

ADDENDUM NO. 3 Appoquinimink School District Whitehall Elementary School – Bid Package 'A' December 4, 2017

NOTICE: Attach this addendum to the project manual for this project. It modifies and becomes a part of the contract documents. Work or materials not specifically mentioned herein are to be described in the main body of the specifications and as shown on the drawings. Bidders shall acknowledge receipt of this addendum on the space provided on the Bid Form. Failure to do so may subject the bidder to disqualification.

Whenever this Addendum modifies a portion of the Project Manual added information is shown as **Bold** and deleted information is shown as strikethrough.

It should be noted that the bid due date has been extended. Bids shall now be due on 14 December 2017 at 2 PM at the Marion Profitt Training Center 118 South Sixth Street, Odessa, DE 19730.

The contract documents for the above referenced project, dated October 13, 2017 are amended as follows:

GENERAL CLARIFICATIONS:

- 1. Date for Addendum #2 previously issued on November 29, 2017 was dated December 4 2017. The correct date should read November 29, 2017.
- 2. Specification Section 061600 Sheathing TechVENT has been identified as an approved equal.
- 3. Specification Section 116800 Play Field Equipment and Structures BCI Burke has been identified as an approved equal. No Product Data was provided in Pre Bid Question.
- 4. Specification Section 230450 Refrigeration Equipment HVAC LG has been previously identified as an approved manufacturer.
- 5. Specification Section 230725 Terminal Heating Units Sigma Unit Heaters have been added as an approved manufacturer.

QUESTIONS AND ANSWERS: (1 – 27 answered in Addendum No. 1, 28 – 37 in Addendum No. 2)

- 38.) Please confirm that the following systems are the only systems to be used on the project. As publicly funded projects usually allow for multiple bidders. Security Instruments was hoping these systems would be opened up to more than one manufacturer. Please confirm.
 - a. The Intrusion Detection System (280725) is locked to Delmarva Systems who is no longer in business, using Detection Systems as a product that is no longer in business.
 - b. The Integrated Access Control & Security Management System (280727) is locked to Software House CCure 9000 System.
 - c. The Fire Alarm and Detection Systems (280721) is locked to Simplex only.

Answer:

No response as of 12/4/17, it is expected in a future addendum.

- 39.) 1.) Please provide specification sections 120600 & 123216. They are not included in the project documents.
 - 2.) 8/A702, please verify that the doors and metal frames are NOT covered under Contract A-09.
 - 3.) Please provide a detail for closet shelving.
 - 4.) Verify that Contract A-09 is not responsible for locker enclosures as listed in specific scope Contract A-09, A, 3. Fillers and closures at student cubbies are part of A-09.
 - 5.) Specific scope for Contract A-09 lists solid surface column wraps, solid surface wall coverings with integral picture rails and solid surface base. None of these items can be found on the contract documents. Please verify these are not part of contract A-09 or this project.

Answer:

- 1.) Section 120600 was and is still included in the bid package. Section 123216 was added in Addendum #1.
- 2.) Contract A-05 Carpentry & General Works shall be responsible for providing hardware and all doors that are not FRP or Aluminum. FRP and Aluminum doors shall be provided by contract A-08 Glass and Glazing.
- 3.) No response as of 12/4/17, it is expected in a future addendum.
- 4.) Per note 27 of contract A-05 Summary of Work, Carpentry & General Works is responsible for providing section 105113 Metal lockers. Refer to detail 6/A9.0 for a section. Any filler strips identified on the drawings are to remain part of contract A-09 Casework and Millwork.
- 5.) Will be addressed in Addendum #3.See revised summary of work for Contract A-09 Casework and Millwork, note #7.
- 40.) On Sheet E3.2 in Lobby B128, there are two items shown that are not listed on the electrical legend. One is an "M" in a diamond; the other is an "R" in a diamond. Please clarify.

Answer:

"M" diamond and "R" diamond are fire alarm monitor/relay modules to interface with fire door.

- 41.) 1.) If a column footing does not give a pier dimension, is it safe to assume that the column bares on the footing?
 - 2.) In the B section at column lines B1.6-BC and B2.5-BC the columns are shown as W8x40 at the foundation level. At the second floor level they appear to change to a HSS column, however, no

size is given. Please provide a size for the HSS column above and a connection detail for hat it attaches to the W column.

Answer:

- 1.) Column footings without piers shall have the column bearing directly on the top of the footing.
- 2.) The column size above is HSS 6x6x3/8. The splice shall occur at the top of steel of the floor framing. WF column shall not extend above the floor slab.
- 42.) Please review the attached Lighting Substitutions from Diversified Lighting Associates.

Answer:

Substitutions will not be reviewed during bidding. Refer to drawing E6.1 Light Fixture Schedule, Note 1 and Specifications 260510, Paragraph 2.1.

- 43.) In addendum #1 that the light fixture schedule, per drawing E6.1 note #1, regarding "preapproval for substitutions" has been eliminated. The note now reads that any of (5) lighting reps can submit for approval after contract award (see attached). This RFI requests that any proposed substitute light fixtures be submitted for approval in advance of the bid or the consultant identify specific manufacturers that will be considered equal and pre-approved. Please consider the following.
 - a.) Spec section 16200 regarding material substitutions, does not permit alternate substitutions after contract award.
 - b.) No two LED fixtures are "identical" among various manufacturers. There will always be minor inconsistencies regarding output, distribution, wattage, amperage etc
 - c.) The lighting reps will quote their products without regard to being exact equals and will not guarantee approval.
 - d.) The ultimate review and approval of light fixtures will become subjective and open for numerous submissions, re-submissions and discussion.
 - e.) Their will be uncertainty among all electrical bidders as to what will be acceptable or approved by the consultants.
 - f.) The intent of State of Del bid laws is to create a competitive bid environment by listing multiple manufacturers, where possible, for all products.

Answer:

Refer to Questions #42 response.

44.) Drawings S2.7 and S2.8 Section 4.1-9 shows a support detail for a movable partition. Drawing A3.1 shows movable partitions at the same locations on the first floor however the structural drawings have no reference to them. Please confirm if the detail shown on S4.1-9 is required at the movable partitions as shown on A3.1.

Answer:

Detail 9/S4.1 shall apply to all first floor operable partition supports hanging from the floor framing.

45.) Please advise what is required for Lintels above the 20'-0" Opening for Windows W5 in Wall Type B63 on A3.1.Mas. Veneer/Stud Lintel schedule 14/S6.2 only addresses up to a 12'-0 opening.

Answer:

The brick veneer will be hung from the floor and roof beams. A typical detail will be issued for this support condition in the upcoming addendum #3, see Sk - S - 012.

46.) Which bid package is responsible for the supply of anchor bolts for top of wall wood plates, such as those in Roof Detail 2/A4.3?

Answer:

All anchor bolts at the top of the wall are to be supplied by the Steel contractor and installed by either the Masonry Contractor (Where installed in Masonry, as in the left side of 2/A4.3) or the Carpentry & General Works Contractor if it is installed in any other material such as Metal stud, Wood blocking or other materials other than Masonry. (For instance, in to wood blocking at the right side of 2/A4.3). The scope should be clear, as a similar detail occurs at 8/S4.3 (Steel supplies anchor bolts to Masonry Contractor to install) & 1/A4.4 (Steel supplies anchor bolts to Carpentry Contractor to install). Space anchor bolts at 18" O.C. staggered.

47.) Please review the substitution request for Specification Section 260731 Wireless Clock System - Sapling Wifi Clock System.

Answer:

Primex System District Standard. No substitutions shall be accepted.

48.) 1.) 5/S6.2 - Non-Load Bearing CMU Wall Bracing Details indicates bracing requirements at a variety of conditions with clips typically at 4′-0 on center, or at structural steel member spacing.

This seems to imply that wall bracing would not be needed at load bearing masonry walls. Confirm the steel contractor should include F & I of steel bracing of Non-Load Bearing CMU Walls only per this set of details.

- 2.) 1/A6.0, 2/A6.0 & 8/A6.0 indicate continuous angles fastened 12" on center on both sides of fire-rated and non-rated Interior CMU walls with G.W.B. spacers added at the rated walls. Where in the building are these details to be followed in place of details from 5/S6.2? Advise which prime contractor should include F & I of the continuous angles for bracing interior fire-rated masonry walls. Advise which prime contractor should include F & I of the G.W.B. spacers at bracing for interior fire-rated masonry walls. Advise which prime contractor should include F & I of the continuous angles for bracing interior non-rated masonry walls.
- 3.) 3/A6.0, 4/A6.0, 5/A6.0 & 6/A6.0 indicate continuous angles fastened 12" on center on both sides of fire-rated interior stud partition with G.W.B. spacers added between angles and wall. Advise which prime contractor should include F & I of the continuous angles for bracing interior fire-rated stud partition walls. Advise which prime contractor should include F & I of the G.W.B. spacers at bracing for interior fire-rated stud partition walls.

Answer:

No response as of 12/4/17, it is expected in a future addendum.

- 49.) 1.) Head Detail 10/A8.4 shows threaded rod hangers for Fire Door B128A.No supplemental steel framing is indicated on the structural drawings to receive these hanger rods. Please confirm no steel header is needed for the Won-Door Firerguard.
 - 2.) There are Coiling Door tracks and guides in Details 2, 5, 6 & 9/A8.4.Please confirm the door manufacturer / installer provides the angle fastening the tracks and guides to the walls.
 - 3.) The Finish Schedule on A3.7 indicates the use of Rubber Treads at Stairs C-S1, A-S1, A-S2 & B-S1.Confirm these Rubber Treads include a non-slip nosing and that Contract No. A-04 does not supply nosings at these stairs.
 - 4.) Please advise any locations where Contract No. A-04 does supply abrasive stair nosings. Please provide a specified manufacturer and product type for any abrasive stair nosings.

- 1. Per Won-Door manufacturer: adequate structural support is required by others (door weight = 5.5 lbs/sq.ft. x width x height).
- 2. Door manufacturer provides angle, track and guides.
- 3. Provide Stair Treads as specified in section 096513, item 2.2.C.
- 4. There are no abrasive stair nosings on this project.
- 50.) 1.) Detail 1 & 8 0n A4.3 shows the Efis moulding caulked to the metal roof edge. Which contract owns this caulking?

- 2.) Detail 1 & 2 on A4.3 does not show caulking from the Efis moulding to the brick. Please confirm no caulking is required at this location. If caulking is required which contract will own it?
- 3.) Detail 14 on A6.0 shows a 2" expansion joint material on the exterior and a compressible filler and aluminum cover plate on the interior. Which contracts own the exterior and interior expansion joint products and installation?
- 4.) Detail 3,4,6,7 & 9 on A8.3 does not show caulking between the precast and the dissimilar masonry. Please confirm there is no caulking required at this location.
- 5.) Will the precast to precast head joints point with mortar or caulk?
- 6.) Which contract owns the caulking at the interior perimeter of the windows?
- 7.) Detail 3 & 6 on A8.3 does not show caulking between the interior solid sill and the masonry and or drywall. Please confirm no caulk is required in these locations. If caulk is required which contract will own it?
- 8.) Will contract A-01 Sitework be responsible for all caulking at the exterior concrete as shown on the drawings?

- 1.) Reference Section 011100 Summary of Work, Contract A-07 Metal Studs & Drywall, Note 33.
- 2.) Refer to spec section 062013, Subparagraph 2.3A, 2.3D, 3.3A, and 3.3D. See Question #1, refer to spec section 011100 Summary of Work, Contract A-07 Metal Studs & Drywall, Note 33
- 3.) Reference section 011100 Summary of Work, Contract A-03 Masonry, note 3. Masonry is responsible for all expansion joints to be installed in exterior masonry walls. Interior expansion joints will be provided by the Carpentry & General Works contractor, except where Ceramic Tile may have them.
- 4.) No caulking required. Will be pointed with mortar.
- 5.) Head joints will be pointed with mortar.
- 6.) Reference section 011100 Summary of Work, Contract A-08 Glass and Glazing, note 9. The glass & glazing contractor is responsible for all caulking associated with materials supplied by this contractor to adjacent surfaces.
- 7.) Refer to spec section 123661.16 sub paragraph 2.3A and 2.3B.
- 8.) Contract A-01 Sitework shall be responsible for all exterior concrete caulking. To be clear, all concrete, asphalt or paving joint sealants & caulking shall be provided by contract A-01 Sitework.
- 51.) Who is responsible to pour all exterior pads (per detail 7/S3.1) within the sidewalk boundary? Are these pads considered within the building footprint?
 - 2.) Are the footings and walls shown on sheet S2.2 details 1/S3.2 & 2/S3.2 considered landscape walls and part of the A-01 Sitework Contract?
 - 3.) What R-value should be used for all below slab on grade exterior perimeter walls?



Answer:

- Page 7
- 1.) The Sitework Contractor shall provide all excavation and materials needed for concrete installations from the edge of the building footprint and outward. The Concrete Contractor will provide all excavation and materials within the footprint of the building. The Concrete Contractor must prepare a clean, square finish for Sitework Contractor to place its concrete up to. Any rebar or cold joint preparations are to be coordinated and installed by the Concrete Contractor.
- 2.) All exterior landscaping walls and their associated foundations are to be completed by the Sitework Contractor. Any rebar or cold joint preparations are to be coordinated and installed by the Concrete Contractor.
- 3.) R value of 10 ci for exterior perimeter walls below grade should be used. Refer to Spec section 072100 subparagraph 2.1.B.3.
- 52.) Please confirm that area "C" will also be left -.67 from FF (-4'-8").

Answer:

Subgrade for each area will be 8" below the finished floor elevation of that area. Areas A and B Elevations: Finished Floor = 65.67', Subgrade = 65.00' Area C Elevations: Finished Floor = 61.00', Subgrade = 60.33'

Note that the architectural plans show the Cooling Tower Enclosure as part of Area C. There is no concrete finished floor in the Enclosure.

53.) The details for the 12/2 pitch shingle roof and any other areas, show 1 layer of plywood attached to metal decking. Nailing Shingles (1 ½" Nails) over this will not work, the nails will not go through the metal decking and shingles and will not be attached per manufacturer guidelines. Please advise.

Answer: Will be addressed in Addendum #3. See Sk – A – 024, 025, & 026.

