EXTERIOR REHABILITATION & REPAIRS/RENOVATION

ECKERSLEY-HALL BUILDING
61 DURANT STREET
MIDDLETOWN, CT 06457
BID #2013-11

S/P+A PROJECT NO. 11.134

DATE: July 25, 2013

The following changes to the Drawings and Project Specifications shall become a part of the Drawings and Project Specifications; superseding previously issued Drawings and Project Specifications to the extent modified by Addendum No. 1.

Requests for Information (RFIs)/Technical Questions:

- See attached RFIs. (7)

New Specifications:

- Renovation:
  - SECTION 01524, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL has been added and is attached as part of this addendum. (11)
  - SECTION 01810, BUILDING COMMISSIONING REQUIREMENTS has been added and is attached as part of this addendum. (30)
  - SECTION 02525, GRANITE CURBING has been added and is attached as part of this addendum. (4)
  - SECTION 04720, CAST STONE MASONRY has been added and is attached as part of this addendum. (7)
  - SECTION 05721, ORNAMENTAL RAILINGS has been added and is attached as part of this addendum. (6)
  - SECTION 08911, GLAZED ALUMINUM CURTAIN WALLS has been added and is attached as part of this addendum. (9)
  - SECTION 09640, WOOD FLOORING has been added and is attached as part of this addendum. (6)
  - SECTION 10652, FOLDING PANEL PARTITIONS has been added and is attached as part of this addendum. (5)
  - SECTION 323113, CHAIN LINK FENCING AND GATES has been added and is attached as part of this addendum. (4)

Changes to the Specifications:

- Renovation:

- TECHNICAL SPECIFICATION TABLE OF CONTENTS:

  - Page 1:

    - Division 1 – General Requirements:

      - Section 01362, Pages, revise "18" to read "20".
      - Add the following:

        "Section 01524 Construction Waste Management and Disposal 11
        Section 01810 Building Commissioning Requirements 30"

    - Division 2 – Site Work, add the following:

      "Section 02525 Granite Curbing 4"

  - Page 2:

    - Division 4 – Masonry, add the following:

      "Section 04720 Cast Stone Masonry 7"

    - Division 5 – Metals, add the following:

      "Section 05721 Ornamental Railings 6"

    - Division 8 – Doors and Windows:

      - Section 08410, Pages, revise "7" to read "6".
      - Section 08710, Pages, revise "14" to read "13".
      - Add the following:

        "Section 08911 Glazed Aluminum Curtain Walls 9"

  - Page 3:

    - Division 9 – Finishes, add the following:

      "Section 09640 Wood Flooring 6"

    - Division 10 – Specialties, add the following:

      "Section 10652 Folding Panel Partitions 5"

    - Division 12 – Furnishings, Section 12494, Pages, revise "7" to read "5".

- Page 5, Division 32 – Exterior Improvements, add the following:

  "Section 323113 Chain Link Fencing and Gates 4"

- SECTION 01362, SUSTAINABLE DESIGN REQUIREMENTS – LEED FOR COMMERCIAL INTERIORS has been deleted in its entirety. A new SECTION 0132, SUSTAINABLE DESIGN REQUIREMENTS – LEED FOR COMMERICAL INTERIORS has been added and is attached as part of this addendum. (20)
- SECTION 07900, SEALANTS, Page 1:

  - Article 1.2.H., revise to read as follows:

    "Section 08331 – Overhead Coiling Door"

  - Article 1.2.K., revise to read as follows:

    "Section 09215 – Veneer Plaster"

- SECTION 08410, ALUMINUM ENTRANCES AND STOREFRONT FRAMING has been deleted in its entirety. A new SECTION 08410, ALUMINUM ENTRANCES AND STOREFRONT FRAMING has been added and is attached as part of this addendum. (6)
- SECTION 08710, DOOR HARDWARE has been deleted in its entirety. A new SECTION 08710, DOOR HARDWARE has been added and is attached as part of this addendum. (13)
- SECTION 09000, SCHEDULE OF FINISHES:

  - Page 5, Flooring, WDF-1, Item, add to the end the following:

    "; See Section 09640 – Wood Flooring"

  - Page 8, Roller Shades, revise to read as follows:

    "**Manf:** Mechoshade
    Style: EcoVeil 1350 Series, 5% Open
    Color: As selected by Architect and Owner from manufacturer's full range
    Note: PVC FREE MATERIAL ONLY
    Local Rep: David Shannon 978.443.4911"

- SECTION 12494, ROLLER SHADES has been deleted in its entirety. A new SECTION 12494, ROLLER SHADES has been added and is attached as part of this addendum. (5)

New Drawings:

- DRAWING SK-A01, METAL STARTER POST BASE DETAIL has been added and is attached as part of this addendum. This sketch adds information to Drawing A6.1.

- DRAWING SK-A02, EXTERIOR LIT HANDRAIL CLARIFICATIONS has been added and is attached as part of this addendum. This sketch clarifies and adds information to Drawing A3.1.

Changes to the Drawings:

- Renovation:

  - DRAWING A4.2, WALL SECTIONS & DETAILS, Wall Section 1, "New architectural precast" note, revise "6/A4.2" to read "C/A4.2".
  - DRAWING A7.1, KITCHEN EQUIPMENT SCHEDULE & PLANS, Foodservice Equipment Schedule, Tag 1, Remarks, revise "X/AXX" to read "8/A7.7".
  - DRAWING A8.1, DOOR SCHEDULE & DETAILS, Door Frame Types 2, Types 'A', 'B' and 'F', revise all instances of "2¼" x 5"" to read "2¼" x 6".

The bid date is changed by this addendum.
The addendum consists of one hundred thirty-seven (137) pages of 8½" x 11" text, one (1) 8½" x 11" drawing and one (1) 11" x 17" drawing.
End of Addendum '1'

Viking Construction, Inc.
General Contractors • Construction Managers
1387 Seaview Avenue, Bridgeport, CT 06607
Voice (203) 353-0260 • Estimating Fax (203) 406-2167
www.vikingconstruction.net

RFI via Fax/email

Date: 7/17/2013

Company: City of Middletown

Attn: Donna Imme, Supervisor of Purchases

purchase@middletown.gov

Email/Fax: fax 860-638-1995 **Phone:**

From: Christopher Petre

Subject: Middletown Sr. Center – RFI #2

Number of Pages, including cover sheet: 1

A copy of the attached documents will also be delivered to you: Yes [ ] No [x]

We have the following issues that we need clarified:

1 Regarding Underpinning of the exterior wall denoted on S.1 by dotted line:
   a. Please confirm detail #7 on S.2 is only under the Main Entry (door #101)
   b. Please confirm detail #1 on S.2 is required for the entire perimeter of the existing foundation . Or please provide revised S.1 showing the limits.

Christopher

S/P+A Response:
1a. Drawing S1.0 correctly shows the underpinning extents at the main entry. Refer to the cross hatching area adjacent to the doors. Assume 4'-0" length of underpinning on either side of the doorway.
b. Detail 1/S2.0 only occurs at the main entry.

Viking Construction, Inc.
General Contractors • Construction Managers
1387 Seaview Avenue, Bridgeport, CT 06607
Voice (203) 353-0260 • Estimating Fax (203) 406-2167
www.vikingconstruction.net

RFI via Fax/email

Date: 7/12/2013

Company: City of Middletown

Attn: Donna Imme, Supervisor of Purchases

Email/Fax: purchase@middletown.gov fax 860-638-1995 **Phone:**

From: Jesper Glysing-Jensen & Christopher Petre

Subject: Middletown Sr. Center – RFI #1

Number of Pages, including cover sheet: 2

A copy of the attached documents will also be delivered to you: Yes [ ] No [x]

We have the following issues that we need clarified:

Already Answered in Minutes

1. ~~At~~ At the pre-bid meeting a statement was made that the project contractors are subject to CT DAS Prequalification, yet none of this is stated in the project manual nor are any of the bid forms associated with this requirement. Please clarify.
2. ~~In~~ In Section 2 of the Project Manual there are 2 different sets of Prevailing Wage Rates (CT DOL dated 6/17/2013 & Davis Bacon dated 5/24/2013). Already Answered in Minutes
   a. Please confirm that Davis Bacon Wage rates which are typically federally mandated take precedence over the State's rates.
   b. Please provide a formal version of the wage rate determination for the project that is within 30 days of the project's bid date.
3. Spec 08710 – Door Hardware:
   a. Paragraph 2.3- the finish BHMA 634 "Oxidized Satin Brass Oiled Rubbed" is not available from the manufacturers listed. The closest match and widely available is BHMA 613 "Dark Oxidized Satin Bronze, Rubbed" (nearest former U.S. equivalent US10B). Please clarify.

b. Paragraph 3.6- DOOR HARDWARE SCHEDULE -the door numbering and count do not match the Door schedule on A8.1
c. Dwg A8.1 -Please coordinate and identify each hardware manufacture/model # for each door hardware type identified in the Door Schedule on this drawing

4. Dwg A6.1 – Stair details
   a. Stair S1 – details A & F. Please specify detail of attachment of posts to wood treads.

Jesper & Chris

S/P+A Response:
1. Refer to pre-bid meeting minutes issued by City.
2. Refer to pre-bid meeting minutes issued by City.
3. a) The proposed BHMA 613 finish is acceptable.
   b) Refer to Addendum #1
   c) Refer to Addendum #1
4) Refer to Sketch SK-A01 in Addendum #1.

Imme, Donna

From: Imme, Donna
Sent: Friday, July 19, 2013 8:43 AM
To: John Ireland (jireland@silverpetrucelli.com)
Cc: Dobmeier, Bob
Subject: FW: Bid # 2013-011 Middletown Senior/ Community Center 7-29-13

Question

From: Joe Aresco [mailto:joearesco@sbcglobal.net]
Sent: Friday, July 19, 2013 6:48 AM
To: Purchasing
Subject: Fw: Bid # 2013-011 Middletown Senior/ Community Center 7-29-13

Donna please see the 3 questions below regarding the Senior Center Project.

Joe Aresco

Joe, #1 There are several black boards in 3 rooms that are not shown on the prints,are we to assume those are ACM or not? #2 Also there are cork boards where black boards existed, are they to stay? #3 Does the city carry the inspections and air sampling or do I carry for those?

Joe Orlando
Accurate Insulation, LLC
Project Manager / Managing Member
Phone: 860-584-2146
Fax: 860-584-2561

S/P+A Response:
1. The chalk boards that are not shown on the abatement drawings do have asbestos adhesive under the slate but are scheduled to remain, as noted in Section 020800, Part 1.2 H.
2. The tack boards and associated adhesive do not contain asbestos; removal of designated tack boards can be done by general trades.
3. The City has hired Eagle to perform monitoring and associated visual inspections and testing.

Technical Questions

1. Note 1 on A-1 calls for repairs/restore to parged concrete foundation and scoring. What quantity should be carried? The extent of the scope needs to be identified.
2. Are there boring or test pit data available for the site? Underpinning work can be impacted by soil types and the water table depth.
3. What is the extent of underpinning on Drawing S1.0 for the existing East foundation footings? The plans are not clear to the extent of the scope.
4. On Drawing S1.1 upper right hand corner of plan there is a bold line noted. What does this bold line represent?
5. Detail D/A-3 and Note 4 on the Exterior plans Drawing A-1 conflict. Existing trim cannot remain if new PT blocking is to be installed per the detail. Please clarify the intent. Is all existing trim to be removed and reinstalled per the detail?
6. There is no Operable Partition specifications in documents. Please provide.
7. What windows have Roller Shades per Section 12494? I could not locate any notes, schedule or symbols on the drawings.
8. What is the gage of the steel floor decking? Specs list both 20 & 18 Ga.
9. There is no Waterproofing specifications in the documents for the elevator pit. Please provide.
10. Is there any water mitigation coatings required for the lower level floors or exterior walls?
11. There is no window schedule in the documents.
12. There are no specifications for new window screens for existing windows. Please provide.
13. There is no specifications for dumpster enclosure fencing. Please provide.
14. Please provide specification for granite curbing shown on drawings. Please provide a specification for the New Wood Floors and the Existing Wood Floor Refinishing.
15. What is the intent of contract documents relating to existing woodwork? Is it to be cleaned per specification section 06201 only or is it to be cleaned then refinished? There is no specifications for refinishing of transparent finishes in documents.
16. Missing Kitchen Equipment specifications from documents. Please provide.
17. Please provide specification for Architectural Cast Stone.
18. Two Kilns are shown on drawings. Who supplies kilns? Are they by owner?
19. There are no specifications for site general conditions relating to power, water, heating, phones, communications, etc.. There was some discussion at the pre-bid but documents don't identify any requirements.

S/P+A Response:
1. Contractor to repair and restore all damaged, loose and missing parging per the contract documents. Contractors are responsible for assessing the existing condition of parging in the field and provided adequate coverage in their bid for all repairs.
2. No boring or test pit data is available.
3. Refer to earlier RFI for response.
4. The bold line 'not' noted refers to the existing header over the window to remain. The noted bold line is the new steel header.
5. The intent is for crown moulding and trim to remain where of acceptable condition. Detail D/A3 pertains to locations where crown moulding and fascia trim are to be removed due to damage. In these locations only should new P.T. blocking be provided. All other trim to be refinished in place.
6. Refer to Addendum #1
7. Refer to Addendum #1. Specified shades to be provided at all windows, new and existing.
8. 20 gauge decking is required.
9. No waterproofing necessary at elevator pit.
10. No
11. Windows are not being replaced with exception to the missing and damaged windows called out in contract documents. Window shades and screens to be quantified off of exterior elevations.
12. Existing window screens to remain. Remove replacement of screens from scope of bid.
13. Refer to Addendum #1
14. Refer to Addendum #1
15. All of the existing woodwork to remain is to be cleaned per Specification Section 06201 (SHPO did not approve refinishing of the woodwork). There may be some locations that require repair, patching or rebuilding to facilitate other work. This should be accomplished with the existing woodwork or with existing woodwork that was salvaged for re-use as needed.
16. Refer to drawing A7.1 for information on Kitchen Equipment
17. Refer to Addendum #1
18. Kilns to be supplied by owner, N.I.C.
19. Refer to City meeting minutes regarding site utilities.

Christopher Nardi

Subject: FW: Middletown Senior Center bid Question

S/P+A Response:

The rolling shutter should be in a surface mounted frame. The Cookson CD10-1 is the correct specification. Alternate products must be equal to this product.

From: Brian Kronenberger [mailto:briank@kronenbergersons.com]
Sent: Thursday, July 18, 2013 11:07 AM
To: Imme, Donna
Cc: Bryan Addy
Subject: FW: Middletown Senior Center bid Question

The Rolling Shutter specifications call for a Cookson CD10-1 which has a surface mounted frame. The other manufacturers have a SS frame that wraps the wall.

What type is required?

Brian T. Kronenberger
President
Kronenberger & Sons Restoration, Inc.
175 Industrial Park Road
Middletown, CT 06457
PH.# 1-860-347-4600
Fax # 1-860-343-0309

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

B. Related Sections:

1. Section 02072 – Demolition and Removals for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
2. Section 04300 – Unit Masonry System for disposal requirements for masonry waste.
3. Section 311000 – Site Clearing for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

D. Salvage: Recovery of construction waste and subsequent sale or reuse in another facility.

E. Salvage and Reuse: Recovery of construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of seventy-five percent (75%) by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Construction Waste:

a. Site-clearing waste.
b. Masonry and CMU.
c. Lumber.
d. Wood sheet materials.
e. Wood trim.
f. Metals.
g. Roofing.
h. Insulation.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated in paragraph above, salvage or recycle one hundred percent (100%) of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within seven (7) days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.

4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. HPBS Submittal: HPBS letter, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

H. Qualification Data: For waste management coordinator.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of Projects with similar requirements, certified by USGBC, as waste management coordinator.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements of this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three (3) days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:

1. Connecticut Waste Processing Materials, LLC 475 Christian Lane, Berlin, CT (860.229.5368)
2. Dainty Rubbish Services, Inc., 80-90 Industrial Park Road, Middletown, CT (860.632.0666)
3. Murphy Road Recycling, LLC, 143 Murphy Road, Hartford, CT (860.746.3200)

C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets

into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

1. Comply with requirements in Section 329010 "Landscaping" for use of chipped organic waste as organic mulch.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements in Section 329010 "Landscaping" for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

3.5 ATTACHMENTS

A. Form CWM-1 for construction waste identification.

B. Form CWM-3 for construction waste reduction work plan.

C. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.

D. Form CWM-7 for construction waste.

END OF SECTION

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	**GENERATION POINT**	**EST. QUANTITY OF MATERIALS RECEIVED* (A)**	**EST. WASTE - % (B)**	**TOTAL EST. QUANTITY OF WASTE* (C = A x B)**	**EST. VOLUME CY (CM)**	**EST. WEIGHT TONS (TONNES)**	**REMARKS AND ASSUMPTIONS**
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN

MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

1 PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. All related Specification sections shall be used in conjunction with this Section.

C. OPR and BoD documentation prepared by the Owner and Architect/Engineer contain requirements that apply to this section.

1.02 SUMMARY

A. This section includes requirements for commissioning during the construction phase, functional testing phase and the building turnover phase. Includes requirements for all specified and associated systems, subsystems and equipment. The intent of this section is to specify the commissioning responsibilities of the Contractor, HVAC Subcontractor, TAB Subcontractor, Automated Temperature Controls Subcontractor, Plumbing Subcontractor, Electrical Subcontractor and the Fire Protection Subcontractor. The Contractor will assure participation and cooperation of his subcontractors as required for the commissioning process. The Commissioning Authority for this project will be hired by the Owner.

B. This project has been designed to meet the requirements of the United States Green Building Council Criteria for Commercial Interiors. This commissioning section includes all requirements to conform to the Mandatory Requirement for Building Commissioning as described in the USGBC Reference Guide. These requirements shall be adhered to, regardless the number mandatory and optional strategies that are chosen.

C. The Commissioning Authority is not responsible for construction means, methods, coordination between trades, job safety or any other related management function on the job site.

1.03 DEFINITIONS

A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor.

B. Automated temperature controls (ATC): building management system and components providing automated control of related environmental and/or process systems and equipment.

C. Basis of Design (BoD): A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both

narrative descriptions and lists of individual items that support the design process.

D. Building Envelope: The exterior enclosure of the building intended to keep occupants and structure dry and is the separation between interior and exterior spaces. Typical exterior envelope systems include foundation waterproofing, under slab vapor retarders, exterior wall systems, fenestrations, and roofing and serves to maintain the interior environment in conjunction with the mechanical systems.

E. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

F. Contractor or Construction Manager: The prime manager of construction activities identified in the Contract for Construction between Owner and Contractor.

G. Construction Checkout Documents / Pre-Functional Checklists: The CxA will produce pre-functional checklists that can be used by the Contractor/Subcontractors prior to the start of functional testing. These checklists are tools to help the Construction Manager and Subcontractors verify that the installation complies with the Contract Documents. Any deficiencies that are found can then be corrected early in the process when the Contractors are fully mobilized on the site. The pre-functional checklists will be created for all equipment included in the scope of the commissioning process.

