cast aluminum, are acceptable.

2.16.6.2 All mounting bolts shall be SAE Grade 8 or equivalent.

#### 2.16.7 Hub:

2.16.7.1 The fan hub shall be made of laser cut aluminum for high strength and light weight. The hub shall consist of two aluminum plates, six (6) aluminum spars and one (1) spacer fastened with a pin and collar rivet system.

2.16.7.2 The hub shall be secured to the output shaft of the gearbox by means of a steel coupling interface. The hub shall incorporate six (6) safety retaining clips made of 1/4" (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.

#### 2.16.8 Safety Cable:

2.16.8.1 The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be at least 1/4" (0.6 cm) in diameter and fabricated out of 7 x 19 galvanized steel cable. The end loops shall be secured with swaged sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).

2.16.8.2 Field construction of safety cables is not permitted.

2.16.9 Variable Frequency Drive:

2.16.9.1 The fan controller shall be a NEMA 4X variable frequency drive (VFD) that is factory programmed to minimize starting and braking torques. The VFD shall have touchpad controls and an LED display for controlling the fan's direction, operation, speed, and programming. The VFD may be equipped with an EMI/RFI filter to limit interference with other electronic equipment and a rotary switch disconnect for lock-out/tag-out requirements.

2.16.9.2 Onboard Variable Frequency Drive: The VFD may be mounted on the fan motor frame. A wall-mounted remote keypad equipped with touchpad controls and an LED display shall be provided for such installations, allowing access to all VFD functions.

2.16.9.3 Wall-Mounted Variable Frequency Drive: The VFD may be wall-mounted for ease of access.

2.16.10 Fire Control Panel Integration:

2.16.10.1 Includes a 10–30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.

2.16.11 Guy Wires:

2.16.11.1 Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.

2.16.11.2 Manufacturer: Delta T Corporation, dba Big Ass Fans, or approved equal.

2.17 INFRARED GAS HEATERS:

2.17.1 Burners:

2.17.1.1 Burners shall be capable of firing at 75,000 BTU/hr, 105,000 BTU/hr, or 130,000 BTU/hr inputs, with natural gas and at 75,000 BTU/hr, 105,000 BTU/hr or 120,000 BTU/hr inputs, with LP gas.

2.17.1.2 Burner power requirements 24 Volt, 60 Hz AC 40VA.

2.17.1.3 Burners shall include the following features:

- a. Burners shall operate under a negative (vacuum) pressure.
- b. Fitted with a 4" diameter combustion air inlet with a fixed combustion air-metering orifice.

- c. Burners shall be fitted a differential air pressure switch so as to prove adequate combustion air is present before burner fires.
- d. Burners shall be fitted with solid state, (3) try, (1) hour reset electronic controls with spark ignition & 100% lockout in event of low fire or main flame failure.
- e. Burner(s) shall have a minimum 15-second pre-purge before ignition.
- f. Burner(s) shall casing to be constructed of 16 Ga. aluminized steel, powder coated.
- g. Burner(s) shall be fitted with inspection window for visual inspection of spark and flame.
- h. Burner(s) shall be fitted with 3 indicator lights - "Power On", "Air Flow On", & "Burner On".
- i. Burner controls, differential pressure switch, gas valve, electrical wiring, etc. shall be segregated from the combustion air supply.

2.17.1.4 Burner(s) and vacuum exhauster electrically interlocked.

2.17.2 Vacuum Exhauster:

2.17.2.1 Dynamically balanced forward inclined fan wheel constructed of stainless steel with a cast iron hub.

2.17.2.2 Direct Drive:

2.17.2.3 Inlet cone and venturi plate engineered for maximum efficiency.

2.17.2.4 16 gauge aluminized steel housing and mounting bracket to be powder coated.

2.17.2.5 Motor to be one sixth (1/6) HP (115V, 3.0 amp), one quarter (1/4) HP (115V, 3.5 amp), one half (1/2) HP dual voltage (115/230V 6.2/3.1 Amps) or one (1) HP dual voltage (115/230 V 12/6 Amps) - 3450 RPM, 60 Hz capacitor start internally protected, class B insulation. Sealed ball bearings front and rear.

2.17.2.6 Vibration isolating rubber mounts. 2.2.8 Stainless steel bird screen on side wall venting.

2.17.2.7 Three and one half inch (3.5") Stainless steel, insulated flexible vibration isolation connector.

2.17.3 System Controls:

2.17.3.1 Optional thermostat, 115V, 16 amp rating.

2.17.3.2 Each system, which includes a vacuum exhauster and burner(s), shall be wired so that they are electrically interlocked and controlled by thermostat action.

#### 2.17.4 Radiant Tube Heat Exchanging Network:

2.17.4.1 Combustion tube shall be 10' long 16 gauge aluminized steel 3.5" OD swaged one end.

2.17.4.2 Balance of radiant tubing shall be constructed of patented, spiral wound 22 gauge aluminized steel, 3.5" OD.

2.17.4.3 Elbows and tube coupler to be made of min. 18 gauge-aluminized steel, swaged at both ends so as to fit into 3.5" spiral tube.

2.17.4.4 Reflectors to be made of minimum 0.025 bright aluminum.

2.17.4.5 Tubing and reflector hangers to be made of 0.25" Dia. Zinc plated CRS.

2.17.4.6 All joints to be sealed and mechanically fastened with self drilling and tapping screws.

2.17.4.7 All radiant tubing to be continuously covered by the reflector, i.e. radiant tube elbows, "U" bends and fittings to be covered by reflectors -- NO GAPS BETWEEN REFLECTORS. Reflectors are to be overlapped a minimum of one-inch (1") and secured together with sheet metal screws allowing for one unsecured overlap joint for expansion on each straight run exceeding ten feet (10').

2.17.4.8 Minimum length of radiant tubing per 100,000 Btu/hr of input shall be 60 lineal feet.

2.17.4.9 The maximum firing rate shall be 2,000 Btu/hr per square foot of radiant tubing surface area. The total radiant tubing surface area is the radiant tubing which is covered by reflectors and associated with one vacuum exhauster.

#### 2.17.5 Combustion Air:

2.17.5.1 Outside combustion air (if used) is to be provided without the use of supplementary supply blowers or fans.

2.17.5.2 Outside combustion air ducting to be minimum of 4" OD (S&D PVC or galvanized stovepipe).

#### 2.17.6 System Performance:

2.17.6.1 System shall attain a net exhaust temperature of not less than 200° F in a 15 min. run cycle and shall not exceed a maximum net temperature of 325° F.

2.17.6.2 System STEADY STATE EFFICIENCY shall be a minimum of 82%, maximum 87%. The system cyclic efficiency shall be a minimum of 85%, maximum 91% (this is based on a 15 minute run time).

2.17.6.3 System shall be a non-condensing dry tube system. (i.e., After a minimum run time of 8 minutes, all condensation will cease and moisture will exit the system in a vapor state.)

2.17.7 Backdraft Dampers (Gravity Dampers): Factory-fabricated, with statically and dynamically balanced blades that open automatically when the fan starts and close by gravity when the fan stops. Provide the edges of blades with felt or rubber strips to prevent rattling.

- a. **BASE UNIT DIMENSIONS**
  - Product Specifications
  - 21" Length
  - 20" Width, Not Including Mounting Brackets
  - 19.5" Height
  
- b. **ARM DIMENSIONS**
  - 4" Dia., 32" Long Fire-Retardant Flex Arm and 15" L
  - Stainless Steel Ducting (7" Dia. Round Hood)
  
- c. **CABINET MATERIAL**
  - 16 ga. Carbon Steel
  
- d. **WEIGHT**
  - 115/1/60, 10.7 amps
  - 220/1/50, 5.35 amps
  - 8' grounded power cord with NEMA 5-15P Plug
  
- e. **AIR VOLUME**
  - Variable Speed Control Standard on 115V
  - 500 CFM High, Down to 50 CFM Low
  - On/Off Toggle Switch Standard on 220V
  
- f. **ELECTRICAL**
  - Approx. 60 lbs. - 100 lbs.
  - Varies Depending on Filter Media Installed
  - 115/1/60, 10.7 amps
  - 220/1/50, 5.35 amps
  - 8' grounded power cord with NEMA 5-15P Plug
  
- g. **SOUND LEVEL**
  - Approx. 72 dba @ 3



h. FILTRATION

Depending on the Application:

- HEPA [up to 99.97% efficient on particles 0.3 microns and larger]
- ASHRAE [up to 95% efficient on particles 0.5 microns and larger]
- ACTIVATED CARBON
- SPECIALTY-BLENDED FILTER MEDIA, i.e., Acid Gas, Mercury, Aldehyde, Ammonia

i. WARRANTY

Limited six-month warranty from date of shipment for the fan/motor assembly.

Limited two-year warranty from date of shipment on defects to parts/assembly due to materials or workmanship.

j. MANUFACTURER

Sentry Air Systems model SS-405-SKY, or approved equal

2.18 VAV

2.18.1 Casing: 22-gage galvanized steel.

2.18.2 Insulation:

2.18.2.1 1" Foil-faced Insulation: The interior surface of the unit casing shall be acoustically and thermally lined with 1-inch, 1.5 lb/ft<sup>3</sup> density glass fiber with foil facing. The insulation R-Value shall be 4.1. The insulation is UL listed and meets NFPA-90A and UL 181 standards as well as bacteriological standard ASTM C 665. There are no exposed edges of insulation (complete metal encapsulation).

2.18.3 Primary Air Valve:

2.18.3.1 Air Valve Round: The primary air inlet connection shall be an 18-gage galvanized steel cylinder sized to fit standard round duct. A multiple-point, averaging flow sensing ring shall be provided with balancing taps for measuring +/-5% of unit cataloged airflow. An airflow-versus-pressure differential calibration chart shall be provided. The damper blade shall be constructed of a closed-cell foam seal that is mechanically locked between two 22-gage galvanized steel disks. The damper blade assembly shall be connected to a cast zinc shaft supported by self-lubricating bearings. The shaft is cast with a damper position indicator. The valve assembly includes a mechanical stop to prevent over-stroking. At 4.0 in. wg, air valve leakage shall not exceed 1% of cataloged airflow.

2.18.4 Outlet Connection:

2.18.4.1 Slip & Drive Connection: Terminal units shall come standard with slip and drive connection.

## 2.18.5 Hot Water Coils:

2.18.5.1 1-Row Hot Water Coils: The 1-row hot water reheat coil shall be factory-installed on the discharge outlet. The coil shall have 144 aluminum-plated fins per foot. Full fin collars provided for accurate fin spacing and maximum fin-tube contact. The 3/8" (9.5 mm) OD seamless copper tubes are mechanically expanded into the fin collars. Coils shall be proof tested at 450 psig (3102 kPa) and leak tested at 300 psig (2068 kPa) air pressure under water. Coil connections are right-hand.

## 2.18.6 Direct Digital Controls:

2.18.6.1 DDC Actuator: 3-wire, 24-VAC, floating-point control actuator with linkage release button. Torque shall be 35 in-lb minimum and shall be non-spring return with a 90-second drive time. Travel shall be terminated by end stops at fully-opened and -closed positions. An integral magnetic clutch eliminates motor stall.

2.18.7 Direct Digital Controller: The microprocessor based terminal unit controller shall provide accurate, pressure independent control through the use of a proportional integral control algorithm and direct digital control technology. The controller, named the Unit Control Module (UCM), monitors zone temperature setpoints, zone temperature and its rate of change, and valve airflow using a differential pressure signal from the pressure transducer. Additionally, the controller can monitor either supply duct air temperature or CO<sub>2</sub> concentration via appropriate sensors. The controller shall be provided in an enclosure with 7/8" knockouts for remote control wiring.

2.18.8 System Communications: The Controller shall be designed to send and receive data from a controller installed on the air handler (AHU-3). Current unit status conditions and set-points shall be monitored via this data communication feature and the temperature setpoint shall be adjusted by a wall mounted zone temperature sensor. The network type is a twisted wire pair shielded serial communication.

2.18.9 Proportional Water Valve: The valve shall be a field-adaptable, 3-way configuration and ships with a cap over the bottom port. The valve shall be designed with an equal percentage plug. The intended fluid is water or water and glycol (50% maximum glycol). The actuator shall be a synchronous motor drive. The valve shall be driven to a predetermined position by the UCM controller using a proportional plus integral control algorithm. If power is removed, the valve shall fail in the full open position. The actuator shall be rated for plenum applications under UL 94-5V and UL 873 standards.

2.18.9.1 Pressure and Temperature Ratings: The valve shall be designed and tested in full compliance with ANSI B16.15 Class 250 pressure/temperature ratings, ANSI B16.104 Class IV control shutoff leakage, and ISA S75.11 flow characteristic standards. Flow Capacity – 3.80 Cv, 6.60 Cv, 0.70 Cv, 2.2 Cv Overall Diameter – 1/2" NPT, 3/4" NPT (7.30 Cv) Maximum Allowable

Pressure – 300 psi Maximum Operating Fluid Temperature – 200°F Maximum Close-off Pressure – 55 psi Electrical Rating – 6VA at 24 VAC. Ten (10) feet of plenum rated 22-gage wire for connection. Terminations are #6 stabs.

