ADDENDUM NO. 1 **DATE: January 27, 2011**

EAST HARTFORD-GLASTONBURY
ELEMENTARY MAGNET SCHOOL PHASE 2
GLASTONBURY, CONNECTICUT
STATE PROJECT NOS. 054-0095 MAG/N/PS & 054-0096 MAG/N/PS
GLASTONBURY BID NO. GL-2011-04

The following changes to the Drawings and Project Manual shall become a part of the Contract Documents superseding previously issued Drawings and Specifications to the extent modified by this Addendum No. 1. Bidders shall ensure this addendum is acknowledged in the appropriate space provided on the Bid Form when submitting their bid.

NOTICE TO ALL PLAN HOLDERS:

If you received this Addendum No. 1 electronically you may not change it in any way except to format it to print on your printer.

The due date and time for bids remains unchanged. See "Invitation to Bidders/Legal Notice" published in the Hartford Courant on Friday, January 14, 2011 for details.

CHANGES TO THE DRAWINGS

A. VARIOUS DRAWINGS AS LISTED BELOW:

1) On Drawing Nos. A-100.1, A-100.2, A-101.1, A-101.2, A-101.3, A-102.1, A-102.2, A-102.3, A-103.1, A-103.2, A-501, A-601, and A-602, under the "NUMBERED LEGEND NOTES", in Note #17, DELETE the words "Fabric Wrapped Tackable" and REPLACE with "Display Case, Refer to Detail 1/A-836".

2) On Drawing Nos. A-100.1, A-100.2, A-101.1, A-101.2, A-101.3, A-102.1, A-102.2, A-102.3, A-103.1, A-103.2, A-501, A-601, and A-602, under the "NUMBERED LEGEND NOTES", in Note #19, Light Box, DELETE the words "RE: (1 or 3/A-836)" and REPLACE with "RE: Detail 2/A-836".

B. DRAWING NO. C-002 - SITE UTILITY PLAN:

1) On the Site Utility Plan, ADD a new eight (8) inch gate valve on the existing eight (8) inch water main as indicated on attached copy of Sketch No. SKC-01 dated 1/26/11.

C. DRAWING NO. A-910 - INTERIOR FINISH SCHEDULE AND FINISH NOTES:

1) On the "Room Finish Schedule", under Stair 2 on the First and Second Floors, in the "Floor Finish" column, REVISE entry to read "RTR-1/R-1".

D. DRAWING NOS. K-1.0 THROUGH K-1.5 - CAFETERIA PLANS:

1) On the Food Service Equipment Schedule, under Item No. 37 - Double (Half) Lockers, in the "MFR" column, DELETE the word "Architect" and ADD "Note: Refer to Section 11 40 00, Tennsco Model DTS-121530-1, single 2-tier locker assemblies with legs, all assembled with sloped tops, gray mist color (provided by Food Service Equipment Contractor".

E. DRAWING NO. S-101.0 - FIRST FLOOR SLAB PLAN, SECTIONS AND DETAILS:

1) Under the "Notes", in Note "9.G.", DELETE the words "General Contractor" and REPLACE them with "Electrical Contractor".

F. DRAWING NO. E101.2 - FIRST FLOOR POWER PLAN:

1) On the First Floor Power Plan, in Science Classroom/B118, ADD a new junction box circuited to Panel RP-14 as indicated on attached copy of Sketch No. E101.2 dated 1/26/11.

CHANGES TO THE PROJECT MANUAL

A. SECTION 00 01 10 – TABLE OF CONTENTS:

1) In Volume 1, on Page 00 01 10-4, under Division 11-EQUIPMENT, DELETE the listing for Section 11 31 00 - Residential Appliances in its entirety.

2) In Volumes 1, 2, and 3, on Page 00 01 10-6, under Division 23-HVAC, REVISE the listing for Sections 23 52 13 and 23 74 13 to read as follows:

"23 52 16 - Condensing Boilers"
"23 73 13 - Indoor, Central-Station Air-Handling Units"

B. SECTION 00 11 16 – INVITATION TO BIDDERS/LEGAL NOTICE:

1) On Page 00 11 16-1, under Bid Package BP-112, DELETE the words "Wood Flooring".

2) On Page 00 11 16-2, under the second paragraph, ADD the following paragraph:

"*PRIME Bidders MUST obtain a set of bid documents from the Construction Manager, located at the job site at 95 Oak Street, Glastonbury, CT 06033.

Definition: "Prime Bidder" is a Contractor that is bidding direct to the Town of Glastonbury on a Complete Bid Package.

Bid Documents are available for viewing at the following locations.
Construction Manager Job Site Field Office Trailer, p: 860-652-9936, f: 860-652-9968, 95 Oak Street, Glastonbury, CT 06033

Joseph Merritt & Company, p: 860-952-1527, f: 860-947-3288, 650 Franklin Avenue, Hartford, CT 06114-3031

McGraw-Hill Construction/Dodge, p: 860-584-2375, f: 860-584-2689, online at http://dodge.construction.com

NOTE: For those Subcontractors, Suppliers, and Vendors the Bid Documents are available online at The Pike Company FTP web site, see the link below to access the documents online.
http://www.pikeco.com/vendor/drawings-specifications. Type in the Key Search word: Glastonbury."

C. SECTION 00 21 13 – INSTRUCTION TO BIDDERS:

1) On Page 00 21 13-4, in Article 3.1, ADD Paragraph F to read as follows:

"F. PRIME Bidders MUST obtain a set of bid documents from the Construction Manager, located at the job site at 95 Oak Street, Glastonbury, CT 06033.

Definition: "Prime Bidder" is a Contractor that is bidding direct to the Town of Glastonbury on a Complete Bid Package."

D. SECTION 00 24 19 – SPECIAL INSTRUCTIONS, PROPOSAL REQUIREMENTS, AND BID PACKAGES:

1) In Section 00 24 19, ADD Bid Package No. 103 - Testing & Inspections consisting of four (4) pages inclusive (copy attached) and Bid Package No. 103 Bid Breakdown Form consisting of two (2) pages inclusive in front of Bid Package No. 104 (copy attached).

2) In Section 00 24 19, in Bid Package No. 107 - Structural Steel, Metal Stairs and Misc. Metals, on Page 00 24 19-6, in Paragraph A, DELETE Item #63 in its entirety and REPLACE with the following:

"63. Contractor shall be responsible to furnish, fabricate and install four (4) access ladders, access hatches, and railings for access to inner dome and outer dome in Planetarium; (reference Drawing No. A101.2, Drawing No. A102.2, Detail 2/PL-1, and Section 08 31 13 - Access Doors and Frames for specification of hatches)."

3) In Section 00 24 19, in Bid Package No. 107 - Structural Steel, Metal Stairs and Misc. Metals, on Page 00 24 19-7, in Paragraph A, ADD Item #70 to read as follows:

"70. Contractor shall be responsible to furnish, fabricate and install custom rolling access service ladder system in Planetarium Silo."

4) In Section 00 24 19, in Bid Package No. 108 - Architectural Millwork & Casework, on Page 00 24 19-3, in Paragraph A, ADD Item #24 to read as follows:

"24. Contractor shall be responsible to provide the Theater Control Console for the Immersive Theater."

5) In Section 00 24 19, in Bid Package No. 111 - General Trades, on Page 00 24 19-7, in Paragraph A, in Item #65, DELETE the words "Kitchen Lockers."

6) CLARIFICATION: In Section 00 24 19, in Bid Package No. 111 - General Trades, on Page 00 24 19-10, in Paragraph A, in Item #99 and 100, wherever "Planetarium" appears in the text it refers to the "Immersive Theater/B122" shown on the Drawings and specified in the Project Manual.

7) In Section 00 24 19, in Bid Package No. 111 - General Trades, on Page 00 24 19-10, in Paragraph A, in Item #99, ADD two (2) new paragraphs to read as follows:

"Planetarium/Immersive Theater Subcontractor shall be responsible to provide to the General Trades Contractor a complete proposal for the Immersive Theater scope of work in its entirety, including but not limited to Inner Dome with Cove light pan, Outer Domes, Theater Control System, controlling all sub-systems in the theater, Surround Audio System, Media Production Suite, Media Production Suite/Auxiliary Equipment, Full-Color LED Cove Lighting System, Ellipsoid Public Address Spot Lights for speaker presentation, Instructional Package Video Projection System required for classroom

applications, and including fixtures, equipment and low voltage wire, floor boxes and terminations, (note: 120v power by Electrical Contractor as part of BP-117 – Electrical)."

"The Planetarium/Immersive Theater Subcontractor shall be responsible to complete the Immersive Theater Bid Breakdown and provide it to the General Trades Contractor. The General Trades Contractor shall be responsible to include the Total Immersive Theater Bid Amount in their Base Bid for Bid Package BP-111 and shall include a copy of the Immersive Theater Bid Breakdown form with their Bid Proposal for Bid Package BP-111, (reference attached Immersive Theater Bid Breakdown form consisting of two (2) pages inclusive, *issued as part of Addenda No.1*). Note, the General Trades Contractor will be required to issue SEPARATE Contracts to the Immersive Theater Suppliers and Subcontractors for the work as outlined on the Immersive Theater Bid Breakdown."

8) In Section 00 24 19, in Bid Package No. 113 - Food Service Equipment, on Page 00 24 19-2, in Paragraph A, ADD Item #17 to read as follows:

"17. Contractor shall be responsible to furnish and install all Food Service Equipment as specified in Section 11 40 00."

9) In Section 00 24 19, in Bid Package No. 117 - Electrical, on Page 00 24 19-3, in Paragraph A, in Item #99, ADD a new paragraph to read as follows:

"Contractor shall be responsible to provide all 120v power, conduit, wiring and boxes required for the Immersive Theater components, including but not limited to Theater Control System, Surround Audio System, Media Production Suite, Media Production Suite/Auxiliary Equipment, Full-Color LED Cove Lighting, Ellipsoid Public Address Spot Lights, Instructional Package Video Projection System, etc. unless otherwise noted."

E. SECTION 01 33 00 – SUBMITTAL PROCEDURES:

1) ADD the attached "SUBMITTAL COVER" consisting of two (2) pages inclusive to the end of Section 01 33 00 in Volume 1 of 3 of the Project Manual.

2) ADD the attached "MATERIALS DOCUMENTATION SUBMITTAL COVER SHEET" consisting of four (4) pages inclusive to the end of Section 01 33 00 in Volume 1 of 3 of the Project Manual.

F. SECTION 01 74 19 – CONSTRUCTION WASTE MANAGEMENT & DISPOSAL:

1) ADD Section 01 74 19 consisting of eight (8) pages inclusive to Volume 1 of 3 of the Project Manual (copy attached).