H. Commissioning Authority (referred to herein as the CxA): The individual or group responsible for executing the commissioning process.

I. Engineering Professionals: Includes the Engineers identified in the Contract for Construction between Owner and Contractor, responsible for design of HVAC, plumbing, fire protection, electrical, communications, controls for HVAC systems and other related systems.

J. LEED Commercial Interiors: A rating system provided by the United States Green Building Council that contains guidelines and requirements for meeting both mandatory and optional strategies to ensure compliance with the criteria.

K. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

L. Subcontractor: Individual contractors responsible to the General Contractor for installation of specific systems to be commissioned.

M. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment,

and components.

N. Testing, Adjusting, and Balancing (TAB): Testing, adjusting and balancing of air and water systems, subsystems, equipment and components as required per the contract documents.

1.04 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner or Owner representative:

1. The CxA: Owner or Owner representative has engaged the CxA under a separate contract.
2. Representatives of the Owner or Owner representative including facility users and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.05 OWNER'S or OWNER'S REPRESENTATIVES RESPONSIBILITIES

A. Provide the OPR and BoD documentation for use in developing the commissioning plan, checklists and testing plans, operation and maintenance training plan, and a systems manual.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities, including but not limited to, the following:

1. Coordination and testing meetings.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration of operation of systems, subsystems and equipment.
4. Review system performance and recent building history approximately 9 months into the 12 month warranty period with the CxA.

1.06 COMMISSIONING RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. It is noted that the services for the Owners Project Manager, Architect, HVAC mechanical and electrical designers/engineers, and Commissioning Authority are not provided for in this contract. That is, the Construction Manager is not responsible for providing their services. Their responsibilities are listed here to clarify the commissioning process.

B. All Parties:

1. Follow the Commissioning Plan: (The commissioning plan is an informational document that clarifies how the commissioning process shall proceed. This plan is developed by the Commissioning Authority and outlines the responsibilities of the Commissioning Authority, Owner as well as what services will be required of the Design Team, Construction Manager and their subcontractors. This document fully describes the processes that will be used to carry out commissioning.)
2. Attend commissioning scoping meeting and additional meetings, as necessary.

C. Architect / Engineer - Construction and Acceptance Phase:

1. The owner manages the Commissioning Authority contract.
2. Attend the commissioning scoping meeting and selected commissioning team meetings.
3. Perform normal submittal review, construction observation as contracted.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Provide the Commissioning Authority with a copy of all bulletins, sketches, RFI's, addenda and any project document updates to help keep the commissioning plan up to date.

D. Commissioning Authority - Construction and Acceptance Phase:

1. The Commissioning Authority is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The Commissioning Authority may assist with problem solving, non-conformance or deficiencies but, ultimately, that responsibility resides with the general contractor and the A/E. The primary role of the Commissioning Authority is to develop and coordinate the testing plan manual, to observe and document performance – which systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, checkout and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the Commissioning Authority.
2. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
3. Coordinate the commissioning work and, with the Construction Manager, ensure that commissioning activities are being scheduled into the master schedule.

4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute pre-functional tests and checklists.
9. Overview the development of an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witnessing the cleaning, flushing and chemical treatment of the hydronic systems prior to balancing.
12. Witnessing any ductwork pressure testing and cleaning. Verifying adherence of the Indoor Air Quality during construction as required by the Indoor Air Quality Management Plan requirement of the High Performance Building Guideline.
13. Verify pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected site observation and spot-checking.
14. Verify systems start-up by reviewing start-up reports and by selected site observation.
15. Review Testing Adjustment and Balancing execution plan and sample report.
16. Verify air and water systems balancing by reviewing completed reports and by selected site observation.
17. Write the functional performance test procedures for equipment and systems.
18. Coordinate, witness and approve “mock-up” installations of systems and equipment as defined in this division, section 3.03.
19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the Contractor with written progress reports and test results

with recommended actions.
22. Oversee the training of the Owner's operating personnel.
23. Review of equipment warranties.
24. Review and approve the preparation of the O&M manuals (one master set).
25. Development of a systems training manual.
26. Provide a final commissioning report.
27. Organize and perform seasonal or deferred testing of equipment and systems.
28. Organize and perform 10th month warranty review of systems and equipment.

E. Project Manager – Owner's Representative - Construction and Acceptance Phase:

1. Facilitate the coordination of the commissioning work by the Commissioning Authority, and, with the Contractor to ensure that commissioning activities are being scheduled into the master schedule by the Contractor well in advance.
2. Review the final Commissioning Plan.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of contractor submittals.
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the Commissioning Authority.
6. Review the functional performance test procedures submitted by the Commissioning Authority, prior to testing.
7. When necessary, observe and witness pre-functional checklists, startup and functional testing of selected equipment.
8. Review commissioning progress and deficiency reports (Commissioning Portal) and respond to issues assigned.
9. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
10. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the Commissioning Authority to facilitate the commissioning process.
11. Arrange for facility operating and maintenance personnel to attend various field commissioning activities including equipment & system "mock-ups" and field training sessions.

F. General Contractor - Construction and Acceptance Phase:

1. General Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

    a. Evaluate performance deficiencies identified in test reports and, in

collaboration with entity responsible for system and equipment installation, recommend corrective action.

b. Provide the CxA with a detailed and accurate construction schedule updated on a weekly basis. Coordinate scheduling of commissioning activities with the CxA and include them in the construction schedule.
c. Provide a schedule for equipment submittals, installation manual submittals, operation and maintenance data submittals, equipment start-up, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
d. Provide CxA with copies of all approved change orders or other modifications impacting construction when approved.
e. Participate in construction phase coordination meetings.
f. Participate in commissioning inspections.
g. Ensure accurate completion of construction checkout documents for all systems to be commissioned prior to verification site visits by the CxA.
h. Certify readiness of systems to be commissioned prior to functional performance testing.
i. Participate in functional performance testing of systems to be commissioned.
j. Resolving issues identified during commissioning and coordinating correction of deficiencies. Ensure responses to open issues within two weeks of being identified.
k. Participate in operation and maintenance planning and verification.
l. Participate in operation and maintenance training sessions.
m. Participate in final review of equipment and systems and participate in final acceptance meeting.
n. Certify the work is complete and systems are operational according to the contract documents, including calibration of controls and any instrumentation.
o. Coordinate subcontractor commissioning activities.
p. Review and approve final commissioning documentation.
q. Assist in coordinating the Subcontractors, as needed, to perform testing of systems and equipment as it relates to project phasing.
r. Assist in coordinating the Subcontractors, as needed, to perform deferred or opposite seasonal testing of systems and equipment.
s. Assist in coordinating the Subcontractors to resolve issues discovered during the system performance review 10 months into the 12 month warranty period.
t. Assist in coordinating personnel and providing documentation, as needed, to meet LEED certification requirements.

G. Subcontractors shall assign representatives with the expertise and the authority to act on behalf of the entity responsible for installation of systems to be commissioned who shall participate in and perform commissioning team activities including, but not limited to, the following:

1. Provide a schedule for equipment submittals, installation manual submittals, operation and maintenance data submittals, equipment start-up, and testing to CxA for incorporation into the commissioning plan. Update schedule on a monthly basis throughout the construction period.
2. Participate in construction phase coordination meetings.
3. Provide information to the CxA for developing construction phase commissioning plan including, but not limited to:

    a. Schedule as mentioned above.
    b. Equipment submittals.
    c. Installation manual submittals.
    d. Operation and maintenance information submittals.
    e. Complete construction checkout documents for all systems to be commissioned.

4. Provide all necessary assistance and work associated with the completeness and installation of "mock-up" equipment as defined in this division, section 3.03.
5. Maintain updated Project Record Documents for periodic review by the CxA and submit final record documents at project completion.
6. Certify readiness of systems to be commissioned prior to functional performance testing.
7. Participate in functional performance testing of systems to be commissioned.
8. Participate in test procedures meeting.
9. Provide technicians who are familiar with the construction and operation of the installed systems, are trained in the use of required testing instruments and procedures to participate in testing of installed systems, subsystems and equipment.
10. Participate in operation and maintenance planning, documentation and verification.
11. Resolving issues identified during commissioning and coordinating correction of deficiencies. Ensure responses to open issues within two weeks of being posted via online tracking database (Commissioning Portal).
12. Participate in training sessions for Owner's operation and maintenance personnel.
13. Participate in final review at acceptance meeting.
14. Participate, as needed, in performing deferred or opposite seasonal testing of systems and equipment.
15. Assist in coordinating personnel and providing documentation, as needed, to meet the High Performance Guidelines requirements.

1.07 COMMISSIONING DOCUMENTATION

A. Commissioning Plan: A document, prepared by the CxA, that outlines the schedule, allocation of resources and documentation requirements of the commissioning process, including but not limited to, the following:

1. Plan for delivery and review of submittals, systems manuals and other documents and reports. Identification of the relationship of these documents to other functions and a description of submittals that are required to support the commissioning processes. Submittal dates include the latest date approved submittals must be received without adversely affecting commissioning.
2. Overview of the organization, layout and content of commissioning documentation and a description of documents to be provided along with identification of responsible parties.
3. Identification of systems and equipment to be commissioned.
4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training, including required training materials.
9. Description of expected performance for systems, subsystems, equipment and controls.
10. Requirements for documenting changes on a continuous basis to appear in the project record documents.
11. Process and schedule for completing construction checklists for systems to be commissioned,
12. Step by step procedures for testing systems, subsystems and equipment with descriptions for methods of verifying relevant data, recording the results obtained and listing parties involved in performing and verifying tests.

B. Construction Checkout Documents / Pre-functional Checklists: The CxA shall develop construction checklists for each system to be commissioned including interfaces with the ATC system, safeties, and interlocks. Separate entries will be provided for each item to be checked. Construction checklists will be completed by the installing Subcontractor and verified by the Contractor and CxA. Space will be provided for sign off of installing Subcontractor, Contractor and CxA. Each checklist will include, but not limited to, the following:

1. Name and identification code of each item being checked.
2. Verification of each item including verification of all required data and construction practices listed in the construction checklists. This list outlines all work necessary to be completed prior to the start of functional testing for the particular system, subsystem and equipment.
3. Notation of any equipment or installation that deviates from approved submittals or the construction documents.
4. Name(s) of personnel involved with verification and dates on which verification activities and construction checklists were completed.

C. Witness systems, assemblies, equipment, and component startup.

D. Hydronic Start-up Documents: Documentation that narrates the flushing, cleaning, chemical treatment, pressure testing and air bleeding of any associated hydronic systems, assemblies, equipment, and component start-up. Documentation should identify individuals present who witnessed said testing.

E. Certificate of Readiness: Certificate of Readiness shall be signed by the Contractor, Subcontractor(s), Installer(s) and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing and that all relevant information including submittals, installation data and operation and maintenance documentation has been submitted. Completed construction checklists signed by the responsible parties shall accompany this certificate.

F. Functional Performance Testing: CxA shall develop functional performance test documents for each system to be commissioned including interfaces and interlocks. Separate entries will be provided for each item to be tested. CxA shall prepare separate tests for each mode of operation and provide space to indicate whether the mode under test responded as required. All information gathered will be documented by the CxA. Each test will include, but not limited to, the following:

1. Name and identification of each item being checked.
2. Date of test.
3. Indication of whether the record is for a first test or retest following correction of a problem or issue.
4. List of deficiencies.
5. Calibration of sensors and sensor function.
6. Testing conditions under which test was conducted, including (where applicable) ambient conditions, setpoints, override conditions, and status and operating conditions that impact the results of the test.
7. Control sequences for mechanical and electrical systems.
8. Verification of control signals for each setpoint at specified conditions.
9. Responses to control signal at specified conditions.
10. Sequence of responses to control signals at specified conditions.
11. Electrical demand or power input at specified conditions.
12. Expected performance of systems, subsystems and equipment at each step of the tests. Narrative description of observed performance of systems, subsystems and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
13. Interaction of auxiliary equipment.

G. Test and Verification Reports: CxA will create test scenarios, record test data, observations, and measurements on test documents. Photographs, forms and other means appropriate for the application shall be included with test documentation. CxA will compile test and verification reports and verification certificates and include them in the commissioning report.

H. Training Plans: To be prepared by the contractor and submitted to the CxA and

the Owner for review and comment prior to finalizing training plans.

I. Corrective Action Documents: CxA will document corrective action taken for systems and equipment that fail tests including required modifications to systems and equipment and revisions to test procedures. Retest and final results will also be documented.

1. Issues Log or Commissioning Notice: CxA prepares and maintains an issues log that describes design, installation and performance issues that are at variance with the OPR, BoD and contract documents. Identification and tracking of issues as they are encountered, documenting the status of unresolved and resolved issues. Issues log is shared with members of the Design/Construction/Commissioning team via an internet portal which is maintained by the CxA.

J. Systems Training Manual: CxA shall develop a systems training manual for the operation and maintenance personnel that includes the intended operation of the systems and equipment listed as well as document setpoints and schedules. It should be noted that the Systems Training Manual does not in any way replace the Subcontractor / vendor training nor does it relieve Subcontractor(s) of their responsibilities as outlined in other divisions within the contract documents.

1.08 SUBMITTALS BY CONTRACTOR

A. Information listed below shall be submitted with the product and system product literature and shop drawing submittals for review and approval by the Owner, Architect, Engineering Professionals and the CxA. This information will be used to confirm the product compliance with the Contract Documents and to establish detailed commissioning requirements and procedures. The information shall be specific to each system to be commissioned and shall be inclusive of all related systems, equipment and components.

1. Manufacturer cut sheets and product literature and shop drawings in accordance with the requirements of other divisions.
2. Manufacturer’s detailed installation and start-up requirements including equipment checklists for each piece of equipment.
3. Operation instructions.
4. Manufacturer’s recommended maintenance and troubleshooting procedures.
5. Warranty and owners obligations to maintain warranty.
6. Detailed product data for each piece of equipment including part load capacities, electrical components and requirements, etc. (As appropriate)
7. Manufacture’s certified test reports on each piece of equipment.
8. Performance curves for each piece of equipment being submitted. (As appropriate)
9. Coordination and Record Drawings.
10. Logic flow diagrams for control systems sequences of operation. Include detailed sections of the Sequence of Operations for related function groups.

11. Interpret function groups for clarity.
12. Indicate initial setpoints, reset schedules, sensor locations, etc.

B. Operation and Maintenance Manuals:

1. The Contractor shall develop the Operation and Maintenance manuals in accordance with the requirements indicated in Division 01.
2. All submittal information indicated in item 1.08A above shall be included in the operations and maintenance manual in addition to the information required below.
3. Manufacturer's break-in instructions.
4. Manufacturer suggested service requirements.
5. Spare parts list edited for specific equipment used on the project. Provide names/numbers of local distributors for spare parts.
6. Copy of all equipment specifications.
7. Preventative maintenance instructions.
8. Troubleshooting guide.
9. Plumbing and HVAC piping sanitation certificates.
10. Air and Water Balancing Reports.
11. Warranties and Warranty start dates.
12. Equipment Start-up Reports

1.09 QUALITY ASSURANCE

A. Operations and Maintenance Training Instructor Qualifications: Equipment training shall be provided by a factory authorized technical representatives, experienced in training, operation and maintenance procedures for installed systems, subsystems and equipment.

1.10 COORDINATION

A. Coordination Meetings: CxA shall conduct periodic coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts and to discuss upcoming commissioning process activities.

B. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review start-up reports, pretest verification results, testing procedures, testing personnel and instrumentation requirements and manufacturer's authorized service representative services for each system, subsystem, equipment and component to be tested.

C. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and verification.

D. Manufacturer's Field Services: CxA shall coordinate services with the help of the Contractor/Subcontractor of manufacturer's field services.

1.11 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned -where applicable- in this project.

1. Heating System – Includes any and all of the following potential systems and equipment: boilers, primary and secondary heating pumps, heating coils, heat exchangers, hydronic balancing variable frequency drives, controls, valves, cabinet unit heaters, unit heaters, radiation and any radiant panels
2. Cooling System – Includes any and all of the following potential systems and equipment: earth loop pumps, building loop pumps, DX systems, VRF's, hydronic balancing, variable frequency drives, valves, and associated controls.
3. Air Handling Systems – Includes any and all of the following equipment: As a minimum, all of the air-handling units and/or energy recovery systems will be thoroughly checked for proper operation and control. The units will be verified for their operation as heating, cooling, heat recovery and ventilation systems, including outdoor air economizer. Unit shut down and start-up under normal and emergency power will be verified.
4. Supply Air Distribution Systems – The installed terminal supply boxes, variable air volume boxes, fan coil units, split systems and reheat coils will be tested to provide a thorough evaluation of their operations; all variables will be covered by exposure, occupancy, and critical and sound sensitive areas.
5. Exhaust Fans – All the general and specialty exhaust fans will be verified for proper operation and their interaction with total building air balance.
6. Any Heat Recovery Systems.
7. The automatic temperature control system shall be verified for proper operation as it relates to the above equipment including interfaces for remote monitoring. All security and systems interlocks associated with the control system shall be commissioned.
8. Spot checking of air and water balancing readings including total building pressurization.
9. Building domestic hot water heating systems including the recirculation line.
10. Day lighting controls.
11. Occupancy Sensors.
12. Electrical Testing – typically the job specifications will purchase the following scope of services regarding electrical equipment testing by the Electrical Contractor:

    a. Short Circuit Study.
    b. Protective Device Coordination.
    c. Generator – Typically calls for manufacturer start-up requirements.
    d. Grounding Infrastructure.
    e. Transformers, Switchboards, motor control centers, panelboards.
    f. Variable Frequency Drives.

2 PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. All standard testing equipment required to perform start-up and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerance specified in this Section. The Contractor(s) instrumentation shall meet the following standards:

1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required to determine adequate performance.
2. Be calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.
3. Be maintained in good repair and operating condition throughout the duration of use on this project.
4. Be recalibrated / repaired if dropped and/or damaged in any way since last calibrated.

3 PART 3 – EXECUTION

3.01 TESTING PREPARATION

A. Prerequisites for Testing:

1. Certify that systems to be commissioned have been completed, calibrated and manufacturer start-ups (where required) are complete. Verify systems to be commissioned are operating according to the OPR, BoD, and the contract documents and the Certificates of Readiness are signed and submitted.
2. Certify that building instrumentation and automated temperature controls associated with the systems to be commissioned have been completed and calibrated and are operating according to the OPR, BoD, and the contract documents and that preset set points have been recorded.
3. Certify that TAB procedures have been completed and that TAB reports have been submitted, discrepancies corrected and corrective work approved.
4. Test systems and intersystem performance after approval of construction checklists for systems, subsystems, and equipment.
5. Set systems, subsystems, and equipment into operating mode to be tested (i.e. normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power and alarm conditions.)
6. Verify each operating cycle after it has been running for a specified period and is operating in a steady state condition.
7. Inspect and verify the position of each device and interlock identified on

checklists. Sign off each item as acceptable or failed. Repeat this test for each operating cycle that applies to system being tested.