2.18.10 Manufacturer: TRANE VCWF per schedule, or approved equal.

2.19 ELECTRIC WALL HEATERS: The heating equipment shall include electric, automatic fan forced air heater suitable for large area heating, as manufactured by QMark ®, or approved equal. The heater shall be designed for wall recess or surface mounting. Heaters shall be UL listed or equivalent (ETL).

2.19.1 Heater Assembly: The heater assembly which fits into the back box shall consist of a fan panel upon which is mounted all of the operational parts of the heater.

2.19.2 Heating Element: The heating element shall be of the non-glowing design consisting of a special resistance wire enclosed in a steel sheath to which steel plate fins are copper brazed. It shall be warranted for 5 years.

2.19.3 Fan And Motor: Fan shall be five-bladed aluminum. Fan motor shall be totally enclosed.

2.19.4 Fan Delay Switch: Fan control shall be of bi-metallic, snap-action type and shall activate fan after heating element reaches operating temperature. The fan shall continue to operate after the thermostat is satisfied and until the heating element is cool.

2.19.5 Thermostat: The tamperproof thermostat shall be of the bi-metallic snap-action type with enclosed contacts. It shall be completely concealed behind the front cover to become tamperproof.

2.19.6 Thermal Cutout: A manual-reset thermal cutout shall be built into the system to shut off the heater in the event of overheating.

2.19.7 Power On/Off Switch: A double-pole, single throw ON/OFF switch shall be mounted on the back box for positive disconnect of power supply. It will be completely concealed behind the front grille panel.

2.19.8 Pneumatic/Electric Switch: An optional pneumatic/electric switch shall be available for use with energy management systems employing pneumatic pressure devices for controlling comfort levels and set-back operations.

2.19.9 Low Voltage Relays: 24-volt and 120 volt low voltage relays shall be available as optional equipment to control 208, 240 or 277 volt heaters in conjunction with central energy control systems. The built-in thermostat can then be used as one of the thermostats in an automatic night set back operation.

2.19.10 Back Box: The back box shall be designed for duty as a recessed rough-in box in either masonry or frame installations, and is also used with the surface mounting frame in surface mounting installations. The back box shall be 20-gauge galvanized steel and shall contain knockouts through which power leads are brought.

2.19.11 Front Panel: The front panel shall be of the bar grille type and shall be constructed of 16-gauge cold-rolled steel, welded into a uniform grille to direct the warmed air toward the floor. The front grille shall be surrounded by a decorative satin-finish aluminum "picture" frame.

2.19.12 Three Piece Design: The heater shall be made up of a back box, a heater assembly, and a front panel.

## 2.20 GAS MONITORING SYSTEM

2.20.1 The gas monitor shall continuously measure and display the concentrations of up to three (3) sensors; toxic, oxygen and/or combustible sensors can be specified.

2.20.2 The TriGard Gas Monitor consists of a single-point up to a three-point monitor. The TriGard Gas Monitor is contained in a plastic, general-purpose enclosure designed to meet NEMA 4X Standards as manufactured by Applied Measurement & Controls, or approved equal.

### 2.20.2.1 Monitor Requirements:

#### 2.20.2.1.1 Monitor Operating Requirements:

- a) Operating Voltage: The monitor shall operate between 30 VDC and an internal 110 VAC power supply shall be provided.
- b) The monitor shall have a reset connector and button for resetting latched alarms.
- c) Monitor set-up and start-up shall not require that the enclosure be opened during this process.
- d) The monitor shall be factory-calibrated and ready for out-of-box use. Only a gas check is required to ensure proper operation.
- e) The monitor output signal capacity shall provide industry standard Modbus RTU format, and Prosoft third-party tested and compliant.

#### 2.20.2.1.2 Monitor Display:

- a) A local scrolling display will indicate the gas type being monitored and the concentration of gas present. The display will alternate between the sensors.

- b) The monitor display shall indicate all diagnostic check/fault conditions with a scrolling message detailing the condition. Error codes shall not be used.
- c) The monitor will display three levels of alarm. Alarm levels will be adjustable by means of a hand-held infrared controller. The display will be present at all times, will not be required to be turned on or off, and will be visible from a distance of five feet. This readout will be a three and one-half inch (3-1/2") digit Liquid Crystal Display (LCD).

#### 2.20.2.2 Smart Sensor Technology:

- a) Sensors shall be contained in sensor modules externally mounted to the main enclosure. All toxic and oxygen sensor modules shall be replaceable without the need for tools and while the unit is under power (hazardous areas).
- b) Sensor modules shall contain all relevant sensor information, including the sensor manufacturer part number within the module.
- c) The sensor module shall store all calibration data, enabling offsite calibration and field-installed without requiring recalibration. The sensor module shall not require a battery or power source to store this data.
- d) The electrochemical sensors shall not require the periodic addition of reagents.
- e) The sensor/transmitter will give an indication of when sensor is nearing the end of its useful life by means of the front panel LCD. This indication that the sensor is nearing its useful life will be based on the sensor output. It shall not be based on the time the sensor was in service.

#### 2.20.2.3 Multi-Sensing Capabilities:

- a) The monitor shall operate up to three sensors at one time.
- b) Combinations of electrochemical, catalytic and infrared sensing technologies shall be available.
- c) The sensor units can be remotely located from a monitor/readout unit by up to 100 feet. The sensors will be able to be mounted up to 3000 feet from the monitor enclosure with optional remote power supplies.
- d) Remote Explosion Proof enclosures shall be provided for all gases, including Combustible gases.
- e) Refer to installation outline drawing for area classification.

#### 2.20.2.4 Infrared Combustible Sensor:

- a) The infrared (IR) combustible sensor must be capable of calibration without gas. The sensor/transmitter must be capable of performing a full calibration by zero adjustment only.
- b) The IR sensor/transmitter shall detect for an above 100% LEL condition (over-range). This condition must be indicated on the front panel LCD.
- c) The IR sensor/transmitter shall not contain a flashback arrestor / frit.
- d) The IR sensor/transmitter must allow for a gas check without alternate calibration/gas check fittings or cap.

#### 2.20.2.5 Sensing Element Warranty:

- a) All sensors will have a minimum useful life of one year.
- b) The supplier shall provide replacement sensors at no charge for any sensor that does not meet the minimum requirement.
- c) The IR source in the infrared sensor will have a minimum useful life of 10 years. The supplier will provide replacement sensors at no charge for any sensor that does not meet the minimum requirement.

#### 2.20.2.6 Non-Intrusive Calibration Capability:

- a) All monitors can be calibrated without opening any enclosures. Do not specify the use of flashlight-type devices, magnets or clamp-on devices to achieve calibration. The acceptable method uses a handheld device.
- b) There will be an option to calibrate the sensor through a push-button actuator, which allows for zero, span and iCAL capabilities.

#### 2.20.2.7 LED/Relay:

2.20.2.7.1 Sensor/transmitter shall have status LEDs, viewable from 50 feet, minimum. The LEDs shall operate as follows:

- a. Solid green LED – normal operation (measure mode)
- b. Solid red LED – fault condition
- c. Blinking red LED – alarm condition

2.20.2.7.2 Sensor/transmitter shall have relays. Relays shall be rated at 5 amps @ 30VDC, 5 amps @ 220VAC, single-pole, double-throw and consist of three for alarm levels and one for fault. All relay contact activation will be monitored. If the relay cannot activate for any reason, the trouble relay will change state. All relays shall be field selectable through a non-intrusive hand-held wireless remote control unit (Controller). Selectable features include:

- a. Alarm level
- b. Latching/Non-latching
- c. Upscale/Downscale
- d. Normally-opened/Normally-closed
- e. Energized/De-energized
- f. Other Features

2.20.2.8 Power Supply Requirements:

- a) The Internal Power Supply Monitor shall be integrally powered by a built-in supply of 100-256 VAC / 24 VDC.

2.20.2.9 Options:

- a) Battery Backup: An internal battery backup shall provide a minimum of 12 hours operation for up to three sensors under no alarm conditions.
- b) Strobes: A Red top-mounted strobe shall be provided.

2.20.2.10 The monitor shall be an MSA TriGard Monitor as supplied by Applied Measurement & Controls, (585) 678-9091.

2.20.3 The Ultima X3 Series Explosion-Proof Gas Monitor consists of a single-point up to a three-point monitor. The Ultima X3 Gas Monitor is contained in a 316 stainless steel enclosure suitable for location in Class I, Division 1 & 2, Groups A, B, C & D classified areas as manufactured by Applied Measurement & Controls or approved equal. The enclosure shall have a minimum of four entries, allowing for flexible mounting options for sensor, power, signal, and optional relay wiring. The enclosure shall offer a means to mount without using an entryway.

2.20.3.1 Monitor Requirements:

2.20.3.1.1 Monitor Operating Requirements:

- a) Operating Voltage: The monitor shall operate between 30 VDC and an internal 110 VAC power supply shall be provided.
- b) The monitor shall have a reset connector and button for resetting latched alarms.

- c) Monitor set-up and start-up shall not require that the enclosure be opened during this process.
- d) The monitor shall be factory-calibrated and ready for out-of-box use. Only a gas check is required to ensure proper operation.
- e) The monitor output signal capacity shall provide industry standard Modbus RTU format, and Prosoft third-party tested and compliant.

#### 2.20.3.1.2 Monitor Display:

- a) A local scrolling display will indicate the gas type being monitored and the concentration of gas present. The display will alternate between the sensors.
- b) The monitor display shall indicate all diagnostic check/fault conditions with a scrolling message detailing the condition. Error codes shall not be used.
- c) The monitor will display three levels of alarm. Alarm levels will be adjustable by means of a hand-held infrared controller. The display will be present at all times, will not be required to be turned on or off, and will be visible from a distance of five feet. This readout will be a three and one-half inch (3-1/2") digit Liquid Crystal Display (LCD).

#### 2.20.3.2 Smart Sensor Technology:

- a) Sensors shall be contained in sensor modules externally mounted to the main enclosure. All toxic and oxygen sensor modules shall be replaceable without the need for tools and while the unit is under power (hazardous areas).
- b) Sensor modules shall contain all relevant sensor information, including the sensor manufacturer part number within the module.
- c) The sensor module shall store all calibration data, enabling offsite calibration and field-installed without requiring recalibration. The sensor module shall not require a battery or power source to store this data.
- d) The electrochemical sensors shall not require the periodic addition of reagents.
- e) The sensor/transmitter will give an indication of when sensor is nearing the end of its useful life by means of the front panel LCD. This indication that the sensor is nearing its useful life will be based on the sensor output. It shall not be based on the time the sensor was in service.

#### 2.20.3.3 Multi-Sensing Capabilities:

- a) The monitor shall operate up to three sensors at one time.



- b) Combinations of electrochemical, catalytic and infrared sensing technologies shall be available.
- c) The sensor units can be remotely located from a monitor/readout unit by up to 100 feet. The sensors will be able to be mounted up to 3000 feet from the monitor enclosure with optional remote power supplies.
- d) Remote Explosion Proof enclosures shall be provided for all gases, including Combustible gases.
- e) Refer to installation outline drawing for area classification.

#### 2.20.3.4 Infrared Combustible Sensor:

- a) The infrared (IR) combustible sensor must be capable of calibration without gas. The sensor/transmitter must be capable of performing a full calibration by zero adjustment only.
- b) The IR sensor/transmitter shall detect for an above 100%LEL condition (over-range). This condition must be indicated on the front panel LCD.
- c) The IR sensor/transmitter shall not contain a flashback arrestor / frit.
- d) The IR sensor/transmitter must allow for a gas check without alternate calibration/gas check fittings or cap.

#### 2.20.3.5 Sensing Element Warranty:

- a) All sensors will have a minimum useful life of one year.
- b) The supplier shall provide replacement sensors at no charge for any sensor that does not meet the minimum requirement.
- c) The IR source in the infrared sensor will have a minimum useful life of 10 years. The supplier will provide replacement sensors at no charge for any sensor that does not meet the minimum requirement.

#### 2.20.3.6 Non-Intrusive Calibration Capability:

- a) All monitors can be calibrated without opening any enclosures. Do not specify the use of flashlight-type devices, magnets or clamp-on devices to achieve calibration. The acceptable method uses a handheld device.

- b) There will be an option to calibrate the sensor through a push-button actuator, which allows for zero, span and iCAL capabilities.

#### 2.20.3.7 LED/Relay:

2.20.3.7.1 Sensor/transmitter shall have status LEDs, viewable from 50 feet, minimum. The LEDs shall operate as follows:

- a. Solid green LED – normal operation (measure mode)
- b. Solid red LED – fault condition
- c. Blinking red LED – alarm condition

2.20.3.7.2 Sensor/transmitter shall have relays. Relays shall be rated at 5 amps @ 30VDC, 5 amps @ 220VAC, single-pole, double-throw and consist of three for alarm levels and one for fault. All relay contact activation will be monitored. If the relay cannot activate for any reason, the trouble relay will change state. All relays shall be field selectable through a non-intrusive hand-held wireless remote control unit (Controller). Selectable features include:

- a. Alarm level
- b. Latching / Non-latching
- c. Upscale / Downscale
- d. Normally-opened / Normally-closed
- e. Energized / De-energized
- f. Other Features

#### 2.20.3.8 Power Supply Requirements:

- a) The Internal Power Supply Monitor shall be integrally powered by a built-in supply of 100-256 VAC / 24 VDC.