G. SECTION 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS:

1) ADD Section 01 91 13 consisting of 22 pages inclusive to Volume 1 of 3 of the Project Manual (copy attached).

H. SECTION 03 30 00 – CAST-IN-PLACE CONCRETE:

1) On Page 03 30 00-29, in Article 3.18, Paragraph B, REVISE Subparagraph 5 to read as follows:

"5. If the test results indicate failure, the Concrete Contractor is responsible for meeting the design performance specification with a topical moisture proofing additive."

2) On Page 03 30 00-31, in Article 3.18, Paragraph D, REVISE Subparagraph 13 and ADD new Subparagraph 14 to read as follows:

"13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements."
"14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents."

3) On Page 03 30 00-31, in Article 3.18, REVISE Paragraph E to read as follows:

"E. Measure floor and slab flatness and levelness according to ASTM E1155 within 48 hours of finishing."

I. SECTION 08 44 13 – GLAZED ALUMINUM CURTAIN WALLS:

1) On Page 08 44 13-7, in Article 2.3, Paragraph A, DELETE Subparagraph 1 in its entirety and renumber subsequent subparagraphs accordingly.

2) On Page 08 44 13-7, in Article 2.3, Paragraph A, REVISE Subparagraph 2 and subsequent sub-subparagraphs to read as follows:

"2. Construction for Type 2: EFCO System 5600 with Duracast Fiberglass Pressure Plate; thermally improved framing.

a. Mullion Depth: 10-1/4 inches.
b. Mullion Width: 2-1/4 inches.
c. Glazing System: Retained mechanically with gaskets on four (4) sides.
d. Glazing Plane: Front.
e. Pressure Plate: Fiberglass composite with a flexural strength of no less than 82 ksi along the lineal major axis. Thermal conductivity of material not to exceed two (2) BTU in/hr ft^2 °F."

J. SECTION 11 40 00 – FOODSERVICE EQUIPMENT:

1) On Page 11 40 00-22, REVISE Item No. 37 quantity from 2 to 3.

K. SECTION 33 80 00 – COMMUNICATION UTILITIES:

1) In the footer for Section 33 80 00, CHANGE the section number to read "33 80 00".

RESPONSES TO BID RFIS

BID RFI No. B-001 (Dated 1/26/2011)

QUESTION: On page 11 40 00-24, under special conditions, lists two approved custom fabricators. Item 56 on the same page above lists an additional fabricator, Low Temp. Will Low Temp be considered an approved fabricator for all custom fabrication?

RESPONSE: Item # 56 was cut and pasted from a previous spec that included Low Temp as an approved fabricator. We as the consultant (R.H. Trauth – FSDI) approve Low Temp on this project.

BID RFI No. B-002 (Dated 1/27/2011)

QUESTION: Please clarify. Do the first three items on Page 2 of Bid Form, Labor, Rental or Equipment & Material/Equipment pertain to Prime Bidders and not their Subcontractors? Subcontractors (Item) would then be the combined labor, material & equipment to perform Subcontract?

RESPONSE: YES, on the Bid Form the Breakdown of Labor, Rental or Owned Equipment, and Material/Equipment, pertain to the Prime Bidder only. YES, the Subcontractors (line) would then be the combined labor, material and equipment to perform the subcontract work.

BID RFI No. B-003 (Dated 1/27/2011)

QUESTION: Please clarify. Page 2 of spec section 00 24 19 for BP-107 lists cold formed steel as part of our responsibilities. There is no listing for this spec under Item #6 of same BP-107 list of responsible spec sections.

RESPONSE: SECTION 00 24 19 Bid Package BP-107 Structural Steel & Misc. Metals
Under Paragraph A, Item #10, DELETE the words "~~Cold Form Steel~~" and ADD the following to complete the last sentence "their work with the General Trades Contractor and Roofing Contractor."

BID RFI No. B-004 (Dated 1/27/2011)

QUESTION: Upon review of specification section 116146- Platform Curtains and drawings, we see only one stage (C103) which appears to have only a front curtain and valance. The spec pg. 1 calls for a complete setting and pg. 3 mentions a TV Studio, is there one? Please clarify.

RESPONSE: As indicated on Drawing A-101.3, Note 13, the Platform is provided only with a front curtain and no other curtains. In specification Section 11 61 46, Article 1.2, Paragraph A, DELETE Subparagraphs 2 – 5 in its entirety. In specification Section 11 61 46, Article 2.1, Paragraph C, the reference to “TV Studio Fabric” is a designation for the type of fabric for the curtain liner and there is no TV Studio being provided as part of the project.

BID RFI No. B-005 (Dated 1/27/2011)

QUESTION: Please verify there are no liquidated damages.

RESPONSE: There are no liquidated damages on this project.

BID RFI No. B-010 (Dated 1/27/2011)

QUESTION: Reference Section 08 44 13, Article 2.3, Paragraph A, Subparagraphs 1 and 2. Please confirm both should read 5600 Series with Duracast Pressure Plates.

RESPONSE: Refer to revision of specification section contained in this addendum.

BID RFI No. B-011 (Dated 1/27/2011)

QUESTION: Special Instructions #6 states "Louvers & Vents - As It Pertains". There are no louvers within any of our frames. Please confirm that any other louvers are not by this bid package.

RESPONSE: In Bid Package BP-110, Special Instruction, under Item 6, DELETE reference to Section 08 90 00 - Louvers and Vents. NOTE: Section 08 90 00 is not part of Bid Package BP-110 Scope of Work.

BID RFI No. B-012 (Dated 1/27/2011)

QUESTION: Scope Item 21 calls for this Bid Package to provide glass and hardware at the Display Cases. This material is specified in Section 10 12 00 which is not listed under sections we are responsible for under BP-100. Please clarify.

RESPONSE: Under Bid Package BP-110 - Glazing, Window & Aluminum Entrances, DELETE Item 21 in its entirety. NOTE: The display cases including glass shelving, glass doors, and hardware as specified in Section 10 12 00 are by the General Trades Contractor as part of Bid Package BP-111.

BID RFI No. B-013 (Dated 1/27/2011)

QUESTION: Please confirm that bathroom mirrors specified in Section 10 28 13, Article 2.2, Paragraph D are not by Bid Package BP-110.

RESPONSE: The bathroom mirrors specified in Section 10 28 13 are by the General Trades Contractor as part of Bid Package BP-111.

END OF ADDENDUM NO. 1

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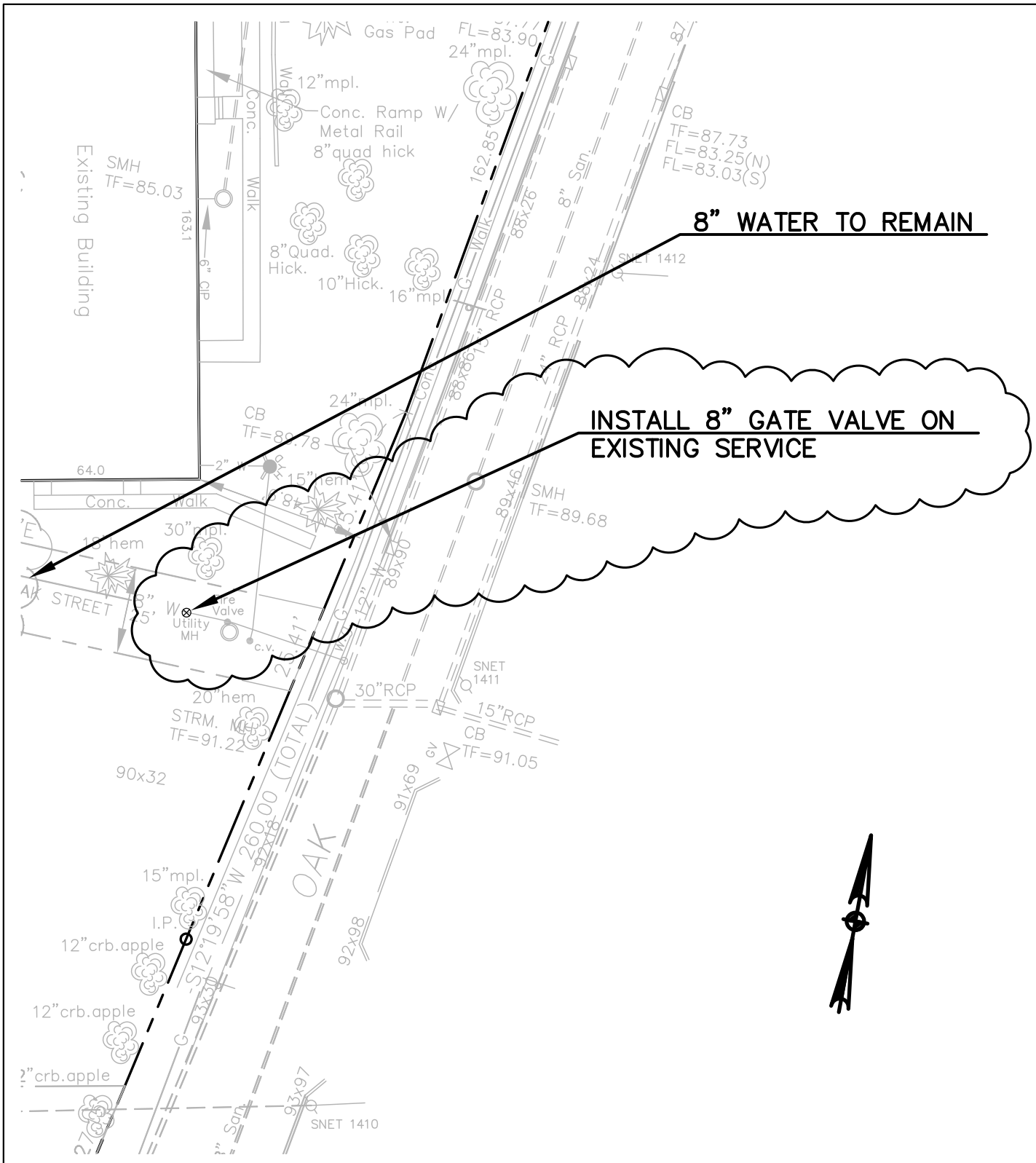