- 54.) 1.) There is a 3" incoming water service detail shown on P5.1 and has a meter and backflow preventer labeled F-29 & F-30; however, the schedule shows these items as floor drains. Please revise and clarify.
 - 2.) Is a domestic water meter needed inside if there is a meter pit outside?
 - 3.) I don't see plumbing fixtures F-6 or F-10 on the drawings. Are these needed? If so, please clarify where they are or might be?
 - 4.) I assume the mop sink in the Janitor's closet (C128) is plumbing fixture F-41? Please clarify.
 - 5.) Drawing M3.1, classrooms A101, A102, and A106 show a FCU with no tag. Please label and identify these units.

Answer:

- 1.) Change label for backflow preventer to F-18. Delete meter from detail.
- 2.) No. Delete interior meter.
- 3.) Addressed in Addendum #2, Sk P 002.
- 4.) Item #51 by Kitchen Equipment Refer to Kitchen Drawings.
- 5.) Addressed in Addendum #1, See Modifications to Drawings Item #25.
- 55.) 1.) Room A105 shows a Telecom outlet with no letter designation; please clarify.
 - 2.) Room A106 shows a Telecom outlet with no letter designation; please clarify.
 - 3.) Room A114 shows a Telecom outlet with no letter designation; please clarify.
 - 4.) Room A116 shows a Telecom outlet with no letter designation; please clarify.
 - 5.) Room A130 shows a Telecom outlet with no letter designation; please clarify.
 - 6.) Room B112 shows an "E" outlet and a "D" outlet; is there to be a corresponding "A" outlet somewhere in the room for the "D" outlet that is shown?
 - 7.) Room B126 shows a Telecom outlet with no letter designation; please clarify.
 - 8.) Room B127 shows two Telecom outlets with no letter designation; please clarify.
 - 9.) Room C116 shows two Telecom outlets both in the area of the Menu Boards that have no letter designation; please clarify.
 - 10.) Room A222 shows a Telecom outlet with no letter designation; please clarify.
 - 11.) Room B212 shows a Telecom outlet with no letter designation; please clarify.
 - 12.) Drawing E9.1 for the Kitchen Room C123: is there to be any data cabling at any of the cash registers as none is shown?
 - 13.) In Section 260740 it speaks to 12 strand 50 micron fiber optic cable. What grade 50 micron cable is this to be OM2, OM3, or OM4? Is this cable to be places between the MDF and each IDF? Is the fiber cable the only tie cable to be installed between the MDF and each IDF or are there other cables to be installed? If yes please specify.
 - 14.) Section 260740, 2.1, A: Can flush jacks be used?

- 1. Delete the data symbol indicated with no letter at that location. It is not required.
- 2. Delete the data symbol indicated with no letter at that location. It is not required.
- 3. Delete the data symbol indicated with no letter at that location. It is not required.
- 4. See Addendum #1, Sk E 002.
- 5. See Addendum #1, Sk E 001.
- 6. Change "E" to "A"
- 7. See Addendum #1, See Sk E 015.
- 8. See Addendum #1, See Sk E 015.
- 9. Type "E"

- 10. Type "E"
- 11. Type "E"
- 12. CAT 6 to IDF
- 13. a. OM3
 - b. Yes
 - c. Yes
- 14. Yes
- 56.) Details F, P, S, V, CC, DD, etc. on A11.0 show ¼"caulk and backer rod at the metal casing bead. Which contract will own this caulking?

Answer:

Contract A-07 Metal Stud & Drywall shall provide backer rod & caulk at all locations indicated.

57.) We understand the type A & AE light fixture by Liteline is a school district standard. As you clarify substitutions and equal manufactures, please confirm if alternate manufacturers will be accepted for type A & AE light fixtures.

Answer:

Substitutions will not be reviewed during bidding, however substitutions will be reviewed during the submittal process.

- 58.) Per the fence detail on CG507:
 - a. All manufactured listed do not manufacture a 5/8" solid picket they use tubular. Will other sizes be acceptable or are we limited based on 5/8" dimension? Please confirm.
 - b. In regards to pickets having finial tops that can be removed and pose a safety hazard. Would owner consider a flat rail top across pickets?
 - c. Also on the sitework bid form Alternate No. 2 and 3 are the same. I believe Alt. No 3 should be Playground Equipment (3A, 3B, 3C)

Answer:

No response as of 12/4/17, it is expected in a future addendum.

59.) 1. Sheet A10.3 shows PT-3 in bathrooms C105 and C106 as a floor finish. However, the finish schedule states PT-1 is the floor finish. The only Porcelain floor tile finish that could be found in

the color schedule/finish schedule was PT-1. Please clarify what PT-3 is and whether or not it is to be installed in bathrooms C105 and C106 or if this is just an error on the drawings.

- 2. Wall elevations show bullnose capping the tile wainscot. Sheet A9.11 states that Anodized Aluminum Corner trims are to be provided at all outside corners in the bathrooms. Are they corner guards installed by others or are they Schluter trim pieces? I do not recommend mixing bullnose and Schluter trim it usually gives an unsightly finish where the two materials meet.

 3. 6x6 Quarry tile base is listed in the color schedule but is nowhere to be found. Could you please clarify whether or not we are required to provide any quarry tile base in areas C131 and
- C132 where quarry tile can be found? We DO NOT recommend installing quarry base at the walk in boxes do to issues bonding quarry to the metal walk in box.

 4. Ceramic Tile Scope of Work item #9 asks for vapor retarding sealer. Is this part of the
- 4. Ceramic Tile Scope of Work item #9 asks for vapor retarding sealer. Is this part of the installation or necessary? Please clarify.
- 5. Ceramic Tile Scope of Work item #12 asks us to provide patching and leveling. At the bidding stage of this project it is not possible to determine the extent of how much leveling/patching is needed. We are aware that this is new concrete and is expected to be flat/level. However, there is a gap in the concrete spec requirements for acceptable work and what is an acceptable substrate for ceramic tile. Substrates for ceramic tile must be flat and level to within a ¼" in 10'. The concrete spec is not as strict. It is the position of the NTCA and TCNA that bidding of patching and leveling of substrates to receive ceramic be done using an allowance. Is the allowance at SOW #22 to be used for this or will there be a separate allowance for ceramic tile substrate repair?
- 6. It is a little unclear what walls get ceramic tile in the Corridors, Stairs and other areas for Alternate 10. Can the architect please provide a wall finish plan or highlight exactly which walls get tiled?
- 7. This has been addressed by several others but specs for ceramic tile install methods are not clear. Please specify: 1. TCNA install method, 2. where waterproofing/crack isolation membrane is to go and if it is full or partial coverage, 3. what type of mortars and grouts (epoxy or cement) are to be used and for what tiles.

Answer:

No response as of 12/4/17, it is expected in a future addendum.

- 60.) 1.) Spec Section 042000 only list 2 manufactures for the DCMU. Will other manufactures be acceptable for the project? For example: York Building Products, Trenwyth Industries, or E.P. Henry.
 - 2.) Spec Section 034500" Precast Architectural Concrete" is a "Wet Cast" method of production. The 3 manufactures listed in spec section 034500 2.1-A-1-3 do not provide this method of production. Can we utilize others or a different method? Are these units intended to be Cast Stone Units under Spec Section 047200?

- 3.) Detail 3/A6.3 calls out the cast stone profile "D" to be 7 5/8" high. However sheet A8.1 calls for profile "D" to be 11 5/8" high. Please Clarify.
- 4.) Contract A-03 Masonry's summary of work item# 22 says to provide stucco. Please identify its location
- 5.) Contract A-04 Structural Steels summary of work item# 9 says to provide all masonry anchors. Is this furnish and install
- 6.) Section079100 1.2-A-1 calls for all of the exterior concrete masonry, precast sills, lintels, wall caps or water tables to receive water repellant. Does the face brick require water repellant also?
- 7.) Are the architectural preformed joint seals on the exterior of the building under contract# A-03-Masonry?
- 8.) Should all of the vertical and horizontal joints of the cast stone units (cast stone to cast stone or cast stone to dissimilar) be raked and caulked or just pointed with mortar?
- 9.) Should the vertical joint of all of the interior column wraps (example: detail 4 & 5/A3.10) where they meet another wall be raked & caulked or just pointed with mortar.
- 10.) Detail 5/A4.4 shows a caulk joint at the metal roof edge cap. Please clarify that this is under contract A-06.

- 1.) Did not receive any acceptable/equal manufacturer requests. No product data was provided for any substitutions.
- 2.) Wet cast or dry method is acceptable.
- 3.) Revise precast concrete profile type "D" on sheet A8.1 to be 7 5/8".
- 4.) Eliminate Item #22 in spec section 011100 Summary of Work, Contract A-03 Masonry.
- 5.) See modified Summary of Work for Contract A-04 Structural Steel & Misc. Metals. Note # 9 has been struck. All masonry anchors are to be provided by Contract A-03 Masonry.
- 6.) Face of brick does not require water repellent.
- 7.) Contract A-03 Masonry shall provide section 079100 Preformed Joint Seals. See detail 8 on drawing 3.9 and detail 5 on A5.5.
- 8.) Raked and caulked.
- 9.) Raked and caulked.
- 10.) The caulk joint at the metal roof edge cap in this detail is to be provided by Contract A-06 Roofing.
- 1. There is no layout or design shown for the irrigation systems on the landscape plans. There also are no specifications for the type of equipment, number of zones, sprinkler heads, etc. How are we to price this item?
 - 2. What type of material is the roof drain piping, HDPE, SCH40 PVC, or SDR35?
 - 3. Can removable bollard model # Model R-8464-RA by Reliance Foundry be approved for use? A cut sheet is attached.

- 4. The Addendum 1 bid form does not contain any alternates for the playground equipment that is called out on the landscape plans. Should we not price the playground equipment?
- 5. The addendum 1 bid form has the same descriptions for alternates 2 and 3. Should we enter a number for both alternates?
- 6. Who is responsible for completing the sidewalk along Mapleton Av. and Raleigh Street that is shown outside of the LOD?
- 7. Addendum 1 scope of work for contract A-01 Sitework, Item 1 lists the sitework contractor as providing electric, telephone, data & fiber lines and gas utilities. Aren't these utilities installed by the respective utility company approved contractors?
- 8. Addendum 1 scope of work for contract A-01 Sitework, Item 4 is blank. Is something missing from the scope of work?
- 9. Addendum 1 scope of work for contract A-01 Sitework, Item 12. Where are the planter walls located? I see retaining walls in the plaza area, but they appear to be integral to the structural concrete contractors' work.
- 10. Addendum 1 scope of work for contract A-01 Sitework, Item 19. What size gates are required for the temporary fencing?
- 11. Addendum 1 scope of work for contract A-01 Sitework, Item 27. Is it the intent that the Sitework contractor provide daily street cleaning even when they are not onsite?
- 12. Addendum 1 scope of work for contract A-01 Sitework, Item 31. The cooling tower slab and foundations appear to be integral to the structural concrete contractors' work since the footings are continuous with the building footings and the slab with pedestal is contained within. This is not what is typically site concrete work. Should they be in the Sitework of the Concrete contractors' scope of work?
- 13. Addendum 1 scope of work for contract A-01 Sitework, Item 34. Where will we be allowed to access a waterline to provide temporary water service? There does not appear to be a waterline on Raleigh Street currently.
- 14. Addendum 1 scope of work for contract A-01 Sitework, Item 63. Where will we be allowed to access a waterline to provide temporary water service for the tire wash station? 15. Addendum 1 scope of work for contract A-01 – Sitework, Item 66. Where are landscape walls located on this project?

Answer:

No response as of 12/4/17, it is expected in a future addendum.

62.) 1.) Item #1 indicates the Sitework scope includes "electric, telephone, data & fiber, gas". However the electric scope Items #6 and 7 indicate that the electric & communications to existing are in that scope. The gas service is not shown on the site drawing and the plumbing drawing P2.3 indicates it will be provided by the gas company. Without the gas routing would it be appropriate to have the site contractors or plumbing contractors carry an allowance for the gas company? Please clarify the extent of work that will be provided by utility companies for

all electric, telephone, data, communications and gas and where the separation occurs. I would suggest 5 '-0" outside the building for the MEP trades to take over and the site contractor do all the utilities wont. Please confirm extent and your opinion on the 5'-0" separation.

2.) Item #31 indicates the cooling tower foundation should be considered exterior and is included in the Sitework scope. However structural drawing S2.3 indicates the foundation is interior & integral with the building foundation. It seems more appropriate to be part of the concrete package. If not, please clarify coordination with concrete scope. This is the issue with the separation of slab from the edge of the building footprint. Please confirm this is acceptable.

Answer:

No response as of 12/4/17, it is expected in a future addendum.

- 63.) 1.) The Sitework package is responsible for Sections 323113 Tubular Barrier Gate and 323119 Decorative Fencing and Gates as outlined in their Technical Specifications Sections outline and described in items 35 and 44 of their specific scope outline. Can specific scope item 44 on page 011100-27 of the A-04: Structural Steel & Misc. Metals scope be removed from our bid package as it seems to be a duplication of material in the A-01: Sitework package?
 - 2.) Can it be confirmed that specific scope item 31 on page 011100-26 of the A-04: Structural Steel & Misc. Metals scope belongs in our bid package?
 - 3.) We find no specifications for the Wrapping of Stainless Steel Opening at Elevator Doors in our Technical Specifications Sections outline. Can you direct us to the correct specification section for the materials and finishes for Wrapping of Stainless Steel Opening at Elevator Doors?
 - 4.) Please confirm that we are not responsible for testing costs, except for our cooperation with testing agencies including Product Test Reports for Pipe and Tube Railings.

- 1.) Yes. These fencing systems were originally different fencing systems. Now that Vandemark & Lynch has confirmed the screen walls and the playground fencing are the same materials, the Sitework Contractor will provide both the Tubular Barrier Gate system and the Decorative Fencing and Gates at the Screen Walls and the Gymnasium. The Structural Steel & Miscellaneous Metals Contractor will no longer provide any fencing associated with the screen walls. See modified Scopes of Work For Contracts A-01 Sitework & A-04 Structural Steel & Miscellaneous Metals Contractors
- 2.) Eliminate Note # 31 from Contract A-04 Structural Steel & Misc. Metals section 011100 Summary of Work. See spec section 142123.16 paragraph 2.1.B.1, this is to be provided by the Elevator Contractor.
- 3.) The wrapping of the stainless steel opening at the elevator doors will be provided by the elevator contractor. Per

- 4.) Testing and associated costs will be provided by others.
- 64.) 1.) Please provide a location for Transformer "T-2" and Distribution Panel "CDP".
 - 2.) Please provide a spec. for Electrical Manholes shown on Drawing E4.2.
 - 3.) Please show the location of the Power Company primary switch on Drawing E4.2.
 - 4.) Please show final termination points for communication ductbank.
 - 5.) Why on the revised bid form from Addendum #1 does Contract A-20 need to name a "Data Installer"? On the revised scope of work for Contract A-20, Item #17 states that telecommunications is by Special Systems Contract A-21.