8. Check safety cutouts, alarms and interlocks with smoke control and life safety systems during each mode of operation.
9. Update checklists or data sheet after a deficiency is observed and corrected.
10. Verify equipment interface with monitoring and control system and TAB criteria including the following:

    a. Supply and return flow rated for variable flow and constant volume systems in each operational mode, including maximum and minimum flow capacity.
    b. Operation of terminal units in both heating and cooling cycles.
    c. Minimum outdoor air intake in each operational mode and at minimum and maximum airflows.
    d. Building pressurization.
    e. Total exhaust airflows and total outdoor air intake.
    f. Operation of indoor air quality monitoring systems.

11. Verify proper responses of monitoring and control systems controllers and sensors to include the following:

    a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If the initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
    b. Report deficiencies and prepare an issues log entry.

12. Verify that construction checkout of systems to be commissioned has been completed and approved. CxA shall verify construction checkout and start-up including requirements specified in individual Division Sections and equipment manufacturer's recommendations.

B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. Operational modes may include the following:

1. Occupied and unoccupied
2. Full load and minimum flow
3. Maximum flow and minimum flow
4. Warm up and cool down
5. Economizer cycle
6. Emergency power supply
7. Life safety alarm modes

8. Temporary upset of system operation
9. Partial occupancy conditions
10. Special cycles

3.02 START-UP, CONSTRUCTION CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned.

B. General: Each piece of equipment receives full construction checkout. No sampling strategies are used. The construction checkout protocol for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system. Before any system start-ups begin, the Contractor(s) shall conduct a final installation verification audit for their work. The Contractor shall be responsible for completion of all work including change orders and punch list items to the Owner's / CxA satisfaction. This visual check of the various systems to be commissioned shall verify that all components are properly installed. The following items as a minimum shall be observed, but not be limited to, check of:

1. Air Distribution Systems:

    a. Mounting and support of equipment.
    b. Noise, vibration, air and water leaks.
    c. Air filtration, presence and operation of dampers, diffusers, grilles, fire dampers and access doors.
    d. Presence of thermostats and other adjustable temperature control devices.
    e. Presence of smoke sensors and other safety devices.
    f. Instrumentation, gauges, thermometers and flow measuring devices.
    g. Access to equipment and filters.
    h. Insulation of ductwork is complete.
    i. Ductwork is sealed.
    j. Power available to equipment.
    k. Temperature controls are complete.
    l. Air and water balancing is complete and a hand written report available.

2. Heating and Cooling Systems Equipment and Piping:

    a. Service access is acceptable.
    b. Proper cycling.
    c. Excessive noise, vibration or leaks.
    d. Presence of safety devices and controls.
    e. Proper identification of all piping, valves, starters and equipment.
    f. Pressure testing and flushing of systems.
    g. Power available to equipment.
    h. Temperature controls are complete.

i. Equipment start-up and checkout by the manufacturer's representatives are complete.
j. Air and water balancing is complete and a hand written report available.

3. Plumbing Systems and Equipment:

a. Service access is acceptable.
b. Proper cycling.
c. Excessive noise, vibration or leaks.
d. Presence of safety devices and controls.
e. Proper identification of all piping, valves, starters and equipment.
f. Pressure testing and flushing of systems.
g. Power available to equipment.
h. Equipment start-up and checkout by the manufacturer's representatives are complete.

4. Building Electrical System and Equipment:

a. Service access is acceptable to all devices.
b. Presence of safety devices and controls.
c. Proper identification of all starters, switches and equipment.
d. Power available to equipment.
e. Equipment start-up and checkout by the manufacturer's representatives are complete.

C. If any work is found incomplete, incorrect, or non-functional, the Contractor shall correct the deficiency before system start-up work proceeds.

D. Contractor shall provide a full start-up plan for each system to be commissioned including all subsystems, equipment and components which shall at a minimum include the following documentation:

1. Construction Check-out Documents
2. Manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
3. Manufacturer's normally used field checkout sheets.

E. Construction Checkout Documents / Pre Functional Checklists

1. Job specific prefunctional checklists will be provided by the CxA along with additional minimum testing and demonstration requirements as set forth by the Owner.

F. Sensor Calibration:

1. Calibration of all sensors shall be included as part of the construction

checklists performed by the Contractors.

3.03 FUNCTIONAL PERFORMANCE TESTING

A. This sub section applies to commissioning functional performance testing for all Divisions.

B. Objectives and Scope:

1. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and function of the systems.
2. In general, each system to be commissioned should be operated through all modes of operation where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall be tested.

C. The responsible subcontractor or his/her designee executes the performance of the construction checkout, start-up, and checkout. When checking off construction checklists, signatures may be required of other subcontractors for verification of completion of their work.

D. The CxA shall observe, at minimum, the procedures for each piece of primary equipment.

E. For lower level components of equipment, (i.e. VAV boxes, sensors, controllers), the CxA shall observe 10% of the construction checkout and start-up procedures.

F. The subcontractors shall execute start-up and provide the CxA with a signed and dated copy of the completed start-up and construction checklists.

G. Only individuals that have a direct knowledge and witness that a line item task on the construction checklist was actually performed shall initial or check that item off.

H. Test Methods:

1. Mock-Up Systems

a. “Mock-Up” equipment and systems are to be completed in all respects and readied for functional testing prior to building completion. These systems are as follows:

1) Window glazing / curtainwall structures

2) Any exterior wall structures – masonry, brick, stucco, metal panels, wood, etc.
3) Typical Air Handling Unit with Freeze Coil Pump
4) Typical Fan Coil Unit
5) Typical Blower Coil Unit
6) Typical Domestic Hot Water Heater

b. "Mock-up" equipment is defined as systems and equipment that are in sufficient quantities where early detection of system deficiencies will help to reduce future rejection of equipment. These are permanent installations – not temporary for the sake of demonstration only. The equipment "mock-up" will establish a level of quality of the equipment installation and its operation. This proactive approach will reduce future installation and operational errors of repetitive equipment.

c. "Mock-up" equipment will be reviewed and approved by the Engineer, CA, and Owner's Representative

d. "Mock-up" equipment will be deemed readied for testing and approval as defined below:

1) Air Handling Unit

a) Manufacturer start-up completed and report submitted
b) Associated VFD is operational (if applicable)
c) Discharge and Return Ducts to unit completed, sealed, and insulated
d) Piping to coils for unit is completed per detail
e) Pump is installed and powered
f) Piping is insulated
g) Equipment identification installed
h) Pipe and Duct identification completed
i) Valve Tags installed
j) Final filters installed
k) All Gages and Thermometers installed
l) Condensate pans trapped and piped to floor drain
m) VAV boxes downstream under control to at least allow BMS command to open.
n) Automatic Temperature Controls installed, functioning, and reporting to the BAS, including all associated sensors and airflow measuring devices

2) Fan Coil Unit (FCU)

a) Equipment identification installed
b) Fan is powered
c) Disconnect switch is installed and operating
d) Piping to FCU chilled water and reheat coil is completed as

per detail. Pipe Identification and Valve tagging completed
e) Piping is insulated
f) Ductwork is completed, sealed, and insulated
g) All diffusers served by FCU are installed with proper flex runs to limit any air velocity noise.
h) Final filter installed
i) Unit supports in place
j) Proper vibration isolation installed
k) Automatic Temperature Controls installed, functioning, and reporting to the BAS, including all associated sensing devices.

3) Blower Coil Unit (BCU)

a) Equipment identification installed
b) Fan is powered
c) Disconnect switch is installed and operating
d) Piping to BCU reheat coil is completed as per detail. Pipe Identification and Valve tagging completed
e) Piping is insulated
f) Ductwork is completed, sealed, and insulated
g) All diffusers served by BCU are installed with proper flex runs to limit any air velocity noise.
h) Final filter installed
i) Unit supports in place
j) Proper vibration isolation installed
k) Automatic Temperature Controls installed, functioning, and reporting to the BAS, including all associated sensing devices.

4) Domestic Water Heater

a) Equipment identification installed
b) Piping installation completed as per detail. Pipe Identification and Valve tagging completed.
c) Piping is insulated
d) Expansion tank installed and properly charged.
e) All equipment disconnect switches are installed and operable.
f) Recirculation pumps installed and powered
g) Thermostatic mixing valve installed and set to design temperature.
h) All temperature sensors or thermostats installed and operating
i) All equipment is properly mounted and supported

e. CM is responsible to schedule and provide all necessary time and personnel to achieve the "mock-up" installations. CM will coordinate this effort with the CA and Owners Representative for acceptance.

2. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's graphic trend log capabilities.
3. Tests shall be performed using design conditions whenever possible and where required.
4. Set-up:

   a. Each function and test shall be performed under conditions that simulate actual conditions to the closest practical approximation.
   b. The Contractor executing the test shall provide all necessary materials, system modifications, etc. to produce the flows, pressures, temperatures, etc. necessary to execute the test under specified conditions.
   c. At completion of the test, the Contractor shall return all affected building equipment and systems to their pre-test condition.
   d. Functional performance testing will commence as systems are brought to substantial completion and will be done on a system by system basis. The results of these tests will be documented and submitted to the Owner for final system acceptance. The Commissioning Authority shall attain this objective by developing individual systems testing protocols which, when implemented by the trade Contractor, will allow the Commissioning Authority to observe, evaluate, identify deficiencies, recommend modifications, adjust, and document the systems and systems equipment performance over a range of load and functional levels. Functional performance testing as a minimum will be performed on the following systems:

5. Air Distribution Systems:

   a. The Testing and Balancing Contractor (TAB) shall demonstrate total airflow at each piece of air handling equipment at simulated full cooling, heating and/or max/min or fresh (outside) air.
   b. Spot checks of approximately 50% of air outlets shall be made. The Commissioning Authority shall select outlets and the air balancer shall demonstrate a reading of that outlet. Where appropriate, the thermostat shall be adjusted to simulate full cooling, full heating, etc.
   c. The Testing and Balancing Contractor (TAB) shall demonstrate proper room static pressure with respect to the adjacent space(s).
   d. Observe motor HP draw at selected fan motors.
   e. Discrepancies between the balancing report and spot check results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure

shall be repeated.

1) Any noted drafts or noisy air distribution devices shall be evaluated and corrective action taken.
2) The Testing and Balancing Contractor (TAB) shall verify the proper calibration of temperature, pressure and safety devices as installed on the various pieces of mechanical equipment. The Testing and Balancing Contractor (TAB) shall assist the Commissioning Authority in the proper setting of all temperature, pressure and safety devices.
3) Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.

6. Hydronic Systems:

a. The Testing and Balancing Contractor shall demonstrate total water flows at each pump, air handler, chiller and terminal heating equipment.
b. Spot checks of approximately 50% of hydronic terminals shall be made. The CxA shall select terminals and the balancer shall demonstrate a reading at the equipment via the flow control device or by using an ultrasonic device.
c. Discrepancies between the balancing report and actual testing results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.
d. Assist in verifying the calibration and operation of any flow meters and differential pressure sensors.
e. Assist in verifying the calibration and operation of any temperature sensors.
f. Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.

7. Exhaust Systems:

a. The Testing and Balancing Contractor (TAB) shall demonstrate total airflow at each exhaust fan system.
b. Spot checks of approximately 50% of air outlets shall be made. The Commissioning Authority shall select outlets and the air balancer shall demonstrate a reading of that outlet.
c. The Testing and Balancing Contractor (TAB) shall demonstrate proper room static pressure with respect to the adjacent space(s).
d. Observe motor HP draw at selected fan motors.
e. Discrepancies between the balancing report and spot check results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.

f. Any noted drafts or noisy air distribution devices shall be evaluated and corrective action taken.
g. Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.

8. Automatic Temperature Controls (ATC):

a. ATC Contractor shall demonstrate the proper operation of the temperature control sequences for each air handling systems, variable air volume boxes, boilers, chillers, pumps, exhaust and terminal heating/cooling equipment as listed in 1.11 of this Section.
b. ATC Contractor shall demonstrate the proper sequences as they apply to the equipment listed in 1.11 of this Section: This includes but not limited to the following:

1) Occupied/unoccupied time sequences.
2) Night setback/night set-up features.
3) Morning warm-up sequences.
4) Air-side economizers.
5) Proper control of boilers and associated equipment.
6) Proper control of discharge air temperature from air handling equipment including reset temperature sequences.
7) Heating hot water discharge temperature control to the building systems including hot water reset.
8) Proper staging and control of the heat exchangers.
9) Lead/lag operation of the various pumps.
10) Control of hot water freeze pumps.
11) Proper control and discharge temperatures from the reheat coils.
12) Operation and control of the fan coils and unit heaters.
13) Proper operation and control of the chillers and cooling towers.
14) Run standby operation of pumps.
15) Proper operation and control of any energy recovery systems.
16) Proper control of the exhaust fans
17) Proper annunciation of building alarms including fail safe controls and proper shut down of equipment.
18) Proper control of all air handling equipment with respect to air volume.
19) Demonstrate any terminal box operation for 30 consecutive days (24 / 7) without a system problem. Shall include temperature and humidity (where applicable) and recording of same.
20) Calibration of all temperature pressure and safety devices.
21) Proper display of all ATC graphics.
22) Control of all automatic control valves and dampers.
23) Assist in calibration of all airflow stations.

9. Plumbing Systems:

a. Verify proper operation and control of the domestic water heating system.
b. Proper operation and calibration of the thermostatic mixing valves.
c. Verify proper operation of the backflow preventer systems.
d. Demonstrate proper operation and control of the various pumping systems – (i.e. domestic water booster, sewage ejector, re-circulation pumps)
e. Demonstrate the ability of the domestic hot water system to maintain the design minimum water temperature at all the faucets serviced by the system for 5 minutes while all faucets are active.
f. Demonstrate domestic hot water at the faucet within a reasonable amount of time of faucet opening.

10. Electrical Systems:

a. Demonstrate proper operation of all building lighting, lighting control systems and occupancy sensors.
b. Demonstrate proper operation of electrical supply and distribution metering system.
c. Verify proper operation of variable frequency drive systems, main electrical gear systems, low and medium voltage systems, and ground systems.

11. Life Safety Systems:

a. Verify operation of fire alarm, egress pressurization, fire suppression and egress lighting.

12. Coordination and Scheduling:

a. Scheduling is the responsibility of the Contractor. Commissioning activities shall be scheduled through the Contractor. The Contractor shall be responsible for integrating functional performance testing and commissioning requirements into the master activity schedule.
b. The subcontractors shall provide sufficient notice to the CxA regarding their completion schedule for the construction checklists and start-up of all equipment and systems. The CxA shall direct, witness and document the functional testing of all equipment and systems.
c. Subcontractors are responsible for execution of all tests.
d. Functional testing is conducted after construction checklists and start-up has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems.
e. The Contractor shall verify completeness of the building envelope, perimeter and interior items which affect proper operation and control of HVAC, Plumbing, Fire Protection and electrical equipment and

systems.

f. The air and water balancing is completed and debugged before functional testing of air and water related equipment or systems.
g. Testing proceeds from components to subsystems to systems.
h. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

13. Problem Solving:

a. The CxA will recommend solutions to problems found, however the burden of responsibilities to solve, correct and retest problems rests with the Contractor, Subcontractor, Architect and Engineering Professionals.

14. Trend Logs:

a. Upon completion of successful functional performance testing, contractor shall submit graphic trend logs to CxA.
b. Submit graphic trend log for each piece of controlled equipment for each controlled parameter.
c. Trend logs shall demonstrate successful performance for a seven day period unless the controlled process requires a longer timeline.
d. Trend log color printouts shall be submitted demonstrating successful seasonal performance.
e. Trend logs shall be color graphic with legend submitted to the CxA in printout.

3.04 SEASONAL/DEFFERRED TESTING

A. The purpose of (opposite) seasonal functional testing is to evaluate the performance of selected equipment during design weather conditions that may not have been available during the initial functional testing. Ideally cooling equipment needs to be functionally tested under hot, humid summer conditions to ensure proper operation in accordance with design specifications. The same is true for heating hot water and steam systems is which require colder, winter climates.

B. The functional testing performed during seasonal testing will adhere to the guidelines listed above in item 3.3 in this section.

C. Any deficiencies will be documented and submitted to the Contractor and correction of these items will be the responsibility of the respective Subcontractors.

3.05 POST OCCUPANCY/WARRANTY REVIEW

A. The purpose of a post occupancy/warranty review is to review the building

systems and equipment prior to warranty expiration. The post occupancy/warranty review will take place approximately 9 months into the 12 month warranty period. The facilities operating staff will be interviewed to discuss any issues discovered during the previous month's operation of the facility (concerning previously commissioned equipment). The building control system and equipment will be inspected to identify any deficiencies.

B. Any warranty related deficiencies will be documented and submitted to the Contractor and correction of these items will be the responsibility of the respective Subcontractors.

3.06 DOCUMENTATION, NON-COMFORMANCE AND APPROVAL OF TESTS

A. Documentation:

1. The CxA will witness and document the results of functional performance tests using the specific procedural forms developed for that purpose.
2. Reports will include measured data, data sheets and a comprehensive summary describing the operation of systems at the time of testing.
3. Data sheets for each controller verifying proper operation of the control system, the system it serves, the service it provides and its location will be provided.

B. Non-Conformance:

1. The CxA will record the results of the functional testing on the procedure or test form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
4. Should a deficiency be identified during checkout, start-up or testing, the CxA will discuss the issue with the responsible subcontractor. When there is no dispute on the deficiency and the subcontractor accepts responsibility to correct it.

    a. The CxA documents the deficiency and the subcontractor's response and intentions and they go on to another test or sequence.
    b. After a system performance testing is complete, the CxA submits the noncompliance issues on the internet portal.

5. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

a. The deficiency shall be documented on the BVH portal with the subcontractor's response and the item shall be tagged for the Engineer / Architect to review and comment for resolution.

6. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Owner.
7. The CxA documents the resolution process.
8. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.
9. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BoD documents shall be implemented or if tests will be accepted as submitted. If corrective Work is performed, Owner will decide if tests shall be repeated and a revised report submitted.
10. Cost of Retesting.

a. The cost for the subcontractor to re-perform a construction check-out or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs proposed shall be negotiated with the appropriate party.
b. The time for the CxA to direct any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be fault, will be negotiated with the appropriate party, who may choose to recover costs from the party responsible for executing the faulty test.
c. Failure Due to Manufacturer Defect:

1) If 10% or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CxA. In such case, the subcontractor shall provide the following:

a) Within one week of notification from the Contractor, the subcontractor or manufacturer's representative shall examine all other identical units making a record of the findings.
b) The findings shall be provided by the CxA within two weeks of the original notice.
c) Within two weeks of the original notification, the Contractor, subcontractor or manufacturer shall provide a

signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals.