DRAWING TITLE

WATER SERVICE MODIFICATION

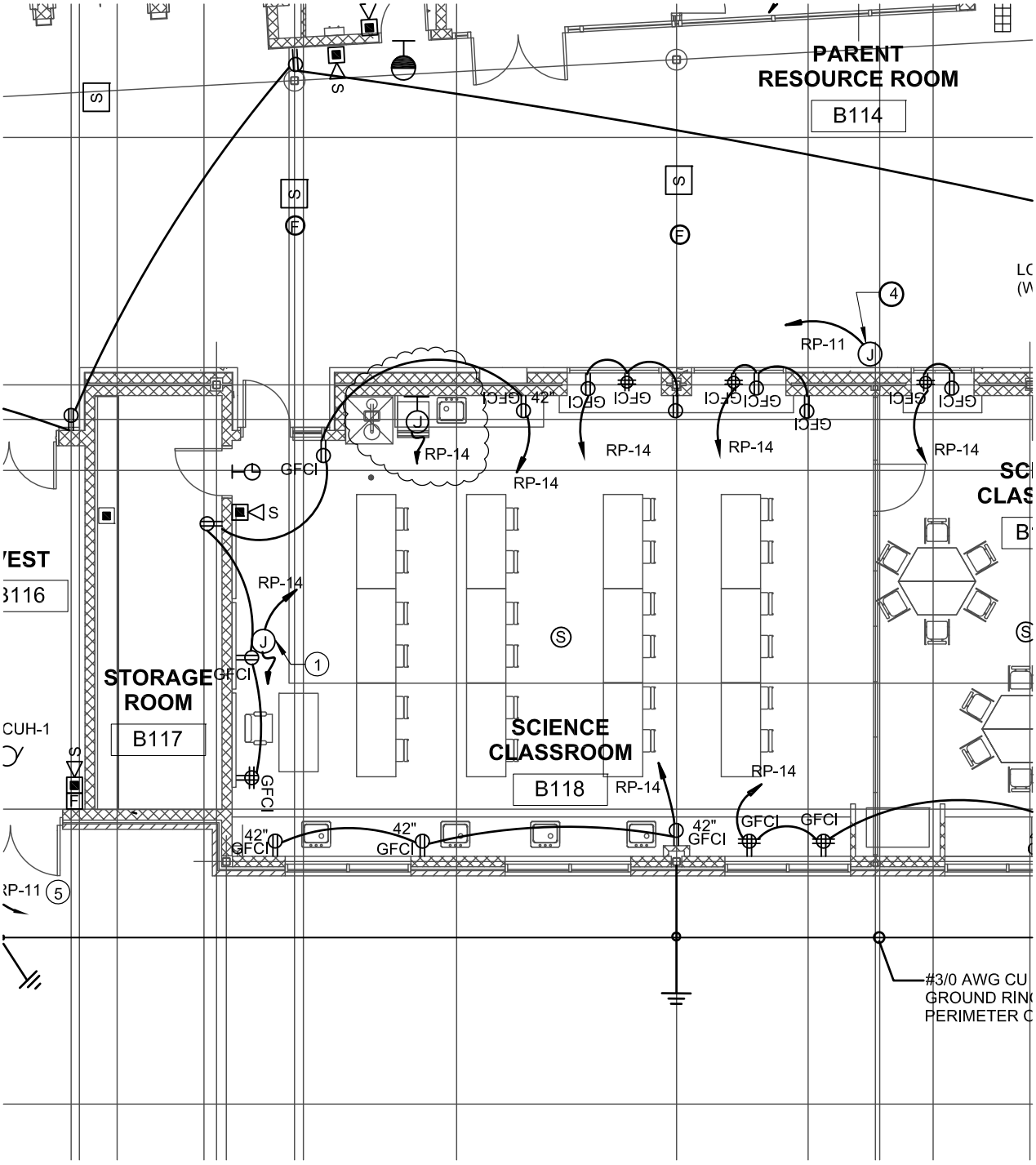
PROJECT TITLE

GLASTONBURY EAST HARTFORD
ELEMENTARY MAGNET SCHOOL
95 OAK STREET
GLASTONBURY, CT

PROJECT NO.	SCALE	REFERENCE
10-379	1"=40'	C-102

CONSULTING ENGINEERS
PURCELL ASSOCIATES
90 National Drive • Glastonbury, Connecticut 06033
Phone: (860) 633-8341 • Fax: (860) 633-1068

DRAWN BY	DATE	SHEET NO.
RSN	01/26/11	SKC-01



FLETCHERTHOMPSON ELEVATING DESIGN I SHAPING SOLUTIONS ARCHITECTURE I ENGINEERING I INTERIOR DESIGN	PROJECT TITLE: GEHEMS		DATE: 26 January, 2011
	DRAWING TITLE: FIRST FLOOR POWER PLAN		PROJECT NO.: H090230
THREE CORPORATE DRIVE SHELTON, CONNECTICUT 06484-6244	DRAWN BY: APW	SCALE: 1/8" = 1'-0"	DWG. NO.: E101.2

BID PACKAGE NO. 103
TESTING & INSPECTIONS

East Hartford / Glastonbury Elementary Magnet School
Dated: July 1, 2010

A. SPECIAL INSTRUCTIONS

1. **The Contractor shall ATTACH a copy of the Bid Package to the Bid Form**

2. The Contractor shall be responsible to furnish all labor, materials, equipment, supervision, permits, fees, hoisting, and all other requirements necessary to complete all work in accordance with the contract documents for the following specification sections listed below. The Contractor shall be responsible to provide all work required and associated with the following to achieve a complete installation per the design intent of work under this Bid Package.

3. The Contractor shall be responsible to furnish and install, including commission of all work associated with the following systems and components as specified per the contract documents. The Contractor shall understand that they are responsible to provide a complete and all-inclusive installation and any ambiguities in the contract documents shall be the contractor's responsibility to provide, at no additional cost to the owner, necessary for all work required for a functional system under this bid package. The scope of work shall include all work essential to meet the objectives and design intent satisfactory to the Construction Manager, Architect, Engineers and Owner.

4. The Contractor shall be responsible for all LEED requirements as required throughout the contract documents as it relates to the work under this bid package; including but not limited to ALL specification sections, attendance at the LEED Kick off Meeting and all follow-up LEED Meetings, responsible for taking photos for IAQ, providing any necessary documentation, logs, etc. as needed to obtain the LEED points as directed by the Architect.

5. The Contractor shall be responsible for all Commissioning requirements under specification section 01 91 13 including as noted throughout the bid documents and as directed by the Architect.

6. Contractor shall be responsible for the work for the following sections as described:

00 24 19	Proposal Requirements	As it Pertains
Division 00	Procurement and Contracting Requirements	As It Pertains
Division 01	General Requirements	As It Pertains
All Divisions	Project Manual	As It Pertains
01 40 10	Structural Tests and Special Inspections	Complete
01 45 23.23	Testing for IAQ, Baseline IAQ and Materials	As It Pertains

7. Contractor shall be responsible to provide all Testing and Inspections requirements as per the construction documents complete and in its entirety.

8. Contractor shall pay close attention to provide the necessary inspections as per the Statement of Special Inspections required per the structural engineer, reference (SECTION 01 40 10).

9. Contractor shall be responsible for all cleanup of work areas on a daily basis and shall remove and disposal of debris in accordance with the General Trades Contractor's Project Waste Management Plan. Reference the LEED special requirements for Waste Management.

10. Contractor shall be responsible for Special Inspection Services as per the bid documents and statement of special inspections.

11. Contractor (Testing and Inspection Agency) shall be responsible and will be held accountable for all Testing and Inspections whether or not identified in the contract documents, as the Owner is hiring the testing and inspection agency for their expertise.

12. Contractor (Testing and Inspection Agency) shall identify any tests or inspection not meeting the contract requirements, and shall immediately notify the Construction Manager. The Contractor (Testing and Inspection Agency) will submit a written report to the CM and A/E Team stating the specific problem, issues or concerns, and the Contractor shall include a recommendation for corrective action.

13. Contractor (Testing and Inspection Agency) shall be responsible to submit a detailed comprehensive list of all required tests and inspections required for the entire project. The A/E Team shall review the list of approval, prior to any construction work starts. The Construction Manager will assist the Contractor (Testing and Inspection Agency) in identifying scheduled times for all tests and inspections and coordinate between the Contractors and the Testing and Inspection Agency Contractor.

B. SCHEDULE

1. The successful completion of this project requires a clear understanding of a very demanding schedule that at times dictates large crew sizes and high equipment and material demands. All costs necessary to meet the requirements of this schedule are to be included in the Base Bid. Close coordination and willingness to cooperate and be flexible will also be necessary. The lowest responsible bidder must demonstrate the capacity to handle and comply with these requirements.

2. The schedule is an indication of <u>SOME</u> of the major work items and allowed durations, this is <u>NOT</u> a complete list of all work included in the scope of work. It is provided to show which major items may be required concurrently with other areas of work. The sequence of the work is indicated in the schedule included in Project Manual, reference Section 01 11 00. Additional schedules will be issued as the project progresses. The completion schedules indicated are fixed and the sequence of the work may be adjusted to meet these requirements.

3. NOTE: The Site Contractor shall be responsible to comply with Section 01 74 19 – Construction LEED Waste Management and Disposal, with the exception that the Site Contractor shall submit their LEED Waste Management Plan to the General Trades Contractor to be incorporated into the Master LEED Waste Management Plan being provided by the General Trades Contractor, who will be ultimately responsible for the LEED Waste Management Plan to be submitted to the Architect for approval. The General Trades Contractor will the contractor who will be responsible for compiling and reporting all information under Section 01 74 19.

C. SUBCONTRACTORS AND PROPOSED SCOPE OF WORK

The Contractor shall identify the Names of All Subcontractors and their proposed Scope of Work in which the Prime Contractor will hire to perform work under this Bid Package as part of the Prime Contractor's Bid Proposal. No Substitutions will be permitted after Bids have been submitted, without the approval of the Construction Manager, Architect and Owner.

*NOTE: Should the Prime Contractor propose to perform ALL work under this bid package by his/her own workforce, the Prime Contractor shall write on the line after the words (Subcontractor Name) on the Bid Form "NO SUBCONTRACTORS". ***Reference Section 00 41 16 - BID FORM**

D. MATERIAL/EQUIPMENT SUPPLIERS

The Contractor shall identify the Manufacturers/Suppliers in which their proposal is based on for the following Major Equipment and Systems, ***Reference Section 00 41 16 - BID FORM** to include the names and information.

E. UNIT PRICES

Provide Unit Prices to furnish and install the following items as listed below, including all necessary components for a complete installation whether or not identified in the description. The Unit Price shall represent the (Add and Deduct) price to be used to adjust the Contract Amount; (Reference: Section 01 22 00 - Unit Prices).

COMPLETE THE ATTACHED - BP-103 TESTING & INSPECTION BID FORM

Contractor shall base the UNIT PRICES on the following, unless otherwise specified.

SPECIAL INSPECTOR - Engineering Services
Scope shall include, but not be limited to, Engineering Services and final signoff on the Statement of Special Inspections. Provide stamped reports and services, including the necessary Inspections.

SOIL or ASPHALT – Density Tests
Fill Inspection (compaction) by nuclear method.
Scope shall include but not be limited to, all required gradation (sieve) analysis, proctor density test samples, #200 sieve wash, grain size distribution cure, ¾ inch correction, soils description and identification.