2.20.3.9 The monitor shall be an MSA Ultima X3 Monitor as supplied by Applied Measurement & Controls, (585) 678-9091.

2.20.4 Manufacturer Capability Requirements: As a minimum, the gas monitoring equipment manufacturer must meet the following requirements:

- a. The manufacturer must be capable of supplying all equipment used to check or calibrate the monitor units.
- b. The manufacturer must be capable of providing on-site service with factory-trained personnel.
- c. The manufacturer must be capable of providing on-site training for owner/operator.
- d. The manufacturer must be capable of providing replacement parts within 24 hours.

## 2.21 CENTRAL-STATION AIR HANDLERS (AHU-3 & 4):

2.21.1 Hot Water Unit General: The unit shall be as manufactured by Engineered Air, or approved equal.

2.21.1.1 The product shall consist of horizontal and vertical air handling units and mixing boxes. Units shall be tested and certified with ARI 430 and ARI 260. The unit complies with NFPA 90A and is UL listed to U.S. and Canadian safety standards.

2.21.1.2 Air handlers shall consist of a hydronic coil, drain pan, and centrifugal fan with motor mounted in a common cabinet. Coil connections shall be independent for the same or opposite side location.

2.21.1.3 Air handlers shall be provided with knockouts in all four corners for installing the unit suspended from the ceiling with threaded rods.

2.21.1.4 Large motor access panels shall be provided on both sides of the unit and accessories.

### 2.21.2 Casings:

2.21.2.1 Casings (structural components) shall be constructed of heavy-gauge galvanized steel, insulated with one-inch, 1-1/2 lb density fiberglass fire resistant and odorless glass fiber material and suitable for exterior installation.

2.21.2.2 Fan housing sides shall be directly attached to the air handler top and bottom panels.

2.21.2.3 Coil access panels shall be located on both sides of the air handler .

2.21.2.4 Main access panels shall provide access to the fan and motor from both sides of the air handler.

### 2.21.3 Coils:

2.21.3.1 Coils shall be 5/8" O.D. O.D. as manufactured by Engineered Air, constructed of copper tube, aluminum fin, and copper headers with schedule 40 steel pipe connectors.

2.21.3.2 Fins constructed of aluminum or copper shall be rippled for maximum heat transfer and shall be mechanically bonded to the tubes by mechanical expansion of the tubes. The coils shall have a galvanized steel casing. All coils shall be factory tested with air at 300 psig (2070 kPa) while immersed in an illuminated water tank.

2.21.3.3 Headers with schedule 40 steel pipe connections utilize male N.P.T. up to 4"(100mm) connections, with weldneck flanges.

2.21.3.4 Headers shall be outside the air-handling unit for maximum serviceability except for blow through applications where headers are internal. The non-headered end of the coil shall be fully concealed. Provide auxiliary drain pan complete with 1/2" (13mm) MPT drain connection at headered end of cooling coils.

2.21.3.5 Provide an insulated header cover to conceal exposed headers.

2.21.3.6 Coils shall be removable from the unit at the header end, unless shown otherwise on the drawings. All water coils shall be equipped with a capped vent tapping at the top of the return header or connection, and a capped drain tapping at the bottom of the supply header or connection.

2.21.3.7 Water and glycol coils shall be circuited to provide adequate tube velocities to meet design requirements. Internal turbulators are not acceptable.

2.21.3.8 5/8" O.D. tube diameter water coils shall be ARI Certified.

2.21.3.9 Refrigerant evaporator type coils (AHU-3 ONLY) shall be equipped with distributors connected to the coil by copper tubes. Where a hot gas bypass is required, the inlet shall be at the refrigerant distributor. Solenoid valves, expansion valves, and related accessories are to be provided and installed by the refrigeration contractor.

2.21.3.10 Refrigerant coils (AHU-3 ONLY) with multiple compressors shall be alternate tube circuited in order to distribute the cooling effect over the entire coil face at reduced load conditions. Provision for use of thermal expansion valves must be included for variable air volume and/or make-up air applications.

2.21.3.11 Provide Heresite P-413C, a pure phenolic with plasticizers thermosetting resinous coating to protect the coils against exposure to corrosive atmospheres. The process shall be accomplished by a multiple coat application of degreasing and etching, dipping and baking (four times), resulting in complete coating coverage of the fins, tubes, headers and casing. Salt spray tested to ASTM B-117 standards.

2.21.4 Fan:

2.21.4.1 The fans shall be DWDI (double width double inlet) forward curved centrifugal blower type. The fans shall be direct drive mounted directly to the motor shaft. Fans shall be dynamically balanced. Air handlers shall have a single fan.

#### 2.21.5 EC Motors:

2.21.5.1 Provide a 60 Hertz, variable speed, multiple voltage EC motor that has a plus or minus 10 percent voltage utilization range. The motor shall be open type with permanently sealed ball bearings, internal overload protection, and frame belly band design. The motor shall be factory installed, programmed, and wired to the air handler control panel. Provide motor starter and disconnect.

#### 2.21.6 Drain Pan:

2.21.6.1 The drain pan shall be noncorrosive and double-sloped to allow condensate drainage.

2.21.6.2 The drain pan construction shall be polymer.

2.21.6.3 Coils shall be mounted above the drain pan—not in the drain pan—to allow the drain pan to be fully inspected and cleaned. The drain pan shall be removable for cleaning.

2.21.6.4 The polymer drain pan connections shall be unthreaded 3/4-inch schedule 40 PVC for solvent bonding.

2.21.6.5 The main drain connection shall be at the lowest point of the drain pan. An auxiliary drain connection shall be provided on the same side as the main connection.

#### 2.21.7 Filters:

2.21.7.1 One-inch standard efficiency throwaway, shall be available on units.

2.21.7.2 Units shall have a standard flat filter rack that is sized for less than 500 feet per minute at nominal airflow.

2.21.7.3 units and filter racks shall use standard filter sizes.

#### 2.21.8 Mixing Box:

- a. Mixing boxes shall be constructed of heavy-gauge galvanized steel.
- b. They shall be complete with two low-leak parallel blade dampers that are factory-linked together.
- c. A 1/2-inch extendible drive rod shall be provided for actuator connection, either internally or externally.
- d. Damper blades shall be extruded aluminum having interlocked PVC extruded edge seals. Damper frame seals are PVC shall be extruded forms interlocked to the damper frame and provided with a continuous edge seal to the blades.
- e. Damper seals shall be stable in the temperature range of -50°F to 230°F.

- f. Mixing boxes shall also include two side access panels as standard to provide access to the unit's internal components.

#### 2.21.9 Piping Packages:

- a. The maximum entering fluid temperature to the water valves shall be 200°F.
- b. Insulation on the piping package shall be by others.
- c. The stop valves shall be ball type.

#### 2.21.10 Controls:

- a. A disconnect switch (for non-electric heat units), fused transformer, contactor(s), and terminal strip shall be provided with the control interface and Tracer controller options.
- b. The control interface shall be intended to be used with a field-supplied, low-voltage thermostat or controller (thermostat or controller shall be explosion proof for the Digester, Influent and Belt Press Buildings).
- c. The control box shall contain a line voltage to 24-volt transformer and a disconnect switch.
- d. The unit controller shall be of a factory mounted, wired and programmed controller for dependable out-of-the box operation.
- e. The unit controller shall include equipment and software to perform the sequence of operation as outlined.
- f. All control options shall be factory programmed with additional configuration and programming in the field using a service tool.

### 2.22 MANUFACTURER

#### 2.22.1 Engineered Air, or approved equal.

### 2.23 SEPARATED COMBUSTION NATURAL GAS FIRED (AHU-1, 2 & 5)

2.23.1 Manufacturers: Engineered Air, or approved equal, which can incorporate the following air control schemes:

- a. Automatic modulation of 0% - 100% outdoor air full recirculation.

#### 2.23.2 Manufactured Units:

- a. Unit: Constant volume indoor indirect-fired air handler.

### 2.23.3 Fabrication:

2.23.3.1 Casing and Components: Units shall have a welded steel frame. The casing shall be constructed of a minimum of 16 gauge, cold rolled steel and the panels shall be fabricated into self-framing, standing seam type construction. The panels shall form a self-framing casing. The exterior roof panels shall be a minimum of 16 gauge, cold rolled steel. The top wearing surface of the floor of each section shall be a minimum of 16 gauge, cold-rolled steel. The cabinetry of the heat exchanger section shall be double wall construction.

2.23.3.2 Fan Support: Fan housing(s) shall be welded to the casing and reinforced with structural angle or tubing to reduce vibration and sound.

2.23.3.3 Access Doors: Doors in the unit housing shall be provided to permit ready access to internal components. The access doors shall be of 16 gauge cold rolled steel. The doors shall be designed to swing out with a hinge.

2.23.3.4 Finish: Per schedule on Contract Drawings.

2.23.3.5 Observation Port: A permanent observation port shall be provided in the burner to allow observation of both the pilot and main frame.

### 2.23.4 Power Burner and Gas Train:

2.23.4.1 Burner: Furnish and install one 10:1 turndown gas burner. The burner shall incorporate a stainless steel frame retention type combustion head. Combustion head shall be symmetrically round with internal gas pilot. Primary-secondary air control shall be a design function of the combustion head.

2.23.4.2 Burner Assembly/Gas Train: The gas train piping shall include a 1/4" NPT pressure tapping with 1/4" pipe plug upstream and downstream of valve and regulator in the gas train, one manually operated ball valve upstream of valves, one main gas pressure regulator with vent (provide piped vent to exterior per NFPA and fuel gas code), one safety shutoff valve which shall be proven closed during pre-ignition by proof of valve closure interlock switch on valve on FM gas train, primary and secondary automatic gas safety shutoff valves to operate simultaneously, manually operated gas valve which shall be located downstream of both automatic gas valves to permit leakage testing of the valves and a normally open, fully ported, electrically operated valve shall be provided in a vent line connected between the two safety shut off valves. The vent pipe shall be run outside to atmosphere. Electronic safety combustion controls shall be supplied complete with ultra-violet flame scanner to monitor the pilot and main flame. A programming relay shall be furnished. It shall be so utilized as to provide intermittent type gas electric ignition and pre-ignition purge timer.

2.23.4.3 Pilot: Automatic electronic ignition system.

2.23.4.4 Damper: Motorized with end switch to prove position before burner operation.

### 2.23.5 Indirect-Fired Heat Exchanger:

2.23.5.1 Heat Exchanger: Heat exchanger drum and front header is to be made entirely from 409 stainless steel. The secondary heat exchange surfaces shall be made from stainless steel. Heat exchanger is to incorporate primary surface drum and secondary surface tubes in a four pass design. Baffles are to be utilized to assure proper air distribution on the heat exchanger at low air volumes. The primary surface is to be no less than 16 gauge, the secondary tubes are to be no greater than 3" (7.6 cm) in diameter and no less than .055" (0.1 cm) wall thickness. The front and rear headers, as well as the intermediate headers are to be a minimum of 16 gauge. The front and rear collector boxes shall be a minimum of 8" (20.3 cm) deep. The front and rear collector boxes shall overhang the drum and include an integral directional baffle to direct air to cover the entire box as well as the box to tube joint.

### 2.23.6 Fans and Motors:

2.23.6.1 Fan: The fan shall consist of centrifugal, forward curved double-width, double-inlet (DWDI) blower wheels and scrolls. The blower assembly shall be dynamically balanced. As standard, blower shafts shall be of a tubular design. The shafts shall not pass through their first critical speed when the unit comes up to the rated RPM. Shaft shall be coated with a rust inhibitor.

2.23.6.2 Drive: V-belt drives shall be standard capacity, with reinforced rubber belts. Drives shall be mounted outside the airstream. The sheaves shall be of a cast iron type. Standard drive sheaves are adjustable with a plus or minus 7% adjustability on 10 HP motors and smaller. The service factor used for V-belt drives shall be not less than 1.25. An adjustable motor base shall provide variation in center distance and shall be readily adjustable by means of screw adjustments. A locking nut, or similar device, shall be provided to secure the base in proper position.

2.23.6.3 Fan Bearings: Blower wheels shall be supported two outboard bearings. Bearings shall be of a self-aligning, ball bearing type and shall have an ABMA L10 rated life of 100,000 hours.

2.23.6.4 Motor: Motor shall be explosion proof, 1800 RPM, 3 Ø, 60 Hz, wired for the scheduled voltage. Motor horsepower shall be as indicated on the schedule. All 3 Ø motors shall be controlled and protected by an automatic starter with thermal overload protection. Starter shall be interlocked to prevent burner operation when overload relays are tripped. Motors shall be mounted outside the airstream.

### 2.23.7 Control System:

2.23.7.1 Factory Testing: The off /low-fire/high-fire operation of the burner shall be controlled by means of a 24V temperature control thermostat.



2.23.7.2 Control Enclosure: A factory pre-wired control cabinet shall be supplied with the burner. Cabinet shall be mounted on or near burner. Cabinet to house the flame safeguard control, programming purge timer, burner motor starter, fuses, control switches and relays. The unit shall be provided with an integral weatherproof control panel with 115 volt control transformer, fuses, terminal strip, and motor starter with overload protection. Fan/blower motor(s) will be wired to the motor starter(s).

2.23.7.3 Disconnect Switch: A unit disconnect switch shall be provided on the exterior of the unit for single point wiring connection.