2) The proposed solutions shall significantly exceed the specification requirements of the original installation.
3) The Owner and Design Team will determine whether a replacement of all identical units or a repair is acceptable.
4) Two examples of the proposed solution will be installed by the subcontractor and the subcontractor will be allowed to test the installations for up to one week, upon which the Owner and Design Team will decide whether to accept the solution.
5) Upon Acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

a) Approval: The CxA notes each satisfactorily demonstrated function on the test form. The CxA recommends acceptance of each test using a standard form.
b) Deferred Testing:

(1) If tests cannot be completed because of a deficiency outside the scope of the subcontractor responsible for installation of the System to be Commissioned, the deficiency shall be documented and reported. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
(2) If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed, documented, and additional tests scheduled.

3.07 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. The Contractor shall be responsible for coordination, scheduling and completing operations and maintenance training for the Owners designated personnel on all Systems to be Commissioned.

1. Training materials shall be submitted for review and approval of the CxA well in advance of training.
2. Trainer qualifications and certifications shall be submitted for review and approval of the CxA well in advance of training.
3. Each subcontractor responsible for training will submit a written training plan to the CxA for review and approval prior to training. The plan will

include field orientation during installation, classroom instruction and field training after the completion of installation and cover the following elements:

a. Equipment (included in training)
b. Intended audience
c. Location of training
d. Objectives
e. Subjects covered (description, duration of discussion, special methods, etc.)
f. Duration of training on each subject.
g. Instructor for each subject
h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
i. Instructor and qualifications

4. For the primary equipment, the Controls subcontractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
5. Subcontractors shall provide all qualified personnel, including manufacturer representatives, for equipment and system training.

B. The CxA will verify and approve the content and adequacy of the training of Owner personnel for systems to be commissioned.

1. Training rigor: to be established by Owner & CxA
2. In addition to these general requirements, the specific training requirements for Owner personnel are specified in Division 01.

C. Training Planning Meeting: Before operation and maintenance training, CxA shall convene a training planning meeting to include Owner's operation and maintenance personnel, each Contractor, and subcontractors. In addition to requirements specified in other Divisions, perform the following:

1. Review the OPR and BoD.

a. Review installed systems, subsystems, and equipment.
b. Review instructor qualifications
c. Review instructional methods and procedures.
d. Review training module outlines and contents.
e. Review course materials (including operation and maintenance manuals.
f. Verify and discuss locations and other facilities required for instruction.
g. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.

h. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

3.08 EXCLUSIONS

A. The Commissioning Authority is not responsible for construction means, methods, coordination between trades, job safety or any other related management function on the job site.

B. The Contractor and Subcontractors will provide all technician services requiring tools or the use of tools to functionally test, adjust or otherwise bring equipment into a fully operational state. It is required by this specification that the person to represent the Automated temperature control system shall be the person who wrote the control programming. The CxA shall observe technicians as they complete testing, and may make minor adjustments, but shall not perform construction or technician services.

END OF SECTION

1 PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.2 DESCRIPTION OF WORK

A. Everything necessary and proper for, or incidental to, executing and completing the work as required by this Section and as reasonably inferable from the Drawings, including but not necessarily limited to the following:

1. New and reset, salvaged vertical granite street curb.
2. Granite cut-back street curb for catch basins, if required.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 312000 – Earthwork
C. Section 321216 – Asphalt Paving
D. Section 321313 – Site Concrete

1.4 REFERENCES

A. State of Connecticut Department of Transportation (CTDOT), Standard Specifications for Roads, Bridges and Incidental Construction, Form 816, most recent issue. Maintain at the job site a complete up to date volume of the above referenced standard specifications for the entire period of construction.

B. American Society for Testing and Materials Standards (ASTM), sections as specified.

1.5 SUBMITTALS

A. Submit to the Architect for approval prior to purchase a sample of granite showing typical color, grain, surfaces representing all specified finishes, with name of quarry source of supply and manufacturer.

B. Submit sample of mortar color for jointing.

1.6 QUALITY ASSURANCE

A. Qualifications: The work of this Section will be performed by qualified and experienced installers. The installers shall be organizations of established reputation which are regularly engaged in and which maintain a regular force of workmen skilled in the installation of the type of work specified in this section

and is acceptable to the Architect.

B. Comply with applicable sections of Materials of Construction and of the Technical Specifications of the Bureau of Engineering, City of Middletown.

C. Coordinate with the City Department of Traffic and Parking regarding permitting, traffic obstructions and related concerns.

D. Do not change source or type of granite during the course of the work.

2 PART 2 – MATERIALS

2.1 MANUFACTURERS – SUPPLIERS

A. Granite for street curb shall be from a New England source:

1. Williams Stone Company, East Otis, MA (800.822.2052)
2. Swenson Granite Works, Concord, NH (603.225.2783)
3. Fletcher Granite Company, North Chelmsford, MA (978.251.403)
4. Or approved equivalent.

2.2 MATERIALS

A. Granite Curb

1. New granite street curb as specified in CTDOT Standard Specifications, Section 8.13 and Article M.12.06. No salvaged curbing from off site will be permitted. Selected salvaged on- site curb may be acceptable if it meets all specifications for new. Existing catch basin, 'cut- back' curb sections may be reused if approved.
2. Granite shall be selected for uniform color and shading, of even, medium texture, free from seams, extraordinary markings, cracks, holes, blemishes or other flaws or defects. Color shall be a uniform medium to dark gray (not white or "salt & pepper"). Stone shall be free from minerals causing rust or other stains and shall be free from tool marks causing staining.
3. Finish as indicated on drawings.
4. Top edge of curbs shall have a 'buzzed' rounded edge to a ¼ inch bullnose radius.
5. Length of Vertical Curb Stones: 6 ft. minimum to 10 ft. maximum.
6. Planter curbs with curved sections shall be all dimension-cut to exact radii.
7. Vertical Curbs on Street Curved Sections:

    a. Curb with a radius of 100 ft. or less cut to required curvature and ends cut on radial lines.

b. Curb with a radius of 101 ft. to 200 ft. cut in 3’-0″ to 4’-0″ straight pieces.
c. Curb with radius of 201 ft. to 500 ft. cut in 4’-0″ to 6’-0″ straight pieces.

8. Bottom corners shall be knocked back to accept concrete anchors complying with City details.

B. Granite Planter curbs shall be of materials specified and shall have sawn and thermal-finished tops and sides of all exposed, visible surfaces.

C. Granular Base: As specified in CTDOT Standard Specifications, Article M.02.03, and as required by the City of Middletown.

D. Concrete: for cradles and back fill at curb line shall be as required by city (“Class C, AE Concrete”) and as specified in Section 321313.

E. Mortar: As specified in CTDOT Standard Specifications, Article M.11.04, and with color additive approved by architect. Color by Davis Colors (800.800.6856), L.M. Scofield Colors or approved equivalent.

F. Sealant for expansion joints shall be non-sag, polurethane sealant by Sonoborn, Sika-Flex or equal, designed for application and color-matched to granite; submit sample(s).

3 PART 3 – EXECUTION

3.1 PREPARATION

A. Stake out the work and/or check previous stake out and make any minor adjustments in location as required by the Architect. Upon receiving approval of final staked location, begin work. Establish grade controls, maintaining the required lines, grades, crown, and cross- slopes for each course during paving operations.

B. Do all necessary compacting to obtain firm, even subgrade surface in accordance with Section 312000. Fill and consolidate depressed areas. Remove incompatible materials, replace with new fill and compact.

C. Verify frames for manholes, drain inlets and other such units within areas to receive curbs so they are at their proper elevation and location relative to proposed curbs. Adjust frames as required. Provide temporary closures over openings until completion of paving operations.

3.2 CURB INSTALLATION

A. See CTDOT Standard Specifications, Section 8.13, except as specified below.

B. Set curb true to arris line and grade on granular stone base so that curb is completely supported throughout its length.

C. Place concrete at joints to support and anchor curb ends. Backfill at street-side face of curb with concrete as per standard city details, allowing for final bituminous concrete placement. Backfill at sidewalk side with compacted, specified material.

D. Joints shall have a maximum width of ¾ inch and minimum width of ¼ inch. They shall be carefully filled with cement mortar mixed and rodded in place. The top and exposed front face of the joint shall be neatly pointed flush with curb surfaces and satisfactorily cleaned of all excess mortar.

E. After curb has been set, backfill with specified material in 6-inch layers and thoroughly tamp prior to proceeding with any further work adjacent to curbs.

F. Note certain planter curb installation over rooftop; protect waterproofing and make adjustments as required for these conditions.

3.3 PROTECTION

A. Protect curb from damage or dislocation due to construction and vehicular traffic until final acceptance. Any curb that is damaged at any time prior to final acceptance shall be removed and replaced at no expense to the Owner.

3.4 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from paving operations.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cast stone panels.

1.2 RELATED SECTIONS:

A. Section 05500 – Metal Fabrications
B. Section 07900 – Sealants

1.3 REFERENCES

A. Reference Standards: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Reference Standards: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Society for Testing and Materials (ASTM) Publications:

A 240-12	Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications
A 276-10	Stainless Steel Bars and Shapes
A 615-15	Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
A 666-10	Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
A 767-09	Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
A 775-07	Epoxy-Coated Steel Reinforcing Bars
C 33-11	Concrete Aggregates
C 114-11	Chemical Analysis of Hydraulic Cement
C 150-12	Portland Cement
C 260-10	Air-Entraining Admixtures for Concrete
C 494-11	Chemical Admixtures for Concrete
C 979-10	Pigments for Integrally Colored Concrete
C 1364-10	Architectural Cast Stone
E 329-11	Agencies Engaged in Construction Inspection, Testing or Special Inspection

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples:

1. For each color and texture of cast stone required, 10 inches square in size.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.
B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two (2) years.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

1.8 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven (7) days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 CAST STONE MATERIALS

A. General: Comply with ASTM C 1364 and the following:

1. Portland Cement: ASTM C 150, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast stone color indicated.
2. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation and colors as needed to produce required cast stone textures and colors.
3. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation and colors as needed to produce required cast stone textures and colors.
4. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
5. Admixtures: Use only admixtures specified or approved in writing by Architect.

    a. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
    b. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
    c. Air-Entraining Admixture: ASTM C 260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of four to six percent (4-6%), except do not add to zero (0) slump concrete mixes.
    d. Water-Reducing Admixture: ASTM C 494, Type A.
    e. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
    f. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.

B. Reinforcement: Deformed steel bars complying with ASTM A 615, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1½ inches of cast stone material.

1. Epoxy Coating: ASTM A 775.

2. Galvanized Coating: ASTM A 767.

C. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240, ASTM A 276, or ASTM A 666, Type 304.

2.2 CAST STONE UNITS

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. Continental Cast Stone East by Russell, West Berlin, NJ (856.753.4000)
2. Corinthian Cast Stone Inc., Wyandanch, NY (631.920.2340)
3. Sun Precast Company, Beaver Springs, PA (570.658.8000)
4. Substitutions: Under provisions of Section 01600.

B. Provide cast stone units complying with ASTM C 1364 using either the vibrant dry tamp method.

1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C 1364.

C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide drips on projecting elements unless otherwise indicated.
3. Provide special shapes as indicated on Drawings.

D. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than ¼ inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

E. Cure units as follows:

1. Cure units in enclosed moist curing room at ninety-five to one hundred percent (95-100%) relative humidity and temperature of 100 deg F (38 deg C) for twelve (12) hours or 70 deg F (21 deg C) for sixteen (16) hours.

2. Keep units damp and continue curing to comply with one (1) of the following:

a. No fewer than five (5) days at mean daily temperature of 70 deg F (21 deg C) or above.
b. No fewer than six (6) days at mean daily temperature of 60 deg F (16 deg C) or above.
c. No fewer than seven (7) days at mean daily temperature of 50 deg F (10 deg C) or above.
d. No fewer than eight (8) days at mean daily temperature of 45 deg F (7 deg C) or above.

F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

G. Colors and Textures: As selected by Architect and Owner from manufacturer's full range.

2.3 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240, ASTM A 276, or ASTM A 666.

B. Dowels: 3/8-inch- diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A 240, ASTM A 276, or ASTM A 666.

2.4 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C 1364.

1. Include one (1) test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

B. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.

C. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.

E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.

1. Form open joint of width indicated, but not less than ½ inch.

F. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07900.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove excess sealant immediately, including spills, smears, and spatter.

END OF SECTION

1 PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Fabricate and install metal railings in accordance with the requirements set forth in this section.

1.2 RELATED SECTIONS

A. Section 03300 – Concrete Work
B. Section 16110 – Conduit
C. Section 16500 – Lighting Systems

1.3 STRUCTURAL REQUIREMENTS

A. Railing assembly shall withstand a minimum concentrated load of 200 pounds applied vertically downward or horizontally in any direction, but not simultaneously, at any point on the top rail.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Furnish references listing projects of similar size and scope.

B. Regulatory Requirements

1. Components and installation are to be in accordance with state and local code authorities.
2. Components and installation are to follow current ADA and ICC/ANSI A117.1 guidelines.

C. Certifications

1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
2. Furnish certification that components were installed in accordance to the manufacturer's engineering data to meet the specified design loads.

D. Pre-Installation Meeting

1. Prior to the beginning of work, conduct a pre-job conference at the job site.
2. Provide seven (7) calendar days advance written notice ensuring the attendance by competent authorized representatives of the fabricator, building owner's representative, architect and subcontractors whose work interfaces with the work of this section.
3. Review the specifications to determine any potential problems, changes,

scheduling, unique job site conditions, installation requirements and procedures and any other information pertinent to the installation.

4. Record the results of the conference and furnish copies to all participants.

1.5 REFERENCES

A. Reference Standards: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Iron and Steel Institute (AISI) Publications:

Steel Products Manual; Stainless and Heat Resisting Steel. Code of Standard Practice

2. American National Standards Institute (ANSI) Publications:

A117.1 Accessible and Usable Buildings and Facilities

3. American Society for Testing and Materials (ASTM) Publications:

A 167	Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
A 269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A 312	Seamless and Welded Austenitic Stainless Steel Pipe
B 221	Aluminum-Alloy Bars, Rods, Wires, Shapes and Tubes
C 595	Blended Hydraulic Cements

4. National Association of Architectural Metal Manufacturers (NAAMM) and National Ornamental and Miscellaneous Metals Association (NOMMA) Publications:

Metal Finishes Manual

1.6 SUBMITTALS

A. Submit shop drawings, product data and manufacturer's installation instructions under provisions of Section 01300.

1. Show sections and plans of stairs, dimensions and assembly of components.

a. Railings
b. Brackets
c. Reinforcements
d. Anchors
e. Welded and bolted connections

2. Show all field connections.
3. Provide setting diagrams for installation of anchors and location of pockets.
4. Specify adequate back up support for anchoring handrail bracket.
5. Indicate all required field measurements.

B. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.

C. Samples:

1. Submit duplicate samples of railing showing style and finish. One (1) approved sample will be returned to Contractor.
2. Certificates:

a. Furnish manufacturer's certification that materials meet specification requirements.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.

B. Storage on site:

1. Store material in a location and in a manner to avoid damage. Stacking shall be done in a way, which will prevent bending.
2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
3. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

2 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The Wagner Companies, Butler, WI (888.243.6914); **Lumenrail**
B. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS AND FINISHES

A. Stainless Steel: Type 304.

1. Bar: ASTM A 167.

2. Pipe and Tubing: ASTM [A 269] [A 312]
3. Finish: Ornamental Grade, AISI No. 4.

B. Aluminum:

1. Extruded Bars, Shapes and Mouldings: Alloy 6063-T6 meeting ASTM B 221.

2.3 RAILING SYSTEM

A. Rails: Fabricate rails from stainless steel.
B. Posts:

1. Fabricate posts from stainless steel pipe.
2. Mounting: Over stubs preset into concrete.
3. Attachment: Attach post to underside of railing by use of top post bracket.

C. LED Lighted Railing:

1. Insert LED light stick into slotted tube.

a. Source: Selected high brightness LED.
b. Life (L70/ 70% brightness): 50,000 hours.
c. Light Output: Standard Output, 4000K; Beam Angle: 60°.
d. Housing: Extruded aluminum.
e. Mounting: Clip system.
f. Listings: ETL Listed for wet or dry locations.
g. Length: Largest size available to fit in between posts, as indicatedon Drawings.
h. Power Requirement: 24V.
i. Power Consumption: 2 W/ft.
j. Power Supply: 24V/100W.
k. Input Voltage to Power Supply: 120-277.
l. Temperature Range: -40° C through +60° C.
m. Product Rating: Interior and Exterior Applications, ETL, Class 2 circuit.

2.4 FASTENERS

A. All mechanical fasteners used in the assembly of stainless steel railings shall be manufactured from stainless steel.

B. Cement: Hydraulic, ASTM C 595, factory prepared with accelerator.

2.5 FABRICATION

A. Form rail-to-end post connections and all changes in rail direction by radius elbows.

B. Cut material square and remove burrs from all exposed edges, with no chamfer.

C. Make exposed joints butt tight and flush.

D. Close exposed ends of tube by use of appropriate end cap.

E. For posts set in concrete, furnish matching sleeves or inserts not less than 5 inches long.

F. Verify dimensions on site prior to shop fabrication.

3 PART 3 – EXECUTION

3.1 PREPARATION

A. Supply items to be cast in concrete.

3.2 INSTALLATION

A. Install in accordance with shop drawings and manufacturer's instructions at locations indicated on the drawings.

B. Erect work horizontal or parallel to rake of steps or ramp, rigid, and free from distortion or defects detrimental to appearance or performance.

3.3 PROTECTION

A. Protect railing system and finish from damage during construction.

3.4 CLEANING

A. As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasives.

C. If stain remains after washing, remove finish and restore in accordance with NAAMM/NOMMA Metal Finishes Manual.

3.5 REPAIR OF DEFECTIVE WORK

A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

B. Repair damaged finish as directed by Architect.

C. Replace defective or damaged components as directed by Architect.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes conventionally glazed aluminum curtain walls installed as unit-and-mullion assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.

D. Source quality-control reports.

E. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.

c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.

2. Warranty Period: Five (5) years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

C. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus ¼ inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to ¾ inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

D. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at one hundred fifty percent (150%) of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than ten (10) seconds.

E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

   a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of6.24 lbf/sq. ft.

F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of twenty percent (20%) of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

G. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.35 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 MANUFACTURERS

A. Basis-of-Design Product:

1. EFCO Corporation; **2¼ inch Series 5500 (TS)**

B. 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. Kawneer North America
2. TRACO
3. YKK AP America Inc.
4. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

C. Source Limitations: Obtain all components of curtain wall system from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four (4) sides.
3. Glazing Plane: Front.
4. Finish: High-performance organic finish.
5. Fabrication Method: Factory-fabricated unit and mullion system.