CONCRETE – Field / Plant Placement Inspections
Scope shall include, but not be limited to all slump, air, temperature, truck timing, unlimited # of cylinder fabrication, protection and pickup.

REINFORCING – Inspection of Reinforcing
Scope shall include, but not be limited to compliance with plans and specifications, verification of bar size, arrangement, concrete cover and the surface conditions of the reinforcing for conformance to the project specifications.

CONCRETE FLATNESS & LEVELNESS – Field Inspections
Scope shall include, but not be limited to, all field measurement and verification of floor flatness and levelness in accordance to ASTM E1155, (reference Section 03 30 00).

MASONRY – On-site Inspections of Masonry Products
Scope shall include, but not be limited to, verification of fabrication of mortar and grout cubes, including compression tests of mortar cubes, grout prisms, CMU block and brick, inspection of masonry reinforcing, inspection of proper weather protection.

SPRAY ON FIREPROOFING
Scope shall include, but not be limited to Inspection of SOFP for conformance with project specifications, ambient temperatures, substrate conditions, preparation of and material thickness, Adhesion and Cohesion Tests, and Density Tests required per the contract documents.

STRUCTURAL STEEL
Scope shall include, but not limited to visual field and/or shop inspections for shear studs, non destructive field and/or shop inspections of structural members using UT, MP or liquid dye penetrant methods as per the contract documents, and including the cost for the actual ultrasonic, magnetic particle or liquid dye penetrant tests.

TESTING FOR INDOOR AIR QUALITY
Scope shall include, but not be limited to provide services to verify the performance of each HVAC system including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources. Provide a report indicating results of IAQ Testing and documentation showing conformance with the IAQ testing procedures and requirements, (reference Section 01 45 23.13).

UNIT PRICES – TERMS AND CONDITIONS

The Unit Prices shall comply with the following terms and conditions.

All services shall be provided by a competent, qualified and experienced inspector or technician. Prices will be good for the duration of the project. All Half days shall be considered a minimum 4 hours on-site, ending before 12:00 Noon or starting after 1:00pm. All Full Day is defined as an eight (8) hour day. Partial Day is defined as a four (4) hour day, plus the hourly rate not exceeding the cost of eight (8) hour day rate. Note: Days less than eight hours shall be calculated as half day four (4) hours, plus the hourly rate for every hour after. All rates shall include travel time, fuel and vehicle expenses time to and from the job site. All costs shall include pickup charges for test samples unless a special request is requested by the Construction Manager

F. ALLOWANCES - NOT USED

END OF BID PACKAGE

GLASTONBURY-EAST HARTFORD ELEMENTARY MAGNET SCHOOL

BID PACKAGE - 103 TESTING AND INSPECTION

BID BREAKDOWN FORM

NOTE: The Unit Prices shall be in compliance with the following terms and conditions.

All services shall be provided by a competent, qualified and experienced inspector or technicians.
Prices will be good for the durations of the project.
All Half days shall be considered a minimum 4hrs on-site, ending before 12:00 Noon or starting after 1:00pm.
All Full Day is defined as an eight (8) hour day.
Partial Day is defined as a four (4) hour day, plus the hourly rate not exceeding the cost of and eight (8) hour day rate.
Note: Days less than eight hours shall be calculated as half day four (4) hours, plus the hourly rate for every hour after.
All rates shall include travel time, fuel and vehicle expenses time to and from the job site.
All costs shall include pickup charges for test samples unless a special request is requested by the Construction Manager..

SOILS or ASPHALT	**½ Day Rate**	**Full Day Rate**
Fill inspection field density (compaction) by Nuclear method.		
Additional soil density tests will be charge at:		

Lab Tests:	**Each**
Gradation (sieve) analysis per sample	
Proctor density test Sample	
#200 sieve wash	
Grain size distribution cure	
3/4 inch correction	
Soils description & Identification	

CONCRETE	**½ Day Rate**	**Full Day Rate**
Field / Plant placement inspection including slump, air, temperature, truck timing (unlimited # of cylinder fabrication and pickup)		
Inspection of formwork geometry		
Inspect of curing and protection procedures		

REINFORCING	**½ Day Rate**	**Full Day Rate**
Inspection of reinforcing including; bar size, arrangement, concrete cover and the surface conditions of the reinforcing for conformance to the project specifications.		

Lab Tests:	**Each**
Curing and compression testing of cylinders	

CONCRETE - FLOOR FLATNESS & LEVELNESS	**½ Day Rate**	**Full Day Rate**
Verification of ASTM E1155		

SPRAY ON FIREPROOFING	**½ Day Rate**	**Full Day Rate**
Inspection of SOFP for conformance with project specifications including ambient temperatures, substrate conditions - preparation and material thickness		

Lab Tests:	**Each**	
Adhesion / Cohesion Tests		
Density Tests		

BID PACKAGE - 103 TESTING AND INSPECTION

BID FORM

MASONRY	½ Day Rate	Full Day Rate
On-site inspections of masonry procedures, including; fabrication of mortar and grout cubes.		
Inspection of masonry reinforcing		
Inspection of proper weather protection		

Lab Tests: Compression Tests of:	Each
Mortar cubes	
Grout prisms	
CMU block	

STRUCTURAL STEEL	½ Day Rate	Full Day Rate
Visual field/shop inspection of open web joists, bolted connections, welding and metal deck.		

	½ Day Rate	Full Day Rate
Certified Steel Inspector for shear stud, non destructive field or shop inspection of structural members using UT, MP or liquid dye penetrate methods.		

Tests:	Each
Ultrasonic, magnetic particle or liquid dye penetrate tests.	

MULTI-DISCIPLINE INSPECTIONS (Excluding Structural Steel)	½ Day Rate	Full Day Rate
Including Soils, Concrete, Rebar, Masonry, Fireproofing *This Unit Price applies when two or more functions are performed in a day. Single Rates apply when only one function is performed.		

TESTING FOR IAQ (Indoor Air Quality)	Lump Sum
Provide Testing and Inspection Agency services as outlined under Section 01 45 23.13 to verify conformance with IAQ Testing Procedures and Requirements and submit Report.	

ENGINEERING / SPECIAL INSPECTIONS	Hourly Rate
Engineering Services for PE signoff of all Statement of Special Inspections, including providing but not limited to monthly reports, etc.	

FIELD INSPECTOR - HOURLY RATES	Hourly Rate
Hourly Rate, after first 4 Hours.	
Overtime Hourly Rate, equals (1 1/2) times the hourly rate (Overtime, include over normal first eight (8) Hours, and Saturdays or Sundays)	

BID PACKAGE - SPECIAL INSTRUCTIONS

Part of Bid Package (BP-111 General Trades)
EAST HARTFORD / GLASTONBURY ELEMENTARY MAGNET SCHOOL

IMMERSIVE THEATER
SUBCONTRACTOR BIDDER NAME: _____

IMMERSIVE THEATER BID BREAKDOWN

The Amounts provided in the breakdown below are to be the Actual Amount in which the General Trades Contractor will issue a (purchase order or contract) to the supplier or subcontractor.

The following shall include all labor, material, equipment, and supervision, startup, commissioning and training as required per the contract documents.

1. **Provide 40ft Tilt Inner Dome with Cove light pan.**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

2. **Provide 50ft Horizontal Outer Dome.**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

3. **Theater Control System, controlling all sub-systems in the theater.**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

4. **Surround Audio System**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

5. **Media Production Suite, digital production workstation with hardware and software for complete show production, (note: 120v power by Electrical Contractor as part of BP-117 – Electrical).**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

BID PACKAGE - SPECIAL INSTRUCTIONS

IMMERSIVE THEATER BID BREAKDOWN

The Amounts provided in the breakdown below are to be the Actual Amount in which the General Trades Contractor will issue a (purchase order or contract) to the supplier or subcontractor.

6. **Media Production Suite/Auxiliary Equipment, used for audio and video production but not part of the production workstation, (note: 120v power by Electrical Contractor as part of BP-117 – Electrical).**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

7. **Full-Color LED Cove Lighting System, including fixtures, equipment and low voltage wire and terminations, (note: 120v power by Electrical Contractor as part of BP-117 – Electrical).**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

8. **Ellipsoid Public Address Spot Lights for speaker presentation, including equipment and low voltage wire and terminations, (note: 120v power by Electrical Contractor as part of BP-117 – Electrical).**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

9. **Instructional Package Video Projection System required for classroom applications, including fixtures, equipment and low voltage wire, floor boxes and terminations, (note: 120v power by Electrical Contractor as part of BP-117 – Electrical).**

   Material Cost: _____ Supplier/Contractor _____

   Labor Cost: _____ Supplier/Contractor _____

10. **Theater Control Console by Architectural Millwork / Casework Contractor part of Bid Package BP-108.**

IMMERSIVE THEATER TOTAL BID AMOUNT: $_____

PROJECT SUBMITTAL No.	SUBMITTAL COVER	MUST indicate if this is a LEED Submittal
SUBMITTED DATE:	Page 1 of 2	LEED SUBMITTAL: YES or NO (Circle One)
RETURN BY DATE:		

GLASTONBURY-EAST HARTFORD ELEMENTARY MAGNET SCHOOL
95 OAK STREET, GLASTONBURY, CT 06033

Architect: Fletcher - Thompson, Inc.
Address: Three Corporate Drive, Shelton, CT 06484-6244
Phone: (203) 225-6500 **Fax:** (203) 225-6800

Construction Manager: Industrial Construction Co., Inc.
Job Site Address: 95 Oak Street, Glastonbury, CT 06033
Phone: (860) 652-9936 **Fax:** (860) 652-9968

Contractor SUBMITTAL No.: _____
Contractor: _____
Contact Name: _____
Address: _____
Phone/Fax: _____
Email Address: _____

Subcontractor SUBMITTAL No.: _____
Subcontractor: _____
Contact Name: _____
Address: _____
Phone/Fax: _____
Email Address: _____

SUBMISSION for: ☐ **APPROVAL** ☐ **INFORMATION ONLY** ☐ **CLOSEOUT RECORDS**

SUBMITTAL TYPE

☐ **Product Data**	☐ **Test Report**	☐ **Warranty / Guarantee**
☐ **Shop Drawing**	☐ **Sample**	☐ **Closeout Document**
☐ **Certification**	☐ **Color Selection**	☐ **OTHER** _____

SPECIFICATION INFORMATION

Spec. Section No: _____ **Part / Para No.:** _____ **Total Number of Pages** _____

Dwg. No.: _____ **Detail Ref:** _____ **Estimated INSTALLATION DATE:** _____

Submittal Description: _____ **Product / Equipment REQUIRED LEAD TIME** _____

Manufacturer Name: _____ (Check One) ☐ **Basis-of-Design** ☐ **or Equal**

SUBCONTRACTOR

By submission of this submittal, the Undersigned hereby certifies that review, verification of Product required, field dimensions, adjacent construction work and coordination of information has been completed and is in accordance with the requirements of the Work and the Contract Documents.