2.23.7.4 Flame Relay: A manual restart of the burner shall be necessary in the event of shutdown due to flame failure.

2.23.7.5 Safety Controls:

- a. High Gas Pressure: The high gas pressure switch shall turn the burner off when the gas pressure is above its setpoint. The maximum gas pressure shall be set at 1" wc above the maximum gas pressure at high fire.
- b. Low Gas Pressure: The low gas pressure switch shall turn the burner off when the gas pressure is below its setpoint. The minimum gas pressure shall be set at 7" wc.
- c. High Temperature Limit Switch: A high temperature switch shall turn the burner off when air is discharged above its setpoint. The high temperature limit switch shall be factory set at 200° F (93.33° C).

2.23.7.6 Electronic Controls System:

2.23.7.6.1 Temperature Controller: Provide with 24V room temperature controller.

2.23.7.6.2 Unit Mounted Control Panel: Mount unit operating switch and Remote Panel lights, as follows:

- a. Including Summer/Off /Winter switch, Blower on/off light, Burner on/off light, flame failure light
- b. Clogged Filter light
- c. Burner alarm horn
- d. Burner on/off outdoor air thermostat
- e. Fan on/off low-limit control with bypass timer

2.23.8 Additional Air Handler Accessories:

2.23.8.1 Filter Section: Standard filter section construction shall be V-bank style, with fiberglass throw-away

2.23.8.2 Mixing Section: (AHU-2 & 5) The mixing box shall be provided with opposed-blade return air and fresh air dampers with modulating 24V actuator(s). The mixing box shall be capable of 0-100% fresh air to return air ratio. Standard damper control shall be controlled by a potentiometer.

2.23.9 Manufacturer:

1. Engineered Air, or approved equal.

2.24 AIR COOLED CONDENSING UNIT (ACCU-1 Connect to AHU-3)

2.24.1 Condensing units shall be cETL, ETL<sub>US</sub> approved. Condensing units shall be designed for a minimum of 15°F (8°C) liquid subcooling. Condensing units shall operate down to 50°F (10°C) as standard. Multiple compressor/condenser circuits shall be separate from each other. Suction and liquid lines shall be extended to the outside of the cabinet. Service ports fitted with Schraeder fittings shall be connected to the suction and discharge lines for charging or pressure gauge readings. Semi-hermetic units shall also incorporate liquid line service ports and liquid line manual shutoff valves.

2.24.2 Controls for hermetic compressor units shall include compressor and condenser fan motor contactors, control circuit transformer, cooling relays, non-recycling pumpdown relays, ambient compressor lockout, manual reset high pressure controls and automatic reset low pressure controls. Head pressure actuated fan cycling control shall be provided on all multiple condenser fan units.

2.24.3 Controls for semi-hermetic compressor units shall include compressor and condenser fan motor contactors, control circuit transformer, cooling relays, non-recycling pumpdown relays, ambient compressor lockout, manual reset high pressure controls, automatic reset low pressure controls, head pressure actuated fan cycling switches, temperature and pressure actuated cylinder unloading, solid state compressor overload protection module with integral two minute anti-cycle timer and oil pressure failure switch with built in time delay.

2.24.4 Provide five minute anti-cycle timers.

2.24.5 Provide interstage time delay timers.

2.24.6 Provide hot gas bypass connection on the lead compressor.

2.24.7 Provide low ambient controls for low temperature operation.

2.24.8 Provide separate compressor compartment complete with 1", 1-1/2 lb./cu. ft. insulation and hinged access doors.

2.24.9 Refrigeration specialties such as solenoid valves, TX valves, etc., to be supplied and installed by refrigeration contractor.

2.24.10 Cooling Control:

2.24.10.1 C-TRAC3 Controller:

2.24.10.2 The controller shall automatically start in economizer, or cooling mode based on continuously monitored ambient temperature and load requirements.

2.24.10.3 The controller shall include an adjustable low limit set point for freeze protection to cease equipment operation in the event of low discharge temperature. If the discharge air temperature falls below the adjusted set point, the blowers will shut down and the outside air dampers shall close. The low limit bypass timer shall vary automatically depending on the thermal coefficient of the style of heat exchanger.

2.24.10.4 If the discharge air temperature approaches the low limit set point, the controller shall automatically reduce the economizer minimum fresh air down to half of its original setting to compensate.

2.24.10.5 As the ambient temperature falls, the C-TRAC3 controller shall automatically compensate for outside air thermal expansion by proportionally reducing the amount of outside air.

2.24.11 Cooling devices:

2.24.11.1 The C-TRAC3 electronic temperature control system shall provide up to 5 stages of mechanical cooling control to maintain discharge (room) temperature. The minimum run and off time for the compressors shall be variable based on load requirements.

2.24.11.2 The C-TRAC3 electronic temperature control system shall provide a modulating signal to a cooling coil control valve and actuator to maintain discharge (room) temperature.

2.24.11.3 The C-TRAC3 electronic temperature control system shall provide a modulating control signal to the cooling coil control valve and actuator with the addition of up to 5 additional stages of mechanical cooling to maintain discharge (room) temperature. The minimum run and off time for the compressors shall be variable based on load requirements.

2.24.11.4 The C-TRAC3 shall automatically enable an additional mechanical cooling stage whenever the ambient temperature rises above a predetermined set point.

2.24.11.5 Mechanical cooling shall be disabled below an adjustable low ambient temperature set point.

2.24.11.6 The cooling function shall be disabled by a remote binary input contact.

2.24.11.7 The controller may initiate the economizer mode on an initial call for cooling with an adjustable minimum fresh air setting. If the calculated discharge temperature set point is higher than the ambient temperature, then the C-TRAC3 will maintain the economizer operation. The minimum position shall be set by a face mounted potentiometer.

2.24.12 Variable air volume (load shedding):

2.24.12.1 The C-TRAC3 shall automatically compensate the internal control algorithms when a change in air volume from the 2-speed supply blower occurs for improved temperature control.

2.24.12.2 The C-TRAC3 shall automatically compensate the internal control algorithms when a change in air volume from the supply blower variable air volume dampers occurs for improved temperature control.

2.24.12.3 The C-TRAC3 shall automatically compensate the internal control algorithms when a change in air volume from the supply blower variable frequency drive occurs for improved temperature control.

2.24.13 Communication:

2.24.13.1 The C-TRAC3 shall have indication and troubleshooting LED lights, multi-meter set point and sensor temperature test points, and a common alarm contact in the event of equipment failure. Information can be accessed from a PDA (personal digital assistant) or laptop computer for improved access to control settings using Engineered Air SMC software.

2.24.13.2 The C-TRAC3 controller with either CRD control panel mounted and/ or remote display panel is designed to monitor and control C-TRAC3 equipment operations via Modbus communication. The CRD controller is preprogrammed with the following:

2.24.13.2.1 Unit Modes, Scheduler, Unit Operation, Discharge Temperature and Setpoints, Ambient and Damper Information, Additional Inputs and Outputs, Alarm Status, Customer Password. All mode functions detailed below.

2.24.13.2.2 Unit Mode:

- Fan on off
- Occupied, Cooling, Economizer, Heating Unoccupied (enable/disable)

#### 2.24.13.2.3 Scheduler:

- Clock override on/off
- Override timer 1,2,3 hours

#### 2.24.13.2.4 Unit Operation:

- Unit Modes, heat, economizer, cooling
- Enable unit on/off
- Unit Status Occupied, off, Unoccupied
- Heating on / off, L/O Hi Ambient
- Cooling on / off, L/O Low Ambient
- Economizer on/ off. L/O Hi Ambient

#### 2.24.13.2.5 Discharge Temp & Setpoints:

- Discharge Temp
- Discharge setpoint
- Secondary Discharge Temp.
- Secondary Discharge Setpoint

#### 2.24.13.2.6 Ambient & Damper Info:

- Ambient Sensor
- Econo. Min Position %
- VFD Feed Back %
- VFD L/O Cooling

#### 2.24.13.2.7 Alarm Status:

- Low Limit Lockout Ok/Alarm
- Heat Failure Lockout Ok/Alarm
- Prepurge Alarm Ok/Alarm
- Flame Failure Ok/Alarm
- HE or LMK Failure Ok/Alarm
- Discharge Air Ok/Alarm
- Secondary Discharge Air Ok/Alarm
- Ambient Ok/Alarm

#### 2.24.13.2.8 Additional Input/ Outputs:

- clogged filter indication
- room temperature

#### 2.24.14 C-TRAC with Carel Compact A, pCO5 SMALL and pCO5 medium

2.24.14.1 The Carel Controller will provide the following functions: status, monitoring, command and reset signals.

#### 2.24.15 Analog Inputs:

1. NTC 10K ohm temperature probes
  - all temperature sensors shall be of this type.
  - available points: BI-1 to BI-8.
  - examples include: supply, return and ambient sensors.
2. 0-10VDC
  - available points: BI-1, BI-2, BI-5, BI-6
  - examples include: VFD feedback, damper position, %RH, CO2.
  - indicates point status only, no control.
3. 0(4)-20mA
  - available points: BI-1, BI-2
  - examples include: VFD feedback, current sensors
  - indicates point status only, no control.

#### 2.24.16 Digital Inputs:

1. Dry Contact - Status
  - available points: BI5 to BI-8, ID1, ID2
  - examples include: fan on/off (via P32 air switch, photohelic or current switch).
  - external relays can provide status via contacts.
  - check to see if required status is available from the CTRAC.  
(i.e. heating status and alarm status are available from the CTRAC via BACnet)

#### 2.24.17 Analog Outputs:

1. 0-10VDC
  - available points: Y2 only
  - any analog output control signal must come from the BMS via BACnet or I/P
  - examples include: VFD speed control, discharge air reset signal, SH control.

#### 2.24.18 Digital Outputs:

1. Relay (250VAC, 8A res.)
  - available points: C1 to C7
  - any digital output control signal must come from the BMS via BACnet or I/P
  - examples include: unit on/off control, fan on/off control, VFD on/off control.

2.24.19 Manufacturer:

1. Engineered Air, or approved equal.

2.25 CONTROL SEQUENCES

2.25.1 AHU-1&2: In the event the space goes into alarm, due to high concentrations of explosive gas (10% below the lower explosive limit (LEL) as detected by the LEL detector), the Associated AHU shall go to full outside air, the exhaust fan shall be controlled by a differential pressure sensor that is set to keep the space in which it is installed at a minimum of -0.02 in wc negatively pressurized with respect to the outside differential pressure (outside intake damper at its maximum position, exhaust louver damper at its maximum position). Associated AHU to modulate its heating output, under all modes of operation as needed, to maintain space temperature set point.

2.25.1.1 The exhaust fan and Associated AHU shall also go to full outside air mode whenever the space light switch is in the ON position.

2.25.1.2 (AHU-1 ONLY) If the outdoor air is at or below 50 Deg F, as determined by the outdoor air temperature sensor, the unit shall modulate down to the minimum AHU scheduled air flow. The exhaust fan shall modulate to maintain the space negative pressurization. If the space is occupied, in alarm or the outdoor air temperature is above 50 Deg F, the unit shall not modulate from its maximum scheduled.

2.25.1.3 The exhaust fan and Associated AHU (AHU-2 ONLY) shall go to full outside air mode whenever the Dewatering unit is operational. The exhaust fan shall modulate to maintain the space negative pressurization.

2.25.1.4 (AHU-2 ONLY) If the outdoor air is at or below 50 Deg F, as determined by the outdoor air temperature sensor and the space is not occupied or in alarm the outdoor air damper shall modulate down to deliver the minimum AHU scheduled air flow & the return air damper shall open allowing the unit to return air. The exhaust fan shall modulate to maintain space negative pressurization. If the space is occupied, in alarm or the outdoor air temperature is above 50 Deg F, the unit shall not modulate from its maximum scheduled. Provide a duct smoke detector in the return air duct/inlet. If the detector senses smoke the entire air system shall shut down.

2.25.1.5 Contractor shall furnish and install ALL required temperature sensors, controls, control wiring, relays, etc to make the unit and system properly perform the entire sequence as defined.

2.25.1.6 In the event of power loss or lack of airflow into the space the damper shall fail spring closed to isolate the LEL area from the unit.

2.25.1.7 the unit shall shut down and all dampers shall close when the fire / smoke alarm is activated.

2.25.2 AHU-3: When the space is in occupied mode, as determined by the 7-day programmable thermostat, the AHU and general exhaust fans shall run continuously (general exhaust fan shall be considered ALL exhaust fans within the admin office/lab, toilet rooms ,etc). The AHU shall deliver the scheduled minimum amount of outside air (outside intake AHU mixing box damper at its minimum position, general exhaust damper(s) at maximum position, AHU mixing box return air at its minimum position, AHU exhaust fan shall modulate to maintain a positive space differential set-point with respect to the garage area. In the event the outdoor air temperature sensor is lower than the subsequent indoor air temperature sensor, and there is a call for cooling from the indoor 7-day programmable thermostat, the AHU shall evoke economizer mode (AHU outside intake damper(s), both at the exterior and within the AHU, at maximum position, general exhaust damper(s) at maximum position and AHU exhaust fan damper at maximum open position and AHU exhaust fan is maintaining pressurization, AHU return air (within the AHU) is in the closed position).

2.25.2.1 When the space is in un-occupied mode, as determined by the 7-day programmable thermostat, the AHU-3 and general exhaust fans shall be off. If there is a call for heating, the AHU shall re-circulate the total amount of supply air (outside intake AHU mixing box damper is at closed position, general exhaust damper(s) at closed position, AHU mixing box return air at its maximum position, economizer louver damper is closed and economizer exhaust fan is off).