B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

    a. Sheet and Plate: ASTM B 209.
    b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

2.4 GLAZING

A. Glazing: Comply with Section 08800.

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Fabricate components to resist water penetration as follows:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

E. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Preparation includes, but is not limited to, cleaning and priming surfaces.
3. Seal joints watertight unless otherwise indicated.
4. Install glazing to comply with requirements in Section 088000 "Glazing."

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than seventy percent (70%) PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect and Owner from manufacturer’s full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; ¼ inch in 40 feet.
2. Level: 1/8 inch in 20 feet; ¼ inch in 40 feet.
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to ½ inch wide, limit offset from true alignment to 1/16 inch.

b. Where surfaces are separated by reveal or protruding element from ½ to 1 inch wide, limit offset from true alignment to 1/8 inch.
c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to ¼ inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; ½ inch over total length.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Field-finished new wood flooring to match existing.
2. Refinishing of existing wood flooring to match existing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.2: For field-applied finishes for wood flooring, documentation including printed statement of VOC content.
3. Product Data for Credit IEQ 4.3: For field-applied finishes for wood flooring, documentation including printed statement of VOC content.
4. Product Data for Credit IEQ 4.3: For wood flooring, documentation from an independent testing agency indicating compliance with the FloorScore Standard.

C. Shop Drawings: For each type of floor assembly and accessory. Include plans, elevations, sections, details, and attachments to other work. Include expansion provisions and trim details.

D. Samples: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wood Flooring: Equal to one percent (1%) of amount installed for each type of wood flooring indicated.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Hardwood Flooring: Comply with NOFMA's "Official Flooring Grading Rules" for species, grade, and cut.

1. Certification: Provide flooring that carries NOFMA grade stamp on each bundle or piece.

C. Build mockup of typical flooring area as shown on Drawings.

1. To set quality standards for sanding and application of field finishes, prepare finish mockup of floor area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood flooring materials in unopened cartons or bundles.

B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.

C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.7 PROJECT CONDITIONS

A. Conditioning period begins not less than seven (7) days before wood flooring installation, is continuous through installation, and continues not less than seven (7) days after wood flooring installation.

1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.

a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.

b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.

B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

1.8 GUARANTEE

A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.

B. Provide manufacturer's warranty against defects in material for a period of one (1) year.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Wood floors shall comply with requirements of FloorScore Standard.

2.2 FIELD-FINISHED WOOD FLOORING

A. Certified Wood: Provide wood flooring produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Solid-Wood Flooring (To Match Existing): Kiln dried to six to nine percent (6-9%) maximum moisture content, tongue and groove and end matched, and with backs channeled.

1. Species and Grade: Select red oak.
2. Cut: Edge grain.
3. Thickness: 25/32 inch.
4. Face Width: 2¼ inches.
5. Lengths: Random-length strips complying with applicable grading rules.

C. Urethane Finish System: Complete water-based system of compatible components that is recommended by finish manufacturer for application indicated.

1. 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:

    a. Hillyard, Inc.
    b. Basic Coatings, Inc.
    c. Dura Seal, Sherwin-Williams Company (The).
    d. Substitutions: Under provisions of Section 012500 “Substitution Procedures”.

2. VOC Content: When calculated according to 40 CFR 59, Subpart D (EPA Method 24), as follows:

    a. Finish Coats and Floor Sealers: Not more than 350 g/L.
    b. Stains: Not more than 250 g/L.

3. Stain: Penetrating and non-fading type.

    a. Color: As selected by Architect and Owner from manufacturers full range to match existing.

4. Floor Sealer: Pliable, penetrating type.
5. Finish Coats: Formulated for multi-coat application on wood flooring.

D. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.3 ACCESSORY MATERIALS

A. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines: Wood Flooring.".

B. Reducer Strips: To match wood flooring. 2 inches wide, tapered, and in thickness required to match height of flooring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring.".

B. Provide expansion space at walls and other obstructions and terminations of flooring of not less than ¾ inch.

C. Solid-Wood Flooring: Blind nail or staple flooring to substrate.

3.4 FIELD FINISHING

A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.

1. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring.".

B. Fill and repair wood flooring seams and defects.

C. Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four (4) coats total and no fewer than two (2) finish coats.

1. Apply stains to achieve an even color distribution matching approved Samples.
2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.
3. **During product application and drying time, floor must be free of dust and dirt. For the first four (4) hours, avoid air currents that carry dust and dirt. Temperatures of the floor, room and materials should be 65°F or above during treatment and curing. Allow adequate ventilation for proper curing.**

D. Cover wood flooring before finishing.

E. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven (7) days after applying last finish coat.

3.5 PROTECTION

A. Protect installed wood flooring during remainder of construction period with covering of heavy Kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

1. Do not move heavy and sharp objects directly over Kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION

1 PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Continuously hinged sliding panel acoustic partition, motorized operation with carpet finish

B. Ceiling track, ceiling guards and operating hardware

C. Sound attenuation batt insulation in cavity above ceilings on each side of panels

1.2 RELATED SECTIONS

A. Section 06100 – Rough Carpentry
B. Section 07213 – Batt and Blanket Insulation
C. Section 09260 – Gypsum Board Systems

1.3 REFERENCES

A. Reference Standards: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Society for Testing and Materials (ASTM) Publications:

E 84-13	Surface Burning Characteristics of Building Materials
E 90-09	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

1.4 PERFORMANCE REQUIREMENTS

A. Sound Transmission Coefficient (STC): ASTM E 90, STC of 52, minimum, tested on panel size of 100 sq ft.

B. Surface Burning of Wall Carpet Finish: ASTM E 84; flame/fuel/smoke rating of 25/35/50.

C. Install partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, track loads, adjacent construction, finish trim and stacking sizes.

C. Product Data: Describe partition operation, hardware and accessories, colors and finishes available.

D. Samples: Two (2) samples of surface finish, 12 x 12 inches size, illustrating quality, color, texture and weight.

E. Manufacturer's Installation Instructions: Include specific installation sequence, special instructions and warranty information.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Describe cleaning materials detrimental to carpet fabric surfaces and hardware finish.

C. Include recommended cleaning methods, cleaning materials and stain removal methods.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three (3) years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to the Connecticut State Building and Fire Safety Codes for combustibility requirements for materials.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

1.10 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Warranty period: Two (2) years.

2 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Modernfold, Inc., New Castle, IN (765.529.1450)

1. Product Numbers listed below are based on the Modernfold system but equal products from other acceptable manufacturers are acceptable as long as they meet all of the standards listed and found on the Modernfold system.

B. Panelfold, Inc., Miami, FL (305.688.3501)
C. Substitutions: Under provisions of Section 01600.

2.2 COMPONENTS (Provide with track system recommended by manufacturer for the panel and specific application to this project.

A. **Acousti-Seal 933 E** Electrically Operated Hinged Panel Construction:

1. Facing: Steel sheet, 21 gauge thick.
2. Core: 16 gauge thick steel frame top, bottom, jambs and intermediates, welded construction, internally reinforced at suspension points, with acoustic insulation fill.
3. Trim: Trimless.
4. Thickness: 3 inches.
5. Panel Length: Not to exceed 4 feet in pocketed location.
6. Hinges: Full leaf butt hinges, attached directly to the panel's steel frame. Welded hinge anchor plates within panel, shall support hinge mounting to frame.
7. Panel to Panel Seals: Grooved and gasketed steel astragals, continuous flexible vinyl, fitted to panel edge construction; color to match panel finish.
8. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
9. Panel to Wall Seals: Expandable panel with fixed jamb wrapped in fabric or carpet to match adjacent finish, with grooved and gasketed steel astragals, continuous flexible vinyl, fitted to panel edge construction; color to match panel finish.
10. Horizontal Bottom Seals: Modernfold **IA2** bottom seal. Automatic operable seals providing nominal 2-inch operating clearance with an operating range of +½-inch to –1½ inch which automatically drop as panels are positioned, without the need for tools or cranks.
11. Size: 21'-8" +/- long x 9'-8" high.

B. Track: Extruded aluminum; 4 x 4 inches size; thickness and profile designed to support live and dead loads; including steel sub-channel and track connectors.

C. Carriers: Glass reinforced nylon with steel ball bearing wheels on trolley carrier at top center of every panel, with threaded pendant bolts for vertical adjustment.

D. Acoustic Seals: Flexible acoustic seals at jambs and meeting mullions, ceilings and floor, and acoustical insulation batts above track to structure above. Provide automatic retractable seals at floor.

E. Partition shall be operated by two (2) push button control stations wired in series and located on opposite sides of the partition. Control stations shall be activated by key switch at stack end of partition. Motor unit shall be reversible, continuous duty and Class A insulated. Motor unit shall have NEMA MG 1 service factor, high starting torque, thermal overload protection and open/drip proof enclosure. Motor assembly shall have wiring compliant with NFPA 70, 24 volt controls, compliant with UL 508A and speed of 28 feet/minute. The drive unit motor shall be equipped with outboard limit switches to prevent over-extension. A positive chain drive attached to the lead panel shall pull the partition across the opening. Cable, belt, or other friction type drives will not be accepted.

1. Electric motor shall be 208/230-volt, 1-phase, 1 HP, 7.0 FLA.

F. Sound Attenuation Insulation: See Section 07213 – Batt and Blanket Insulation.

G. Accessories: Aluminum jamb and head moldings, fittings and attachments, with white finished aluminum soffit trim.

2.3 PANEL FINISHES

A. Acoustical Carpet: Non-woven needle punch carpet, with fused fibers to prevent unraveling, type manufactured by approved supplier; color as selected from manufacturer's full range.

B. Shop apply surface finish.

3 PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Confirm track supports are laterally braced and will permit track to be level within ¼ inch of required position and parallel to the floor surface.

C. Confirm floor flatness of 1/8 in 10 feet, non-cumulative.

D. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Install partition in accordance with manufacturer's instructions.
B. Fit and align partition assembly level and plumb.
C. Install sound attenuation batt insulation as described in Section 07213. Extend sound attenuation batts from the ceiling to the underside of structure at all

indicated locations.

3.3 ADJUSTING

A. Adjust work under provisions of Section 01730.

B. Adjust partition assembly to provide smooth operation from stacked to drawn position.

C. Visually inspect partition in drawn position for light leaks to identify a potential acoustic leak. Adjust to achieve light seal.

3.4 CLEANING

A. Clean finish surfaces and partition accessories.

END OF SECTION

1 PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Chain link fencing and gates

1.2 RELATED SECTIONS

A. Section 321313 – Site Concrete

1.3 SYSTEM DESCRIPTION

A. Provide and install chain link fencing and gates as shown on the Drawings. Coordinate with the work of other trades to supply mounting hardware, sleeves and other items as may be necessary.

1.4 STANDARDS

A. Provide chain link fencing, gates and backstops as complete units with each produced by a single manufacturer, including all necessary erection accessories, fittings and fasteners.

B. Installer: Shall be fully experienced in fence installations.

B. Standards: Comply with the standards of the Chain Link Manufacturer's Institute for materials and installation.

C. Handicapped accessibility: all gate latches and other operable hardware shall be in full conformance with ADA and other applicable codes for handicapped accessibility.

1.5 SUBMITTALS

A. In accordance with Division 1 requirements, submit manufacturers' data certifying that furnished materials comply with specifications.

B. Submit shop drawings including details delineating fence heights, size of posts, rails, braces, footings and accessories.

2 PART 2 – PRODUCTS

2.1 MATERIALS

A. Top, Bottom and Brace Rails: 1-5/8 inch O.D. standard weight galvanized steel with 2.0 ounces of hot dipped zinc in accordance with ASTM A 120. Top rail couplings (6 inch min. length) shall be spaced at 21 feet o.c. maximum. Fabric tie

wire shall be spaced at 12 inches o.c. maximum.

B. Terminal Posts:

1. 4 Foot CLF (End and Corner Posts): 2-7/8 inch O.D. standard weight galvanized steel pipe with 2.0 ounces of hot-dipped zinc in accordance with ASTM A 120.
2. 6 Foot Refuse Enclosures: 6-5/8 inch diameter posts, Schedule 40. Hinged Posts. Concrete filled posts.

C. Truss Rod: 3/8 inch diameter galvanized steel solid rod.

D. Tie Wires: 9 gage aluminum or 11 gage galvanized steel.

E. Post Tops: Galvanized steel caps to provide a secure weather-tight closure.

F. Miscellaneous: Provide all other fittings and parts necessary for a complete fence installation.

G. Vinyl-Coated Chain Link Fabric: PVC coating (7 mil thickness) thermally fused and bonded to 9 gage zinc-coated steel core wire in 2 inch mesh pattern per ASTM F 668 Class 2b, unless detailed otherwise. Fabric shall be knuckled at both the top and bottom selvage. Color of PVC Coating shall be black.

H. PVC Coated Finish (Posts, Rails and other Components): Supplemental color coating of 10-15 mils thermally fused and bonded to zinc-coated components per ASTM F 1043. Color shall match color of chain link fabric.

I. Concrete for Footings: Standard mix Portland cement concrete with a minimum compressive strength of 3,000 psi at twenty-eight (28) days. Comply with all applicable requirements of Section 321313 and Division 3 sections.

J. Epoxy Grout: Fast setting, expansive concrete cement or epoxy grout. Submit manufacturer's data for approval.

K. Gates

1. For Double Gates, provide minimum ½-inch diameter drop rod on each gate pair. Drop rod assembly and related latches shall be configured to secure gate in a closed position and accept padlock as an integral part of the latch system.

    a. Provide Gate Hold Backs, cast iron, for Refuse Enclosure Gates.

L. Privacy Slats: PVC Slats shall slide in vertically between curvature created by woven chain link diamonds. Slat shall fill the mesh, making the fence nearly solid. Color shall be black.

3 PART 3 – EXECUTION

3.1 INSPECTION

A. General: Do not commence fencing installation before final grading is complete, with finish elevations established.

B. Inspection: Examine the conditions under which all new fencing is to be installed. Installation of fencing shall not proceed until all unsatisfactory conditions, if any, have been corrected.

3.2 FOOTINGS

A. Drill/excavate holes of diameters and spacing as detailed for post footings in firm, undisturbed or compacted soil. Excavate hole depths approximately 6 inches lower than the post bottoms.

3.3 POST INSTALLATION

A. Preparation: Remove all loose and foreign materials from sides and bottoms of holes and moisten soil prior to placing concrete.

B. Placement: Center and align posts in holes 6 inches above bottom of excavation.

C. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

D. Keep exposed concrete surfaces moist for at least forty-eight (48) hours after placement, or cure with membrane curing materials, or other acceptable curing method.

3.4 CHAIN LINK FABRIC INSTALLATION

A. General: Install as detailed at locations as shown on the Drawings.

B. Timing: Allow concrete footings to attain at least seventy-five percent (75%) of minimum twenty-eight (28) day compressive strength, but in no case sooner than forty-eight (48) hours after placement, before fabric is installed. Do not stretch or apply tension to fabric until the concrete has attained its full design strength.

C. Rails: Install all rails as detailed. Rails shall be parallel to finished grade.

D. Braces: Provide brace and truss assemblies at all terminal posts, gate posts and at both sides of corner and pull posts. Locate brace rail at mid-height of fence fabric. Install braces so posts are plumb when truss rod is under proper tension.

E. Fabric: Leave approximately 1½ inches between finish grade and bottom of fabric selvage. Pull fabric taut and tie to posts and rails. Install fabric on side of fence as detailed and anchor to framework so that fabric remains in tension after pulling force is released.

F. Ties: Thread stretcher bars through or clamp to fabric 4 inches o.c., and secure to posts with metal bands.

G. Use U-shaped tie wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisting at least two (2) full turns. Bend ends of wire to minimize hazard to persons or clothing.

H. Hardware: Install hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Gold certification based on the USGBC's "LEED 2009 for Commercial Interiors."

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. A copy of the LEED Project checklist is attached at the end of this Section for information only.

B. Related Requirements:

1. Divisions 01 through 16 contain sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.3 DEFINITIONS (for full list of LEED definitions, see LEED 2009 for Commercial Interiors Reference Guide)

A. Carpet and Rug Institute: A trade association that represents manufacturers and suppliers of carpets, rugs, and floor coverings.

B. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

C. Commissioning: The process of verification that the building's systems perform as designed and according to the project requirements and construction documents, including assurances that the specified systems are installed properly and adjusted correctly.

D. Composite wood and agrifiber projects: Including, but not limited to, particleboard, medium density fiberboard, plywood, wheatboard, strawboard, panel substrates, and door cores.

E. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor.

F. EnergyStar: A program developed jointly by the United States Department of Energy and United States Environmental Protection Agency that labels projects to designate high levels of energy efficiency.

G. Forestry Stewardship Council: A not-for-profit, international membership based organization that accredits third-party organizations to certify that forest managers and forest product producers support responsible forest management.

H. Green Label Plus: An independent testing program developed by the Carpet and Rug Institute to provide assurances that carpet and adhesive products meet stringent criteria for low chemical emissions.

I. Heat-Island Effect: Local air and surface temperatures that are higher than nearby natural areas as a result of heat absorbing surfaces at a site.

J. Low emitting and fuel efficient vehicles: Vehicles that are classified as zero emission vehicles by the California Air Resources Board or have achieved a minimum green score of forty (40) on the American Council for an Energy Efficient Economy annual vehicle rating guide.

K. Minimum Efficiency Reporting Value (MERV): A number ranging from one (1) to sixteen (16) that indicates the efficiency at which an air filter can remove particles, where one (1) is the least efficient and sixteen (16) is the most efficient at removing particles.

L. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within five hundred (500) miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value. Mechanical, electrical, plumbing components and specialty items (such as elevators) shall not be included in this calculation.

M. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its

intended purpose.

2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

N. Renewable Energy Credit (REC): A certificate representing one megawatt hour of renewable energy that is physically metered and verified from the generator or the renewable energy project.

O. Solar Heat Gain Coefficient (SHGC): A measure of how well a window blocks heat from sunlight. The SHGC is the fraction of the heat from the sun that enters though a window. It is expressed as a number between zero (0) and one (1). The lower a window's SHGC, the less solar heat it transmits.

P. Solar Reflectance Index (SRI): A measure of a surface's ability to reflect solar heat, with white being one hundred (100) and black being zero (0).

Q. Volatile Organic Compounds (VOCs): A class of chemicals that are emitted as gases from certain solids and liquids and that have short- and long-term adverse health effects.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

B. Register (permission will be provided), provide, upload, populate templates, and send the information on the USGBC website for this registered project for each of the items noted below in 1.5 Action Submittals. The Contractor shall provide this administrative function through their services and shall allow a line item on the application for payment with this dollar amount for this administrative function.