COMMENTS: _____

SUBCONTRACTOR: _____ (Signature) _____ (PRINT Name)

CONTRACTOR

By submission of this submittal, the Undersigned hereby certifies that review, verification of Product required, field dimensions, adjacent construction work and coordination of information has been completed and is in accordance with the requirements of the Work and the Contract Documents.

COMMENTS: _____

CONTRACTOR: _____ (Signature) _____ (PRINT Name)

CONSTRUCTION MANAGER

Construction Manager hereby certifies to the best of their knowledge that attached submittal is in accordance with the requirements of the Contract Documents, unless otherwise noted.

COMMENTS: _____

CONSTRUCTION MANAGER: _____ (Signature) _____ (PRINT Name)

PROJECT SUBMITTAL No.	SUBMITTAL COVER	MUST indicate if this is a LEED Submittal
SUBMITTED DATE:	Page 2 of 2	LEED SUBMITTAL: YES or NO (Circle One)
RETURN BY DATE:		

GLASTONBURY-EAST HARTFORD ELEMENTARY MAGNET SCHOOL

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Construction Manager: Industrial Construction Co., Inc.
Job Site Address: 95 Oak Street, Glastonbury, CT 06033
Phone: (860) 652-9936 **Fax:** (860) 652-9968

ARCHITECT / ENGINEER REVIEW

COMMENTS: _____

_____

_____

_____

CONTRACTOR
EAST HARTFORD-GLASTONBURY EMS PHASE 2

PROJECT TITLE _____

SPEC. SECTION NO.: _____

Approved for conformance to contract requirements:

DATE:_____ **BY:**_____

FLETCHER-THOMPSON INC. **ARCHITECTS-ENGINEERS**
FT PROJECT NO.: **H090230** **DATE RECEIVED:**

COMMENTS MADE ON THE SUBMITTALS DURING THIS REVIEW DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH REQUIREMENTS OF THE CONTRACT DOCUMENTS.

THE CONTRACTOR SHALL DIRECT SPECIFIC ATTENTION ON ALL SUBMITTALS, IN WRITING AND/OR GRAPHIC FORM, TO DEVIATIONS FROM THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, OR, ON RESUBMITTALS, TO ANY DEVIATIONS OTHER THAN THOSE REQUESTED BY THE ARCHITECT ON PREVIOUS SUBMITTALS.

THIS REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS; SELECTING FABRICATION PROCESSES; TECHNIQUES OF CONSTRUCTION; COORDINATING THE WORK WITH THAT OF ALL OTHER TRADES; AND PERFORMING THE WORK IN A SAFE AND SATISFACTORY MANNER.

REFER TO SPECIFICATION SECTION 01 33 00

SUBMITTAL NO.: _____ **REFERRED TO:** _____

☐ **APPROVED** ☐ **REVISE AND RESUBMIT**

☐ **REJECTED** ☐ **FURNISH AS CORRECTED**

DATE:_____ **BY:**_____

MATERIALS DOCUMENTATION SUBMITTAL COVER SHEET
USGBC LEED BD+C v.3.0 RATING SYSTEM

Instructions to Contractor/Installer: For each material, please complete the following information in all applicable categories. Use additional submittal sheets as needed. Attach cut sheets, letters from manufacturers, and/or other supporting information and submit for review. **Limit to one product per cover sheet.**

Project Number: _____ Project Name: _____

Specification No.: _____ Company Submitting Information: _____

Signed by (print): _____ Signature: _____ Date: _____

LEED Materials Credits (Divisions 02 – 10)

Please list the material cost charged to the client excluding any equipment rental or installation.

Product / Material	Manufacturer/Vendor	Material Cost

LEED MR c3: Materials Reuse (Divisions 02 - 10)

Has the material/product been salvaged, refurbished or reused?

Material	Origin of material	Salvaged, Refurbished, or Reused?

❑ *I confirm that appropriate backup documentation has been provided*

LEED MR c4: Recycled Content (Divisions 02 – 10)

Does the material/product contain post-consumer or post-industrial content? Yes / No

Product / Material	Percent post-industrial	Percent post-consumer

If only select components of a product contain recycled content, see LEED NC v.3.0 Reference Guide for instructions to calculate total product recycled content (based on relative material weights).

❑ *I confirm that appropriate backup documentation has been provided.*

LEED MR c5: Regional Materials (Divisions 02 – 10)

Were the raw materials extracted/harvested and the final product manufactured within 500 miles?

Product / Material	Location of harvest	Distance (mi)	Location of manufacture	Distance (mi)

Use http://indo.com/distance/ to confirm linear distance (as-a-crow flies) from site.

❑ *I confirm that appropriate backup documentation has been provided.*

LEED MR c6: Rapidly Renewable Materials (Divisions 02 – 10)

Does the product/material contain rapidly renewable materials?

Raw Materials	% of Rapidly Renewable	Cost

❑ *I confirm that appropriate backup documentation has been provided.*

LEED MR c7: Certified Wood (Divisions 02 – 10)

Does the material/product contain Forest Stewardship Council (FSC) certified wood?

Component	% of Material	Chain-of-Custody Certificate #:	Cost

❑ *I confirm that appropriate backup documentation has been provided.*

LEED EQ c4.1: Low-Emitting Materials, Adhesives and Sealants (Anywhere w/in moisture barrier)

Do the adhesives and sealants comply with the LEED NC v.3.0 VOC limits?

Product Name	Manufacturer	VOC Content (grams / liter)

❑ *I confirm that appropriate backup documentation has been provided.*

LEED EQ c4.2: Low-Emitting Materials, Paints and Coatings (Anywhere w/in moisture barrier)

Do the paints and coatings comply with the LEED NC v.3.0 VOC limits?

Product Name	Manufacturer	VOC Content (grams / liter)

❑ *I confirm that appropriate backup documentation has been provided.*

LEED EQ c4.3: Low-Emitting Materials, Flooring Systems

Does the carpet meet the Carpet and Rug Institute's Green Label Plus IAQ testing requirements?

Does the cushion meet the Green Label IAQ testing requirements?

Does the carpet adhesive meet the requirements of EQ Credit 4.1?

Is the hard surface flooring (vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring and wall base) certified as compliant with the FloorScore standard?

Does the sealer, stain and finish for concrete, wood, bamboo and cork flooring meet the requirements of SCAQMD Rule 1113?

Do the tile setting adhesives and grout meet SCAQMD Rule 1168?

Product Name	Manufacturer

❑ *I confirm that appropriate backup documentation has been provided.*

LEED EQ c4.4: Low-Emitting Materials, Composite Wood and Agrifiber Products

Does the material/product contain any added urea-formaldehyde resins?

Product/Manufacturer	Yes or No?

❑ *I confirm that appropriate backup documentation has been provided.*

LEED EQ c4.5: Low-Emitting Materials, Furniture and Furnishings - LEED for Schools ONLY

Is the furniture and seating GREENGUARD Children and Schools certified?

Product/Manufacturer	Yes or No?

❑ *I confirm that appropriate backup documentation has been provided.*

LEED EQ c4.6: Low-Emitting Materials, Ceiling and Wall Systems - LEED for Schools ONLY

Does all gypsum board, insulation, acoustical ceiling systems and wall coverings installed in building interior meet the testing and product requirements of California Dept of Health Services Standard Practice for the Testing of Volatile Organic Emissions for Various Sources Using Small-Scale Environmental Chambers?

Product/Manufacturer	Yes or No?

❑ *I confirm that appropriate backup documentation has been provided.*

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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 SECTION INCLUDES

A. Administrative and procedural requirements for the following:

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

1.3 RELATED REQUIREMENTS

A. Section 01 12 00 - Multiple Contract Summary: Coordination of responsibilities for waste management.

B. Section 02 41 19 - Selective Structure Demolition: Disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

C. Section 04 22 00 - Concrete Unit Masonry: Disposal requirements for masonry waste.

D. Section 04 43 00 - Stone Masonry: Disposal requirements for excess stone and stone waste.

E. Section 31 10 00 - Site Preparation: Disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.4 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. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. 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.

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

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

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.5 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-project rates for salvage/recycling of at least 95 percent 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. Demolition Waste:

a. Asphalt paving.
b. Concrete.
c. Concrete reinforcing steel.
d. Concrete masonry units.

2. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Carpet and pad.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated in "General" paragraph above, salvage or recycle 100 percent 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.

1.6 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Waste Management Plan: Submit plan within seven (7) days of date established for commencement of the Work.

1.7 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use forms acceptable to the Architect. 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.

C. 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.

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

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

F. 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.

G. 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.

H. Qualification Data: For waste management coordinator.

1.8 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-Accredited Professional, certified by the GBCI, as waste management coordinator. Waste management coordinator may also serve as LEED coordinator.

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

C. Waste Management Conference: Conduct conference at project site to comply with requirements in Section 01 31 00. 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.

1.9 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E1609 and requirements in this section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. 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 demolition, site-clearing and construction waste generated by the Work. Use forms acceptable to Architect. 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 forms acceptable to the Architect. 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 where materials separation will be performed.

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 forms acceptable to the Architect. 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 Used)

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.

1. Comply with operation, termination, and removal requirements in Section 01 50 00.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

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

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.
2. Comply with Section 01 50 00 for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on project site.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.

C. 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.

D. 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 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 from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

3.5 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. 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.

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

3.6 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: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary of Work.”

1.2 SECTION INCLUDES

A. Commissioning scope.

B. Systems to be commissioned.

C. Responsibilities.

D. Commissioning team.

E. Pre-functional and functional check lists.

1.3 RELATED SECTIONS

A. Division 01 - General Requirements

B. Division 22 - Plumbing

C. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC)

D. Division 26 - Electrical

1.4 SCOPE

A. The work under this Section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and Division 01 - General Requirements.

1.5 SUMMARY

A. This project shall be registered with the Green Building Certification Institute (GBCI) and the goal is to obtain LEED™ Silver level certification. All requirements of the LEED 2009 Building Design + Construction for Schools Green Building Rating System are required to be met during construction. Contractor is responsible to provide all required documents as per request of Architect, LEED Project Administrator, and Commissioning Agent.

1.6 DESCRIPTION OF WORK

A. The objective of commissioning is to provide documented confirmation that a facility fulfills the functional and performance requirements of the building owner, occupants, and operators. To reach this goal, it is necessary for the commissioning process to establish and review the owner's criteria for system function, performance, and maintainability (Design Intent); and to also verify and document compliance with these criteria at start-up, and the initial period of operation. In addition, complete operation and maintenance (O&M) manuals, as well as training on system operation, shall be provided to the building operators to ensure the building continues to operate as intended.