2.25.2.2 The AHU to modulate its heating output, under all modes of operation as needed, to maintain space temperature set point.

2.25.2.3 If the unit is not in economizer mode due to outdoor conditions and there is a call for cooling the unit shall invoke DX cooling and the air cooled condensing unit shall operate to maintain space temperature set point.

2.25.2.4 Contractor shall furnish and install ALL required temperature sensors, controls, control wiring, relays, etc to make the unit and system properly perform the entire sequence as defined.

2.25.2.5 In the event the space is occupied and the mixed air temp falls to 40 deg F (adjustable) the return and outdoor air shall modulate to maintain a mix box / coil entering air temp above 40 Deg F. A freezestat shall be laced over the coil.

2.25.2.6 Provide a duct smoke detector in the return air duct / inlet. If the detector senses smoke the entire air system shall shut down.

2.25.2.7 The AHU exhaust fan shall be controlled by a differential pressure sensor that is set to keep the space in which it is installed at a minimum of +0.02 in wc positivity pressurized with respect to the garage differential pressure.



2.25.3 AHU-4 When the space is in occupied mode, as determined by the 7-day programmable thermostat, the AHU and associated exhaust fan (F-8) shall run continuously. The AHU shall deliver the scheduled minimum amount of outside air (outside intake AHU mixing box damper at its minimum position, general exhaust damper(s) at maximum position, AHU mixing box return air at its minimum position, exhaust fan is modulating to maintain space differential set-point with respect to the garage area). In the event the outdoor air temperature sensor is lower than the subsequent indoor air temperature sensor, and there is a call for cooling from the indoor 7-day programmable thermostat, the AHU shall evoke economizer mode (AHU outside intake damper(s), both at the exterior and within the AHU, at maximum position, general exhaust damper(s) at maximum position and economizer exhaust fan damper at maximum open position and exhaust fan shall modulate to maintain space differential set-point, AHU return air (within the AHU) is in the closed position).

2.25.3.1 When the space is in un-occupied mode, as determined by the 7-day programmable thermostat, the AHU-4 and exhaust fan shall be off. If there is a call for heating, the AHU shall re-circulate the total amount of supply air (outside intake AHU mixing box damper is at closed position, general exhaust damper(s) at closed position, AHU mixing box return air at its maximum position, economizer louver damper is closed and economizer exhaust fan is off).

2.25.3.2 If the space becomes occupied, as determined by the space light switch, the AHU shall deliver the full amount of supply / outdoor air and provide a minimum of 1.5 CFM per square foot of outdoor air. In the event the space is occupied and the mixed air temp falls to 40 deg F (adjustable) the return and outdoor air shall modulate to maintain a mix box / coil entering air temp above 40 Deg F. A freeze-stat shall be laced over the coil.

2.25.3.3 The AHU to modulate its heating output, under all modes of operation as needed, to maintain space temperature set point.

2.25.3.4 Contractor shall furnish and install ALL required temperature sensors, controls, control wiring, relays, etc to make the unit and system properly perform the entire sequence as defined.

2.25.3.5 Provide a duct smoke detector in the return air duct / inlet. If the detector senses smoke the entire air system shall shut down.

2.25.4 AHU-5: In the event the outdoor air is above 50 Deg F, the Associated AHU shall go to full outside air, the exhaust fan shall be controlled by a differential pressure sensor that is set to keep the space in which it is installed at a minimum of -0.02 in wc negatively pressurized with respect to the outside differential pressure (outside intake damper at its maximum position, exhaust louver damper at its maximum position, return air in closed position). Associated AHU to modulate its heating output, under all modes of operation as needed, to maintain space temperature set point.

2.25.4.1 The fan and Associated AHU shall also go to full outside air mode whenever the space light switch is in the ON position.

2.25.4.2 If the outdoor air is at or below 50 Deg F, as determined by the outdoor air temperature sensor and the space is not occupied, the outdoor air damper shall modulate down to deliver the minimum AHU scheduled air flow & the return air damper shall open allowing the unit to return. The exhaust fan shall modulate to maintain space negative pressurization. If the outdoor air temperature is above 50 Deg F, the unit shall not modulate from its maximum scheduled.

2.25.4.3 Contractor shall furnish and install ALL required temperature sensors, controls, control wiring, relays, etc to make the unit and system properly perform the entire sequence as defined.

2.25.4.4 In the event of power loss or lack of airflow into the space the damper shall fail spring closed to isolate the LEL area from the unit.

2.25.4.5 Provide a duct smoke detector in the return air duct / inlet. If the detector senses smoke the entire air system shall shut down.

2.25.5 Inline Building Circulating Pump Control Sequences (P-1 & BCP-1): The heating pumps shall be controlled as follows:

2.25.5.1 Provide an outdoor air temperature sensor and flow switch and interconnect them to the boiler and pump. In the event the outdoor air temperature falls below 50 deg (adjustable), as determined by the outdoor air temperature sensor, the inline pump shall run continuously. The Heating Unit(s) shall cycle and the coil valves shall modulate to maintain space temperature set-point.

2.25.5.2 Contractor shall furnish and install ALL required temperature sensors, controls, control wiring, relays, etc to make the unit and system properly perform the entire sequence as defined.

2.25.6 Gas Fired Unit Heater & Infrared Gas Heater:

2.25.6.1 On a call for heat, as determined by the space thermostat, the combustion air fan / exhauster shall run, the burner shall prove combustion air flow and the burner shall ignite to maintain space temperature set-point.

2.25.6.2 Contractor shall furnish and install ALL required temperature sensors, controls, control wiring, relays, etc to make the unit and system properly perform the entire sequence as defined.

#### 2.25.7 Electric Wall Heater:

2.25.7.1 On a call for heat, as determined by the unit mounted thermostat, the unit shall cycle to maintain space set-point.

2.25.7.2 Contractor shall furnish and install ALL required temperature sensors, controls, control wiring, relays, etc to make the unit and system properly perform the entire sequence as defined.

#### 2.25.8 Blower Room Cooling/Vent System:

2.25.8.1 In the event the space temperature is at the space cooling set point as determined by the space thermostat, the exhaust fan shall operate and the outside air louver shall open 100%.

2.25.8.2 If the space is occupied, as determined by the space light switch, and the outside air temp is above 50 Deg F, as determined by the outside air temperature sensor, the exhaust system and intake louver shall operate as mentioned above.

#### 2.25.9 Differential Pressure Fan Controller

2.25.9.1 Service: Air and non-combustible, compatible gases. Differential pressure fan controller.

2.25.9.2 Wetted Materials: Consult factory.

2.25.9.3 Housing Material: Die cast aluminum case and bezel.

2.25.9.4 Accuracy:  $\pm 1.5\%$  for 0.25" and  $\pm 0.25$ " w.c. ranges. Ranges 0.5" to 5" w.c. and corresponding bi-directional (except  $\pm 2.5$ " w.c.)  $\pm 1\%$ ; All other ranges:  $\pm 0.5\%$  @ 77°F (25°C) including hysteresis and repeatability (after 1 hour warm-up).

2.25.9.5 Stability:  $< \pm 1\%$  per year.

2.25.9.6 Pressure Limits: Ranges  $\leq 2.5$  in w.c.: 25 psi;  $\pm 2.5$ ", 5 in w.c.: 5 psi; 10 in w.c.: 5 psi; 25 in w.c.: 5 psi; 50 in w.c.: 5 psi; 100 in w.c.: 9 psi.

2.25.9.7 Temperature Limits: 32 to 140°F (0 to 60°C).

2.25.9.8 Compensated Temperature Limits: 32 to 140°F (0 to 60°C).

2.25.9.9 Thermal Effects: 0.020%/°F (0.036/°C) from 77°F (25°C). For 0.25" and  $\pm 0.25$ " w.c. ranges:  $\pm 0.03\%$ /°F ( $\pm 0.054\%$ /°C).

2.25.9.10 Power Requirements: 12 to 28 VDC, 12 to 28 VAC 50 to 400 Hz.

2.25.9.11 Power Consumption: 3 VA max.

2.25.9.12 Output Signal: 4 to 20 mA DC into 900  $\Omega$  max.

2.25.9.13 Zero & Span Adjustments: Accessible via menus.

2.25.9.14 Response Time: 250 ms (damping set to 1).

2.25.9.15 Display: Backlit 4 digit LCD 0.4" height LED indicators for set point and alarm status.

2.25.9.16 Electrical Connections: 15 pin male high density D-sub connection. 18" (46 cm) cable with 10 conductors included. 4' and 10' cables available.

2.25.9.17 Process Connections: 1/8" female NPT. Side or back connections.

2.25.9.18 Mounting Orientation: Mount unit in vertical plane.

2.25.9.19 Size: 5" (127 mm) OD x 3-1/8" (79.38 mm).

2.25.9.20 Weight: 1.75 lb (794 g).

2.25.9.21 Agency Approvals: CE.

2.25.9.22 Switch Type: 2 SPDT relays.

2.25.9.23 Electrical Rating: 1 A @ 30 VAC/VDC.

2.25.9.24 Set Point Adjustment: Adjustable via keypad on face.

2.25.9.25 Manufacturer: Dwyer, or approved equal.

## PART 3 - EXECUTION

3.1 INSTALLATION: Install mechanical equipment as indicated and in accordance with the manufacturer's instructions. Provide clearance for inspection, repair, replacement and service. Electrical work shall conform with NFPA 70 and Division 26, "Electrical". Include overload protection in the operating disconnect switches and magnetic starters where provided. The Contractor shall provide all necessary labor, materials, equipment and rigging required to facilitate installation of the equipment items. Special care shall be taken to ensure that no damage occurs to the new equipment or existing facilities during installation of those items. Any damage to new equipment items or existing facilities shall be repaired at the Contractor's expense.

3.1.1 Pump Alignment: The Contractor shall furnish the services of a qualified technician to shim and level pump frames, and shim and align pumps, motors and couplings.

3.2 FIELD TESTS: Schedule and administer tests for each item of mechanical equipment as applicable. Operational tests shall be for a minimum period of 4 hours for each item of mechanical equipment.

3.3 INSTRUCTION TO OWNER'S PERSONNEL: Provide four (4) hours of field instruction to the Owner's personnel for mechanical equipment and associated controls provided in this Section. Training shall be provided under the supervision of a qualified manufacturer's representative.

3.3.1 Install all mechanical equipment and appurtenances in accordance with manufacturer's written instructions.

++ END OF SECTION ++

SECTION 23 31 13

DUCTWORK AND DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section, the Contractor shall furnish all labor, materials and equipment for Ductwork and Ductwork Accessories, as shown on the Plans, as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 Air Diffusion Council (ADC) Publications:

1062-R4 Certification, Rating and Test Manual

AD Measurement of Room-to-Room Sound Transmission Through Plenum Air Systems

1.2.2 American National Standards Institute, Inc. (ANSI) Publication:

S1.4 Sound Level Meters

1.2.3 Air Movement and Control Association, Inc. (AMCA) Publication:

500 Test Methods for Louvers, Dampers and Shutters

1.2.4 Air-Conditioning and Refrigeration Institute (ARI) Publication:

410 Forced-Circulation Air-Cooling and Air-Heating Coils

1.2.5 American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) Publication:

52 Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter

1.2.6 American Society for Testing and Materials (ASTM) Publications:

A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A167	Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet, and Strip
A527	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process Lock-Forming Quality
B117	Salt Spray (Fog) Testing
B127	Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
B152	Copper Sheet, Strip, Plate, and Rolled Bar
C423	Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
C553	Mineral Fiber Blanket and Felt Insulation (Industrial Type)
D822	Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products
D1654	Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
E90	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
E96	Water Vapor Transmission of Materials
E437	Industrial Wire Cloth and Screens (Square Opening Series)

1.2.7 National Fire Protection Association (NFPA) Publication:

90A Installation of Air Conditioning and Ventilating Systems

1.2.8 Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) Publications:

HVACTAB HVAC Systems - Testing, Adjusting and Balancing (HVACTAB)

HVACDCS HVAC Duct Construction Standards - Metal and Flexible (HVACDCS)

HVACALTM HVAC Air Duct Leakage Test Manual (HVACALTM)

1.2.9 Underwriters Laboratories, Inc. (UL) Publications:

181 Factory-Made Air Duct Connectors

555 Fire Dampers and Ceiling Dampers

900 Test Performance of Air Filter Units

1.3 GENERAL REQUIREMENTS: Section 230501, "Mechanical General Requirements", applies to this Section with the additions and modifications specified herein.

1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements"

1.4.1 Manufacturer's Catalog Data:

- a. Ducts
- b. Flexible ducts and connectors
- c. Casings and Plenums
- d. Duct Sleeves and prepared openings
- e. Access Doors
- f. Dampers
- g. Bird screen
- h. Diffusers and Grilles
- i. Dampers and Wall Caps
- j. PVC Duct
- k. Fire Dampers
- l. Double Walled Duct



#### 1.4.2 Drawings:

- a. Ductwork layout

#### 1.4.3 Test Reports:

- a. Sound pressure level rating
- b. Corrosion protection

#### 1.4.4 Field Test Reports:

- a. Air duct leakage tests

1.5 QUALITY ASSURANCE: SMACNA Duct Construction Manuals: The SMACNA recommendations shall be considered as mandatory requirements. Substitute the word "shall" for the word "should" in these manuals. No negative pressure construction for 4-inch, 6-inch, or 10-inch water gauge is provided herein.