1.5 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. LEED Documentation Submittals:

1. SSc3.2: Provide product data and shop drawings for on-site bicycle storage.

2. WEc1: Submittals must include manufacturer's cut sheets for all water-consuming plumbing fixtures and fittings (toilets, urinals, faucets, showerheads, etc.) highlighting maximum flow rates and/or flush rates. Include cut sheets for any automatic faucet-control devices. Provide manufacturer's cut sheets for all water-consuming commercial equipment (clothes washers, dishwashers, ice machines, etc.), highlighting water consumption performance. Include manufacturer's cut sheets or product data highlighting water consumption estimates, and water use reduction measures.
3. EAc1.4: Provide copies of manufacturer's product data for all Energy Star eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), verifying compliance with EPA's Energy Star program. Equipment includes, but is not limited to:

    a. Computers
    b. Monitors
    c. Printers
    d. Scanners
    e. Copy machines
    f. Water coolers
    g. Refrigerators
    h. Ceiling fans
    i. Washing machines
    j. Vending machines
    k. Compact fluorescent lamps
    l. Exit signs
    m. Residential/small commercial HVAC equipment

4. MRc1.2: Comply with Section 02072 "Demolition and Removals."
5. MRc2: Comply with Section 01524 "Construction Waste Management."
6. MRc3.1: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs for salvaged and refurbished materials.
7. MRc4: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation:

    a. Cost of each material or product, excluding cost of labor and equipment for installation.
    b. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product
    c. Populate LEED Online Template as prescribed by USGBC/GBCI. This template shall be kept current and will be reviewed in conjunction with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-

consumer recycled content, and combined recycled content value.

8. MRc5: Submittals for all products or materials expected to contribute to the regional calculation (excluding MEP systems equipment and components) must include the following documentation:

    a. Cost of each material or product, excluding cost of labor and equipment for installation.
    b. Location of product manufacture and distance from point of manufacture to the Project Site.
    c. Location of point of extraction, harvest, or recovery for each raw material in each product and distance from the point of extraction, harvest, or recovery to the Project Site.
    d. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of manufacture for each regional material.
    e. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of extraction, harvest, or recovery for each regional material or product, including, at a minimum, gravel and fill, planting materials, concrete, masonry, and GWB.
    f. Populate LEED Online Template as prescribed by USGBC/GBCI. This template shall be kept current and will be reviewed in conjunction with the Contractor's Certificate and Application for Payment. It should indicate on an ongoing basis, line items for each material, including cost, location of manufacture, distance from manufacturing plant to the Project Site, location of raw material extraction, and distance from extraction point to the Project Site.

9. MRc7: Submittals for all wood-based materials must include the following documentation:

    a. Statement indicating the cost of each product containing FSC Certified wood, exclusive of labor and delivery costs.
    b. Certificates of chain-of-custody from manufacturers certifying that specified certified-wood products were made from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2 "Principles and Criteria."
    c. Populate LEED Online Template as prescribed by USGBC/GBCI. This template shall be kept current and will be reviewed in conjunction with the Contractor's Certificate and Application for Payment. It should indicate on an ongoing basis, line items for each material, including cost and percentage of FSC material.

10. IEQp1: Document pressure and ventilation measurements to confirm compliance with LEED 2009 for Commercial Interiors as described in Section 15990 –Testing, Adjusting, and Balancing. Provide manufacturer's

cut sheets or product data verifying that mechanical sound insulation materials in air distribution ducts comply with ASHRAE Standard 62.1.

11. IEQp2: Provide product data and shop drawings for smoking-related signage to be installed as part of the signage package.
12. IEQc3.1: Construction Indoor Air Quality Management Plan – During Construction.

    a. Product data for filtration media used during construction.
    b. Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs).
    c. Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction.
    d. Construction Documentation: Six (6) photographs at three (3) different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

13. IEQc3.2: Construction Indoor Air Quality Management Plan – Before Occupancy.

    a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    b. Product data for filtration media used during flush-out and during occupancy.
    c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

14. IEQc4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used and that those products contain no restricted components.
15. IEQc4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used and those products contain no restricted components.
16. IEQc4.3: Product data for flooring systems used inside the weatherproofing system indicating VOC content and certifications as prescribed by the LEED 2009 for Commercial Interiors Reference Guide of each product used.
17. IEQc4.4: Product data for products containing composite wood or agrifiber products or wood glues (including but not limited to particleboard, wheatboard, strawboard, agriboard products, engineered wood components, solid-core wood doors, OSB, MDF, and plywood products) indicating that they do not contain urea-formaldehyde resin.

18. IEQc4.5: Product data for Systems Furniture and Seating used inside the weatherproofing system indicating VOC content of each product used and Greenguard Certification.
19. IEQc5: Provide manufacturer's cut sheets for all walk-off systems installed to capture particulates, including permanently installed grates, grilles, slotted systems, direct glue-down walk-off mats, and non-permanent roll-out mats.
20. IEQc6.1: Provide manufacturer's cut sheets and shop drawing documentation highlighting all lighting controls systems components.
21. EAp3: Provide manufacturer's cut sheets for all cooling equipment with manufacturer's product data, highlighting refrigerants; provide manufacturer's cut sheets for all fire-suppression equipment, highlighting fire-suppression agents; provide manufacturer's cut-sheets for all polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation, highlighting the blowing agent(s).

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data for LEED Coordinator
B. Project Materials Cost Data

1. Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of item:

    a. Furniture.
    b. Plumbing.
    c. Mechanical.
    d. Electrical.
    e. Specialty items such as elevators and equipment.
    f. Wood-based construction materials.

2. Not more than sixty (60) days after the Preconstruction Meeting, the General Contractor shall provide to the Owner and Architect a preliminary schedule of materials costs for all materials used for the Project organized by specification section. Exclude labor costs and all mechanical, electrical, and plumbing (MEP) systems materials and labor costs.
3. Populate all required LEED Online Templates with data as prescribed by the USGBC/GBCI template.
4. Provide final versions of the above templates to the Owner and Architect not more than fourteen (14) days after Substantial Completion.

C. IEQc3.1 and IEQc3.2 Construction Indoor Air Quality (IAQ) Management: Submittals must include the following:

1. Not more than thirty (30) days after the Preconstruction Meeting, prepare and submit for the Architect and Owner's approval, an electronic copy of

the draft Construction IAQ Management Plan in an electronic file including, but not limited to, descriptions of the following:

a. Construction procedures for meeting or exceeding the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling
b. Construction procedures for protecting absorptive materials stored on-site or installed from moisture damage
c. Schedule of submission to Architect of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials
d. Construction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille
e. Construction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit.

2. Not more than thirty (30) days following receipt of the approved draft CIAQMP, submit an electronic copy of the approved CIAQMP in an electronic file, along with the following:

a. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for all filtration media to be installed at return air grilles during construction if permanently installed AHUs are used during construction.
b. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs).

3. Not more than fourteen (14) days after Substantial Completion provide the following:

a. Documentation verifying required replacement of air filtration media in all air handling units (AHUs) after the completion of construction and prior to occupancy and, if applicable, required installation of filtration during construction.
b. A minimum of eighteen (18) Construction photographs: Six (6) photographs taken on three (3) different occasions during construction of the SMACNA approaches employed, along with a brief description of each approach, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

4. A copy of the report from testing and inspecting agency documenting the results of IAQ testing, demonstrating conformance with IAQ testing procedures and requirements defined in ASHRAE Standards 62.1-2007.

D. Commissioning: See Section 01810 – General Commissioning Requirements for submittal requirements.

E. LEED Action Plans: Provide preliminary submittals within thirty (30) days of date established for commencement of the Work indicating how the following requirements will be met:

1. MRc2: Waste management plan complying with a Construction Waste Management and Disposal plan prepared by the Contractor.
2. MRc3.1: List of proposed salvaged, refurbished, and reused materials. Identify each material that will be salvaged, refurbished, or reused, including its source, cost, and replacement cost if the item was to be purchased new.
3. MRc4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
4. MRc5: List of proposed regionally manufactured materials and regionally extracted and manufactured materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
5. MRc7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
6. IEQc3.1/IEQc3.2: Construction Indoor Air Quality Management Plan.

F. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with HPBS action plans for the following:

1. MRc2: Waste reduction progress reports complying with Section 01524 "Construction Waste Management and Disposal."
2. MRc3.1: Salvaged, refurbished, and reused materials
3. MRc4: Recycled content.
4. MRc5: Regionally manufactured materials and regionally extracted and manufactured materials
5. MRc7: Certified wood products.

1.7 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

B. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner, Architect, and all Subcontractors to discuss the Construction Waste Management Plan, the required Construction Indoor Air Quality (IAQ) Management Plan, and all other Sustainable Design Requirements. The purpose of this meeting is to develop a mutual understanding of the Project's Sustainable Design Requirements and coordination of the Contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.

C. Construction Job Conferences: The status of compliance with the Sustainable Design Requirements of these specifications will be an agenda item at all regular job meetings conducted during the course of work at the site.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED requirements and guidelines in this Section. Although other Sections may specify some requirements that contribute to LEED, the Contractor shall determine additional materials and procedures necessary to obtain LEED requirements indicated.

2.2 SALVAGED, REFURBISHED, AND REUSED MATERIALS

A. MRc3.1 and MRc3.2: Not less than five percent (5%) of building materials (by cost) shall be salvaged, refurbished, or reused materials. Excluding furniture and furnishings.

2.3 RECYCLED CONTENT OF MATERIALS

A. MRc4: Building materials shall have recycled content such that post-consumer recycled content value plus one-half (½) of pre-consumer recycled content value for Project constitutes a minimum of twenty percent (20%) of cost of materials used for Project, exclusive of all MEP equipment, labor, and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials with recycled content.

1. The post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content by the total weight of the material and multiplying by the cost of the material. The pre-consumer recycled content value of a material shall be determined by dividing the weight of pre-consumer recycled content by the total weight of the material and multiplying by the cost of the material.
2. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.
3. Do not include labor and delivery costs in the calculations.

4. At a minimum, the materials in the following list must contain the minimum recycled content indicated:

Category	**Minimum Recycled Content**
Compost/mulch	100% post-consumer
Asphaltic Concrete Paving	25% post-consumer
Cast-in-Place Concrete	6% pre-consumer
CMU: Gray Block	20% pre-consumer
Steel Reinforcing Bars	90% combined
Structural Steel Shapes	90% combined
Steel Joists	75% combined
Steel Deck	75% combined
Steel Fabrications	60% combined
Steel Studs	30% combined
Steel Roofing	30% post-consumer
Aluminum Fabrications	35% combined
Rigid Insulation	20% pre-consumer
Batt insulation	30% combined
Cellulose Insulation	90% combined
Rock Wool Insulation	75% pre-consumer
Fireproofing	20% combined
Steel Doors and Frames	35% combined
Gypsum Wallboard	100% combined
Carpet	40% combined
Ceramic Tile Flooring	60% combined
Resilient Flooring and Base	60% combined
Acoustical Ceiling Tile (ACT)	40% post-consumer
ACT Suspension System	90% post-consumer
Toilet Partitions	60% post-consumer

2.4 REGIONAL MATERIALS

A. MRc5: Not less than ten percent (10%) of building materials (by cost) shall be manufactured and extracted/harvested within a five hundred (500) mile radius of the project site, exclusive of labor and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials within this specified five hundred (500) mile radius.

2.5 CERTIFIED WOOD

A. MRc7: Not less than fifty percent (50%) (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Only include materials permanently installed on the project.

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

    a. Rough carpentry.
    b. Miscellaneous carpentry.
    c. Heavy timber construction.
    d. Wood decking.
    e. Particleboard
    f. Plywood
    g. Metal-plate-connected wood trusses.
    h. Structural glued-laminated timber.
    i. Finish carpentry.
    j. Architectural woodwork.
    k. Wood paneling.
    l. Wood veneer wall covering.
    m. Wood flooring.
    n. Wood cabinets.
    o. Furniture.
    p. Wood doors.

2. Preservative- treated lumber with chromated copper arsenate (CCA) treatments is not permitted, and lumber with copper-based treatments (such as ACQ) is permitted only for ground-contact applications

2.6 LOW-EMITTING MATERIALS

A. MRc4.1-MRc4.5: The following products and systems, where installed inside the weatherproofing system, shall meet the testing and product requirements indicating that they are certified for low emissions of volatile organic compounds (VOC) using specifications or certification programs listed in the LEED 2009 for Commercial Interiors Reference Guide.

1. MRc4.1 Adhesives and sealants.
2. MRc4.2 Paints and coatings.
3. MRc4.3 Flooring Systems
4. MRc4.4 Composite wood and agrifiber products.
5. MRc4.5 Systems Furniture and seating.

2.7 ENTRYWAY SYSTEMS

A. Employ permanent entryway systems to capture particulates at least ten (10) feet long in the direction of entry travel at all entryways directly connected to the outdoors that are used as regular entry points by building users. Acceptable entryway systems will include:

1. Permanently installed grates, grilles, or slotted systems that allow for cleaning beneath them.

2. Permanently installed direct glue-down walk-off mats.
3. Non-permanent roll-out mats, but only if a service organization is contracted for maintenance on a weekly basis.

2.8 WATER CONSERVING FIXTURES

A. Plumbing fixtures, fittings, and process water shall use in aggregate at least thirty percent (30%) less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements. Flow and flush rates shall not exceed the following:

1. Toilets: No more than 1.3 gallons per flush, otherwise be dual flush 1.6/0.8 gallons per flush, and have documented bowl evacuation capability per MaP testing of at least 400 grams.
2. Urinals: No more than 0.125 gallons per flush or use.
3. Lavatory Faucets: 0.5 gpm with automatic faucet controls.
4. Kitchen Sink Lavatories: 1.0 gpm.
5. Showerheads: No more than 2.0 gpm.

B. For process water equipment not addressed by EPACT 2005 or the list below, additional equipment performance requirements may be proposed provided documentation supporting the proposed benchmark or industry standard is submitted:

1. Dishwasher with Racks: 1.0 gallons/rack
2. Ice Machine: 20 gallons/100 pounds ice for machines making over 175 pounds of ice per day; 30 gallons/100 pounds ice for machines making less than 175 ice per day. Avoid water-cooled machines.
3. Food Steamer: 2 gallons/hour. Use only boilerless steamers.
4. Pre-Rinse Spray Valves: 1.4 gallons/minute
5. Kitchen Pot-Washing Sinks: 2.2 gallons/minute
6. Cooling Towers

    a. Install meters on make-up water and discharge blow-down.
    b. Install drift eliminators.

2.9 NO SMOKING POLICY

A. No smoking shall be permitted in the building. All exterior designated smoking areas shall be located at least 25 feet away from outdoor air intakes, operable windows, and building entrances.

2.10 ADHESIVES AND SEALANTS

A. All adhesives and sealants used inside the buildings thermal envelope must be third-party certified under one of the following programs:

1. Indoor Advantage Gold from Scientific Certifications Systems, Inc.

2. Greenguard Certification Program Greenguard Environmental Institute
3. Green Seal – GS-36

B. All adhesives and sealants, regardless of where they are used, must comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24), or as prescribed by the LEED 2009 for Commercial Interiors Reference Guide, whichever is more stringent:

1. Concrete Curing Compound: 60 g/L.
2. Concrete Sealer: 10 g/L.
3. Concrete Form Release Agents: 0g/L.
4. Garage Deck Sealer: 50g/L.
5. Wood Glues: 20 g/L.
6. Millwork and Casework Adhesives: 20g/L.
7. Metal to Metal Adhesives: 30 g/L.
8. Adhesives for Porous Materials (Except Wood): 50 g/L.
9. Subfloor Adhesives: 50 g/L.
10. Plastic Foam Adhesives: 50 g/L.
11. Carpet Adhesives: 50 g/L.
12. Carpet Pad Adhesives: 50 g/L.
13. Carpet Seam Sealer: 50g/L.
14. VCT and Sheet Vinyl Adhesives: 50 g/L.
15. Cove Base Adhesives: 50 g/L.
16. Rubber Floor Adhesives: 60 g/L.
17. Wood Flooring Adhesives: 100 g/L.
18. Ceramic Tile Adhesives: 65 g/L.
19. Gypsum Board and Panel Adhesives: 50 g/L.
20. Gypsum Drywall Joint Compound: 20 g/L.
21. Portland Cement Plaster: 20 g/L.
22. Multipurpose Construction Adhesives: 70 g/L.
23. Cast Resin Countertop Silicone Sealant: 20g/L.
24. Plastic Laminate Adhesives: 20 g/L.
25. General Contact Adhesive: 80 g/L.
26. Structural Glazing Adhesives and Compounds: 100 g/L.
27. Silicone Sealant: 50 g/L.
28. Pipe Thread Sealant: 50 g/L.
29. Duct Sealant: 10 g/L.
30. Plastic Cement Welding Compounds: 250 g/L.
31. ABS Welding Compounds: 400 g/L.
32. CPVC Welding Compounds: 270 g/L.
33. PVC Welding Compounds: 150 g/L.
34. Adhesive Primer for Plastic: 250 g/L.
35. Architectural Sealants: 250 g/L.
36. Single-Ply Roofing Membrane Adhesives: 250 g/L.

C. Interior sealants shall not contain: mercury, butyl rubber, neoprene, SBR (styrene butadiene rubber), or nitrile.

D. Sealants and glazing compounds formulated with aromatic solvents (organic solvent with a benzene ring in its molecular structure) fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, or their components shall not be used.

E. Adhesives used to apply laminates, whether shop-applied or field-applied, shall contain no urea-formaldehyde.

2.11 PAINTS AND COATINGS

A. Interior Paints and Coatings: For interior field-applied applications, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal Standard GS-11, Paints, and South Coast Air Quality Management District Rule 1113, Architectural Coatings, rules in effect on January 1, 2004, as follows, or as prescribed by the LEED 2009 for Commerical Interiors Reference Guide, whichever is more stringent:

1. Flat Paints and Coatings: Not more than 100 grams of VOC per liter of coating less water and exempt compounds, including pigments
2. Non-Flat Paints and Coatings, Except High Gloss: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments.
3. High Gloss Paints and Coatings: Not more than 250 grams of VOC per liter of coating less water and exempt compounds, including pigments. High Gloss Coatings are coatings that register a gloss of 70 or above on a 60-degree meter according to ASTM Test Method D 523 as specified in paragraph (e)(6).
4. Anti-Corrosive Coatings: Not more than 250 grams of VOC per liter of coating less water and exempt compounds
5. Waterproofing Sealers: Not more than 400 grams of VOC per liter of coating less water and exempt compounds
6. Concrete Curing Compounds: Not more than 350 grams of VOC per liter of coating less water and exempt compounds
7. Clear Wood Finishes: Not more than 350 grams of VOC per liter of coating less water and exempt compounds
8. Interior Stains: Not more than 250 grams of VOC per liter of coating less water and exempt compounds

B. Interior field applied varnishes and lacquers are not permitted.

C. Coordinate with paint manufacturers for implementing a “take-back program” for all unused paint. Set aside scrap and unused paint to be returned to the manufacturer for recycling into new product. Close and seal all partially used containers of paint to maintain quality as necessary for reuse.