- 1.) Refer to Addendum #3. See Sk E 044.
- 2.) Refer to Addendum #3, See spec section 260130 Manholes.
- 3.) Refer to Addendum #3. See revised drawing E4.2
- 4.) Along East Wall.
- 5.) Data/VoIP wiring by data contractor under Electrical Contractor. Telephone System by Special Systems Contract.
- 65.) 1.) In Spec. Section 011100 Summary of Work Contract NO. A-06 Roofing, Item number 1 states PVC Materials, please clarify where this material is required and if so will a specification be issued for the material?
 - 2.) In Spec. Section 011100 Summary of Work Contract NO. A-06 Roofing, Item number 1 states Roof Overflow Drains, typically the Plumbing contractor owns providing and installing the Overflow Drains, and the Roofing Contractor would own cutting the roof membrane and flashing of the drains, please advise who owns providing and installing the Overflow drains?

 3.) In Spec. Section 011100 Summary of Work Contract NO. A-06 Roofing, Item number 1 states Lamb Tongue, should these be provided and installed by the Plumbing Contractor since they are connecting to their piping for the Overflow Drains, please advise who owns providing and installing the Lamb Tongues at the overflow drain piping?
 - 4.) In Spec. Section 011100 Summary of Work Contract NO. A-06 Roofing, Item number 7 states "flashing and installation of the roof drains shall be by the Roofing Contractor", typically the Plumbing contractor owns providing and installing the Roof Drains, and the Roofing Contractor would own cutting the roof membrane and flashing of the drains, please advise who owns providing and installing the Roof drains?
 - 5.) Specification Section 074113.13 Formed Metal Roof Panels is the material specified in this section to be used at the metal wall panels shown on Details 3 and 7 on Drawing A4.2, please advise? If not where is this material to be used and will a specification for the Wall Panels at the backside of the Mansard be issued?

- 6.) In Specification Section 073113 Asphalt Shingles Paragraph 2.4 Ridge Vents A. States using "polypropylene or other UV-stabilized plastic ridge vent…" but the Basis of Design is a Metal Era product and Details 9 and 10 on Drawing A4.0 show a Metal Ridge Vent, please clarify which type of ridge vent is to be used, and if it is to be metal will a revised specification be issued?
- 7.) On Drawing A4.2 Detail 3 shows a 2" wide continuous air vent with galvanized metal bug screen, will a specification be issued for this material, please advise?

Answer:

- 1.) PVC as required for closing in piping, etc.
- 2.) Per Section 011100 Summary of Work, Contract A-06 Roofing note #1. This contract shall provide (furnish and install) roof overflow drains.
- 3.) Per Section 011100 Summary of Work, Contract A-06 Roofing note #1. This contract shall provide (furnish and install) lamb tongue.
- 4.) Contract A-18 HVAC and Plumbing shall provide (furnish and install) roof drains. Contract A-06 Roofing shall cut the roofing membrane and provide flashings for the drains.
- 5.) Correct.
- 6.) Basis of design to be used.
- 7.) See item #12 in Modifications to Specifications.
- 66.) On the electrical power plan E3.8, room C107 there is a note next to the circuit RP-4-3 referencing an occupancy sensor/power pack. What sensor/power pack is being referenced?

Answer:

Occupancy sensors are low-voltage and need relay power packs to control circuits.

67.) Is the pattern going to be revised to take the tile size difference into consideration, or will it remain as is. If it remains as is, the waste factor will go up significantly. Please advise.

Answer:

Upon acceptance of the alternate bid for LVT, the floor pattern plans will be revised.

68.) Here's another submittal from Diversified with a different type 'C', see below & attached.

Answer:

Substitutions will not be reviewed during bidding. Refer to drawing E6.1 Light Fixture Schedule, Note 1 and Specifications 260510, Paragraph 2.1.

- 69.) 1.) Spec Section 323258 2.5-B-1-a,list the utility brick manufacture as Belden Tri-State Building Materials "Frisco Blend" as the brick to be used for the street screen piers and walls which is different from the brick listed in spec section 042000 2.5 B 1 a&b. Is the size and manufacture correct as it does not match the brick on the building?
 - 2.) Details 1, 2, 3, 4, & 7 on sheet A2.2 show the 3 ½" spray foam insulation continuing up and over the metal decking. Does this stop a certain distance back from the vertical insulation, or does it continue back and cover the decking under the roof trusses?
 - 3.) Does this insulation fall under contract # A-03 scope of work?

Answer:

- 1.) Spec section 042000 is the correct brick.
- 2.) Sprayed insulation to continue to back of Mansard Roof. Refer to detail 3/A4.2.
- 3.) Yes, Contract A-03 Masonry shall provide all sprayed insulation, including the overlapping identified above. See section 011100 Summary of Work for Contract A-03 Masonry, note #27.
- 70.) 1.) Contract NO A-05 calls to Furnish & Install Vision Panels. Please clarify that this contract is only responsible for the non-aluminum vision panel frames, and that Contract A-08 will supply all glass.
 - 2.) Contract NO A-05 calls to Furnish & Install Vision Panels. Please clarify that this contract is only responsible for the non-aluminum vision panel frames, and that Contract A-08 will supply all glass.
 - 3.) Recommendation to move providing interior expansion joints from Contract No A-05 to Contract No A-07 & No A-12 since these will need to be installed into their wall and ceiling systems.
 - 4.) Item #52 of Contract A-05 is listed in several different scopes of work, and is also covered by the Sitework Contract No A-01. Will the sitework contractor be responsible for this item?
 - 5.) Contract NO A-05 calls to provide the low voltage wiring within the doors and for automatic door openers. However, the Electrical and Special Systems Contracts call for all wiring to the door hardware locks and door contacts for a complete Card Access System. Please verify Contract NO A-05 is only responsible to provide the hardware, and provide any necessary raceways through doors and or frames. All wiring to be completed by others.
 - 6.) Who will own any fire treated plywood required in Electrical/Tel/Data rooms for new panels? If under Contract NO A-05, could you provide scope and/or locations?

Answer:

1.) Eliminate the work "Vision Panels" form Carpentry & General Work Scope #5. These will be provided by Glass & Glazing Contractor.

- 2.) See Door B128A and technical section 083513.23.
- 3.) We will keep this item as initially issued. The Carpentry & General Works Contractor will need to coordinate with the other trades to install all interior expansion joints.
- 4.) The site contractor is responsible for their vehicle traffic only. All contractor scopes of work have the same referenced note. The intent of the note was that the flaggers will be needed for their individual work(the prime or their subcontractor deliveries) that they are responsible for. That said, if multiple trucks or deliveries occur, they must be coordinated with all trades as well as the Construction Manager and may require multiple flaggers.
- 5.) By Electrical Contractor, See Note 5 on Drawings E6.1.
- 6.) Contract A-05 Carpentry & General Works shall provide fire treated plywood where indicated for electrical and data panel installations.
- 71.) Per Fence Detail on CG507, In regards to pickets having finial tops that can be removed and pose a safety hazard, would the owner consider a flat rail top across pickets?
 - 2.) May tubular pickets be used in place of solid pickets? It's my understanding the manufactures listed do not manufacture a solid picket. Please Advise.

Answer:

No response as of 12/4/17, it is expected in a future addendum.

- 72.) 1.) Please review the attached HVAC Substitutions.
 - a. Lennox RTU
 - b. Quantech Chiller
 - c. Heatcraft Fluid Coil Specifications
 - d. LG
 - e. Sigma Unit Heaters

- 1.) a. Not Approved.
 - b. Not Approved.
 - c. Not Approved.
 - d. LG is already an approved Manufacturer.
 - e. Sigma Unit Heaters will be added to the list of acceptable manufacturers in Addendum
 - #3. See modifications to specifications Item #18
- 73.) Ref. specification 093013, Tile, page 7, paragraph 2.8B, Metal Edge Strips. We note the specification indicate that the outside corners are to receive a Schluter QUADEC edge strip

however the elevation details on drawing A9.9 indicate a bullnose trim at the vertical and horizontal edges. Is all the tile wainscot to be priced with bullnose trim or a Schluter QUADEC trim at all edges.

Answer:

See modifications to specifications Item #14.

- 74.) 1.) Line 1 in site scope lists electric, telephone, data and fiber lines, Electrical scope line 3 has the excavation and back fill in that scope for all underground. Please provide clarification that all electric, telephone, data and fiber lines excavation / back fill is in scope A-20 Electrical?
 - 2.) Item 14 requires select under SOG? Is this required if onsite material meet DELDOT spec for structural fill?
 - 3.) Item 68 states we are to grade building to elevation 100.0 minus 8". Addendum #1 states elevation 100.0 = 65.67. There are two F.Fl. elevations, are we to grade entire building to elevation to elevation 65.0 or 8" below the finish floor?
 - 4.) Note on drawing and now in specs 320523 says concrete mix for external improvements to be Whitehall Mix by Bear Concrete, is this a proprietary mix?
 - 5.) Item 31 states the cooling tower is outside the building therefore part of the site scope, it appears the foundation is attached to and part of the building footing, please confirm this is not in the building concrete scope.
 - 6.) If footing is in site scope please provide detail for interface of footing for cooling tower to building footing since they appear as one on S-2.3?
 - 7.) Please provide detail for interface of retaining wall & planter wall footing to building footing.
 - 8.) Masonry planter wall is part of scope A-03?
 - 9.) Item 24 states we are to use onsite material and import as required. We can only cover deficient amount of material in bid. If material is unsuitable will this be covered under unit price #6?
 - 10.) Please provide detail and type of downspout boot required. Specifications provide manufacturer but insufficient information to price exact type.
 - 11.) Item 27 Cleaning of the street is only if we have tracked mud while performing our work only with the exception of the 30 required visits? Other contractors responsible for their cleanup of mud tracked offsite?
 - 12.) What line striping is required for fields and what drawing is it shown on?
 - 13.) Please provide specification for planter waterproofing referred to in Item 65.
 - 14.) On Drawing CG111 (see attachment) where the proposed 8" fire line and 6" domestic water line connect to the 8" water main in Raleigh Street there is a note that reads 'Connect to 8" x 8" tee and 8" x 6" tee'. Will the (2) tees be installed by "others" when the 8" water main is run along the south shoulder of Raleigh Street or will the site work contractor on the Whitehall School project be expected to wet tap the 8" main at the two locations indicated?

Answer:

No response as of 12/4/17, it is expected in a future addendum.

- 75.) 1.) Will there be 110V AC power provided for the intrusion system control panel in the MDF closet?
 - 2.) Will there be 120V AC power provided for the main panel for the area of rescue system in the main entrance area next to the fire alarm annunciator. Please provide a sketch detailing location.
 - 3.) Please confirm that the POE switches for the wireless clocks are to be provided by ASD to power the E Bridge (3 total).
 - 4.) Please confirm that the door provider will make final connections for all field door access control devices through their door frame and provide power and reader connection at a location above the door frame and label all wire appropriately.

Answer:

- 1.) Indicated on Drawing E3.7.
- 2.) Indicated on Drawing E3.7.
- 3.) Confirmed, Yes.
- 4.) Electrical Contractor to make all final connections.
- 76.) Please review the substitution request from Kurt Building Materials.
 - a. TechWALL Pro
 - b. TechVENT
 - c. TechBASE

Answer:

We accept the Kurt Building Materials for TechVENT only as an equal manufacturer for spec section 061600 sub paragraph 2.6.A.1.

- 77.) 1. Electrical Legend on Drawing E6.1 references a symbol as a Dimming Scene Controller (DSC) by Encelium System Contractor which appears as
 - \$ DIMMING SCENE CONTROLLER (DSC) BY ENCELIUM SYSTEM CONTRACTOR
 However we are unable to find any other reference to Encelium anywhere. Please clarify the intent here.
 - 2. Electrical Legend on Drawing E6.1 does not list the following symbols, but they show up on the electrical floor plan drawings. Please advise on the following symbols that do not appear on the legend:
 - a. 🕦
 - b. sos

- 3. Spec section 015200 states to refer to spec section 015113 for TEMPORARY ELECTRIC. Unable to locate spec section 015113. Please advise.
- 4. Can a typical lighting & receptacle control drawing be provided for the Classrooms and other areas of the building to clarify the intent? Is there dimming of these fixtures? For example, many of the light fixtures in classrooms appear to be 0-10-volt dimming capable, and show (3) rows of fixtures controlled by what appears to be (2) single pole switches (but according to the Electrical Legend are actually Encelium Dimming Scene Controllers by the Encelium Contractor) but then the typical light fixture detail on Drawing E5.1 only shows (3) #12 conductors going to the fixture, so how is it controlled and how does it dim? Also the electrical power drawings show receptacles in classrooms controlled by occupancy sensor/ power pack, which assumes this is all controlled by an occupancy sensor, but there is no occupancy sensor shown on the Electrical Legend.
- 5. The Electrical Summary of work 0111000 item #15 states the Electrical Contractor is to own the utility company related costs/ fees, and Addendum #1 stated to contact Dave Darrone at Delmarva Power in order to obtain values of those costs. After doing that, these costs are still unknown. Therefore in order to make this bidding practice fair, can these costs be included as a separate Allowance in the bid? If so, please clarify the amount of the Allowance.
- 6. The new bid form for Contract A-20 Electrical in Addendum #1 shows Data Installer listed under the subcontractor list. Please clarify if this is intended to be "Networked Cabling Systems" as detailed in spec section 260740?
- 7. Unable to locate any Outdoor Plant Cable in the documents as detailed in spec section 260740; 2.3A. Please clarify if all underground incoming services (Outdoor Plant Cable) for spec section 260740 are by that respective utility provider?
- 8. The Electrical Summary of work 0111000 item #6 states to provide pad mounted transformer, conduit, and wiring from existing primary switch for new incoming service. However, drawing E4.2 & E5.2 show the new transformer by the Local Power Company, and there is no spec section for a medium voltage transformer. Please clarify which is correct?
- 9. Drawing E4.2 shows what appear to be (2) new electric manholes appearing as symbol . However, there is no symbol on the legend for these, no spec section, nor are there any details for associated manhole sizes, racking, ladders, etc. Can this please be provided for clarity?
- 10. Drawing CG111 shows several electric vaults, transformer pads, and communication pedestals. However, these do not coordinate with the electrical drawing E4.2. Can a clear location for bidding purposes please be provided for the primary and communications ductbanks?
- 11. Please provide the following in reference to Drawing E5.2:
 - a. Circuit #1 breaker size in MDP feeding T-1? Also, please review the feeder size to the primary side of transformer T1 from this circuit.