B. The CA shall be involved throughout the warranty phase. The warranty phase shall be the post occupancy portion of the commissioning which includes any remaining commissioning as well as any follow up visits to verify proper operation of the system. During construction the CA develops and coordinates the execution of a testing plan, which includes observing and documenting all systems' performance to ensure that the systems are functioning in accordance with the owner's Design Intent (DI) requirements and the contract documents. The CA is not responsible for design or general construction scheduling, cost estimating, or construction management, but may assist with problem-solving or resolving non-conformance issues or deficiencies. The installing Contractors, TAB Sub and ATC Sub shall be required to provide support of the commissioning under their base Contracts.

C. The following is a summary of services provided for commissioning:
1. Reviews at pre-50% and 90% CD
2. Develop commissioning plan
3. Develop pre-functional and functional test procedures
4. On-site reviews to confirm that systems are ready for commissioning
5. Witness piping and ductwork tests
6. Review system start-up reports
7. Maintain master deficiency and resolution log
8. Create contractor checklists
9. Create functional test sheets
10. Witness, perform or have demonstrated functional testing
11. Ensure O&M and commissioning documentation requirements are complete.
12. Coordinate Owner staff training
13. Final report and presentation to Owner
14. Systems Manual
15. Follow up visits after occupancy to review building operations

D. Commissioning does not reduce responsibility of installing contractors to provide a finished and fully functioning product.

E. This section shall in no way diminish the responsibility of the Divisions 22, 23 and 26 Contractors, Sub-contractors and Suppliers in performing all aspects of work and testing as outlined in the Contract Documents. Any requirements outlined in this section are in addition to requirements outlined in Division 22, 23 and 26 Specifications.

1.7 ABBREVIATIONS

A. The following are common abbreviations used in the Specifications. Definitions are found further in this Section.
   1. A/E - Architect and Design Engineers
   2. ATC - Automatic Temperature Controls
   3. BAS - Building Automation System
   4. CA - Commissioning Agent
   5. CM - Construction Manager
   6. CT - Commissioning Team
   7. Cx - Commissioning
   8. Cx Plan - Commissioning Plan
   9. CC - Controls Contractor
   10. EC - Electrical Contractor
   11. FPT - Functional Performance Test
   12. MC - Mechanical Contractor
   13. OR - Owner's Representative
   14. PC - Pre-functional Checklist
   15. TAB - Test, Adjust and Balance
   16. O&M - Operations & Maintenance
   17. RFI - Request for Information

B. The following Standards shall be used where referenced by the following abbreviations:
   1. AABC Associated Air Balance Council
   2. ACGIH American Conference of Governmental Industrial Hygienists
   3. ADC Air Diffusion Council
   4. AGA American Gas Association
   5. AIA American Institute of Architects
   6. AMCA Air Moving and Conditioning Association
   7. ANSI American National Standards Institute
   8. API American Petroleum Institute
   9. ARI Air Conditioning and Refrigeration Institute
   10. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
   11. ASME American Society of Mechanical Engineers
   12. ASPE American Society of Plumbing Engineers
   13. ASSE American Society of Sanitary Engineers
   14. ASTM ASTM International
   15. NIST National Institute of Standards and Technology
   16. SBI Steel Boiler Industry (Division of Hydronics Institute)
   17. SMACNA Sheet Metal and Air Conditioning Contractors National Association
   18. UL Underwriters' Laboratories

1.8 DEFINITIONS

A. Acceptance Phase: Phase of construction after start-up and initial checkout when Functional Performance Tests, O&M documentation review and training occur.

B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in tested modes according to the Contract Documents.

C. Architect/Engineer (A/E): Prime consultant (architect) and subconsultants who comprise the design team, generally HVAC Mechanical Designer/Engineer and Electrical Designer/Engineer.

D. Basis of Design: Documentation of primary thought processes and assumptions behind design decisions made to meet design intent. Describes systems, components, conditions and methods chosen to meet intent.

E. Commissioning Agent (CA): Contracted to Owner. CA directs and coordinates day-to-day commissioning activities. CA reports directly to Owner.

F. Commissioning Plan: Overall plan developed after bidding that provides structure, schedule and coordination planning for commissioning process.

G. Construction Manager (CM): The prime contractor for this project. Generally refers to the CM's subcontractors as well. Also referred to as the Contractor in some contexts. The CM is hired by the Owner and is authorized to overseen fulfillment of all requirements of the Contract Documents.

H. Contract Documents: Documents binding on parties involved in construction of this project (drawings, specifications, change orders, amendments, contracts, etc.).

I. Control System: System and components associated with building automation system.

J. Deferred Functional Tests: Functional tests performed after substantial completion due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow test from being performed.

K. Deficiency: Condition of a component, piece of equipment or system that is not in compliance with Contract Documents (that is, does not perform properly or is not complying with design intent).

L. Functional Performance Test Procedures: Commissioning protocols and detailed test procedures and instructions that fully describe system configuration and steps required to determine if the system is performing and functioning properly. These procedures shall be used to document Functional Performance Tests.

M. Functional Performance Test (FPT): Test of dynamic function and operation of equipment and systems. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, life safety conditions, power failure, etc. Systems are run through all specified sequences of operation. Components are verified to be responding in accordance with Contract Documents. Functional Performance Tests are executed after pre-functional checklists and start-ups are complete.

N. Monitoring: Recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or trending capabilities of control systems.

O. Overidden Value: Writing over a sensor value in control system to see response of a system (e.g., changing outside air temperature value from 72˚ F to 52˚ F to verify economizer operation). See also "Simulated Signal".

P. Pre-Functional Checklist (PC): A list of static inspections and elementary component tests that verify proper installation of equipment (e.g., belt tension, oil levels, labels affixed, gauges in place, sensors calibrated, etc.).

Q. Seasonal Performance Tests: Functional Performance Tests deferred until system(s) ambient conditions are closer to design conditions.

R. Simulated Condition: Condition created for testing component or system (e.g., applying heat to space temperature sensor to monitor response of VAV box).

S. Simulated Signal: Disconnecting sensor and using signal generator to send amperage, resistance or pressure transducer and/or DDC system to simulate value to BAS.

T. Specifications: Construction specifications of Contract Documents.

U. Start-up: The activities where systems or equipment are initially tested and operated. Start-up is completed prior to functional testing.

V. Sub-contractor: Contractors of CM, and their sub-contractors, who provide and install building components and systems.

W. Test Procedures: Step-by-step process, which must be executed to fulfill test requirements.

X. Test Requirements: Requirements specifying what modes and functions will be tested. Test requirements are not detailed test procedures and are identified in the Cx Plan.

Y. Trending: Monitoring using building control system.

Z. Vendor: Supplier of equipment.

AA. Warranty Period: Warranty period for entire project, including equipment components.

1.9 COORDINATION

A. Commissioning Team: Members of Commissioning Team (CT) will consist of:
   1. Commissioning Agent (CA)
   2. Owner's Representative(s) (OR)
   3. Construction Manager (CM)
   4. Architect and Design Engineers (A/E)

5. Mechanical Contractor (MC)
6. Electrical Contractor (EC)
7. Test and Balance Agency (TAB Agency)
8. Controls Contractor (CC)
9. Equipment Suppliers and Vendors

B. Management: Owner will contract services of the CA. The CA directs and coordinates commissioning activities and reports to OR. All members of the Commissioning Team shall cooperate to fulfill responsibilities and objectives of the Contract Documents.

C. Kick-off Meeting: Within 60 days of commencement of construction, CA will plan, schedule and conduct a commissioning kick-off meeting. Membership and responsibilities of the commissioning team will be clarified at this meeting. CA will distribute meeting minutes to all parties.

D. Scheduling:
1. A/E will work with commissioning team to establish required commissioning activities to incorporate in preliminary commissioning schedule. The CM will integrate commissioning activities into master construction schedule. Representatives of the commissioning team will address scheduling problems. Necessary notifications are to be made in a timely manner in order to expedite commissioning.
2. The CA will provide initial schedule of primary commissioning events at commissioning kick-off meeting. As construction progresses, more detailed schedules are developed by the commissioning team.

1.10 SUBMITTALS

A. Contractor shall provide CA with documentation required for commissioning work. At minimum, documentation shall include: Full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details, start-up reports. In addition, installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms used by factory or field technicians shall be submitted to CA.

B. CA shall review submittals for conformance as it relates to commissioning. Review is primarily intended to aid in development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The CA shall not be part of the A/E's submittal approval process.

1.11 START-UP PLAN

A. Sub-contractor responsible for purchase, installation and start-up of equipment develops and submits start-up plan by combining manufacturer's detailed start-up and checkout procedures with normally used field checkout sheets. Plan shall include checklists and procedures with specific boxes or lines for recording and documenting inspections of each piece of equipment.

B. A/E reviews submitted start-up plane for content and format. Primary role of A/E is to substantiate written documentation for each manufacturer-recommended procedure.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division contractors shall provide all specialized tools, test equipment and instruments required to execute start-up, checkout and functional performance testing of equipment under their contract.

B. Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance with tolerances specified. A testing laboratory shall have calibrated test equipment within the previous 12 months. Calibration shall be NIST traceable. Equipment shall be calibrated according to manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COMMISSIONING OVERVIEW

A. The following provides a brief overview of typical commissioning tasks during construction and general order in which they occur:

1. Commissioning during construction begins with a kick-off meeting conducted by CA where membership of commissioning team is established and responsibilities reviewed. A preliminary commissioning plan is distributed for review.
2. CA schedules subsequent meetings as necessary to plan, coordinate and schedule commissioning activities. Deficiencies and problem resolution will also be discussed at these meetings.
3. Sub-contractors develop and submit detailed start-up plans to Cx team.
4. CM develops, with cooperation of Sub-contractor/vendor, detailed training plan. Training plan is reviewed and approved by commissioning team.
5. CA develops specific pre-functional checklists and equipment and system Functional Performance Test procedures. Commissioning team members review procedures.
6. Sub-contractors inform CA when the pre-functional items are complete by phase. The CA executes and documents pre-functional checklists in phases such as setting equipment, piping equipment, insulating it, making up electrical connections, etc. The purpose is to execute the process as the work is being completed.
7. The Sub-contractors perform start-up and initial checkout. CA collects documentation completed according to approved plans. CA will witness start-up of selected equipment.
8. Functional Performance Tests are executed by Sub-contractors, under supervision of and documented by CA.

9. Items of non-compliance in material, installation or set-up will be corrected at Sub-contractor expense and system shall be retested.
10. CM coordinates training sessions and executes training plan. Specific training to be provided as specified in Divisions 1, 15 and 16, by Sub-contractor/vendor.