1.6 TESTING FOR CORROSION PROTECTION: Comply with ASTM A123 or protect the equipment with a corrosion-inhibiting coating or paint system that has proved capable of satisfactorily withstanding corrosion in accordance with ASTM B117. Test 125 hours for equipment installed indoors and 500 hours for equipment installed outdoors or subjected to marine atmosphere. Each specimen shall have a standard scratch as defined in ASTM D1654.

1.6.1 Corrosion Criteria: Upon completion of exposure, coating or paint shall show no indication of deterioration or loss of adhesion, nor shall there be indication of rust or corrosion extending further than 1/8 inch on either side of original scratch.

1.6.2 Thickness of Coating: Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, conditions of application, and dry film thickness.

1.7 PRESSURE-VELOCITY CLASSIFICATION: SMACNA HVACDCS, Section 1, and as indicated.

## PART 2 - PRODUCTS

### 2.1 BASIC MATERIALS

2.1.1 Galvanized Steel Sheets: ASTM A527; coating designation G90.

2.1.2 Galvanized Steel Hot Dipped After Fabrication: ASTM A123.

## 2.2 DUCTS OF PRESSURE CLASSES 3-INCH OR LESS WATER GAUGE:

Construction, metal gauge, hangars and supports, and reinforcements shall conform with SMACNA HVACDCS. Ductwork shall be airtight and shall not vibrate or pulsate when system is in operation. Air leakage shall be less than 5 percent of the system capacity. Construct ductwork of galvanized steel.

2.2.1 Curved Elbows: Make a center line radius not less than 1-1/2 times the width or diameter of the duct.

2.2.2 Joints: Make airtight. No dust marks from air leaks shall show at duct joints or connections to grilles, registers, and diffusers.

2.2.3 Laps: Make laps at joints in the direction of airflow. Space button punch or bolt connection in standing seams at fixed centers not greater than 6 inches. Longitudinal locks or seams, known as "Button Punch Snap-Lock" may be used in lieu of Pittsburg Lock, but will not be permitted on aluminum ducts.

2.2.4 Fittings: Elbows, vaned elbows, take-offs, branch connections, transitions, splitters, volume dampers, fire dampers, flexible connections, and access door shall conform with SMACNA HVACDCS, Section 2. Factory fabricate test holes to be airtight and noncorrosive with screw cap and gasket.

2.2.5 Exterior Duct: All exterior duct shall double walled SS duct with insulation between the walls per part 2.13 this specification.

2.3 FLEXIBLE DUCTS AND CONNECTORS: UL 181, Class I, UL listed, SMACNA HVACDCS, and additional requirements herein specified. Use to connect between rigid ducts and outlets or terminals. There shall be no erosion, delamination, loose fibers, or odors from the ducts into the air stream. At 250 degrees F, minimum rating pressures shall be 2 inches water positive and 1-1/2 inches negative up to 2500 cfm flexible ducts. Flexible ducts shall be maximum 6 feet in length. Minimum bend radius shall be twice of the duct diameter. Maximum angle of bend in any segment shall be 45 degrees.

2.3.1 Materials: Interlocking spiral or helically corrugated type constructed of zinc-coated steel, or noncollapsible fire-retardant, chloroprene or chlorosulphonated polyethylene impregnated, minimum 30 ounces per square yard woven mineral fabric.

2.3.2 Insulation and Vapor Barrier: ASTM C553; minimum one inch nominal thickness and one lb./cu. ft. density. The insulation shall be sheathed with a vapor barrier having a maximum water vapor permeance of 0.02 perm per ASTM E96, Procedure C. Coat ends of insulation with cement to prevent erosion and delamination.

2.3.3 Joints: Make airtight slip joints, seal with pressure-sensitive vapor-seal adhesive tape or duct sealer, and secure with sheet metal screws. To prevent insulation compression, place 2-inch wide by one-inch thick closed cell foam plastic spacers over the joints under vapor barriers. To provide a vapor-tight joint, use a zinc-coated steel clamp over such spacers.

2.4 CASINGS AND PLENUMS: Factory fabricate components with field installation. The plenum or casing manufacturer shall provide certified testing data, obtainable directly from an independent acoustical laboratory, listing sound absorption and transmission loss characteristics of panel assembly. Sound absorption coefficients and sound transmission loss, determined by an independent laboratory, shall be in accordance with ASTM C423 and ASTM E90, respectively.

## 2.5 DUCT SLEEVES AND PREPARED OPENINGS

2.5.1 Duct Sleeves and Closure Collars: Fabricate from minimum 20-gauge galvanized steel. Where sleeves are installed in bearing walls, provide structural steel sleeves as indicated.

2.5.2 Prepared Openings: Provide one-inch clearance between the duct and the sleeve.

2.6 ACCESS DOORS: Weld door frame in place. Door shall be rigid and airtight with neoprene gaskets and two or more chrome-plated galvanized steel hinges and tension fasteners. Provide doors as large as practical. Mount doors, if possible, so that air pressure holds them closed.

2.7 DAMPERS: Construct dampers with two gauges heavier than ducts in which installed. Except as modified herein, the construction shall be of aluminum or galvanized steel with interlocking edges and maximum 10-inch blade width. Conform with SMACNA HVACDCS. Dampers shall be opposed-blade type where indicated.

2.7.1 Backdraft Dampers (Gravity Dampers or Shutters): Factory-fabricated, with statistically and dynamically balanced blades that open automatically when the fan starts and close by gravity when the fan stops. Provide the edges of blades with felt or rubber strips to prevent rattling.

2.7.2 Manual Volume Dampers: Balancing, factory-fabricated type. Equip dampers with accessible mechanism such as quadrant operators or 3/16-inch rods brought through the side of ducts with locking setscrew and bushing. Where quadrant operators are used, they shall be chrome-plated or enamel painted with all exposed edges rounded.

2.7.2.1 Bird Screens: ASTM E437, general industrial-use wire cloth, Grade C, (medium light) or heavier, nominal 2 mesh 0.063-inch wire diameter, aluminum bird screens. Provide removable insect screens of grooved type, with vinyl or neoprene spline insert for securing screen cloth.

## 2.8 DIFFUSERS, REGISTERS, AND GRILLES

2.8.1 Material and Finishes: Construct diffusers, registers, and grilles of steel or aluminum as scheduled. Exterior and exposed edges shall be rolled, or otherwise stiffened and rounded. Steel parts shall be factory zinc-phosphate treated prior to priming and painting or have a baked-on enamel finish. Colors shall be selected or approved by the Architect.

2.8.2 Sound Pressure Level: Manufacturer certified sound pressure level rating of inlets and outlets in accordance with ADC 1062-R4. Conform with the following permissible room sound pressure levels:

NC Range, dB	Typical Application
25 – 30	Private Offices and Conference Rooms
30 – 40	Corridors

2.8.3 Throw: Defined as distance from the diffuser, register, or grille to the point which the air velocity falls below 50 feet per minute. Throw shall not exceed 1.5 times the outlet mounting height.

2.8.4 Drop: Maximum drop of air stream shall not be so great that it is within 5 feet of the floor at the end of the throw.

2.8.5 Ceiling Diffusers: Equip with baffles or other devices required to provide proper air distribution pattern as indicated. Provide factory-fabricated, single key, volume dampers. Except for linear air diffusers, internal parts shall be removable through the diffuser neck for access to the duct and without the use of special tools.

2.8.5.1 Circular, Square, and Rectangular Diffusers: Construct each ceiling diffuser of four or more concentric elements designed to deliver air in a generally horizontal direction without excess smudging of the ceiling. The interior elements of square and rectangular ceiling diffusers may be circular, square, or rectangular as manufacturer's standard. Manufacture shall be as by Titus Omni series, or approved equal.

2.8.5.2 Linear Diffusers: Two-slot extruded aluminum with factory mounted pre-insulated 24-gauge galvanized steel plenum, four-feet in length, and border style appropriate for lay-in type ceiling. Provide friction type volume damper located in the entry collar of the plenum. Manufacture shall be as by Titus Model FT-10, or approved equal

2.8.6 Registers: Perforated flush face ceiling return-air diffuser. Provide manufacturer-furnished volume dampers furnished by the manufacturer. Volume dampers shall be of the group-operated, opposed-blade type and key adjustable by inserting key through face of register. Operating mechanism shall not project through any part of the register face. Manufacture shall be as by Titus Model PAR, or approved equal.

2.9 DEFLECTORS: Factory-fabricated and factory- or field-assembled units consisting of curved turning vanes for uniform air distribution and change of direction with minimum turbulence and pressure loss. Provide curved vanes for square elbows. For round ducts taking off from rectangular ducts, provide factory fabricated, galvanized sheet metal, spin-in fittings. These fittings shall have butterfly dampers and locking quadrant operators.

2.10 DAMPERS AND WALL CAPS: Construct dampers with two gauges heavier than ducts in which installed. Except as modified herein, the construction shall be of aluminum for the chlorine room and galvanized steel for the tank room with interlocking edges and maximum 10-inch blade width. Conform with SMACNA HVACDCS. Dampers shall be opposed-blade type.

2.10.1 Automatic Dampers: Allow maximum leakage of 10cfm per square foot of damper face area at 2-inch w.g. pressure difference.

2.10.2 Wall Caps: Wall caps shall be constructed of 0.025 aluminum – natural finish. The wall cap shall be for 12” duct connection and shall come equipped with a built in spring loaded back-draft damper and bird screen. NOTE: Any intake wall cap shall NOT come equipped with a built in back-draft damper. The wall caps shall be model number(s) 643 & 613 as manufactured by BROAN, or approved equal.

2.10.2.1 Bird Screens: ASTM E437, general industrial-use wire cloth, Grade C, (medium light) or heavier, nominal 2 mesh 0.063-inch wire diameter, aluminum bird screens.

2.11 PVC DUCT – (Class 1 Div 1 areas only-Interior Duct on DWG M-121 & M-141)

2.11.1 PVC material compounds used in the manufacture of HARRISON SUPERDUCT® PVC pipe and the fabrication of HARRISON SUPERDUCT® fittings or approved equal and shall conform to Type 1 Grade 1 PVC, Cell Class 12454B, as described in ASTM D-1784.

2.11.2 Duct diameters thru 20" & 24" will be extruded and of seamless construction. Sizes thru 18" will have a 0.187" wall thickness. 20" diameter will be @ 0.219" and 24" @ 0.250" thickness.

2.11.3 Fabricated (heat formed) duct diameters 22" and 26" thru 30" will have a 0.187" wall while 32", 34" and 36" & larger diameters will have a 0.250" wall. Fabricated duct shall consist of a singular butt welded seam, thermally fused under computer controlled temperature and pressure, without the use of PVC welding/filler rod.

2.11.4 All extruded duct shall be furnished in 10 or 20 foot lengths, plain end; fabricated duct will be furnished in standard 4 foot lengths with a coupling attached on one end.

2.11.5 Three piece 90° elbows and two piece 45° elbows are considered standard and are furnished with a centerline radius of approximately 1 to 1 1/2 times the duct diameter. Five piece 90° elbows and 3 piece 45° elbows, per SMACNA specifications, can be provided, on specific project requirements.

2.11.6 All couplings will be "sleeve" type style having an over-all length of 4 1/2"

2.11.7 All belled end sockets (5" and above) shall have a minimum socket depth of 2" or more. 2", 3", & 4" belled socket depths will be @ 1 3/4".

2.11.8 Branch fittings are designed to enter the main duct, at an angle not exceeding 45° Branch 90° tees are available where systems allow.

2.11.9 Transition fittings shall have formed corners where practical. They will be of concentric design (unless otherwise requested) with a tapered cone-type body.

2.11.10 Reducer couplings having a size reduction greater than "two-step", shall be formed with cone-type body having an overall length generally calculated @ 4" per 1" size reduction, where space allows. One-step and two-step reducers will have a smooth-flow concentric design.

2.11.11 Blastgate Dampers shall be furnished with a 3-position locking pin (open, half-open, closed).

2.11.12 Butterfly (Balancing) Dampers shall be furnished with a locking quadrant, to permanently position. Motorized dampers are available on request.

2.11.13 Rain Caps shall be of "Zero Pressure Loss" design, commonly known as Style "B". Style "A" Rain Caps.

## 2.12 FIRE DAMPERS

2.12.1 Furnish and install at locations shown on plans or as described in schedules AMCA Certified fire dampers constructed and tested in accordance with UL Safety Standard 555 that meet or exceed the following specifications. Fire Dampers shall be produced in an ISO9001 certified factory.

2.12.2 Damper frame, where size permits, shall be constructed using UniFrame Design Concept (UDC) and shall be a minimum of 16 gage galvanized steel formed into a structural hat channel superior to 13 gage channel frame. Top and bottom frame members on dampers less than 13" (330) high shall be low profile design to maximize the free area of these smaller dampers.

2.12.3 Damper blades shall be single skin 16 gage galvanized steel (or stainless steel) with three longitudinal grooves for reinforcement. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame for maximum life.

2.12.4 Each fire damper shall have a 2 hour fire protection rating and shall be supplied with a 165°F or 212°F fusible link. Fire dampers shall be approved for vertical or horizontal mounting as required by the location shown and shall be installed using steel sleeves, angles and other materials and practice required to provide an installation in accordance with the damper manufacturer's installation instructions.