- b. Feeder #2 shows (4) primary cables to the primary side of the new pad mount medium voltage transformer, but shouldn't that actually be (3)?
- 12. Unable to locate if this building to be primary metered, or secondary metered by the Utility Company? Please clarify.

Answer:

- 1.) Remove and replace with single pole switch.
- 2.) Occupancy Sensors ceiling/wall mounted.
- 3.) To be issued with Addendum #3. See spec section 015113 Temporary Electric.
- 4.) Refer to question #1.
- 5.) See revised electrical drawings E4.2 Please note the General Notes item #4.
- 6.) Correct
- 7.) None required.
- 8.) Transformer by Power Company. Pad, Conduit, and wiring by Electrical Contractor.
- 9.) To be issued with Addendum #3. See Section 260130 Manholes.
- 10.) For bidding purposes own the quantity and approximate locations on the drawings. Locations will need to be coordinated with the electrical provider.
- 11.) Refer to Addendum #2. See Sk E 028.
- 12.) Metered secondary meter to be located on side of transformer.
- 78.) 1) Please clarify who furnishes equipment (amplifier, tuner, projector etc), indicated on sketch SK-E-26. If supplied by contract A-20, is there a spec for reference? Will alternates be accepted?
 - 2) Please advise a list of State approved network cabling installers (per spec 260740). We are unable to find this information on the State of Del website.
 - 3) Per Add #1 spec section modification #24, 260930 revisions, advise if alternates will be accepted for the lighting fixtures which are specified as ETC & Colorado. Also, per item #2 in this section, the front of house spot lights are listed as qty of (3) ETC, although the drawings show 6 fixtures. Please clarify,
 - 4) Drawing E5.2 indicates the padmount transformer is supplied by the utility company; although, scope of work item #6, indicates the A-20 contractor provides the padmount transformer. If we are supplying the padmount transformer, we'll need a spec from the engineer, including the size. Please clarify.

- 1.) Provided by Simplex.
- 2.) Gilbert to respond in addendum to follow.

- 3.) Yes, Quantity is to be six(6).
- 4.) See revised note #6 in section 011100 Summary of Work, Contract A-20 Electrical.
- 79.) 1.) Item #22 in the scope of work for Contract # A-03 Masonry states to "Provide stucco" Don't see a reference or detail about stucco in the bidding documents. Can you provide a general location for this work and a detail that shows substrate and finish?
 - 2.) Alternate #4: Brick Veneer on Parking Lot Elevation. Is this alternate to include the Cooling tower Enclosure, the Courtyard Wall, the Courtyard Planter Wall, the stage loading dock and the exterior wall of C123 Kitchen and C130 Vestibule?

Answer:

No response as of 12/4/17, it is expected in a future addendum.

MODIFICATIONS TO SPECIFICATIONS:

- 1.) Section 000110 Table of Contents shall be deleted in its entirety, see updated section attached below.
- 2.) Section 001113 Advertisement for Bid shall be deleted in its entirety, see updated section attached below.
- 3.) Section 004100 Bid Form Contract A-01 Sitework shall be deleted in its entirety, see updated section attached below.
- 4.) Section 011100 Summary of Work shall be deleted in its entirety, see updated section attached below.
- 5.) Specification Section 013700 BIM Execution Plan. Replace in its entirety.
- 6.) Add specification section 015113 Temporary Electric.
- 7.) Add specification section 015123 Temporary Heating, Cooling, and Ventilating.
- 8.) Add specification section 017329 Cutting and Patching.
- 9.) SECTION 323158 UNIT MASONRY FOR SCREEN WALL

Page 323158-5, Revise 2.5.B.1.a to read "Bowerston Shale Co.; Frisco Blend, Meridian size."

10.)SECTION 042000 - UNIT MASONRY

<u>Revise</u> Subparagraph 2.4 CONCRETE MASONRY UNITS E.4.a to be **Westbrook Concrete Block, Co.; SF-349** in place of Westbrook Concrete Block, Co.; SF-349a.

11.) SECTION 061600 - SHEATHING

<u>Add</u> Subparagraph 2.6 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING A.1 add subletter **f. Kurt Building Materials**.

12.) SECTION 0713113 - ASPHALT SHINGLES

Revise Subparagraph 2.4 RIDGE VENTS A. Rigid Ridge Vent: Manufacturer's standard.

13.) SECTION 074293 - METAL SOFFIT PANELS

<u>Add</u> Subparagraph 2.2 METAL SOFFIT PANEL e. Accessory: Stockton Products, BUGSTOP Soffit Vent, or approved manufacturer.

14.)SECTION 074293 – METAL SOFFIT PANELS

Add Subparagraph 2.2 METAL SOFFIT PANEL B.5 BUGSTOP soffit vent, galvanized steel, .062 aluminum wire screen, ASTM A653 LFQ, C1063, B209, B69.

15.)SECTION 087100 – DOOR HARDWARE

Add Delete section in its entirety and replace section attached below (per Addendum No. 3).

16.)SECTION 093013 - TILE

<u>Add</u> Subparagraph 2.5 SETTING MATERIALS: Re-add Subparagraph B. that was previously deleted in Addendum No. 2:

- B. Modified Dry-Set Mortar (Thinset): ANSI A118.4
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Building Products; ProLite.
 - b. <u>Laticrete International, Inc.</u>; 254 Platinum Thinset.
 - c. MAPEI Corporation; UltraFlex 3.
 - d. Merkrete by Parex USA, Inc.;735 Premium Flex.
 - 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

<u>Revise</u> Subparagraph 2.8 MISCELLANEOUS MATERIALS B.: Replace, Metal Edge Strips with **Metal Edge Strips/Corner Trim**.

<u>Add</u> Subparagraph 2.8 MISCELLANEOUS MATERIALS B.: Add, **3. Accessories: Quadec Corner end caps at all open ends of Quadec strip.**

<u>Revise Subparagraph 3.8 INTERIOR TILE INSTALLATION SCHEDULE, Replace subletter A.</u> with the following:

A. Interior Floor Installations

- 1. Porcelain Tile on Concrete Subfloor Installation: TCNA F113 with epoxy grout.
 - a. Thinset Mortar: Modified Dry-Set Mortar.
 - b. Grout: Water-Cleanable Epoxy Grout.
- 2. Porcelain Tile on Elevated Subfloor Installation: TCNA F122A with epoxy grout.
 - a. Fluid-Applied Membrane.
 - b. Thinset Mortar: Modified Dry-Set Mortar.
 - c. Grout: Water-Cleanable Epoxy Grout.

- 3. Quarry Tile Installation: TCNA F131.
 - a. Thinset Mortar: Water-Cleanable, Tile-Setting Epoxy.
 - b. Grout: Water-Cleanable Epoxy Grout.

17.)SECTION 142123.16 – MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

Revise Subparagraph 2.3 ELEVATORS B.4: Replace, Rated Load: 2500 lb. with **Rated Load: 4000lb.**

<u>Revise</u> Subparagraph 2.3 ELEVATORS B.9.a.: Replace, Inside Width: 6′ 5 9/16″ from side wall to side wall with **7′ 5 9/16″ from side wall to side wall.**

<u>Revise</u> Subparagraph 2.3 ELEVATORS B.9.b.: Replace, Inside Depth: 4′ 3 9/16″ from back wall to front wall with 5′ 5 9/16″ from back wall to front wall.

Revise Subparagraph 2.3 ELEVATORS B.10.a.: Replace, Width: 42" with Width: 48".

18.) SECTION 210171, FIRE PUMP - ELECTRIC

DELETE in its entirety and REPLACE with new attached Section.

19.) SECTION 230450, REFRIGERATION EQUIPMENT – HVAC:

DELETE in its entirety and REPLACE with new attached Section.

20.) SECTION 230725, TERMINAL HEATING UNITS

Page 230725-2, Paragraph 2.2.J: ADD Sigma as an approved manufacturer.

21.) SECTION 230760, AIR HANDLING EQUIPMENT

DELETE in its entirety and REPLACE with new attached Section.

22.)SECTION 230900: AUTOMATIC TEMPERATURE CONTROLS

- a. Page 230900-3, Paragraph 2.1.A: DELETE in its entirety. The host computer and accessories shall be provided by the Owner. COORDINATE with article 2.9.A.
- b. Page 230900-6, Paragraph 2.9:
 - DELETE and REPLACE with the attached new Paragraph.

22.) SECTION260140, WIRING DEVICES

- a. Page 260140-1, Paragraph 2.3.C: INSERT the following and renumber D through H:
- "C. Controlled receptacles shall be similar to above except face of device indicated with permanent controlled receptacle markings."

23.) SECTION 260130, MANHOLES

a. ADD new attached Section.

24.) SECTION 260731, WIRELESS CLOCK SYSTEM

- a. Page 260731-2, Paragraph 1.5.A.3: REMOVE "[enabled with Power over Ethernet (PoE) technology]".
- b. Page 260731-3, Paragraph 1.5.D.6: REMOVE "[ac power]".

- c. Page 260731-9, Paragraph 3.2.D:
 - CHANGE Division to 26.
 - INSERT the following:
 - "F. Provide and Install 12.5" in all rooms, except Cafeteria and Gymnasium.
 - G. Provide and Install 16" clocks with wire guards in Cafeteria and Gymnasium, 2 per side."

25.) SECTION 260740, NETWORK CABLING SYSTEMS

- a. Page 260740-2, Paragraph 1.3.A.5: REVISE to read:
 - "5. Optical Fiber Cables OS2 Single Mode"
- b. Page 260740-3, Paragraph 2.3.A.3: REVISE to read:
 - "3. Plenum, 12 stand, OS2 Single mode."
- c. Page 260740-3, Paragraph 2.3.A: DELETE "Outdoor" in its entirety.

26.) SECTION 260771, INTERCOM/TELECOMMUNICATION AND CLOCK SYSTEM

- a. Page 260771-1, Paragraph 1.1.A: ADD the following: "Electrical Contractor shall provide device boxes, conduit stubs, and pull strings for all wall-mounted speakers."
- b. Page 260771, Paragraph 1.2.B.6: DELETE and renumber as necessary.
- c. Page 260771-1, Paragraph 1.2.C: DELETE lines 2, 3, 4, and 5 and renumber as necessary.
- d. Page 260771-11, Paragraph 2.3.A: DELETE "Telephone Type" and "Quantities" and REPLACE with the following:
 - "1. Simplex Grinnell to coordinate with district for which rooms are to be equipped with administrative and classroom handsets."
- e. Page 260771-12, Paragraph 2.4.C: REVISE to read:
 - "C. AM/FM Tuner: Simplex 5100-9177 AM/FM Digital Tuner with antenna mounted above ceiling at exterior wall."
- f. Page 260771-12, PERIPHERAL SYSTEM DEVICES
 - i. Paragraph B: DELETE in its entirety and renumber as necessary.
 - ii. Paragraph E.1: REMOVE "with shield".

27.) SECTION 260772, CAFETORIUM SOUND REINFORCEMENT SYSTEM

- a. Page 260772-4, Paragraph 4.1.F: REVISE to read as follows:
 - "F. The mixing console (sound board) shall be manufactured by Soundcraft model EFX12 and be provided with rack mounting kit in sound rack."
- b. Page 260772-6, Paragraph 4.6: DELETE in its entirety.
- c. Page 260772-6, Paragraph 4.7.A: REVISE first line to read as follows:
 - "(2) ULXS124/85 Combo Wireless System with Rack Mount Receivers"
- d. Page 260772-6, Paragraph 4.8: DELETE in its entirety.
- e. Page 260772-7, Paragraph 4.9.A:
 - i. DELETE Floor Boxes.
 - ii. CHANGE quantity of racks to (1).

iii. ADD the following:

"(4) Single Gang Device Plates with (1) ¼" phone plug jack for foldback speakers." 28.)SECTION 280724, AREA RESCUE SYSTEM

- a. Page 260724-1, Paragraph 1.1: REPLACE with the following:
- "1.1 GENERAL
 - A. The Electrical Contractor shall furnish and install all outlet boxes and conduit (with pull strings). Simpex Grinell shall furnish and install all wiring, telephones, annunciators and speakers as shown on the plans, and all other equipment necessary to provide a complete and operating Area of Rescue system. All equipment shall comply with ADA Code 4.3.11.4.
 - B. Equipment supplied by Simplex Grinell shall be considered as meeting these specifications and as the base bid."
- b. Page 260724-1, Paragraph 1.2: REPLACE with the following:
- "1.2 ACCEPTABLE MANUFACTURERS
 Simplex-Grinell
 Rath System"
- 29.)SECTION 280727, INTEGRATED ACCESS CONTROL & SECURITY MANAGEMENT SYSTEM
 - a. DELETE in its entirety and REPLACE with new attached Section.

MODIFICATIONS TO DRAWINGS:

- 1.) DRAWING CG507 DETAILS AND NOTES
 - a. Revise the Decorative Fence Detail to specify "<u>3/4" OR 1" SQ. PICKET</u>" and "<u>TUBULAR STEEL 3/4" OR 1" PICKETS</u>".
- 2.) ALL ARCHITECTURAL DRAWINGS
 - a. <u>Clarification</u> All planter and courtyard walls indicated as split-face masonry veneer will be brick under alternate #4.
- 3.) Drawing A3.2 PARTIAL FIRST FLOOR PLAN AREA "B"
 - a. Revise FACULTY PLANNING B101 and ELEVATOR E-1. Refer to sketch SK-A-012.
- 4.) Drawing A3.5 PARTIAL SECOND FLOOR PLAN AREA "B"
 - a. Revise ASSISTANT PRINCIPAL B206 and ELEVATOR E-1. Refer to sketch SK-A-013.
- 5.) Drawing A3.7 ROOM FINISH SCHEDULE
 - a. Add to the ROOM FINISH SCHEDULE NOTES, "4. USE 2" X 6" BULLNOSE CERAMIC TILE TRIM AT THE TOP OF THE CERAMIC TILE WAINSCOT IN STAIR B-S1 ONLY. SEE INTERIOR ELEVATIONS ON A9.9 FOR LOCATIONS WITHIN STAIR B-S1."
 - b. Add to the COMMENTS column for B-S1 STAIR on the first and second floor "**NOTE** 4".