3.2 SYSTEMS TO BE COMMISSIONED

A. HVAC systems

B. All HVAC controls (BMS)

C. Lighting controls and daylighting controls including occupancy sensors and dimming controls

D. Domestic hot water systems including water heaters and hot water recirculation systems

E. Emergency Generator and Automatic Transfer Switch

F. Measure of building pressurization at all exterior doors

G. Measurement of Sound Levels at Property Lines

3.3 RESPONSIBILITIES

A. Responsibilities of commissioning team members are:
1. Architect/Engineer (A/E):
a. Document design intent of systems
b. Witnesses first run of primary equipment as necessary
c. Review test documentation
d. Review functional performance trend log data
e. Review training plan
f. Review O&Ms and record documents
g. Attend commissioning kick-off meeting
2. Commissioning Agent (CA):
a. Develop commissioning specifications
b. Identify commissioning activities for inclusion into the project schedule by the CM.
c. Develop detailed project specific pre-functional performance tests and Functional Performance Test procedures.
d. Provide progress reports of commissioning status.
e. Execute pre-functional checklists.
f. Witness FPTs. Document test results and recommend system for acceptance.
g. Review, track and coordinate resolution of non-compliance and deficiencies identified by commissioning team. Maintain records of all issues submitted by commissioning team.
h. Review completed TAB reports.
i. Review training plan developed by CM.
j. Review O&M Manuals for compliance

k. Monitor completion and accuracy of project closeout documents and training.
l. Provide final commissioning report, summarizing final disposition of building systems after functional testing.
m. Facilitate cooperation of CT in commissioning work.
n. Attend and conduct commissioning team meetings.
o. Witness seasonal or deferred testing and modify or update commissioning report as required.
p. Participate in a warranty review of system/equipment performance.

3. Construction Manager (CM):
   a. Incorporate commissioning activities into the construction schedule.
   b. Periodically update commissioning activities in the construction schedule.
   c. Develop, with cooperation of A/E and Sub-contractor/vendor, detailed training plan.
   d. CM coordinates training sessions and executes training plan through his sub-contractors.
   e. Facilitate cooperation of Sub-contractors in commissioning work.
   f. Submit copies of approved submittals, with manufacturer start-up criteria, contractor start-up checklists and operating and maintenance criteria to CA.
   g. Verify equipment and systems are ready for execution of pre-functional checklists by the CA. Assures CA at each phase of installation equipment and systems are ready.
   h. Insures resolution of non-compliance and deficiencies of construction related items identified by commissioning team. Obtains written documentation of completion from the appropriate Sub-contractors.
   i. Coordinate Sub-contractor/vendor participation in training sessions. Provide workspace or conference room as needed. Ensure attendance at training is documented.
   j. Schedule, coordinate and assist CT in seasonal or deferred testing.
   k. Participate in warranty review of system/equipment performance.

4. Sub-contractors/Vendors:
   a. Review commissioning plan, pre-functional checklists, and FPT procedures.
   b. Ensure installation work is complete, is in compliance with Contract Documents and is ready for Functional Performance Testing.
   c. Develop and submit detailed equipment start-up procedures to CT. Procedures shall include checklist to be completed by Sub-contractor/vendor.
   d. Notify CT that equipment and systems are ready for functional performance testing.
   e. Execute FPTs developed and provided by CA during the construction phase as described in Contract Documents and commissioning plan to be performed under direction of CA.

f. Provide certified and calibrated instrumentation required to take measurements of system and equipment performance during functional performance testing.
g. Assist CT with developing a comprehensive commissioning schedule.
h. Attend commissioning kick-off meeting and other commissioning team meetings.
i. Prepare training plans with CM and execute training as specified in Divisions 01, 23 and 26, of these specifications.
j. Execute seasonal or deferred functional performance testing as necessary.
k. Make necessary amendments to O&M manuals and as-built drawings for applicable issue identified in season/deferred testing.
l. Participate in a warranty review of system/equipment performance.

5. Controls Contractor (CC):
   a. Completely install and thoroughly inspect start-up, test, adjust, calibrate and document systems and equipment under Building Automation/Controls Contract.
   b. Provide laptop computer, software and training to accommodate TAB Contractor in system balancing.
   c. Install software on CA's laptop and provide training to CA for off-site trend logging and monitoring "BMS".
   d. Maintain database of control parameters submitted by TAB Contractor subsequent to field adjustments and measurements.
   e. Provide on-site technician skilled in software programming and hardware operation to exercise sequences of operation and to correct control deficiencies identified during functional performance testing.
   f. Provide instrumentation, computer, software and communication resources necessary to demonstrate total operation of building systems during functional performance testing of control system equipment.
   g. Attend commissioning kick-off meeting and other commissioning team meetings.
   h. Prepare training plans with CM and execute training as specified in Divisions 01, 23 and 26, of these specifications.
   i. Maintain comprehensive system calibration and checkout records. Submit records to CT.
   j. Set up trend logs as requested by CT to substantiate proper systems operation.
   k. Participate in a warranty review of system/equipment performance.
6. Test, Adjust and Balance (TAB) Agency:
   a. Attend commissioning kick-off meeting and other commissioning team meetings.
   b. Submit TAB plan and forms describing methodology for execution of test and balance procedures specific to this project to CT for review.
   c. Cooperate with CC with execution of required work.

d. Rebalance deficient areas identified during commissioning.
e. Provide on-site technician, as necessary, skilled in TAB procedures to provide verification of equipment and system performance and TAB reading during functional performance testing.
f. Participate in a warranty review of system/equipment performance.

3.4 COMMISSIONING TEAM (CT) MEETINGS

A. CT meetings will be held periodically as determined by CA with frequency increasing as construction advances and systems become operational. Attendance is mandatory. CA will record minutes and attendance. CA will chair CT meetings.

B. Discussions held in CT meetings shall include, but not be limited to system/equipment start-up, progress, scheduling, testing, documentation, deficiencies and problem resolution.

3.5 REPORTING

A. CA will provide regular status reports to CM and Owner, with increasing frequency as construction and commissioning progresses.

B. CA will regularly communicate with members of commissioning team, keeping them apprised of commissioning progress.

C. CA shall submit non-compliance and deficiency reports to Owner and CM.

D. CA shall provide a final summary report to Owner.

E. CA shall provide a Systems Manual

3.6 START-UP AND INITIAL CHECKOUT

A. Sub-contractor shall schedule equipment start-up with Commissioning Team. Sub-contractor shall execute equipment start-up.

B. CA reserves the right to witness any start-up or equipment testing.

C. Pre-functional checklists are provided and executed by CA. Prototypical examples of PFCs are included at the end of this specification section. Final copies of PFCs will be developed after issuance the Construction Documents and issued to the CT as part of the Commissioning Plan. CM and Sub-contractor shall review final construction documentation for applicable details and specifications related to equipment to be commissioned in order to fully ascertain all of the pre-functional checklist requirements.

3.7 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope:

1. The objective of Functional Performance Testing is to demonstrate each system is operating according to documented design intent and Contract Documents. Functional Performance Testing facilitates bringing system from a state of substantial completion to full dynamic operation. Additionally, during Functional Performance Testing, areas of deficient performance are identified and corrected, improving operation and functioning of systems.
2. Each system shall be operated through all modes of operation (occupied, unoccupied, warm-up, cool-down, etc.) where there is a specified system response. Verifying each sequence in the sequences of operation is required.

B. Development of Test Procedures:
1. The purpose of any given specific test is to verify and document compliance with stated criteria of acceptance given on test form. CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Sub-contractor responsible to execute test will provide assistance to CA in developing procedure (i.e., answering questions about equipment, operation, sequences, etc.) Prior to execution, CA shall provide a copy of test procedures to Sub-contractor. Sub-contractor will review tests for feasibility, safety and equipment warranty protection. CA shall submit tests to Owner, CM and A/E and other Commissioning Team members for review.
2. Test procedure forms developed by the CA will include (but not be limited to) the following information:
    a. System and equipment or component name(s)
    b. Equipment location and ID number
    c. Date
    d. Project name
    e. Specific sequence of operation or other specified parameters being verified
    f. Specific step-by-step procedures to execute test, in a clear, sequential and repeatable format
    g. A Yes/No checkbox to allow for clearly marking whether or not proper performance of each part of the test was achieved
    h. Section for comments
3. A prototypical example of Functional Performance Test Checklist has been included at the end of this specification section. Final copies of FPTs will be developed after issuance of the Construction Documents and issued to the CT as part of the Commissioning Plan. CM and Sub-contractors shall review final construction documentation for applicable details and specifications related to equipment to be commissioned in order to fully ascertain all FPT requirements.

C. Coordination and Scheduling:
1. CM will provide sufficient notice to CA regarding completion of schedule for equipment and systems. CM will schedule Functional Performance Test with CT. CA shall witness and document functional testing of

equipment and systems. Sub-contractor shall execute test under direction of CA.

2. Functional Performance Testing is conducted after system operation and checkout is satisfactorily completed. Air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems.

3.8 DOCUMENTATION, NON-COMFORMANCE AND APPROVAL OF TESTS

A. Documentation:

1. CA will witness and document results of FPT using specific Functional Performance Test developed for that purpose. Prior to testing, FPTs are provided to the Commissioning Team for review and approval. CA will include filled out FPTs in Commissioning Turnover Package.

B. Non-Conformance:

1. CA will record results of functional testing. Deficiency or non-conformance issues will be noted and reported to CM and Owner on standard non-compliance FPT form.
2. Corrections of minor deficiencies identified may be made during tests at discretion of CA. In such cases, deficiency and resolution will be documented on FPT form.
3. Every effort will be made to expedite testing and minimize unnecessary delays, while not comprising integrity of tests. CA shall not overlook deficient work or relax acceptance criteria to satisfy scheduling or cost issues unless directed to do by the Owner.
4. Deficiencies are handled in the following manner:
   a. When there is no dispute on deficiency and Sub-contractor accepts responsibility for remedial action:
      1) CA documents deficiency and Sub-contractors response and intentions and they go on to another test or sequence. CA submits deficiency report to CM and Owner. Copy is provided to Sub-contractor. Sub-contractor corrects deficiency, and verifies correction to CM. CM forwards response to CA.
      2) CM reschedules test with Sub-contractor.
   b. When there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
      1) CA documents deficiency and Contractors response and they go on to another test or sequence. CA submits deficiency report to CM and Owner. Copy is provided to Sub-contractor.
      2) CM facilitates resolution of deficiency. Other parties are brought into discussions as needed. Final interpretive authority is A/E. Final acceptance authority is with the Owner.
      3) CM documents resolution process.
      4) Once interpretation and resolution has been decided, appropriate party corrects deficiency, and verifies correction to CM. CM forwards response to CA. CM

reschedules test and test is repeated until satisfactory performance is achieved.