2.12.5 Submittal information shall include the fire protection, maximum velocity and pressure ratings and the manufacturer's UL installation instructions. In addition, the fire dampers shall be AMCA licensed for air performance and shall bear the AMCA Certified Ratings Steel.

2.12.6 Each fire damper shall be labeled for use in dynamic systems. Static only damper labels are not permissible. The damper shall be rated for dynamic closure at 2,000 fpm and 4" w.g. static pressure and shall be tested and rated to close with airflow in either direction.

2.12.7 Dynamic fire dampers shall be Ruskin multiple model DFD35 or DFD35SS, or approved equal.

2.13 DOUBLE WALL DUCTWORK (EXTERIOR DUCT ONLY- exterior duct on DWG M-121 & M-141)

2.13.1 Material: Stainless steel type 304L conforming to ASTM standard A240.

2.13.2 Double Wall:

2.13.2.1 Perforated inner liner will consist of 0.125" perforations on 0.250" staggered centers corresponding to an overall open area of 23%.

2.13.2.2 Glass fiber insulation will have a maximum conductivity factor (k) of 0.26 BTU-in/hr x ft<sup>2</sup> x °F at 75°F mean ambient temperature (R=3.8) and be between the inner and outer wall of the duct.

2.13.2.3 Retaining fabric will be 0.008" thick, 15.6 lb/ft<sup>3</sup> density non-woven polyester fabric with an air permeability rate of 9.2 ft<sup>3</sup> /ft<sup>2</sup> x s.

2.13.2.4 Insulation stop will be a closed-cell elastomeric foam with a maximum conductivity factor (k) of 0.28 BTU-in/hr x ft<sup>2</sup> x °F and an operating temperature range of -70°F to +220°F.

2.13.3 Surface Finish; Stainless steel type 304L - Mill Finish.

2.13.4 Thickness; Material thickness constructed from galvanized steel in accordance with the latest SMACNA's HVAC Duct Construction Standards for +10" water gauge pressure.

2.13.5 Construction:

2.13.5.1 Duct is of spiral lock seam construction with a mechanically formed seam locking indentation evenly spaced along the spiral seam. All spiral duct 8" diameter and larger shall incorporate multiple corrugations between spiral seams. Inner and outer duct will be of spiral lockseam construction.

2.13.5.2 Double wall duct and fittings will consist of a perforated or solid inner liner, 2" thick x 1.0 lb/ft<sup>3</sup> layer of glass fiber insulation, and a solid outer pressure shell. When a perforated inner liner is specified, a retaining fabric must be wrapped, between the perforated inner and the glass fiber insulation.

2.13.5.3 Double wall insulation: 2" thick insulation.

2.13.5.4 The outer pressure shell diameter shall be two times the insulation thickness larger than the inner liner.

2.13.5.5 Fittings shall be manufactured using one or more of the following construction methods:

- a. Overlapped edges stitch welded along the entire length of the fitting
- b. Standing seam gore locked and internally sealed Button punched and internally sealed
- c. Elbows 3" through 12" diameter will be die stamped and continuously stitch welded

2.13.5.6 Connections:

2.13.5.6.1 Fitting ends shall be sized to slip-fit into spiral duct of the same nominal size.

2.13.5.7 Joint Sealing:

2.13.5.7.1 Fitting ends are equipped with factory installed, double-lipped, U-profile gaskets. When installed in spiral duct per manufacturer's installation instructions, the gasket creates a seal against the interior of the spiral duct. The system tightness shall be factory warranted to meet SMACNA's Leakage Class 3 performance. EnergyX is a foam insulation stop and is included on LindabSafe product only.



2.13.5.7.2 If no gasket is used, all joints must be sealed by the installer during the installation process. The type of sealant used as well as the method and level of application should be as directed by the specification and in accordance with the sealant manufacturer's published installation instructions.

#### 2.13.5.8 Gasket:

2.13.5.8.1 The gasket shall be EPDM rubber. The gasket is located in a groove at the end of the fitting and securely fastened by means of a stainless steel band. In order to achieve optimum sealing for all diameters, different size gaskets shall be used. The gasket shall be classified by Underwriters Laboratories for flame spread and smoke developed in accordance with ASTM E84-91a.

### 2.14 DUCTS (HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS (HVAC) Admin Building Only) INSULATION:

2.14.1 Duct Insulation in Concealed Spaces: Two-inch thick mineral fiber flexible resilient blanket insulation with a maximum conductivity of 0.31 btu-in/per hr-sq. ft.-degree F at 75 degrees F mean temperature as tested in accordance with ASTM C177.

2.14.2 Duct Insulation Not in Concealed Spaces: Mineral fiber per ASTM C612, Class 2 (maximum surface temperature 400 degrees F), 3 pcf (pounds per cubic foot) average, 1-1/2-inch thick, inside the building.

2.14.3 Wicking-Type Insulation: ASTM C795. Use over austenitic stainless steel surfaces.

2.14.4 Insulation Thickness for All Types of Ductwork Located Outside: See outdoor duct description part 2.13.

#### 2.14.5 Duct Insulation Finishes:

2.14.5.1 All-Purpose Jacket: Provide a factory applied all-purpose jacket with or without integral vapor barrier as required by the service. Provide jackets in exposed locations with a white surface suitable for field painting. All-purpose jacket shall have a maximum water vapor permeance of 0.05 perm per ASTM E96; a puncture resistance of not less than 50 Beach units; and a tensile strength of not less than 35 pounds-force per inch of width.

2.14.5.2 Vapor-Barrier Material: Material shall be resistant to flame, moisture penetration, and shall not support mold growth. Provide vapor barrier on all HVAC duct insulation, including up to 10' from exterior wall penetrations. Barrier is not required for the supply and return air ducts in a heating only system.

2.14.5.3 Metal Jackets: Provide metal jackets with moisture barrier lining for externally insulated ductwork located outside.

2.14.5.3.1 Aluminum Jackets: ASTM C921, Type II metallic, Temper H14, 0.016- inch thick, smooth.

2.14.5.3.2 Stainless Steel Jackets: ASTM A167, Type 304, 0.010-inch thick, smooth.

## 2.6 ADHESIVES, SEALANTS, AND COATING COMPOUNDS:

2.6.1 Adhesive for Securing Insulation to Metal Surfaces and Vapor Barrier Lap Adhesive (For Use in Building Interior Only): ASTM C916, Type I (an adhesive in which the vehicle is nonflammable in liquid (wet) state and which will pass the edge-burning test), or Type II (An adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will not pass the edge-burning test).

2.6.2 Mineral Fiber Insulation Cement: ASTM C195, thermal conductivity 0.85 maximum at 200 degrees F mean when tested per ASTM C177.

2.6.3 Weatherproof Coating: For outside applications use a weatherproof coating recommended by the manufacturer of the insulation and jackets.

## 2.7 ACCESSORIES:

2.7.1 Staples: ASTM A167, Type 304 stainless steel outside-clinch type.

2.7.2 Insulation Bands: 3/4-inch wide; 0.018-inch stainless-steel.

2.7.3 Bands for Metal Jackets: 3/8-inch minimum width; 0.01-inch stainless-steel.

2.7.4 Anchor Pins: Provide anchor pins and speed washers recommended by the insulation manufacturer.

2.7.5 Glass Cloth and Tape: Tape shall be 4-inch wide rolls. Class 3 tape shall be 4.5 ounces per square yard. In lieu of glass cloth and tape, open weave glass membrane may be used.

2.7.6 Coal-Tar-Saturated Organic Felt: ASTM D227, minimum weight of 13 pounds per 100 square feet.

2.7.7 Wire: Soft annealed stainless steel, 0.047-inch nominal diameter.

## PART 3 - EXECUTION

3.1 INSTALLATION: Installation shall conform to NFPA 90A, SMACNA HVACDCS. Provide mounting and supporting of ductwork and accessories including, but not limited to, structural supports, hangers, vibration isolators, stands, clamps and brackets, access doors, and dampers. Use electrical isolation between dissimilar metals. Electrical isolation may be fluorinated elastomers or sponge-rubber gaskets. Install ductwork accessories as indicated in accordance with the manufacturer's printed instruction. Allow clearance for inspection, repair, replacement, and service.

3.1.1 Ductwork: When air distribution systems are operated, there shall be no chatter, vibration, or dust marks. After ducts are thermally or acoustically insulated, ensure air flow area equal to duct cross section dimensions indicated.

3.1.1.1 Field Changes to Ductwork: Those required to suit the sizes of factory-fabricated equipment actually furnished, shall be designed to minimize expansion and contraction. Use gradual transitions in field changes as well as modifications to connecting ducts.

3.1.1.2 Dampers: When installed on ducts to be thermally insulated, equip each damper operator with stand-off mounting brackets, bases, or adapters to provide clearance between the duct and operator not less than the thickness of insulation. Stand-off mounting items shall be integral with the operator or standard accessory of damper manufacturer.

3.1.1.3 Access Doors: Provide for automatic dampers, volume dampers, fire dampers, coils, thermostats, temperature controllers, valves, filters, humidifiers and other concealed apparatus requiring service and inspection in the duct systems.

3.1.1.4 Duct Sleeves and Prepared Openings: Install for duct mains, duct branches, and ducts passing through roofs and ceilings. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings.

- a. Duct Sleeves: Allow one inch clearance between duct and sleeve or one inch clearance between insulation and sleeve for insulated ducts, except at grilles, registers, and diffusers.
- b. Prepared Openings: Allow one inch clearance between duct and opening or one inch clearance between insulation and opening for insulated ducts, except at grilles, registers, and diffusers.
- c. Closure Collars: Provide not less than 4 inches wide on each side of walls or floors where sleeves or prepared openings are installed. Fit collars snugly around ducts and insulation. Grind smooth edges of collar to preclude tearing or puncturing insulation covering or vapor barrier. Use nails with maximum 6-inch centers on collars.

3.1.2 Duct Hangers and Supports: SMACNA HVACDCS, Section 4. Unless otherwise indicated, provide not less than two one-inch by 1/16-inch galvanized strap-iron hangers spaced one on each side of duct. Anchor risers in the center of the vertical run to allow ends of riser free vertical movements. Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal decking unless a means is provided and approved for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing member, provide suitable intermediate metal framing. Where C clamps are used, use retainer clips.

3.1.2.1 Flexible Ducts: Support ducts by hangers every 3 feet, unless supported by ceiling construction. Use stretch flexible air ducts to smooth out corrugations, and long radius elbows, where possible, using a minimum length to make connections.

3.1.2.2 Flexible Connectors: Provide flexible connectors between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connectors by zinc-coated steel clinch-type draw bands. For rectangular ducts, lock flexible connectors to metal collars.

3.1.3 Flashings: Provide waterproof flashings where ducts pass through exterior walls and roofs.

3.1.4 Cleaning of Ducts: Remove all debris and dirt from ducts and wipe clean. Before installing air outlets, use air handler to blow dry air through entire system at maximum attainable velocity. Provide temporary air filters for this operation.

3.2 FIELD TESTS AND INSPECTIONS: The Contractor is responsible for the administration and direction of tests. Furnish instruments, equipment, connecting devices, and personnel for the tests. Notify Engineer 5 days before inspection or testing is scheduled. Correct all defects in the work. Repeat tests until the work is in compliance.

3.2.1 Air Duct Leakage Tests: Comply with SMACNA HVACALTM. Test ducts, plenums, and casings for air leakage. Prior to application of insulation, subject new ductwork to static pressure equivalent to that indicated. Before installing supply outlets, apply temporary caps where outlets will be connected. Connect a test blower temporarily to inlet end of duct and, by throttling its intake, adjust static pressure in duct to required value. Read voltage and current to blower motor and total static pressure across blower wheel. Apply these data to AMCA certified performance table for the test blower to derive volumetric flow rate (cfm) of air injected into duct. Remove temporary caps and test blower. Verify the maximum allowable air leakage of the total air that the duct is required to deliver. Perform the measurement of leakage using a calibrated orifice tube with its individual calibration curve.

3.2.2 Performance Testing and Balancing: Section 230593, "Testing and Balancing Air and Water Systems".

++ END OF SECTION ++



1.4 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements

1.4.1 Shop Drawings: Within 15 days after award of the Contract, submit four complete sets of shop drawings for approval. They shall contain enough detailed information to determine that the equipment conforms to the requirements of this Specification and not less than the following information:

1.4.1.1 Dimensional equipment and fabrication drawings, including equipment weights, equipment locations, duct sizing, fan sizing and materials for all items and equipment.

1.4.1.2 Remote control devices.

1.4.1.3 Schematic and wiring diagrams.

1.4.2 Operation and Maintenance Instructions: Five complete sets of neatly and substantially bound operating and maintenance instructions shall be furnished specifically for this installation. Operating portion shall be bound separately from maintenance portion. Operating instructions shall include detailed information relative to type, method and sequence of controls and operation, with sufficient illustrations to prevent misinterpretations. Maintenance instructions shall include complete detailed data sufficient for adequately servicing the complete system, lock-out procedures, repairing and ordering of all replacement parts, and shall be fully illustrated for clarity. Any components or methods peculiar to a particular system shall be explained in detail.