6.) Drawing A3.8 – DOOR SCHEDULE

- a. Add Fire Rating **20 MIN**. to Doors A104, B110, B117B, B204, B206, B207 and B211.
- b. Replace Hardware Set 039 with Hardware Set 039.1 at Doors A104, B204, B207 and B211.
- c. Replace Hardware Set 025 with Hardware Set 026 at Doors B206.
- d. Replace Hardware Set 039 with Hardware Set 013 at Doors A109 and A110.
- e. Replace Door Type N with Door Type **N3** at Doors A104, B110, B204, B206, B207 and B211.
- 7.) Drawing A4'S ROOF PLANS
 - a. <u>Replace</u> note "PREFABRICATED E.I.F.S MOULDING" with "PREMANUFACTURED EXTERIOR MOULDING" at all locations.
- 8.) Drawing A4.0 TYPICAL ROOF DETAILS
 - a. Revise Roof Type "R04". Refer to sketch SK-A-024.
- 9.) Drawing A4.1 OVERALL ROOF PLAN
 - a. Revise Roof Drain note in ROOF LEGEND to read "ROOF DRAIN WITH 48" x 48" TAPERED INSULATION SUMP (1/2" PER FOOT SLOPE, 3 1/2" AT DRAIN AND 4 1/2" AT HIGH POINT OF SUMP)".
- 10.) Drawing A4.2-A4.4 ROOF DETAILS
 - a. Revise Roof Detail 1/A4.2. Refer to sketch SK-A-025. (Revise Roof Details 2/A4.2, 3/A4.2, 4/A4.2, 7/A4.2, 3/A4.3, 10/A4.3, 6/A4.4 and 7/A4.4 similarly.)
- 11.) Drawing A4.3 ROOF DETAILS
 - a. Revise Roof Detail 6/A4.3. Refer to sketch SK-A-022
 - b. Revise Roof Detail 9/A4.3. Refer to sketch SK-A-023.
- 12.) Drawing A4.4 ROOF DETAILS
 - a. Revise Roof Detail 8/A4.4. Refer to sketch SK-A-026.
 - b. Revise Roof Detail 9/A4.4. Refer to sketch SK-A-027.
- 13.)Drawing A5.1, A5.2, A5.3, A5.4, A5.5 ELEVATION DRAWINGS
 - a. <u>Replace</u> note "PREFABRICATED E.I.F.S MOULDING" with "PREMANUFACTURED EXTERIOR MOULDING" at all locations.
- 14.) Drawing A7.3 ELEVATOR PLANS, SECTIONS AND DETAILS
 - a. Revise Detail 1/A7.3 ELEVATOR PIT PLAN. Refer to sketch SK-A-014.
 - b. Revise Detail 2/A7.3 ELEVATOR FIRST FLOOR. Refer to sketch SK-A-015.
 - c. Revise Detail 3/A7.3 ELEVATOR SECOND FLOOR. Refer to sketch SK-A-016.
- 15.) Drawing A7.0 TYPICAL STAIR AND RAILING DETAILS
 - a. Revise Detail 16/A7.0. Refer to sketch SK-A-011.
- 16.) Drawing A8.1 DOOR AND FRAME TYPES AND WINDOW TYPES
 - a. Revise PRECAST CONCRETE PROFILE TYPE "D" from height of 11 5/8" to height of 7 5/8".

17.)Drawing A9.9 – ENLARGED PLANS AND INTERIOR ELEVATIONS – CORRIDORS AND LOBBIES

- a. Replace the note in Elevation 12/A9.9 "BULLNOSE EDGE, TYPICAL" with "BULLNOSE VERTICAL EDGE AT THIS LOCATION ONLY".
- 18.) Drawings A10.1 A10.5 FLOOR PATTERN PLANS
 - a. Add to the General Notes 2. REVISED FLOOR PATTERN PLANS WILL BE ISSUED UPON ACCEPTANCE OF THE ALTERNATE BID FOR LVT FLOORING.
- 19.) Drawing A10.3 FLOOR PATTERN PLAN LOWER LEVEL AREA 'C'
 - a. Replace the note "PT-3" with "PT-1" at all locations

20.) DRAWING S2.4

a. Revise plans to show folding partitions and cut section 9/S4.1 through them in 7 places. Beam sizes supporting the folding partitions do not change.

21.) DRAWING S2.4

a. Revise perimeter beam size from W16x26 to W18x35 two feet from column line1 between grids D and F and between grids M and P. Brick over W5 windows is to be hung from these beams per typical detail in sketch SK-S-01.

22.) DRAWING S2.5

a. Add HSS6x6x3/8 column callout to columns at grids B1.6 BC and B2.5 BC. These columns transition from wide flange at first floor to HSS at second floor. The splice connection must occur at the second floor top of steel. The wide flange column can not extend higher than the second floor top of steel.

23.) DRAWING S2.2, S2.5 and S2.8

a. The elevator size increased. See sketches SK-S-014, SK-S-015 and SK-S-016 for plan revisions at each level.

24.) DRAWING S4.2

a. Revise 13/S4.2 to add bent plate at perimeter of roof per sketch SK-S-013.

25.) DRAWING S6.1

a. Add typical detail above W5 window per sketch SK-S-012.

26.) DRAWING S2.3

a. Add note to plan reading, "SEE TYP. DETAIL 13/S6.1 FOR DUNNAGE DETAIL" pointing at cooling tower support framing.

27.) DRAWING S1.1

a. Revise stage live load under Design Criteria to be 150 PSF.

28.) Drawing M6.1, SCHEDULES – MECHANICAL

- a. ROOFTOP ENERGY RECOVERY UNIT SCHEDULE
 - REVISE Note 2 to read as follows:
 - "2. UNIT SHALL BE PROVIDED WITH A SPRING ISOLATED ROOF CURB, AND RA AND OA FILTERS."
 - REVISE Note 3 to read as follows:
 - "3. UNIT SHALL BE PROVIDED WITH 2-INCH DOUBLE WALL CONSTRUCTION, MODULATING GAS FURNACE, AND DIRTY AIR FILTER SWITCH."

b. PACKAGED ROOFTOP UNIT SCHEDULE:

- REVISE Note 3 to read:
 - "3. UNIT SHALL BE PROVIDED WITH A ROOF CURB, 2 STAGE GAS HEAT, DIRTY FILTER SWITCH, PHASE MONITOR, STAINLESS STEEL DRAIN PAN, AND HUMIDITY SENSOR."
- DELETE Hot Gas Reheat Column.
- CHANGE model number of RTU-1 from "J12ZRN24D4B2FCA2E1" to "J12ZFN24D4B2FCA2E1"
- CHANGE model number of RTU-2 from "J10ZRN18D4B2FCA2E1" to "J10ZFN18D4B2FCA2E1"
- CHANGE model number of RTU-3 from "J12ZRN18B4B2FCA2E1" to "J12ZFN18B4B2FCA2E1"
- CHANGE model number of RTU-4 from "JA4ZRH06B4B2FCA2E1" to "JA4ZFH06B4B2FCA2E1"
- CHANGE model number of RTU-5 from "J07ZRN12D4B2FCA2E1" to "J07ZFN12D4B2FCA2E1"

c. BOILER SCHEDULE

- REVISE Note 2 to read as follows
 - "2. PROVIDE BOILER MANAGEMENT/SEQUENCING PACKAGE WITH 4-20mA CONTROL, OUTDOOR AIR RESET, AND EFFICIENCY & RUN-TIME OPTIMIZATIONS."

d. CHILLER SCHEDULE

- REVISE Note 1 to read as follows
 - "1. UNIT SHALL BE PROVIDED WITH MINIMUM OF 4 STAGES OF COOLING, HOT GAS BYPASS ON 1ST CIRCUIT, DIFFERENTIAL PRESSURE FLOW SWITCH ON EVAPORATOR, COMPRESSOR SOUND BLANKETS, CONTROL TRANSFORMER, AND SUCTION VALVES."
- 29.) Drawing P5.1, DETAILS PLUMBING
 - a. MODIFY Domestic Water Detail to exclude meter and backflow preventer fixture number. Refer to attached Sketch SK-P10.
- 30.) Drawing P6.1, LEGENDS AND SCHEDULES PLUMBING
 - a. PLUMBING FIXTURE/EQUIPMENT SCHEDULE
 - MODIFY F-10, F-41, and F-42, as items are not used in the Scope of Work Refer to attached Sketch SK-P11.
- 31.) Drawing E3.2, PARTIAL FIRST FLOOR LIGHTING PLAN AREA "B"
 - a. ADD Emergency Lighting in Room B121. Refer to attached revised Drawing E3.2.
- 32.) Drawing E3.3, PARTIAL FIRST FLOOR LIGHTING PLAN AREA "C"
 - a. ADD Emergency Lighting in Rooms C115, C116, C119, C123, and Fire Pump Room. Refer to attached revised Drawing E3.3.
- 33.) Drawing E3.6, PARTIAL FIRST FLOOR POWER PLAN AREA "A"
 - a. REVISE location of "C" outlet and outlet in Rooms A104, A105, and A106. Refer the

attached Sketch SK-E-42.

- 34.) Drawing E3.7, PARTIAL FIRST FLOOR POWER PLAN AREA "B"
 - a. REVISE location of receptacles in Room B101. Refer the attached Sketch SK-E-43.
 - b. ADD circuit for microwave in Room B101. Refer the attached Sketch SK-E-43.
 - c. ADD Wireless Access Points in Admin. Area. Refer to attached Sketch SK-E-51.
- 35.) Drawing E3.8, PARTIAL FIRST FLOOR POWER PLAN AREA "C"
 - a. **GENERAL NOTES**
 - REVISE Note 1. Refer to the attached Sketch SK-E-44.
- 36.) Drawing E3.9, PARTIAL SECOND FLOOR POWER PLAN AREA "A"
 - a. REVISE location of "C" outlet and receptacle in Rooms A204, A205, and A206. Refer to attached Sketch SK-E-45.
- 37.) Drawing E3.10, PARTIAL SECOND FLOOR POWER PLAN AREA "B"
 - a. REVISE location of monitor receptacles in Room B206. Refer the attached Sketch SK-E-46.
- 38.) Drawing E4.2, SITE PLAN
 - a. MODIFY Electrical Service. Refer to attached revised Drawing E4.2.
- 39.) Drawing E5.1, DETAILS ELECTRICAL
 - a. TYPICAL CLASSROOM SOUND/VIDEO SINGLE LINE DIAGRAM
 - REVISE. Refer to attached Sketch SK-E-47.
 - b. COMMUNICATIONS OUTLET CONFIGURATION
 - REVISE. Refer to attached Sketch SK-E-48.
- 40.) Drawing E6.1, SCHEDULES ELECTRICAL
 - a. FIXTURE SCHEDULE
 - REVISE Type "C" and "N2". Refer to attached Sketch SK-E-49.
- 41.) Drawing E6.4, PANEL SCHEDULES ELECTRICAL
 - a. RP-3
 - REVISE. Refer to attached Sketch SK-E-50.

End of Addendum No. 1

SECTION 000110 TABLE OF CONTENTS

<u>DIVISION 00 - PROCUREMENT AND CONTRACT REQUIREMENTS</u>

000110	Table of Contents
000115	List of Drawings
001113	Advertisement for Bid
002113	Instructions to Bidders
003132	Geotechnical Data
004100	Bid Forms
005200	Agreement Forms
006113	Performance and Payment Bond Forms
006216	Certificate of Insurance
007200	General Conditions
007300	Supplementary General Conditions
007343	Wage Rate Requirements
008114	Drug Testing Forms

DIVISION 01 - GENERAL REQUIREMENTS

011100	Summary of Work - Work Covered by Contract Documents
012100	Allowances
012200	Unit Prices
012300	Alternates
012600	Change Order Procedures
012613	Contractor Compensation
012900	Payment Procedures
013113	Project Coordination Meetings
013119	Pre-installation Meetings
013125	Web-Based Project Management System
013216	Construction Schedule
013219	Submittals Register
013226	Contractor Daily Reports
013300	Submittal Procedures
013500	Contractor Employee Background Check
013523	Safety Program
013700	Building Information Modeling Coordination
014500	Quality Control
015113	Temporary Electric
015123	Temporary Heating, Cooling, and Ventilating
015200	Construction Facilities & Temporary Controls
016200	Material and Equipment
017123	Field Engineering
017329	Cutting and Patching
017700	Contract Closeout

DIVISION 03 – CONCRETE

033000	Cast-In-Place Concrete
033600	Concrete Floor Sealer

034500 Precast Architectural Concrete

034900 Glass-Fiber-Reinforced Concrete (GFRC)

DIVISION 04 - MASONRY

042000 Unit Masonry

DIVISION 05 - METALS

051200	Structural Steel Framing
052100	Steel Joist Framing
053100	Steel Decking
054000	Cold-Formed Metal Framing
055000	Metal Fabrications
055113	Metal Pan Stairs
055213	Pipe and Tube Railings

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

061000	Rough Carpentry
061600	Sheathing
062013	Exterior Finish Carpentry
062023	Interior Finish Carpentry
064023	Interior Architectural Woodwork

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

071416	Cold Fluid-Applied Waterproofing
071700	Bentonite Waterproofing
071900	Water Repellents
072100	Thermal Insulation
072119	Foamed-In-Place Insulation
073113	Asphalt Shingles
074113.13	Formed Metal Roof Panels
074293	Soffit Panels
074646	Fiber-Cement Siding
075323	Ethylene-Propylene-Diene-Monomer (EPDM) Roofing
076200	Sheet Metal Flashing and Trim
077100	Roof Specialties
077200	Roof Accessories
078100	Applied Fireproofing

078413	Penetration Firestopping
	11 8
078443	Joint Firestopping
079100	Preformed Joint Seals
079200	Joint Sealants
079513.13	Interior Expansion Joint Cover Assemblies

DIVISION 08 - OPENINGS

081113	Hollow Metal Doors and Frames
081416	Flush Wood Doors
081613	FRP Flush Doors
083113	Access Doors and Frames
083323	Overhead Coiling Doors
0835113.23	Accordion Folding Fire Doors
084113	Aluminum-Framed Entrances and Storefronts
085113	Aluminum Windows
087100	Door Hardware
088000	Glazing
088813	Fire-Resistant Glazing