2.12 LIGHTING CONTROLS

A. Install and calibrate controls as specified by Division 16 – Electrical in order to comply with Credit IEQ 6.1 lighting controllability requirements.

2.13 EXTERIOR LIGHTING FIXTURES

A. Non-emergency luminaires with a direct line of sight to any openings in the envelope (translucent or transparent) must have their input power reduced automatically by at least fifty percent (50%) between the hours of 11:00PM and 5:00AM. After-hours override may be provided by a manual or occupant sensing devise provided the override lasts no more than thirty (30) minutes.

2.14 CHLOROFLUOROCARBON (CFC) REFRIGERANT BAN

A. All Ozone Protection: Base building cooling equipment shall contain no refrigerants other than the following: HCFC-123, HFC-134a, HFC-245fa, HFC-407c, or HFC 410a.

B. Fire suppression systems may not contain ozone-depleting substances.

C. Extruded polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation shall not be manufactured with hydro chlorofluorocarbon (HCFC) blowing agents.

2.15 DUCT ACOUSTICAL INSULATION

A. Duct Acoustical Insulation: Mechanical sound insulation materials within the duct shall comply with ASHRAE Standard 62.1.

2.16 AIR FILTRATION

A. Air Filtration: Install air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of eight (8) or better in all air handling units for processing both return and outside air that is delivered to the air supply system. Replace all filtration media after the completion of construction and prior to occupancy.

2.17 APPLIANCES AND EQUIPMENT

A. Appliances and Equipment: All EnergyStar eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), shall be qualified by EPA’s EnergyStar program.

2.18 FLOORCOVERINGS

A. All carpet systems, including adhesives, must meet or exceed the Carpet and Rug Institute Green Label Plus Indoor Air Quality Test Program.

B. Carpet cushion shall not contain brominated flame retardants.

C. All hard surface floorcovering must be certified under the FloorScore indoor emissions testing programs.

D. All flooring adhesives shall have less than 50g/L VOC content. All sealers, stains, tile setting adhesives, and grouts must comply with the requirements of LEED 2009 for Commercial Interiors Reference Guide.

2.19 SYSTEMS FURNITURE AND SEATING

A. All systems furniture and seating that was manufactured, refurbished, or refinished within one (1) year prior to occupancy must be Greenguard Indoor Air Quality Certified. Alternative Path of Air Quality Testing for compliance shall be implemented at the discretion of the Architect and Owner and as prescribed by the LEED 2009 for Commercial Interiors Reference Guide.

2.20 COMPOSITE WOOD AND AGRIFIBER PRODUCTS

A. Composite wood and agrifiber products used inside the weatherproofing system must contain no added urea-formaldehyde resins. Laminate adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies must not contain added ure-formaldehyde resins.

PART 3 - EXECUTION

3.1 CHLOROFLUOROCARBON (CFC) REFRIGERANT BAN OR PHASE OUT

A. CFC-based refrigerants shall not be utilized for energy systems in new construction.

B. EAp3: Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based or initiate a CFC phase-out conversion. Replace or adjust existing equipment to accommodate new refrigerant as described in HVAC Sections.

3.2 COMMISSIONING

A. EAp1: All building energy-related systems and building envelope components shall be commissioned in accordance with the requirements of Section 01810 – General Commissioning Requirements and related commissioning sections in other divisions in order to verify and ensure that fundamental building elements

and systems are installed, constructed, calibrated to operate, and perform according to the Owner's Project Requirements, Basis of Design, and Construction Documents.

3.3 CONSTRUCTION WASTE MANAGEMENT

A. MRc2: Comply with the Construction Waste Management and Disposal plan prepared by the Contractor, quantifying material diversion by weight in order to recycle, reuse, and/or salvage at least seventy-five percent (75%) (by weight) of construction, demolition, and land-clearing waste.

B. Clean materials which are contaminated prior to placing in collection containers. Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Utilize any on-site existing paving materials that are scheduled for demolition as granulated fill or subbase material, and include the weight of this material in the calculations for material diverted from landfill disposal.

D. Arrange for materials collection by or materials delivery to the appropriate recycling or reuse facility.

E. Tax credits and other savings obtained or revenue generated for recycled or reused materials accrue to the Contractor.

F. Discuss CWMP procedures and measures as an agenda item at all regular job meetings conducted during the course of work at the site, and record progress in meeting minutes.

G. Submit monthly progress reports with a line item on the Applications for Payment in accordance with City of Middletown's requirements, documenting the status of the CWMP and current diversion percentage rates.

3.4 MINIMUM VENTILATION

A. IEQp1: Comply with ASHRAE Standard 62.1 using the Ventilation Rate Procedure or the current Connecticut State Building Code, whichever is more stringent.

3.5 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

A. IEQc3.1 and IEQc3.2: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period, install filter media having a MERV of (eight) 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.

2. During construction, protect all absorptive materials stored on-site or installed from moisture damage as described in the Construction IAQ Management Plan (CIAQMP) defined above. Specifically:

    a. Exercise special care at all times in the storage of materials to prevent exposure to moisture.
    b. Avoid installation of gypsum wallboard and other porous materials until the building is weather-tight.
    c. All standing water which accumulates on interior floors shall be removed on the day that it is observed.
    d. Any drywall that has retained more than twenty percent (20%) moisture after forty-eight (48) hours following exposure to moisture, or that has evidence of mold, must be disposed of in accordance with the Construction Waste Management and Disposal plan prepared by the constructor,
    e. The contractor shall identify and remove all porous building materials that become wet or damaged by moisture within seven (7) calendar days of such exposure.
    f. Replace all air filters immediately prior to occupancy.

3. During construction and HVAC system installation, provide the Architect with photographs of IAQ management measures (such as protection of ducts and on-site or installed absorptive materials), per submittal requirement depicting implemented SMACNA approaches.
4. Air Quality Testing

    a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
    b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

        1) Formaldehyde: 27 ppb.
        2) Particulates (PM10): 50 micrograms/cu. m.
        3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
        4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
        5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

    c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same

locations as in the first test.

d. Air-sample testing shall be conducted as follows:

1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Non-fixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
3) Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
4) Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four (4) hour period.

END OF SECTION

1 PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Aluminum doors
B. Integral air and vapor barrier
C. Perimeter sealant
D. Door hardware

1.2 RELATED SECTIONS

A. Section 07900 – Sealants
B. Section 08911 – Glazed Aluminum Curtain Wall
C. Section 08710 – Door Hardware
D. Section 08800 – Glazing

1.3 REFERENCES

A. Reference Standards: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. American Architectural Manufacturers Association (AAMA) Publications:

	Metal Curtain Wall, Window, Store Front and Entrance – Guide Specifications Manual
2605-05	Superior Performing Organic Coatings on Aluminum Extrusions and Panels
SFM-1-87	Aluminum Storefront and Entrance Manual

2. American National Standards Institute (ANSI) Publications:

A117.1-03	Accessible and Usable Buildings and Facilities

3. American Society for Testing and Materials (ASTM) Publications:

A 36-05	Carbon Structural Steel
A 123-02	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
B 221-05	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
E 283-04 (R 2012)	Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen

4. American Society of Civil Engineers (ASCE) Publications:

7-05 Minimum Design Loads for Buildings and other Structures

5. Society for Protective Coatings (SSPS) Publications:

Paint 20-04 Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)

1.4 SYSTEM DESCRIPTION

A. Aluminum entrance system includes tubular aluminum sections, shop fabricated, factory pre-finished, vision glass, related flashings, anchorage and attachment devices.

1.5 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with the International Building Code (IBC) to a design pressure as indicated on Drawings and corresponding suction in accordance with ASCE 7. The Contractor shall verify in certified engineering calculations the load pressure, demonstrating compliance with ASCE 7 as required by ASCE 7.

B. Limit mullion deflection to flexure limit of glass with full recovery of glazing materials.

C. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

D. Air Infiltration Test:

1. With door sash closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 1.57 psf.
2. Air infiltration shall not exceed .50 cfm/sf of unit, for single doors.
3. Air infiltration shall not exceed .10 cfm/sf of unit, for a pair of doors.

E. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a twelve (12) hour period without causing detrimental effect to system components.

F. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and internal drainage details.

D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1 and AAMA – Metal Curtain Wall, Window, Store Front and Entrance – Guide Specifications Manual.

B. Conform to requirements of ANSI A117.1 and the Americans with Disabilities Act.

1.8 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three (3) years experience.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene one (1) week prior to commencing work of this Section, under provisions of Section 01300.

1.10 DELIVERY, STORAGE AND HANDLING

A. Protect pre-finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F during and forty-eight (48) hours after installation.

1.12 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.13 COORDINATION

A. Coordinate the Work with installation of masonry, floor finishes and other components or materials.

1.14 WARRANTY

A. Provide three (3) year warranty under provisions of Section 01740.

B. Warranty: Include coverage for complete system for failure to meet specified requirements.

C. Provide manufacturer's fifteen (15) year warranty on the Kynar finish coating under provisions of Section 01740.

2 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. EFCO Corporation, Monett, MO (800.221.4169); **Series D518 Doors**

B. Other acceptable manufacturers offering equivalent Products:

1. Kawneer Company, Inc., Bloomsburg, PA (877.505.3756)
2. Traco, Cranberry Township, PA (800.837.7001)

C. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B 221; 6063 alloy, T6 temper.
B. Sheet Aluminum: 6063 alloy, T6 temper.
C. Steel Sections: ANSI/ASTM A 36; shaped to suit mullion sections.
D. Fasteners: Stainless steel.
E. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20, zinc rich type.

2.3 COMPONENTS

A. Doors: 2 inches thick, 5 inch wide top rail, 5 inch wide vertical stiles, 10 inch wide bottom rail; square glazing stops.

B. Muntins: Aluminum grilles permanently installed between the panes of the insulating glass to match windows; ¾ inch wide and white.

2.4 GLASS AND GLAZING MATERIALS

A. As specified in Section 08800.

2.5 SEALANT MATERIALS

A. As specified in Section 07900.

2.6 HARDWARE

A. As specified in Section 08710.

2.7 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Prepare components with internal reinforcement for door hardware, security electric strikes and door operator hinge hardware.

F. Reinforce framing members for imposed loads.

2.8 FINISHES

A. Finish coatings to conform to AAMA 2605.

B. Interior and Exterior Exposed Aluminum Surfaces: Kynar 500 finish coating in entire range of colors, as selected by Architect.

C. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A 123 to 2.0 oz/sq ft.

D. Apply one (1) coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

3 PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and AAMA – Metal Curtain Wall, Window, Store Front and Entrance – Guide Specifications Manual.

B. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

C. Set thresholds in full bed of mastic and secure.

D. Install hardware using templates provided. Refer to Section 08710 for installation requirements.

E. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria using exterior wet/dry method of glazing.

F. Install perimeter sealant to method required to achieve performance criteria with backing materials, and installation criteria in accordance with Section 07900.

3.3 ADJUSTING

A. Adjust work under provisions of Section 01700.
B. Adjust operating hardware for smooth operation.

3.4 CLEANING

A. Clean work under provisions of 01700.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished Work from damage.

END OF SECTION

1 PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes

1. Furnish, deliver and install all finish hardware necessary for all doors as indicated and required by actual conditions at the building, and also hardware as specified herein and as enumerated in "Set Numbers". The hardware shall include the furnishing of all necessary screws, bolts, expansion shields and all other devices necessary for the proper application of the hardware.

B. Related Work Specified in Other Sections

1. The following items are to be furnished under other sections of the specifications and are specifically excluded from this section:

   Hardware for: Rough and Constructional Type

1.2 REFERENCES

A. The following documents should be used in estimating, detailing and installing the items specified:

1. 2005 Connecticut Fire Safety Code, NFPA and Supplements
2. American National Standards Institute (ANSI)
3. CT State Building Code, Supplements and 2003 International Building Code including ICC/ANSI A117.1-2003
4. DHI Publication "Sequence and Format for the Hardware Schedule"
5. DHI Publication "Keying Systems and Nomenclature"
6. 1996 Uniform Federal Accessibility Standards

1.3 SUBMITTALS

A. General Requirements

1. Make all submittals in accordance with Section 01300.

B. Schedules

1. Submit detailed Hardware Schedules in conformance with standard DHI sequence and format. Provide four (4) copies of the schedule with each submission.

C. Product Data

1. Provide four (4) complete sets of catalog cuts or product data sheets with the initial submission of the Hardware Schedule.

D. Samples

1. Provide a sample of each item to be proposed as a substitute for a specified product.

E. Templates:

1. Submit template information as required for the proper application of all items of hardware.
2. Submit a Keying Schedule with each Hardware Schedule, in standard DHI format as referenced in the DHI manual "Keying Systems and Nomenclature".

F. Wiring Diagrams

1. Submit wiring diagrams as required for the proper installation of all electrical, electro-mechanical, and/or electro-magnetic products.

1.4 QUALITY ASSURANCE

A. Substitutions

1. Standards: Manufacturers and model numbers listed are to establish a standard of quality. Unless otherwise noted as "no substitution", similar items by approved manufacturers that are equal in design, function and quality will be accepted upon prior approval of the Architect.

B. Supplier Qualifications

1. Qualifications: The hardware supplier must be engaged regularly in contracting work, be staffed to expedite work and have warehousing facilities to reasonably service the project. The firm shall have been furnishing hardware on similar projects in the vicinity for not less than two (2) years. The supplier must have in his employ a certified Architectural Hardware Consultant or a person with equivalent qualifications, to inspect periodically and direct detailing, applying and adjusting of hardware.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

A. Provide hardware for fire-rated openings in compliance with current NFPA standards. Provide only hardware which has been tested and listed with requirements of door and frame labels. All hardware shall be in accordance with applicable Fire, Safety and Building Codes.

B. Outside trim on the following doors to hazardous areas shall be provided with a manufacturer approved tactile finish (supplier cutting or notching of hardware is not permitted):

DOORS: 105, 108, 109, 111, 112, 113, 114, 116, 121, 125, 201, 207, 217, 221, 222

1.6 DELIVERY, STORAGE AND HANDLING

A. Marking and Packaging

1. Hardware shall be delivered to the job site in the manufacturers' original packages, marked to correspond with the approved Hardware Schedule.

B. Storage

1. The contractor shall check all deliveries of hardware against the approved list and receipt for same, and immediately report any shortages or damage. The contractor shall be solely responsible for the proper storage and care of all material, and shall make good without cost to the Owner, any loss, shortage or damage.

1.7 GENERAL NOTES

A. Door hardware accessible to persons with disabilities shall be provided to comply with Uniform Federal Accessibility Standards.

B. Installation Seminar: Hardware manufacturer is to provide an installation seminar for the hardware installer prior to installation.

C. Punch List Preparation: Hardware manufacturer’s representative to inspect the hardware installation prior to closeout.

1.8 WARRANTY

A. All hardware furnished shall be warranted for a period of not less than one (1) year after date of final completion of the building, against defective material and workmanship. Where manufacturer's warranty is extended for a period greater than one (1) year, said warranty shall apply for that item to its full extent. The hardware supplier shall not however, be liable where faulty operation is due to improper installation, abnormal usage or lack of normal maintenance.

1. Closers: Ten (10) years, except electronic closers, two (2) years.
2. Exit Devices: Three (3) years, except electrified exit devices, one (1) year.
3. Locksets: Three (3) years, except electrified locksets, one (1) year.

2 PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturer's products have been specified herein:

1. Stanley Hardware, New Britain, CT (800.337.4393)
2. Hager Companies, St. Louis, MO (800.255.3590)
3. McKinney Products Company, Scranton, PA (800.346.7707)
4. Schlage Lock, Colorado Springs, CO (800.847.1864)
5. Von Duprin, Indianapolis, IN (317.613.8944)
6. Rockwood Manufacturing Company, Rockwood, PA (800.458.2424)
7. Burns Manufacturing, Inc., Erie, PA (800.519.2610)
8. H.B. Ives, Wallingford, CT (203.294.4837)
9. LCN Closers, Princeton, IL (800.526.2400)
10. Dorma Architectural Hardware, Reamstown, PA (800.523.8483)
11. Glynn-Johnson, Indianapolis, IN (877.613.8766)
12. Door Controls International (DCI), Inc., Dexter, MI (800.742.3632)
13. Pemko Manufacturing Company, Memphis, TN (800.824.3018)
14. Zero International, Inc., Bronx, NY (800.635.5335)
15. Reese Enterprises, Inc., Rosemount, MN (800.328.0953)
16. Knox Company, Phoenix, AZ (800.552.5669)
17. Gyro Tech, by Nabco Entrances, Inc., Muskego, WI (877.622.2694)

2.2 MATERIALS

A. Screws and Fasteners

1. All hardware shall be packed with the necessary machine screws, sheet metal screws and sex bolts as required for proper and secure application.

B. Butt Hinges

1. Unless otherwise noted, hinges shall be of the types and sizes as follows: (Numbers are taken from ANSI/BHMA Standard A156.1 and Stanley Hardware)

   a. 1¾ inch thick – Up to 2'-11¾" wide, A8112, 4½ inches; **CB179**
   b. 1¾" thick – 3'-0" wide and over, A8111, 5 inches; **CB179** (or when paired with a 3'-0" leaf)
   c. Furnish one (1) pair of hinges for all doors up to 5'-0" high. Furnish one (1) additional hinge for every additional 2½ feet or fraction thereof.

2. Equivalent products by the following manufacturers will be accepted:

a. Hager
b. McKinney

C. Continuous Hinges

1. Unless otherwise noted, hinges shall be of the types and sizes as follows:

a. Roton **780-110HD**
b. The width of hinges shall be sufficient to clear all trim.

2. Equivalent products by the following manufacturers will be accepted:

a. Stanley

D. Continuous Electric Hinges:

1. Unless otherwise noted, hinges shall be of the types and sizes as follows:

a. McKinney **SER**
b. Provide sufficient number of concealed wires to accommodate electric function of specified hardware.

2. Equivalent products by the following manufacturers will be accepted:

a. Stanley

E. Locks, Latches and Cylinders

1. Locks and latches shall be Schlage **ND Series**, Commercial Cylinder Lock – **Rhodes**, **Vandlgard** functions as directed by the Architect and/or Owner. No substitution.
2. Deadbolt shall be Schlage **B600 Series – Cylinder Only**, Commercial Auxiliary Lock, functions as directed by the Architect and/or Owner. No substitution.

F. Exit Devices

1. Unless otherwise specified in the schedule, shall be Von Duprin **Series 99L and 99L-F**, Rim Exit Device with **06** trim as indicated in the hardware sets. No substitutions.

a. Exit devices for fire labeled doors shall be UL listed. Sex bolts shall be furnished for installing exit devices on mineral core wood labeled fire doors where appropriate blocking is not provided.
b. Coordinate exit device operation with Schlage locks where specified.

c. Interior panic hardware shall be cut ½ width of door from latch side only.
d. All exit devices shall be provided with internal dogging hardware for manual setting and reset with a special key.
e. At paired exit device doors, provide removable mullions similar to Von Duprin steel mullion, **Model #9954**, where indicated.
f. Provide electric latch retraction (**EL-**), power supply (**PS873**) and electric power transfer where required for electrified exit devices.