1.4.3 Manufacturer's Warranty: Submit written warranty prior to final payment.

1.5 DELIVERY, STORAGE AND PROTECTION: Inspect materials delivered to the site for damage. Unload and store electrical equipment with minimum handling. Provide storage space in dry location with adequate heat and ventilation, free from dust or water, and easily accessible for inspections and handling. Store electrical equipment neatly on the floor, properly stacked on nonabsorptive strips or wood platforms. Do not cover with tarps, polyethylene film or similar coverings. Handle, store, and protect other materials in accordance with the manufacturer's recommendations. Replace damaged items with new items or repair as approved by the Owner.

1.6 WARRANTY: The Contractor shall warrant in writing all the work, materials and equipment called for in the Contract against defects in materials or workmanship for a period of twelve months following the date of the Owner's acceptance. Under this warranty, the Contractor shall make good, at his own expense and without delay, any failure of any part due to poor or faulty materials, construction or installation, or to the failure of any equipment to satisfactorily perform the work required of it by the Specifications. The Contractor shall also make good any damage to any part of the project or other property of the Owner caused by such

failure. Any work replaced or rebuilt during the above-mentioned guarantee period shall be similarly guaranteed for a 12-month period starting from the date of acceptance of the repair, reconstruction or replacement.

1.7 SPARE PARTS: Provide all routine maintenance equipment and parts required to service equipment for a period of one year from the date of the Owner's acceptance. Maintenance intervals and requirements shall be in accordance with the manufacturer's recommendations. In addition, provide one set of the following spare parts to the Owner prior to completion of the work:

1.7.1 6-Inch Wye Fitting: Minimum of two.

1.7.2 Exhaust Pipe Nozzle: Minimum of two.

1.7.3 Flexible Exhaust Hose: Minimum of one.

## PART 2 - PRODUCTS:

2.1 ENGINE EXHAUST FAN: Fan shall be constructed in accordance with AMCA Type-B standards and be specifically designed and suited for engine exhaust system applications. Install fans in locations shown on M-111. Manufacture shall be Fume-A-Vent Model HRF-1.5-3, or equal.

2.1.1 Housing: Fan frame and blower housing shall be constructed of heavy gauge galvanized steel and finished entirely with baked-on epoxy powder coating to resist corrosion. Discharge arrangement shall be 90° to the inlet and shall be capable of mounting in any position. Motor and impeller removal shall be accomplished without disconnecting inlet duct, outlet duct or housing from its permanently mounted position.

2.1.2 Impeller: Provide impeller of non-sparking aluminum construction and backward inclined arrangement.

2.1.3 Motor: Provide non-overloading motor of size scheduled and indicated on Plans. Shaft shall be 5/8" diameter minimum high grade steel and utilize rubber as a seal between it and the fan housing. Service factor shall be 1.15 and unit shall be of premium efficiency.

2.1.4 Controls: Provide hose reel spring loaded switch for each fan as indicated on Plans or as directed by Owner or Engineer. Provide combination motor starter/disconnect with built in thermal overload protection in NEMA 4X enclosure. Mount starter adjacent to fan and secure to building structure.



2.2 HOSE REEL: Hose Reel shall be spring loaded operation. Frame and housing shall be constructed of heavy gauge galvanized steel with polyester powder coated drum ends. Reel assembly shall be capable of storing a minimum of 25' minimum of 6" diameter exhaust hose. Provide all hardware, duct collars and accessories necessary for complete installation. Provide motor starter/disconnect mounted adjacent to reel on building structure for associated fan. Actuation shall be by spring loaded drum / switch operation. Manufacture shall be Fume-A-Vent Model HRS-3-0635W, or approved equal.

2.3 EXHAUST HOSE: Exhaust Hose shall be crush resistant, flexible and designed for exhaust gas temperatures maximum of 600°F. Each hose shall be 6" diameter and 25' in length minimum. Manufacture shall be Fume-A-Vent, or approved equal.

2.4 EXHAUST NOZZLE: Exhaust nozzle shall a magnetic capture termination designed specifically for slipping over engine exhaust pipes and resist temperatures up to 600°F. Provide nozzle with plug with chain and emissions sampling port with removable plug. Manufacture shall be Fume-A-Vent, or approved equal.

2.5 ENGINE EXHAUST DUCTWORK: Provide duct system of sizes indicated on Plans along with all necessary fittings, connectors, reducers, dampers, hangers, supports and other appurtenances as required for a complete and operable system. The duct system shall consist of fittings that are factory fitted with a sealing gasket and round duct which, when installed according to the manufacturer's instructions, will seal the duct joints without the use of duct sealer. Unless otherwise noted, all duct and fittings shall be stainless steel type 304 or type 316 in accordance with ASTM A240. Duct and fittings shall be 22 gauge. All fitting ends shall come factory equipped with a double lipped, U-profile, EPDM rubber gasket. Gasket shall be classified by an internationally recognized laboratory authority to conform to ASTM E84-91a and NFPA 90A flame spread and smoke developed ratings of 25/50. All fitting ends shall have rolled over edges for added strength and rigidity. Duct system performance shall meet SMACNA's Leakage Class 3 requirements at the system design static pressure as indicated on the Contract Documents not to exceed -20 inches W.G. or +12 inches W.G. The system shall be an integrated design of a single supplier. Manufacture shall be Norfab, or equal.

### PART 3 - EXECUTION:

3.1 INSTALLATION: In accordance with the manufacturer's approved installation instructions and diagrams, excepts as specified otherwise. The Contractor shall make as many visits to the site as required to complete the work. Correct defects or errors in the welding and fabrication of components in an approved manner. If defects or errors in fabrication of components cannot be corrected in an approved manner, remove and provide non-defective components. Contractor is responsible for coordination and proper relation of all work to the building structure and the work of all trades and space usage. The Contractor shall verify all dimensions of the building that relate to installation of the equipment and notify the Owner of any discrepancy before the equipment order is finalized. Contractor shall connect to a power

supply. Provide all interconnecting power and control wiring for field installed components of equipment. All wiring shall be run inside electrical metallic tubing, provide flexible waterproof conduit for connecting rigid tubing to power pack. The routings and locations of all power and control wiring, ductwork and remote control stations shall be approved by the Owner. The Contractor shall provide all anchorage and supports required. Provide and install all necessary fluids and grease for operation of the equipment.

3.2 CLEANING, PRIMING AND PAINTING: Support brackets, hangers, and any other non-cadmium plated or non-galvanized surfaces shall be (1) cleaned of dirt, rust, scale, loose particles, grease, oil, and other deleterious substances, (2) given one coat of rust-inhibiting primer, and (3) then be given one coat of an industrial enamel. Minimum dry-film thickness of each coat shall be 1.0 mils. Color shall match the manufacturer's standard color.

3.2.1 Workmanship: Conduct field touch-up work as to avoid damaging other surfaces in the area. Do not apply field applied paint during foggy, damp, rainy weather, or if the ambient temperatures below 45 degrees F and above 95 degrees F.

3.3 INSTRUCTION TO OWNER PERSONNEL: Upon completion of the work, and acceptance of the installation, and at a time designated by the Owner, the services of a competent technician regularly employed or authorized by the manufacturer of the system shall be provided for instructing personnel in the proper operation, maintenance, safety and emergency procedures. The period of instruction shall be not less than two hours. The training shall be conducted at the job site during actual operation and coordinated with the Owner one week in advance.

++ END OF SECTION ++

SECTION 23 52 00

HEATING BOILERS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Under this Section the Contractor shall furnish all labor, materials and equipment for the Heating Boilers as specified and/or directed.

1.2 REFERENCES: The publications listed below and their latest revisions form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.2.1 American Society of Mechanical Engineers (ASME) Publications:

BPVC SEC IV	Recommended Rules for the Care and Operation of Heating Boilers
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CSD-1	Control and Safety Devices for Automatically Fired Boilers
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1.2.2 National Fire Protection Association (NFPA) Publications:

54	National Fuel Gas Code
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70	National Electrical Code
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85	Boiler and Combustion Systems Hazards Code
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90A	Installation of Air Conditioning and Ventilating Systems
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1.3 SUBMITTALS: The following shall be submitted to RPE in accordance with Section 230501, "Mechanical General Requirements

1.3.1 Manufacturer's Data:

- a. Boiler Module
- b. Boiler Management System
- c. Circulator
- d. Exhaust Vent and Combustion Air Piping
- e. Accessories and Specialties
- f. Boiler System Sequence of Operation

## 1.4 QUALITY ASSURANCE

1.4.1 Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum ten years experience.

## 1.5 WARRANTY

1.5.1 Provide a five-year warranty for modular boiler assemblies.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT

2.1.1 Furnish and install one packaged, modulating, sealed combustion, power-vented, high efficiency gas-fired boiler(s) with cast aluminum heat exchangers that use outside or inside air for combustion and is wall mounted.

2.1.2 The boiler shall be a Lochinvar CADET Model CD, Weil – McLane, Paterson-Kelly, or approved equal having a modulating input and shall be operated on Natural Gas. The boiler shall be capable of full modulation, firing down to 20% of rated input with a turndown ratio of 5:1 on 70,000-120,000 Btu/Hr inputs. The 40,000 Btu/Hr input BOILER shall have a turndown ratio of 4.4:1.

2.1.3 The boiler shall bear the ASME "H" stamp for 50 psi working pressure and shall be National Board listed. There shall be no banding material, bolts, gaskets or "O" rings in the header configuration. Water ways shall be constructed of stainless steel. The composite condensate collection system shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in trap shall allow condensation to drain from the heat exchanger assembly. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

2.1.4 The boiler shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada. The boiler shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard and the minimum efficiency requirements of the latest edition of the ASHRAE 103 Standard. The boiler shall meet U.S. Environmental Protection Agency and Department of Energy guidelines for "Energy Star" efficiency. The boiler shall operate at a minimum of 94.0% Annual Fuel Utilization Efficiency. The boiler shall be certified for indoor installation. The boiler's AFUE shall be verified through third party testing by the Hydronics Institute Division of AHRI and listed in the AHRI Certification Directory.

2.1.5 The boiler shall be constructed with an expanded polypropylene jacket assembly. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame

observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The boiler shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The boiler shall operate in a safe condition at a derated output with gas supply pressures as low as 4 inches of water column.

2.1.6 The boiler shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The boiler shall be equipped with; a temperature/pressure gauge, high limit temperature control certified to UL353, ASME certified pressure relief valve, outlet water temperature sensor, return water temperature sensor, a UL 353 certified flue temperature sensor, outdoor air sensor, low water flow protection and built-in freeze protection.

2.1.7 The boiler shall feature standard controls with a Graphic Electronic LCD display with password security, adjustable outdoor air reset curve, freeze protection and pump exercise. Supply voltage shall be 120 volt / 60 hertz / single phase.

2.1.8 The boiler shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 14 data points for safety and operating controls, i.e., Auxiliary Proving Switch, Flow Switch, Room Thermostat, Tank Thermostat, System Sensor, Outdoor Sensor. A high voltage terminal strip shall be provided for supply voltage. The high voltage terminal strip plus integral relays shall be provided for independent pump control of the boiler pump.

2.1.9 The boiler/system circulation pump; See Section 233000, "HVAC Air Distribution".

2.1.10 The boiler shall be installed and vented with a direct vent concentric vent/air termination:

2.1.10.1 Direct Vent system with a vertical termination of both the vent and combustion air. The flue shall be CPVC sealed vent material terminating through the roof with the manufacturers specified vent termination at heights and offset distances as illustrated in the unit installation manual. A separate pipe shall supply combustion air directly to the boiler from the outside through the direct vent concentric vent/air termination. The air inlet pipe shall be CPVC pipe. The boiler's total combined air intake length shall not exceed 100 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 100 equivalent feet. Foam core pipe is not an approved material for exhaust piping.

2.1.11 The boiler shall have an independent laboratory rating for Oxides of Nitrogen (NO<sub>x</sub>) of 20 ppm or less corrected to 3% O<sub>2</sub>. The manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

2.1.12 The boiler shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments.

2.1.13 Boiler Sequence: Whenever the outdoor air temperature sensor is 50 Deg F or below, and the boiler has proven water flow from the boiler/building circulation pump via a flow sensor that shall be provided with the boiler controls, the boiler shall fire and modulate to maintain loop water temperature that is inversely proportional to the outdoor air temp (OAT) and have a range of 130 Deg F when the OAT is 50 Deg F to a high of 180 Deg F whenever the OAT reaches 32 Deg F (both OAT and water temps shall be adjustable).

### PART 3 - EXECUTION

3.1 INSTALLATION: Install in accordance with manufacturer's instructions.

3.1.1 Install boilers on wall-mounted configuration and ensure that they are level. Provide for connection to electrical service, hot water piping, gas piping, exhaust venting, combustion air venting, condensate drain, and boiler drain. Provide low water cutoff and manual reset high limit for each boiler. These items are to be installed between the boiler module isolation valves.

3.2 FIELD SERVICES: Contractor shall provide the services of a local factory-authorized representative to supervise all phases of equipment startup. A letter of compliance with all factory recommendations and installation instructions shall be submitted to the Engineer with operation and maintenance instructions.

3.3 INSTRUCTION TO OWNER'S PERSONNEL: Provide four (4) hours of field instruction to the Owner's personnel for modular boiler systems and controls provided under this Contract. Training shall be provided under the supervision of a qualified manufacturer's representative.

++ END OF SECTION ++