DIVISION 09 - FINISHES

090600	Room Finish Schedule – Color Legend
092216	Non-Structural Metal Framing
092900	Gypsum Board
093013	Tiling
095113	Acoustical Panel Ceilings
096400	Wood Flooring
096513	Resilient Base and Accessories
096519	Resilient Tile Flooring
096723	Resinous Flooring
096813	Tile Carpeting
097723	Tackable Wall Panels
098433	Sound-Absorbing Wall Units
099123	Interior Painting

DIVISION 10 - SPECIALTIES

100600	Instructional Board Schedule
101100	Visual Display Units
101416	Plaques
101419	Dimensional Letter Signage
101423	Panel Signage
102113	Plastic Toilet Compartments
102123	Cubicle Curtains and Track

102239	Folding Panel Partitions
102600	Wall and Corner Protection
102800	Toilet, Bath and Laundry Accessories
104413	Fire Protection Cabinets
104416	Fire Extinguishers
105113	Metal Lockers
107316	Metal Canopies
107516	Ground-Set Flag Poles

DIVISION 11 - EQUIPMENT

110000	Miscellaneous Equipment
114000	Foodservice Equipment
115213	Projection Screens
116143	Stage Curtains
116623	Gymnasium Equipment
116800	Play Field Equipment and Structures

DIVISION 12 - FURNISHINGS

120600	Plastic Laminate Casework Schedule
122413	Roller Window Shades
123623	Plastic-Laminate-Clad Countertops
123661.16	Solid Surfacing Countertops
124813	Entrance Floor Mats and Frames

DIVISION 14 - CONVEYING EQUIPMENT

142123.16	Machine Room-Less Electric Traction Passenger Elevators
144200	Wheelchair Lifts

<u>DIVISION 21 – FIRE SUPPRESSION</u>

210170	Fire Suppression Sprinkler System and Standpipe System
210171	Fire Pump – Electric

DIVISION 22 - PLUMBING

220000	General Provisions – Plumbing/Fire Protection
220010	Basic Materials and Methods – Plumbing
220030	Insulation & Covering – Plumbing
220110	Drainage Systems – Plumbing
220120	Domestic Water Systems – Plumbing
220130	Gas Piping Systems – Plumbing
220140	Fixtures – Plumbing

220150	Equipment – Plumbing
220190	Testing – Plumbing
220191	Balancing – Plumbing

<u>DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)</u>

230200	General Provisions – HVAC
230210	Basic Materials and Methods – HVAC
230215	Valves
230230	Insulation & Covering – HVAC
230300	Vibration and Sound Isolation – HVAC
230400	Heating Generation Equipment
230410	Heating Generation Auxiliary Equipment
230450	Refrigeration Equipment – HVAC
230500	Piping Systems & Accessories – HVAC
230510	Water Treatment (HVAC)
230600	Air Distribution & Accessories – HVAC
230605	Fans
230725	Terminal Heating Units
230760	Air Handling Equipment
230900	Automatic Temperature Controls
230950	Testing & Balancing of Mechanical Systems

DIVISION 26 - ELECTRICAL

260000	General Provisions – Electrical
260055	Electrical Identification
260110	Raceways
260120	Wires and Cables
260135	Electrical Boxes & Fittings
260140	Wiring Devices
260155	Motor Starters
260160	Panelboards
260165	Switchboards
260170	Motor and Circuit Disconnects
260180	Overcurrent Protective Devices
260190	Supporting Devices
260195	Power System Studies
260430	Metering Equipment
260452	Grounding
260460	Transformers
260470	Distribution Circuits
260471	Feeder Circuits
260472	Branch Circuits
260475	Elevator Electrical Systems
260510	Building Lighting

260520	Roadway & Parking Area Lighting
260601	Lightning Protection Systems
260731	Wireless Clock System
260771	Intercom/Telecommunication and Clock System
260772	Cafetorium Sound Reinforcement System
260930	Dimming Controls

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

280721	Fire Alarm and Detection Systems
280724	Area Rescue System
280725	Intrusion Detection System
280727	Integrated Access Control & Security Management System

DIVISION 31 - EARTHWORK

311000	Site Clearing
312000	Earthmoving
312500	Erosion and Sediment Controls

DIVISION 32 - EXTERIOR IMPROVEMENTS

320523	Cement and Concrete for Exterior Improvements
321216	Asphalt Paving
321613	Concrete Curb
321816.13	Playground Protective Surfacing
323114	Tubular Barrier Gate
323119	Decorative Metal Fencing and Gates
323157	Cast-In-Place Concrete for Screen Wall Footings
323158	Unit Masonry for Screen Wall
323319	Bicycle Racks
329000	Planting

DIVISION 33 - UTILITIES

331417	Water Service Piping
333100	Sanitary Sewerage
334000	Stormwater utilities

END OF SECTION

SECTION 001113 ADVERTISEMENT FOR BID

Receipt of Bids

Public notice is hereby given that sealed bids for the following prime contracts will be received for the construction of **Appoquinimink School District Whitehall Elementary School** located in Middletown, Delaware. Bids will be received at the office of **Appoquinimink School District Office**, **Marion Profitt Training Center 118 South Sixth Street Odessa**, **DE 19730** until <u>2:00 PM</u> local time on <u>Thursday</u>, <u>December 14, 2017</u> at which time they will be publicly opened and read aloud. *Bidder bears the risk of late delivery*. *Any bids received after the stated time will be returned unopened*. The time and location of the bid opening may be extended with a minimum of 2 calendar days' notice to the Bidders.

Contract: A-01: Sitework Contract: A-02: Concrete Contract: A-03: Masonry

Contract: A-04: Structural Steel & Misc. Metals Contract: A-05: Carpentry & General Works

Contract: A-06: Roofing

Contract: A-07: Metal Studs & Drywall

Contract: A-08: Glass & Glazing

Contract: A-09: Casework & Millwork Contract: A-10: Folding Partitions Contract: A-11: Paint & Wallcoverings Contract: A-12: Acoustical Ceilings

Contract: **A-13: Flooring**Contract: **A-14: Ceramic Tile**

Contract: A-15: Kitchen Equipment

Contract: A-16: Elevator & Wheel Chair Lifts

Contract: A-17: Fire Protection
Contract: A-18: HVAC & Plumbing

Contract: A-19: Building Management Systems

Contract: A-20: Electrical

Contract: **A-21: Special Systems**Contract: **A-22: Testing & Balancing**

Bidding Document

- Documents may be examined on the State of Delaware Online Bid Solicitation Directory, bids.delaware.gov, or at the office of the Construction Manager, EDIS Company, 110 S. Poplar Street, Suite 400, Wilmington, Delaware 19801; on or after November 6, 2017.
- Documents may be viewed and downloaded at EDiS' FTP site on or after November 6, 2017.
 Bidders requesting the log on information may obtain user name and password permission by contracting: Jackie McKee at jmckee@ediscompany.com. Each contractor will be required to provide the following information prior to receiving the log on information: company name,

contact name, email address phone number, fax number and postal mailing address. Upon receipt of this information, instructions detailing how to access the bid document on the FTP site will be emailed to you.

It is the responsibility of each bidder to review and coordinate all Project Documents. This includes plans, specifications and addendums. Documents may be examined on the State of Delaware Online Bid Solicitation Directory, http://bids.delaware.gov or at the office of the Construction Manager, EDiS Company, 110 S. Poplar Street, Suite 400, Wilmington, DE 19801.

Bid Security

A bid security in the amount of 10% of the bid, plus a consent of surety must accompany each bid. Bid Security shall specify the Owner as the obligee. Owner: **Appoquinimink School District**.

Pre-Bid Meeting

A pre-bid meeting will be held at Alfred G. Waters Middle School, Cafeteria, located at 1235 Cedar Lane Rd, Middletown, DE 19709 on <u>Thursday November 16, 2017</u> at 3:00 PM local time.

Questions

Please contact EDiS Company, Mark Grunza at (302) 421-2956 or mgrunza@ediscompany.com with questions.

Conformance to the Delaware Architectural Accessibility Act and the standards of the Architectural Accessibility Board is required on the Project.

Prevailing Wage Rates

Prevailing Wage Rates, as directed by Delaware Law, must be adhered to where applicable.

Pursuant to the Office of Management and Budget (OMB) "4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects" required that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds implement a Mandatory Drug Testing Program. The regulation can be downloaded from the following website:

http://regulations.delaware.gov/register/september2015/final/19%20DE%20Reg%20207%2009-01-15.pdf

END OF SECTION

Contract: A-01: Sitework

	BID FO	<u>RM</u>	
For Bids Due:	То:	Appoquinimink School District 118 South Sixth Street Odessa, De 19730	
Name of Bidder:			
Bidder Address:			
Contact Name:		E-Mail Address:	
Delaware Business License No.:		Taxpayer ID No.:	
(Other License Nos.):(A copy of Bidder's Delaware Business License I	must be attached	to this form.)	
Phone No.: ()		Fax No.: ()	
The undersigned, representing that he has read accordance therewith, that he has visited the si Work is to be performed, and that his bid is ba Documents without exception, hereby propose transport and other facilities required to execuitemized below:	ite and has famil sed upon the ma es and agrees to p	iarized himself with the local condition terials, systems and equipment descr provide all labor, materials, plant, eq	ons under which the ribed in the Bidding uipment, supplies,
\$		(\$)
ALTERNATES Alternate prices conform to applicable project of following Alternates. An "ADD" or "DEDUCT Alternate No. 1: Landscape Irrigation of the second	r" amount is indi		
Add/Deduct		(\$)
Alternate No. 2: Multi-Purpose Field In	rrigation		
Add/Deduct		(\$)

Alternate No. 3a:	Swing Assembly Items		
Add/Deduct		(\$)
Alternate No. 3b:	<u>Play Assembly Items</u>		
Add/Deduct		(\$)
Alternate No. 3c:	<u>Play Items</u>		
Add/Deduct		(\$)
Alternate No. 4:	Brick Veneer on Parking Lot Elevation		
Add/Deduct		(\$)
Alternate No. 9:	Trees Along Mapleton & Raleigh Areas		
Add/Deduct		(\$)
Alternate No. 11:	Additional Construction Entrance Access Road		
Add/Deduct			

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

		BUL! Add	<u>K</u> <u>Deduct</u>	<u>TREN</u> <u>Add</u>	I <u>CH</u> <u>Deduct</u>
1.	Price per Cubic Yard for earth excavation	c/y _	c/y	C/	<u>'y</u> c/ <u>y</u>
2.	Additional mass concrete in footings	c/y	c/y	C/	<u>c/y</u>
3.	Price per cubic yard for concrete in foundation walls (including forms and reinforcement)	c/y _	<u>c/y</u>	C/	<u> </u>
4.	Price per cubic yard for reinforced concrete on grade.	c/y _	<u>c/y</u>	C/	<u>c/y</u>
5.	Price per cubic yard for reinforced concrete. Including forms) for structural slabs above grade	c/y _	c/y	C/	<u>/y</u> <u>c/y</u>

6. Price per cubic yard for excavation and backfill With select material	c/y	c/y	c/y	<u>c/y</u>
$\underline{\text{NOTE}}$: The difference in price between Add and Deduct ir (15%).	n the above Unit F	Prices should not o	exceed fifteen perc	ent
I/We acknowledge Addendums numberedcost/schedule impact they may have.		and the pric	e(s) submitted inc	lude any
This bid shall remain valid and cannot be withdrawn for six undersigned shall abide by the Bid Security forfeiture provi	•	•	0	
The Owner shall have the right to reject any or all bids, and	to waive any info	ormality or irregu	arity in any bid re	eceived.
This bid is based upon work being accomplished by the Sub	o-Contractors nam	ned on the list atta	ached to this bid.	
The undersigned represents and warrants that he has comp national laws; that no legal requirement has been or shall be contract to him or in the prosecution of the work required; t indirectly, entered into any agreement, participated in any o competitive bidding.	e violated in maki hat the bid is lega	ng or accepting that h	nis bid, in awardir e has not, directly	ng the or
Upon receipt of written notice of the acceptance of this Bid, agreement in the required form and deliver the Contract Bo Documents.			•	
I am / We are an Individual / a Partnership / a Corporation				
By T (Individual's / General Partner's / Corporate Name)	rading as			_
(State of Corporation) Business Address:				
business Address.				
Witness: B	y:			
(SEAL)	(Authorized S (Title)	Signature)		
Dat	te:			_

<u>ATTACHMENTS</u>

Sub-Contractor List

Non-Collusion Statement

Bid Bond

Consent of Surety

Affidavit of Employee Drug Testing Program (1 per contractor/subcontractor)

Delaware Business License

New Castle County Business License

(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b <u>Delaware Code</u>, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor</u> <u>Category</u>	Subcontractor	Address (City & State)	Subcontractors tax payer ID # or Delaware Business license #
1. Sitework			of Delaware Dusiness ficense π
2. Paving			
3. Landscaping			
4. Irrigation			

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of *Contract A-01 Sitework* have been thoroughly examined and are understood.