G. Push/Pulls

1. Push plates shall be **Rockwood 70C 4 x 16**.
2. Pulls shall be **Rockwood RM4410-12**.
3. Equivalent products by the following manufacturers will be accepted:

a. Burns
b. Ives

H. Door Closers

1. Door closers, marked closer, shall be LCN **4040 Series Smoothee**, with delayed action cylinder, sized to the door leaf size. No substitutions.
2. Door closers, marked closer/stop, shall be LCN **4040 Series Cush-N-Stop**, with delayed action cylinder, sized to the door leaf size. No substitutions.
3. Door closers, marked concealed closer and closer/stop, shall be Dorma **ITS96-9613 Series**, with delayed action cylinder, sized to the door leaf size. No substitutions.
4. Door closers are to be mounted on the least conspicuous side of the door. The hardware supplier shall consult with the Architect to verify applications, and note mounting locations on the hardware schedule.

I. Door Stops

1. Door stops shall be provided for all new doors. Wherever possible, Ives wall bumpers **407** shall be provided. Provide Ives floor stops **436** or **438** where the use of wall bumpers is not feasible, provided the location of the stop is not a stumbling hazard or would cause the door to rack at the hinges.
2. Overhead Stops: Glynn-Johnson **90S** (stop only). Furnish with 300 series stainless steel, in BHMA 613 finish.
3. Equivalent products by the following manufacturers will be accepted:

a. Glynn-Johnson
b. DCI

J. Protective Plates

1. Provide Burns Manufacturing door protection plates, of 16 gauge construction, where indicated in the hardware sets, in heights as follows:

    a. Mop Plates: 8 inches.

2. Widths shall be 2 inches less than door width for single doors and 1 inch less than door width for pairs of doors.
3. Plates shall be beveled three (3) sides.
4. Equivalent products by the following manufacturers will be accepted:

    a. Ives
    b. Rockwood

K. Flush Bolts

1. The inactive leaf of pairs of doors not required for egress purposes shall be provided with top and bottom flush bolts, **DCI 790F**.

    a. The bottom bolt shall be located 12 inches from the door bottom to the center of the faceplate. The top bolt shall be located no higher than 6'0" from the finished floor to the center of the faceplate.

3. Equivalent products by the following manufacturers will be accepted:

    a. Ives
    b. Glynn-Johnson

L. Thresholds

1. Thresholds shall be Pemko **2005DT**, in size and profiles as detailed in the construction documents.
2. Equivalent products by the following manufacturers will be accepted:

    a. Zero

M. Weatherstripping

1. Head and Jamb: Zero International **#328AA**, Solid Neoprene in an extruded aluminum housing.
2. Sill: Zero International **#339AA** with extruded aluminum housing, solid neoprene.
3. The following manufacturer's equivalent products will be accepted:

    a. Pemko

N. Silencers

1. Ives rubber door silencers **SR64** for metal frames and **SR65** for wood frames shall be provided for all new interior frames. Provide three (3) silencers for each single door frame, and two (2) silencers for each frame for pairs of doors.
2. Equivalent products by the following manufacturers will be accepted:

    a. Glynn-Johnson
    b. Reese

O. Smoke Seals (Smoke and Fire Rated Doors)

1. Smoke Rated Doors: Pemko **S88D** at the jambs and heads.
2. Fire Rated Doors: Provided by the door manufacturer.

P. Knox Box

1. Provide one (1) **3200 Series** Knox Box by Knox Company, location to be determined in the field during construction, securely fastened to the structural elements of the facility in accordance with the manufacturer's instructions. Provide two (2) keys with this box.

Q. Power Operator

1. Active Leaf: Gyro Tech **Model 710** Gemini automatic swing door operator. Provide with two (2) wall mounted 6 inch diameter "Push to Open" paddles and switches, mounted as required by the ADA. Provide a door position switch at the door frame to manually terminate power to the exterior paddle after hours. The interior "Push to Open" paddle shall be operable at all times. Coordinate installation with electrical work.

2.3 FINISHES

A. In general, unless otherwise specified in the hardware sets or specification, materials and finishes for the buildings shall be as follows:

1. Interior Door Butts: Steel with finish BHMA 613.
2. Locks and Latches: Finish BHMA 613.
3. Door Closers: Iron with sprayed finish to match balance of hardware.
4. Protective Plates: Stainless Steel with finish BHMA 613.
5. All other items of hardware with finish BHMA 613 unless otherwise specified.

2.4 KEYING

A. All locks and cylinders shall be master keyed to a master key system for the facility per the Architect and/or Owner.

B. All master keys shall be delivered to the Architect or Owner as directed.

C. The Contractor shall tag all change keys with temporary cardboard tags, using the final room numbers to be marked on the doors as indicated on the drawings. All tagged keys shall be turned over to the Owner.

D. Keys required:

1. Change Keys: Three (3) per cylinder.
2. Master Keys: Six (6) per master key set.

3 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine doors, frames and related items for conditions that would prevent the proper application of finish hardware. Do not proceed until defects are corrected.

3.2 INSTALLATION

A. Unless otherwise noted, all finish hardware shall be installed according to DHI published standard mounting locations.

B. All tools, wrenches, instruction and maintenance sheets and other items of hardware shall be turned over to the Owner.

3.3 FIELD QUALITY CONTROL

A. After installation has been completed, provide the services of a qualified hardware consultant to check the project to determine the proper application of hardware according to the approved Hardware Schedule and Keying Schedule. Also, check the operation and adjustment of all hardware items.

3.4 ADJUSTING AND CLEANING

A. At final completion, all hardware shall be left clean and free from disfigurement. Make a final adjustment to all items of hardware. Where hardware is found defective, repair or replace or otherwise correct as directed.

3.5 PROTECTION

A. Provide for the proper protection of all items of hardware until the Owner accepts the project as complete.

3.6 HARDWARE SCHEDULE

A. Provide hardware as specified in the previous articles in sets according to the following schedule.

B. The hardware supplier shall meet with the Architect and/or Owner to determine lock functions and keying requirements.

HW-1

EACH TO HAVE:

	BUTTS
1	CLASSROOM LOCKSET
1	CONCEALED CLOSER
1	OH STOP
1	MOP PLATE
	SILENCERS

DOOR: 102

HW-2

EACH TO HAVE:

	BUTTS
1	STOREROOM LOCKSET
1	CLOSER
1	STOP
1	MOP PLATE
	SILENCERS

DOOR: 103, 109, 121

HW-3

EACH TO HAVE:

	BUTTS
1	CLASSROOM LOCKSET
1	CONCEALED CLOSER
1	STOP
1	MOP PLATE
	SMOKE SEALS

DOOR: 104

HW-4

EACH TO HAVE:

	BUTTS
1	PUSH/PULL
1	DEADBOLT
1	CLOSER/STOP
1	MOP PLATE
	SILENCERS

DOOR: 107, 206

HW-5

EACH TO HAVE:

	BUTTS
1	CLASSROOM LOCKSET
1	CLOSER
1	STOP
1	MOP PLATE
	SILENCERS

DOOR: 108

HW-6

EACH TO HAVE:

	CONTINUOUS HINGES
1	EXIT DEVICE (CLASSROOM)
1	CLOSER
1	OH STOP
1	THRESHOLD
	WEATHERSTRIPPING

DOOR: 110

HW-7

EACH TO HAVE:

	BUTTS
1	CLASSROOM LOCKSET
1	CLOSER/STOP
1	MOP PLATE
	SILENCERS

DOOR: 111

HW-8

EACH TO HAVE:

	BUTTS
1	STOREROOM LOCKSET
1	CLOSER/STOP
1	MOP PLATE
	SILENCERS

DOOR: 114, 207

HW-9

EACH TO HAVE:

	BUTTS
1	STOREROOM LOCKSET
2	STOPS
2	MOP PLATES
	FLUSHBOLTS
	SILENCERS

DOOR: 112, 113, 216A, 216B, 216C, 221, 222

HW-10

EACH TO HAVE:

	BUTTS
1	EXIT DEVICE (PASSAGE)
1	CONCEALED CLOSER
1	STOP
1	MOP PLATE
	SMOKE SEALS

DOOR: 119

HW-11

EACH TO HAVE:

	CONTINUOUS HINGES
2	EXIT DEVICES (CLASSROOM)
2	CLOSERS
2	OH STOPS
1	REMOVABLE MULLION
1	THRESHOLD
	WEATHERSTRIPPING

DOOR: 106, 115

HW-12

EACH TO HAVE:

	BUTTS
1	PUSH/PULL
1	DEADBOLT
1	CLOSER
1	STOP
1	MOP PLATE
	SILENCERS

DOOR: 120, 122, 215

HW-13

EACH TO HAVE:
- BUTTS
- 1 OFFICE LOCKSET
- 1 STOP
- 1 MOP PLATE
- SILENCERS

DOOR: 117, 118

HW-14

EACH TO HAVE:
- BUTTS
- 1 STOREROOM LOCKSET
- 1 CLOSER/STOP
- 1 MOP PLATE
- SMOKE SEALS

DOOR: 125

HW-15

EACH TO HAVE:
- BUTTS
- 2 PUSH/PULLS
- 2 CONCEALED CLOSERS
- 2 STOPS
- 2 MOP PLATES
- SILENCERS

DOOR: 123, 124

HW-16

EACH TO HAVE:
- BUTTS
- 1 OFFICE LOCKSET
- 1 CONCEALED CLOSER
- 1 STOP
- 1 MOP PLATE
- SILENCERS

DOOR: 126

HW-17

EACH TO HAVE:
- BUTTS
- 1 CLASSROOM LOCKSET
- 1 STOP
- 1 MOP PLATE
- SILENCERS

DOOR: 202, 203, 204, 218, 219

HW-18

EACH TO HAVE:
- BUTTS
- 1 CLASSROOM LOCKSET
- 1 CONCEALED CLOSER/STOP
- 1 MOP PLATE
- SILENCERS

DOOR: 205, 208, 209, 212, 213, 216, 217

HW-19

EACH TO HAVE:
- BUTTS
- 1 STOREROOM LOCKSET
- 1 CLOSER
- 1 STOP
- 1 MOP PLATE
- SMOKE SEALS

DOOR: 201, 301

HW-20

EACH TO HAVE:
- BUTTS
- 1 CLASSROOM LOCKSET
- 1 CONCEALED CLOSER
- 1 STOP
- 1 MOP PLATE
- SILENCERS

DOOR: 210, 211

HW-21

EACH TO HAVE:

	BUTTS
1	STOREROOM LOCKSET
1	STOP
1	MOP PLATE
	SILENCERS

DOOR: 214, 214A

HW-22

EACH TO HAVE:

	BUTTS
1	OFFICE LOCKSET
1	CONCEALED CLOSER/STOP
1	MOP PLATE
	SILENCERS

DOOR: 220

HW-23

EACH TO HAVE:

	CONTINUOUS ELEC. HINGES
2	EXIT DEVICES (CLASSROOM)
1	POWER OPERATOR
1	CLOSER
1	OH STOP
1	REMOVABLE MULLION
1	THRESHOLD
1	POWER SUPPLY
	WEATHERSTRIPPING

DOOR: 101

HW-24

EACH TO HAVE:

	BUTTS
1	STOREROOM LOCKSET
1	CLOSER/STOP
	SMOKE SEALS

DOOR: 105, 116

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 06100 – Rough Carpentry for wood blocking and grounds for mounting roller shades and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches long.

D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to five percent (5%) of quantity installed for each size, color, and shadeband material indicated, but no fewer than two (2) units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product:

1. MechoShade Systems, Inc.

B. 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. Lutron Electronics Co., Inc.
2. Nysan Solar Control Inc.; Hunter Douglas Company
3. SWF Contract
4. Substitutions: Under provisions of Section 01600.

C. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, sill mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of inside face of shade.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.

E. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.
    b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As indicated in Section 09000.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: One hundred percent (100%) thermoplastic polyolefin, PVC-free.
3. Weave: Basketweave.
4. Roll Width: 72 inches.
5. Orientation on Shadeband: Up the bolt.
6. Openness Factor, Style and Color: As indicated in Section 09000.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less ¼ inch per side or ½-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less ¼ inch, plus or minus 1/8 inch.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

B. Install at all window locations.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

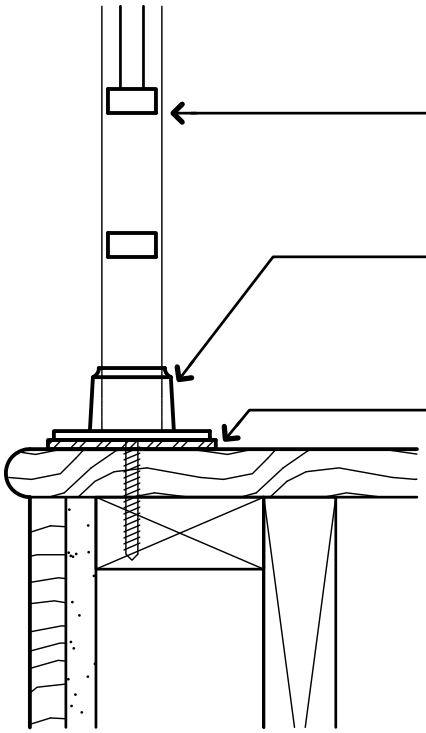
3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION



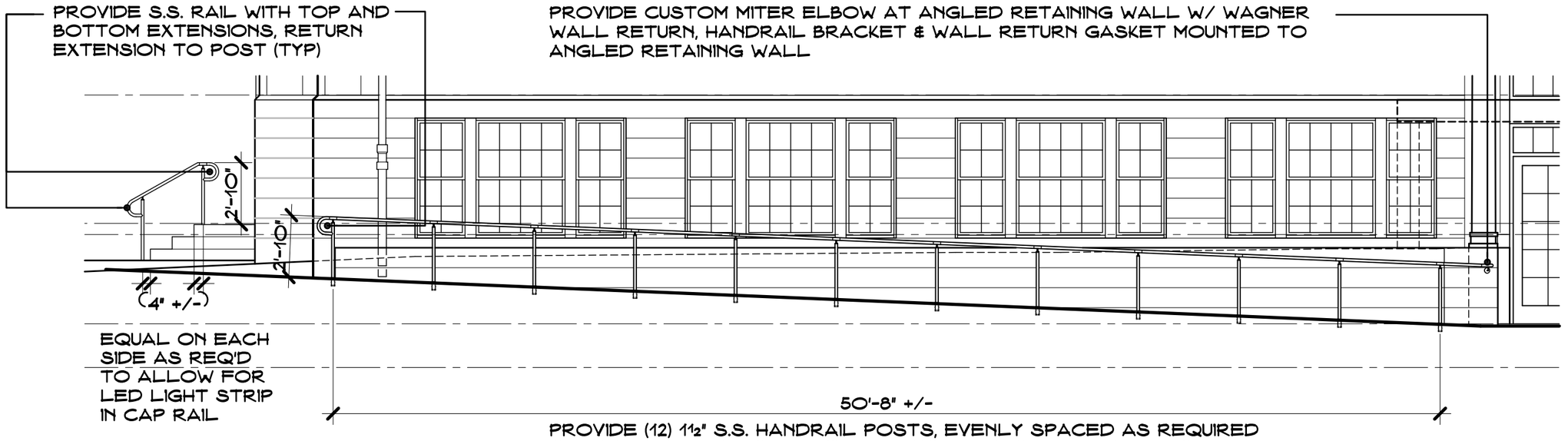
JULIUS BLUM STARTER POST 343 (OR EQUAL) FED THROUGH AND WELDED TO TUBE SOCKET - GRIND WELDS SMOOTH

JULIUS BLUM TUBE SOCKET 202 (OR EQUAL) - CENTERED ON AND WELDED TO STEEL PLATE - GRIND WELDS SMOOTH

3½" X 3½" STEEL PLATE W/ PREDRILLED HOLE, FASTENED TO WOOD STAIR STRUCTURE

NOTE: CONTRACTOR TO CONFIRM THAT STARTER POST AND TUBE SOCKET HOLE SIZE ARE COMPATIBLE PRIOR TO PROCUREMENT.

Project Title: Eckersley-Hall Renovations For Middletown Senior / Community Center 61 Durant Terrace Middletown, Connecticut 06457	SILVER / PETRUCELLI + ASSOCIATES *Architects / Engineers / Interior Designers* 3190 Whitney Avenue, Hamden, CT 06518-2340 Tel. 203 230 9007 Fax. 203 230 8247 *silverpetrucelli.com*	*Drawing Title:* METAL STARTER POST BASE DETAIL	*Date:* JULY 23, 2013 *Scale:* 3" = 1'-0" *Drawn By:* CTN *Project Number:* 11.134	*Drawing Number:* SK A01

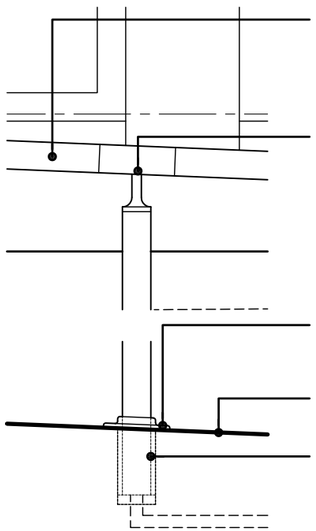


PARTIAL EAST ELEVATION (DURANT TERRACE)

SCALE: 3/16" = 1'-0"

NOTE: RAILS ON OPPOSITE SIDE OF EAST ELEVATION AND AT NORTH STAIR TO BE THE SAME (MIRRORED) AS SHOWN HERE

1 / A3.1



TYPICAL POST

SCALE: 1½" = 1'-0"

1 / SKA02

NOTE: CONTRACTOR TO PROVIDE FULL STAINLESS STEEL ASSEMBLY FOR NEW LIT HANDRAIL ASSEMBLY INCLUDING ALL RAILS, POSTS, ANCHORS, BRACKETS, CAPS, SLEEVES, FASTERNERS, HARDWARE, ETC. AS REQUIRED FOR COMPLETE INSTALLATION. TYPICAL OF (4) RAIL SECTIONS

- NORTH ENTRY
- SOUTH ENTRY
- EAST ENTRY (X2)

Drawing Number: SK A02

Date: 7/25/13
Scale: 3/16" = 1'-0"
Drawn By: CTH
Project Number: 11134

Drawing Title: EXTERIOR LIT HANDRAIL CLARIFICATIONS

SILVER/PETRUCELLI + ASSOCIATES
Architects / Engineers / Interior Designers
3190 Whitney Avenue, Hamden, CT 06518-2340
Tel. 203 230 9007 Fax. 203 230 9247
silverpetrucelli.com

Project Title:
Eckersley Hall Renovations for
Middletown Senior / Community Center
61 Durant Terrace
Middletown, Connecticut 06457