C. Cost of Retesting:
   1. Sub-contractor shall retest FPT, if they are responsible for deficiency at no additional cost.
   2. Time for CA to direct any retesting required because a specific pre-functional checklist or start-up test items reported to have been successfully completed, but determined during Functional Performance Testing to be faulty, may be backcharged to Sub-contractor.

D. Approval:
   1. CA notes each satisfactorily demonstrated function on test form. CA, A/E and Owner provide formal approval of FPT. CA recommends acceptance of each test to Owner.

3.9 COMMISSIONING DOCUMENTATION

A. Commissioning Turnover Package
   1. CA is responsible to compile and organize commissioning records. CA shall deliver Cx records to the Owner in Commissioning Binders. Turnover Package to include the following:
      a. Commissioning Plan
      b. Pre-functional Checklists
      c. Completed Functional Performance Test records
      d. Deficiency Reports
      e. Final Commissioning Report

B. Final Report Details
   1. Final Commissioning Report will include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and general description of testing and verification methods. Recommendations for improvement to equipment or operations, future actions, etc., will also be listed. Each non-compliance issue will be referenced to specific FPT where deficiency is documented.

3.10 TRAINING OF OWNER PERSONNEL

A. Sub-contractors will provide complete training in start-up, operation and maintenance of all equipment under contract.

B. CM and Sub-contractors will be responsible for developing Owner training plan, scheduling of Owner training, execution of Owner training and documentation of completed Owner training.

C. A/E will be responsible for approving content and adequacy of Owner training.

D. CA will be responsible for monitoring completion of Owner training.

E. Sub-contractor will submit a written training plan to A/E and CA for review and approval with submission of shop drawings. Plan will cover the following elements:
   1. Equipment (included in training)
   2. Intended audience
   3. Location of training
   4. Objectives
   5. Subjects covered
   6. Duration of training on each subject
   7. Instructor for each subject
   8. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
   9. Instructors and qualifications

F. CM and sub-contractors schedule training with CA and Owner. CA develops criteria to determine training satisfactorily completed.

G. CM shall provide videotaping of training sessions.

3.11 DEFFERRED TESTING

A. Deferred Seasonal Testing:
   1. During warranty period, seasonal testing (test delayed until weather conditions are closer to system's design) will be completed as part of this contract. CM will coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate sub-contractor(s), with CA witnessing. CA will incorporate final updates to Turnover Package as necessary.

B. Unforeseen Deferred Tests:
   1. Any check or test not completed due to building structure, required occupancy condition, or other deficiency, may be delayed upon approval of Owner. These tests will be rescheduled as soon as possible.

NOTE: The prototypical Pre-Functional Checklists and Functional Performance Test procedures are enclosed.

END OF SECTION

Functional Test

AIR HANDLING UNITS

IMPORTANT:

Please refer to the Master Deficiency and Resolution Log for numbers referenced in parentheses, which will indicate deficiencies discovered and resolved. For quick reference you will find, in the front of this section a list of Master Deficiency and Resolution Log items pertaining only to this section.

1. Submittal / Approvals

Submittal. The above equipment and systems integral to them are complete and ready for functional testing. A Statement of Correction will be submitted upon completion of any outstanding areas.

2. Prerequisite Checklist

a. All associated equipment has been started up, is operational and is ready for functional testing.
b. All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed.
c. Test and balance (TAB) completed and approved for the hydronic systems and terminal units connected.
d. All A/E punchlist items for this equipment corrected.
e. Safeties and operating ranges reviewed.
f. Schedules and setpoints attached.
g. This checklist does not take the place of the manufacturer's recommended checkout and startup procedures.
h. Items that do not apply shall be noted with the reasons on this form (N/A = not applicable, BO = by others).
i. Contractors assigned responsibility for sections of the checklist shall be responsible to see that checklist items by their subcontractors are completed and checked off.

3. Installation Checks

Check if Okay. Enter comment or note number if deficient.

Check Equip Tag è	AHU's	Comments
Cabinet and General Installation		
Permanent labels affixed, including for fans		
Casing condition good: no dents, leaks, door gaskets installed		
Access doors close tightly - no leaks		
Boot between duct and unit tight and in good condition		
Vibration isolation equipment installed & released from shipping locks		
Maintenance access acceptable for unit and components		
Thermal insulation properly installed and according to specification		
Instrumentation installed according to specification (thermometers, pressure gages, flow meters, etc.)		
Clean up of equipment completed per contract documents		
Filters installed and replacement type and efficiency permanently affixed to housing--construction filters removed		
Unit Configuration is correct		
Valves, Piping and Coils		
Pipe fittings complete and pipes properly supported		
Pipes properly labeled		
Pipes properly insulated		
Strainers in place and clean		
Piping system properly flushed		
No leaking apparent around fittings		
All coils are clean and fins are in good condition		
Condensate drains with P-trap or capped where appropriate		
Valves properly labeled		
Valves installed in proper direction		
OSAT, MAT, SAT, RAT, hot water, chilled water supply sensors properly located and secure (related OSAT sensor shielded)		
Sensors calibrated		
Isolation valves installed per drawings		

Check if Okay. Enter comment or note number if deficient.

Check **Equip** **Tag è**	AHU's	Comments
Fans and Dampers		
Supply fan and motor alignment correct		
Supply fan belt tension & condition good		
Supply fan area clean		
Supply fan and motor properly lubricated		
Return fan and motor aligned		
Return fan belt tension & condition good		
Return fan area clean		
Return fan and motor lube lines installed and lubed		
Filters clean and tight fitting		
Filter pressure differential measuring device installed and functional (magnahelic, inclined manometer, etc.)		
All dampers close tightly		
All damper linkages have minimum play		
Low limit freeze stat sensor located to deal with stratification & bypass		
Ducts		
Ducts properly insulated		
Duct joint sealant properly installed		
No apparent severe duct restrictions		
Turning vanes in square elbows as per drawings		
OSA intakes located away from pollutant sources & exhaust outlets		
Balancing dampers installed as per drawings and TAB's site visit		
Electrical and Controls		
Power disconnects in place and labeled		
All electric connections tight		
Safeties in place and operable		
Control system interlocks hooked up and functional		
Smoke detectors in place		
All control devices wiring complete		
Service light if provided is operational		

The checklist items of Part 3 are all successfully completed for given trade ☐ YES ☐ NO

4. Operational Checks

Check if Okay. Enter comment or note number if deficient.

Check **Equip** **Tag è**	AHU's	Comments
General Findings		
Operation of Dampers and Valves		
Dampers stroke fully without binding and spans calibrated and BAS reading site verified.		
Valves stroke fully and easily and spanning is calibrated.		
Valves verified to not be leaking through coils when closed at normal operating pressure.		
Operator Station Display to read as follows:		
System graphic		
System On/Off indication		
System Occupied/Unoccupied mode		
System supply fan On/Off indication		
Return exhaust fan status On/Off indication		
Outside air temp indication		
Outside air humidity indication		
Outside air enthalpy calculation		
Supply air temperature		
Supply air temperature setpoint		
Return air temperature		
Damper positioning (%)		
Supply static pressure setpoint		
Supply static pressure		
Hot water coil valve position		
Chilled water coil valve position		
Space/average space temperature		
CO2 indication and setpoint		
All alarm indications		

The checklist items of Part 4 are all successfully completed for given trade ☐ YES ☐ NO

5. Functional Testing Record

AHU

Test #	Mode ID	Test Procedure	Expected Response	Pass Y/N	Note
1	Unoccupied Mode	Using BMS put unit into unoccupied mode. Using the trend log features ensure the following occurs	OA temp is above 40ºF. - Verify Outside Air and Exhaust Dampers are Closed and return air damper is open, HW/CHW coil valves are closed		
			OA temp is below 40ºF – The HW heating coil valve is 25% open subject to safeties.		
		Unit in unoccupied with a call for heat – If Average temperature drops 2 degrees below the unoccupied heating setpoint of 60ºF (adj)	OA damper shall remain closed. Subject to safeties, supply fan shall cycle and 3-way valve shall open based on call for heat from space sensor. Once space temp is 1ºF above unoccupied setpoint, the supply fan shuts down. Ensure areas with perimeter radiation use radiant heat as 1st stage if applicable		
2	Morning Warm-up	Set up trends for morning warm up status, heating control valve temperature, discharge air temperature and supply fan status	Check trending to verify that the warm up cycle is occurring prior to the occupied mode enable. OA dampers remain closed, SF starts, and HW valve opens 100%. The supply fan VFD shall modulate to maintain static pressure setpoint.		
3	Occupied, Fan On	Return unit to occupied mode using BMS.	Outside, return and relief damper opens to minimum position, supply fan and return fan start (once OA damper is proven open), RA damper modulates inverse of OA damper.		
4	Supply Fan and Return Fan Control	Using BMS set unit to occupied mode	Supply fan starts and runs continuously during occupied times. Return fan VFD shall track the supply fan by an adjustable offset as determined by the balancer.		
		Manually fail the supply fan and return fan	Verify an alarm is generated at the BMS		
5	Economizer Control	Simulate a situation, using the BMS controls where the unit is looking for cooling and the OA enthalpy is less than 22 btu/lb.	HW valve closed, OA damper modulates to 100% open.		
6	Chilled Water Cooling Coil	With a need for cooling, set the enthalpy setpoint below the actual OA enthalpy	The Chilled water cooling coil shall open and cool air shall be delivered		
		Create a situation where there is a need for cooling, the economizer damper is at 100% open and the cooling setpoint is not satisfied	The economizer damper shall remain 100% open and the chilled water cooling coil valve shall open. Cool air shall be delivered.		

7	Hot Water Heating Coil	In occupied mode, with fan running, raise the space temperature setpoint	Verify the hot water coil valve modulates to satisfy the heating requirement. (Ensure the system resets Supply air temperature to maintain space temp (adj.))		
8	Smoke Control	Simulate a smoke condition	Verify the duct smoke detectors will send a signal to stop the fans and close the OA dampers		
9	Freeze Condition	Manually simulate a freeze condition at the low limit duct thermostat	Verify the supply fan stops, OA dampers close, heating coil valve opens (when tempfalls below 40ºF) and an alarm is sent to the BMS		
		Manually reset the alarm	The alarm shall be cleared and the units shall be capable of restarting		
10	Filter Switch	Simulate a dirty filter condition	Ensure that the BMS reports an alarm		
11	Demand Control Ventilation ($C0_2$ Override)	Simulate a CO2 level beyond the adjustable setpoint	The outside air damper shall be allowed to modulate past minimum position until the CO2 concentration has fallen below setpoint		

The functional test of Part 5 have all passed for given trade ☐ YES ☐ NO

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