NAME OF BIDDER:		
AUTHORIZED REPRESENTATIVE (TYPED):		
AUTHORIZED REPRESENTATIVE (SIGNATURE):		
TITLE:		
ADDRESS OF BIDDER:		
PHONE NUMBER:		
Sworn to and Subscribed before me this _	day of	20
My Commission expires	NOTARY PUBLIC	

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL (Not necessary if security is used)

KNOW ALL MEN BY THESE PRESE	NTS That:	of	
		and State of	as
Principal, and	of	in the County of	
and State of	as Surety, legall	y authorized to do business in the State	of Delaware
('State"), are held and firmly unto the	Appoquinimink School D	istrict in the sum of	
Dollars (S), or p	percent not to exceed		
Dollars (S) of amount of bid on	Contract No to	be paid to the
		poquinimink School District for which	
		eirs, executors, administrators, and suc	ccessors, jointly
and severally for and in the whole firm	mly by these presents.		
NOW THE CONDITION OF THIS OF	BLIGATION IS SUCH That i	f the above bounden Principal who has	s submitted to the
Appoquinimink School District a cer	rtain proposal to enter into t	his contract for the furnishing of certair	n material and/or
services within the State, shall be awa	rded this Contract, and if sa	id Principal shall well and truly enter i	nto and execute
this Contract as may be required by th	ne terms of this Contract and	approved by Appoquinimink School	District this
Contract to be entered into within two	enty days after the date of of	ficial notice of the award thereof in acco	ordance with the
terms of said proposal, then this oblig	ation shall be void or else to	be and remain in full force and virtue.	
Sealed withseal and dat	ed thisday of	in the year of our Lord	two thousand
and(20).	•	•	
SEALED, AND DELIVERED IN THE	DDECENICE OF		
SEALED, AND DELIVERED IN THE	FRESENCE OF		
	Name o	f Bidder (Organization)	
Corporate	By:		
Seal	Authorized Signatu		
Attest			
	Title		
	Name of Surety		
Witness			
	 Title		

	CONSENT OF SURETY
DATE_	
То:	Appoquinimink School District 118 South Sixth Street Odessa, De 19730
Gentle	men:
We, the	
	(Surety Company's Address)
a Suret	y Company authorized to do business in the State of Delaware hereby agrees that if
	(Contractor)
	(Address)
is awar	rded the Contract No.
	l write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to
	(Surety Company)
	By(Attorney-in-Fact)

AFFIDAVIT OF EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite that complies with this regulation:

Contractor/Subcontractor Name:		
_		
_		
Authorized Representative (typed or prin	nted):	
Authorized Representative (signature):		
Title:		
Sworn to and Subscribed before me this _	day of	
My Commission expires	NOTARY PUBLIC	<u>.</u>

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

SECTION 011100 - SUMMARY OF WORK

1. RELATED DOCUMENTS

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

2. CONTRACTS

A. The work will be performed under separate prime contracts managed by the Construction Manager.

3. <u>ALTERATIONS & COORDINATION</u>

A. Contractor shall be responsible to coordinate their work with the work of others, including, but not limited to, the preparation of general coordination drawings, diagrams and schedules, and control of site utilization, from the beginning of activity, through project close-out and warranty periods.

4. KNOWLEDGE OF CONTRACT REQUIREMENTS

- A. The Contractor and his Subcontractors, Sub-subcontractors and material men shall consult in detail the Contract Documents for instructions and requirements pertaining to the Work, and at his and their cost, shall provide all labor, materials, equipment and services necessary to furnish, install and complete the work in strict conformance with all provisions thereof.
- B. The Contractor will be held to have examined the site of the Work prior to submitting his proposal and informed himself, his Subcontractors, Sub-subcontractors and material men of all existing conditions affecting the execution of the Work.
- C. The Contractor will be held to have examined the Contract Documents and modifications thereto, as they may affect subdivisions of the Work and informed himself, his Subcontractors, Sub-subcontractors and material men of all conditions thereof affecting the execution of the Work.
- D. The Scope of Work for the Contract is not necessarily limited to the description of each section of the Specifications and the illustrations shown on the Drawings. Include all minor items not expressly indicated in the Contract Documents, or as might be found necessary as a result of field conditions, in order to complete the Work as it is intended, without any gaps between the various subdivisions of work.
- E. The Contractor will be held to be thoroughly familiar with all conditions affecting labor in the area of the Project including, but not limited to, Unions, incentive pay, procurements, living, parking and commuting conditions and to have informed his

Subcontractors and Sub-subcontractors thereof.

5. <u>CONTRACT DOCUMENTS INFORMATION</u>

- A. The Contract Documents are prepared in accordance with available information as to existing conditions and locations. If, during construction, conditions are revealed at variance with the Contract Documents, notify the Construction Manager immediately, but no more than three (3) days from the day the variance is first known. Failure to give timely notice shall operate to waive any claim Contractor might otherwise have for an adjustment to Contract Time or Sum as a consequence of such variance.
- B. The Specifications determine the kinds and methods of installation of the various materials, the Drawings establish the quantities, dimensions and details of materials, the schedules on the Drawings give the location, type and extent of the materials.
- C. Dimensions given on the Drawings govern scale measurements and large scale drawings govern small scale drawings, except as to anything omitted unless such omission is expressly noted on the large scale drawings.
- D. The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive", "open generic/descriptive", "compliance with standards", "performance", "proprietary", or a combination of these. The methods used for specifying one unit of work has no bearing on requirements for another unit of work.
- E. Whenever a material, article or piece of equipment is referred to in the singular number in the Contract Documents, it shall be the same as referring to it in the plural. As many such materials, articles or pieces of equipment shall be provided as are required to complete the Work.
- F. Whenever a material, article or piece of equipment is specified by reference to a governmental, trade association of similar standard, it shall comply with the requirements of the latest publication thereof and amendments thereto in effect on the bid date.
- G. In addition to the requirements of the Contract Documents, Contractor's work shall also comply with applicable standards of the construction industry and those industry standards are made a part of Contract Documents by reference, as if copied directly into Contract Documents, or as if published copies were bound herein.
- H. Where compliance with two (2) or more industry standards, contract requirements, or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, then the most stringent requirements, which are generally recognized to be also the most costly, is intended and will be enforced, unless specifically detailed language written into the Contract Documents clearly indicates that a less stringent requirement is to be fulfilled.

- Refer apparently equal but different requirements, and uncertainties as to which level of quality is more stringent, to Architect for decision before proceeding.
- I. Reference standards referenced directly in Contract Documents or by governing regulations have precedence over non-reference standards which are recognized in industry for applicability of work.
- J. Contractor's bid is based on the complete set of Contract Documents including documents not specifically issued as part of the bid pack but referenced in same.

6. SCOPE OF WORK/GENERAL INFORMATION

- A. A Scope of Work for each contract to be awarded on the project follows in this section. When a Contract has been awarded to a Contractor, the successful Contractor will be listed after the title of the Contract. When no Contract has yet been awarded, no Contractor's name will be listed. Previous Scopes of Work include addendum changes.
- B. Contractor is responsible for performing the work listed in the Summary of Work for his contract. Contractor is also responsible for knowing the work that has been assigned to preceding contracts. No additional compensation or extension of time will be allowed a Contractor due to his ignorance of the work assigned to his Contract or to other contracts which may affect his work. The Contractor is responsible, however, for all items which are covered in the Specifications and Drawings relating to their Contract if not specifically mentioned in the Summary of Work.
- C. The Construction Manager will provide on-site a source for temporary electric, temporary water and portable sanitation facilities only. It is each Contractor's responsibility to make the necessary connections, including all material for temporary electric and water. Please note that utility charges for office trailers will be the responsibility of the individual Contractors.
- D. A dumpster will be provided on site for free use by Contractors to dispose of non-hazardous, common, work-related refuse. The masonry contractor will provide their own dumpster for masonry debris. Clean-up is the responsibility of each Contractor. Clean up shall be performed on a daily basis. Contractors not complying will be advised in writing and back charged for all costs associated with the cleanup of their work.
- E. Contractors are reminded that there are limited storage areas available on site. Off-site storage will be the responsibility of each individual Contractor.
- F. Office trailer permits off site will be the responsibility of each individual Contractor. On site Contractor's field offices, one (1) per Contractor, if required, will be located as directed by the Construction Manager.
- G. Contractor will be prepared to discuss and submit a detailed project schedule seven (7)

days after receipt of Notice to Proceed and to begin its submittal process. The Project Schedule is an integral part of this contract. Certain construction sequences and priorities must take place in order to meet the target dates. Concentrated work periods will occur and each Contractor is responsible to staff the project as required by the current Construction Schedule or as directed by the Construction Manager. Contractor will cooperate with the Construction Manager in planning and meeting the required sequences of work and Project Schedule as periodically updated by the Construction Manager.

- H. All bids must include insurance limits in accordance with Article 11 of the Section 007300 SUPPLEMENTARY CONDITIONS.
- I. Hoisting, scaffolding and material handling is the responsibility of each Contractor, unless otherwise noted.
- J. Contractor will be responsible for layout of its own work. The Construction Manager will provide benchmark and layout of the building line.
- K. Contractor will be responsible to keep clean public roadways soiled by construction traffic on a daily basis. If cleaning is not done, the Construction Manager may perform the cleaning on an overtime basis and backcharge the Contractor responsible.
- L. Contractor Scopes of Work and Schedule are interrelated. Familiarity with each is required.
- M. The Construction Manager will provide testing services for soil, concrete and steel. Other testing as required by the Contract Documents will be in accordance with the technical specifications and/or the individual scope of work. Refer to Specification Section 004500 - QUALITY CONTROL.
- N. Safety is the responsibility of each individual Contractor. The project will be governed under the guidelines of OSHA.
- O. Inter-Contractor shop drawing distribution will be performed by the Construction Manager. Contractor is individually responsible for either coordinating his work with these distributed drawings or notifying the Construction Manager, in writing, of any discrepancies.
- P. Coordination with other trades will be required. The Contractor will be required to attend periodic coordination meetings with other trades where requirements, conflicts and coordination issues will be discussed and resolved. Attendance when requested will be mandatory. If inter-Contractor coordination is not satisfactorily performed, the conflicting Contractors shall mutually share the cost to relocate and/or reinstall their work.

- Q. Contractor shall submit a schedule of values to the Construction Manager prior to the submission of their first invoice for approval through Building Blok.
- R. Contractor is expected to review and coordinate its Work with the complete set of Contract Documents, including all items noted as by his trade whether or not shown on that particular set of drawings. Documents are available at the site for review.
- S. Contractor is responsible for obtaining all necessary permits required for his work, including street permits. Unless otherwise noted, building permit shall be secured by the Construction Manager. Any subcontractor who will be restricting access to street, right of way or adjacent property must notify the Construction Manager 48 hours in advance.
- T. Contractor's License: Submit a copy of all business licenses required by local and state agencies.
- U. Contractor shall absorb, without additional compensation, any and all costs of working beyond normal hours to maintain job progress in accordance with the current construction schedule.
- V. No asbestos or PCB's in or on any material or equipment will be accepted or allowed on this project. All hazardous materials will be treated in accordance with all State and Federal regulations.
- W. Daily cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Contractor will be individually back charged by the Construction Manager for clean up not satisfactorily performed by the Contractor.
- X. In the event asbestos is uncovered, the Contractor shall notify the Construction Manager of the areas requiring removal of asbestos. The Construction Manager shall then coordinate the removal with the Owner.
- Y. This project is to be constructed adjacent to and in existing buildings. Contractor shall exercise all due precautions to minimize noise, air pollution and any other construction hazards which in any way would cause discomfort or danger to the occupants of the existing building in the area.
- Z. The Safety Cable System shall not be altered or removed without a written request submitted to the Project Manager with a copy to the Field Manager. It shall be the responsibility of each and every Contractor that is removing or altering the Safety Cable System to maintain the fall protection safety provided by the safety cable and not leave the area unprotected. Each and every Contractor shall be responsible to re-install the Safety Cable System immediately after work is completed. Each and every Contractor shall be responsible to re-install the Safety Cable System in accordance to OSHA standards.

- AA. Normal work hours for this project are from 7:00 a.m. to 3:30 p.m. Any work to be performed outside of these hours must receive prior approval from the Construction Manager. Requests to work beyond normal work hours shall be submitted at least 48 hours prior.
- AB. Contractor is responsible for having a competent project superintendent/foreman on-site during all work performed under its contract.
- AC. In the event the Contractor has non-English speaking employees or subcontractors on the project, they shall have a superintendent or foreman on site, at all times, who speaks English and can communicate with Contractor's employees. Should the Contractor fail to meet this requirement, at any time, Construction Manager may direct all Work to stop until the proper supervision is on site. The Contractor will be responsible for maintaining the project work schedule and make up at its own expense, any delay to the Schedule resulting from the work stoppage.
- AD. <u>Punch List Procedures</u>: Contractor shall be given a copy of the punch list with his appropriate work identified. Contractor shall have nine (9) calendar work days to complete its punch list work. On the 10th day or as determined by the Construction Manager, the Construction Manager shall employ other contractors, as required, to complete any incomplete punch list work and retain from the appropriate Contractors retainage all costs incurred.
- AE. All contractor shall provide the necessary safety barricades and railings required to complete their work and comply with all OSHA, local code and contract specifications.
- AF. <u>Prohibition of Using Photographs on EDiS Projects</u>: The Contractor and all associated subcontractors agrees to not issue any news release or advertising pertaining to the Work or the Project, including references to the Project on the Contractor's/subcontractor website or other social media outlets, without obtaining EDiS' prior written approval, in each instance. The Contractor, for itself, its employees, vendors and subcontractors, agrees to not use the name of the Owner, the Project, EDiS or any photographs, videos, or other images of the Project in connection with any of Contractor's business promotion activities, advertising, website, social media outlets, or operations, without EDiS' prior written approval in each instance.
- AG. All contractor vehicles, their companies subcontractors vehicles and all delivery vehicles will need to utilize the tire wash at all times prior to leaving the site. Any contractors that do not use or clean vehicles or tires vehicles well enough that additional cleaning will be needed, will be back charged all additional costs and could be removed or not allowed further vehicle access if not corrected. Access to the site is a privilege and this rule will be strictly enforced.

AH This contractor shall must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements. At a minimum, and it must be implemented in to the safety plan, including all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as water and keep records of exposures.

CONTRACT NO. A-01 - SITEWORK

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements

Division 3 Concrete

Section 071416 Cold Fluid-Applied Waterproofing Section 116800 Play Field Equipment and Structures

Division 21 Fire Suppression

Division 22 Plumbing
Division 23 Mechanical
Division 26 Electrical
Section 260130 Manholes
Division 31 Earthwork

Division 32 Exterior Improvements

Section 311000 Site Clearing Section 312000 Earth Moving

Section 312500 Erosion and Sediment Controls

Section 320523 Cement and Concrete for Exterior Improvements

Section 321216 Asphalt Paving Section 321613 Concrete Curb

Section 321816.13 Playground Protective Surfacing

Section 323113 Tubular Barrier Gate

Section 323119 Decorative Metal Fencing and Gates

Section 323157 Cast-In-Place Concrete for Screen Wall Footings

Section 323319 Bicycle Racks Section 329000 Planting

Section 331417 Water Service Piping Section 333100 Sanitary Sewerage Section 334000 Stormwater Utilities

Division 33 Utilities

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 1. Provide all sitework, site clearing, landscaping, electric, telephone, data & fiber lines, gas, storm, sanitary and water utilities, concrete & asphalt paving, exterior concrete steps, tree grates, signage, curbs, walks and topsoil/seeding.
- 2. A site visit and site examination is strongly encouraged, but not mandatory, in the preparation of this bid.

- 3. Provide water meter pit.
- 4. Void
- Furnish, install, maintain and remove erosion & sediment control system including erosion sediment control plan. Maintain sediment control until substantial completion established by DNREC.
- 6. Provide compost filter log sediment trap, inlet protection, stabilization matting, check dams, dust control, topsoil stockpile disposal area and associated silt fence.
- 7. Provide clearing, grubbing and removal of trees, roots and stumps.
- 8. Provide topsoil stripping and stockpiling on site and include all E & S measures to comply throughout substantial completion.
- 9. Contractors should carefully review the soil borings as they relate to the extent of rubble to be removed and other man made obstructions. Saw cutting and removal of sidewalks, curbs, etc. in the performance of work is this Contractor's responsibility. Rock excavation (if applicable) will be paid for on a unit price basis.
- 10. Provide rough grading for area defined on site drawings for building, lawn areas, bituminous roads, parking and walkways. Preparation of subgrade for building slabs, walks and pavements.
- 11. Provide site entrances. This shall include all subbases, tie-in details, handicapped requirements and clearances as indicated. Saw-cut paving shall be in accordance with drawing notes and where indicated on contract documents. Additional saw cutting may be necessary, but not specifically identified, to correctly perform the scope of work.
- 12. Provide all excavation, installation and backfill of planter walls. Provide foundations and sidewalks (Include colored concrete where indicated). All sidewalks shall include expansion and control joints as indicated.
- 13. This Contractor to provide a tabletop (subgrade elevation) to the building pad which meets the tolerances set forth in the specifications and which is accepted by the Construction manager before footing and underground MEP excavation begins. This contractor to extend the bulk excavation outside of the building plan in order to facilitate construction and maintain safety requirements. Concrete Contractor will be responsible for laying out, excavating, and backfilling all concrete work as shown on the structural and architectural drawings. Written acceptance of the building pad condition will be provided by the concrete contractor before foundation work proceeds. Once the Concrete Contractor has accepted this work it will be the responsibility of the Concrete Contractor to maintain and dewater the building pad and all excavations until the concrete work is complete and backfilled. The Concrete Contractor and this Contractor are to coordinate this procedure

so that there are no additional costs to the Owner for additional excavation or concrete. Spoils left after backfilling of foundations is complete are to be left outside the building perimeter by the concrete contractor and gathered by this contractor and spread on site.

- 14. Furnish, install and maintain select fill under slab.
- 15. The certified construction reviewer (CCR) will be provided by Vandemark & Lynch. This contractor to coordinate with the CCR being provided by the owner.
- 16. Provide all DelDOT permits related to work for this project.
- 17. Furnish, install and remove temporary orange construction fencing as required by Construction Manager (include 1,000 linear feet in base bid to be utilized by the Construction Manager).
- 18. Remove/relocate utilities including, but not limited to the removal of light standards.
- 19. Furnish, install, maintain and remove temporary site fencing at the completion of the project. Temporary fencing shall consist of 900' of movable 6'-0" chain link fencing sections. There will also be two construction gates that will need to be mounted at each end of the entrances in to the new school. These gates will need to be lockable.
- 20. Provide proof rolling of limit of excavation.
- 21. All utilities shall be brought to within +/- 5 feet of the building line by this Contractor. The connection and all utilities from +/- 5 feet and into the building shall be by others.
- 22. Provide perimeter drains at all buildings (including within 5' of the building perimeter). Provide downspout adaptors and coordinate with roofer for the correct downspout size.
- 23. Backfilling as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with Del Dot standard specifications.
- 24. It is the intent to use on site material, imported fill as required. The use of this onsite material shall conform with the compaction requirements as specified on Civil drawings and in Specification Division 31. If the on site material does not meet those requirements or if there is insufficient on site material available, this contractor shall import at no additional expense to the project sufficient material to complete the work.
- 25. Provide perimeter protection of all excavated areas until suitably backfilled.
- 26. Provide, maintain and remove stabilized construction entrance once substantial excepted by DNREC.
- 27. Provide street cleaning of mud, etc. on a daily basis for the duration of sitework activities.

In addition to the street cleaning, this contractor will also include all costs associated for the use of an additional 30, 1 hour, street sweeper uses on an as needed basis to be directed by the Construction Manager. Any costs for deliver, pick up or remobilization of sweepers should be included in base bid.

- 28. Include all costs for temporary barricades, arrows, pedestrian protection, flagmen, etc. required to complete the work.
- 29. Provide site utilities to playing fields and courtyards, including irrigation lines as part of this contract.
- 30. Base bid shall include all standard dewatering measures; utilizing trenches, crocks, stone and portable pumping measures. This contractor to provide these measures as required to perform their work. Well pointing if necessary will be handled as a negotiated cost by the Owner.
- 31. It is the intent that this contractor provide all exterior (Outside of building footprint) concrete and associated expansion materials including walks, planters, ramps, etc. All interior (Inside of building footprint to be completed by the concrete contractor. The cooling tower concrete slab and foundations will be considered outside the building and therefore are to be included in the Sitework contractor's scope.
- 32. This Contractor shall provide and maintain all temporary access roads as detailed in Contract Documents, until completion of project.
- 33. Provide playing field construction including grading, preparation of subbase, planting mix, seeding and line striping.
- 34. Provide a temporary water means for other trades to utilize. Include all costs associated with metering from local utilities as well as valves and hoses for contractors to utilize. The Construction Manager will not provide this service.
- 35. Hardware for permanent exterior gates will be provided by Carpentry & General Works Contractor and the security will be provided by the Special Services Contractor. These locations are indicated on the Architectural and Civil Drawings. The Sitework Contractor shall provide the gates and associated adjacent fencing. The balance of hardware will be provided by the Carpentry & General Works Contractor, as indicated on the door hardware schedule. The Electrical & Special Systems Contractors shall provide all power and coordination with fire alarm integration.
- 36. Respread topsoil from the established topsoil stockpile and fertilize as required to establish lawn areas. Provide permanent stabilization grass seeding at all areas following the completion of construction activities. This contractor is responsible for all weeding, watering, fertilization, and grass cutting to ensure 100% grass growth in the entirety of these areas.

- 37. Provide all plant material and all associated work including, but not limited to, fabric, staking, watering, sod installations, mulching, weeding, etc.
- 38. Provide soil mix in beds and topsoil. Provide all additional soil mix required to set plant materials and final grading.
- 39. Provide filter fabric, weed, check and mulch.
- 40. Provide all trees, shrubs, plantings, ornamental grasses & ground covers.
- 41. Provide specified warranties.
- 42. Provide pricing for all alternates as described in Section 012300-Alternates.
- 43. Provide excavation, installation of foundations and backfilling for street screen walls. The masonry and fence will be provided by Masonry & Steel contractors respectively.
- 44. Provide decorative metal fencing and gates as indicated.
- 45. Provide playground protective surfacing.
- 46. Provide all bike racks and associated pads for mounting.
- 47. Provide all bollards. Include standard & removable bollards, along with excavation, backfill and the finished painting.
- 48. Furnish and install all site signage. This includes all traffic, pedestrian and School related signage not mounted on buildings, including fire lane curbing and signage.
- 49. Provide all yard and fire hydrants as indicated. Include all thrust block details as directed.
- 50. Provide all painting of fire lane, curbs, striping as indicated.
- 51. This contractor shall pay particular attention to all notes that identify requirements for inspections, reviews, installation requirements, etc.
- 52. Coordinate with Plumbing and Electrical Contractors. The Sitework Contractor shall provide all tie-ins to the downstream side of grease trap. The Plumbing contractor shall provide all excavation, backfill and piping from building to grease trap. It is the intent that no additional costs will be provided for lack of coordination that requires relocation of newly installed site utilities for the installation of the grease trap by Plumbing or Electrical Contractors.
- 53. All dimensions and elevations shown on plans must be field verified by this contractor

- PRIOR to construction. This contractor must notify owner & engineer in writing if discrepancies exist PRIOR to proceeding with construction. No extra compensation shall be paid to the contractor for work having to be re-done due to dimensions or grades shown incorrectly on these plans if written notification has not been provided.
- 54. This subcontractor shall pay particular attention to the requirements pertaining to the stormwater management inspection and maintenance schedule and the install and maintenance items.
- 55. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 56. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 57. Provide an allowance, included in base bid, to provide, maintain and remove upon construction manager direction, 250' of stoned roadway, 20'-0" wide. Road shall have consist of fabric, 10" of stone for the length of the road and the means to compact it.
- 58. Provide an allowance, included in base bid, to provide, maintain and remove upon construction manager direction, 1,600′ of stoned roadway, 10′-0″ wide. Road shall have consist of fabric, 10″ of stone for the length of the road and the means to compact it.
- Provide all playground equipment and playground exposed and subsurface material installations. This shall also include all excavations, foundations, backfilling of equipment bases.
- 60. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 61. Provide generators and other means for temporary services for the completion of your work.
- 62. Provide temporary lighting as required for the completion of all work included in this scope of work.
- 63. Furnish and install wash station, labor to wash tires, clean and drain the area as required before vehicles leave the site daily. Clean tires and tracks of all vehicles before leaving the construction site. Wash station will be utilized by other contractors and will be removed only when directed by EDiS. Furnish and install Non-freeze Hose Bib, water line, valve box & drainpipe to daylight or plug for the contractor tire wash areas, and for building

construction.

- 64. Furnish and install and maintain concrete wash out areas for other subcontractors and their suppliers for project duration. Remove this item at conclusion of project and complete as indicated on finished drawings.
- 65. Provide Fluid-Applied Waterproofing at planters.
- 66. Furnish and install all landscape walls including excavation & backfill, sub base, perforated piping and stone. All foundations shall include: concrete & rebar. Wall materials other than concrete, such as masonry brick & caps, fencing/guards along top of walls will be provided by others. Coordinate brick shelf, embeds, light fixtures, etc.
- 67. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.
- 68. The Sitework Subcontractor will provide the area beneath the building to an elevation 99.33 +/- 1/2". (This accounts for Elevation 100'-00" FF minus (4"SOG & 4" of drainage fill and vapor barrier) The area will then be turned over to the Concrete Contractor who will be excavating and installing the foundations. Backfilling around the foundation walls, inside and outside, will be the responsibility of the Concrete Contractor. The Concrete Contractor will also be responsible for additional excavation and backfilling within the building as may be required to accommodate the sloped floors in the auditorium, varying slab thicknesses, depressed slabs and grade changes. Close coordination with the Sitework, Masonry, Mechanical and Electrical Contractors is required.
- 69. Provide a \$25,000 allowance, included in base bid, to be used at the discretion of the Construction Manager.
- 70. Provide all manholes.
- 71. Provide all fencing associated with the street screen walls.

CONTRACT NO. A-02 - CONCRETE

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-In-Place Concrete
Section 033600	Concrete Floor Sealer
Section 071700	Bentonite Waterproofing
Section 072100	Thermal Insulation
Section 079200	Joint Sealants
Division 31	Earthwork
Division 32	Exterior Improvements

nprovements

Division 33 Utilities

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 1. Provide concrete footings, foundations, foundation walls, piers, wall footings, grade beams, elevator pit walls and slab, slabs on grade, slabs on deck and all forms and reinforcing steel.
- 2. Provide all form work, concrete, reinforcement, excavation, etc. required to complete this
- 3. This Contractor will be responsible for laying out all concrete work as shown on the structural and architectural drawings.
- 4. This Contractor shall furnish and install steel & fiber reinforcing, admixtures, curing compound, under slab thermal insulation, foundation wall insulation, reglets, key ways, saw cutting, joint filler strips, joint fillers, control and construction joints (including required caulking at control and construction joints) as required in the Contract Documents.
- 5. Provide floor and slab treatments
- Provide concrete floor sealers. 6.
- 7. Provide bonding agents.
- Provide perimeter insulation at foundation walls. 8.
- 9. Provide underslab vapor barrier, insulation, reglets, waterstops, control and construction joints (including required caulking at control and construction joints).

- 1. Provide placement of related items furnished under other Specification Sections. This includes but is not limited to anchor bolts, plates, embeds, sleeves, etc. Installation must be completed within required tolerances. Anchor bolt assemblies to be placed with templates only. Furnish and install any additional grouting after anchor bolts are installed if needed to be drilled in. Coordinate and provide penetrations through wall, floors, etc. including cutting, patching and fire safing. The contractor requiring wall sleeves in concrete & masonry walls must supply and locate these to the concrete and masonry contractors for them to install. Include costs in base bid to install these sleeves, supplied by others.
- 10. Anchor bolts and leveling plates will be installed by this Contractor and furnished by the Structural Steel contractor. Installation within required tolerances. Anchor bolt assemblies to be placed with templates only. Contractor shall supply as-built drawings to steel erector for coordination prior to steel placement.
- 11. Provide all block outs and embedment's required by plans and specifications.
- 12. This Contractor to furnish and install all sleeves for incoming utilities at the perimeter walls.
- 13. This Contractor is responsible for grouting all structural steel base or leveling plates.
- 14. This contractor shall include all hot and cold concrete weather materials and practices. This includes, but is not limited to frost protection, hot/cold water additives and admixtures and pumping as required. This Contractor is also responsible for the premiums associated with any added costs for hot water, heated aggregate and all admixtures for cold or hot weather concrete practices.
- 15. Coordinate the "Notch" in the concrete slabs to allow for a future Contractor to easily install expansion joint details.
- 16. Provide concrete fill at steel pan stair treads, landings and associated items.
- 17. Provide concrete and accessories for slab on deck at stage.
- 18. Provide dewatering after acceptance from Sitework Contractor until re-acceptance by the Sitework Contractor.
- 19. Furnish, install and maintain stone underslab. Sitework contractor is to provide a building pad to this contractor. Upon sign off of acceptance by this contractor, this contractor to provide dewatering and maintenance of open trenches including clean-off of mud from poured footings. This contractor to provide excavation and backfill of all concrete work including footings, grade beams, and foundation walls. Spoils left after backfill is complete are to be lost on site. Provide access to other trades such as Masonry and Roofing Contractors for foundation work. This Contractor and the Sitework Contractor are to coordinate this procedure so that there are no additional costs to the Owner for additional

excavation or concrete.

- 20. This Contractor to excavate down to the bottom of all wall and column footings as shown on drawings. This Contractor is responsible for excavating all elevator pits, stairs and ramps as shown on drawings. This Contractor is also responsible for the backfill of these areas.
- 21. The Sitework Subcontractor will bring the area beneath the building to an elevation 99.33 +/- 1/2". (This accounts for Elevation 100'-00" FF minus (4"SOG & 4" of drainage fill and vapor barrier) The area will then be turned over to the Concrete Contractor who will be excavating and installing the foundations. Backfilling around the foundation walls, inside and outside, will be the responsibility of the Concrete Contractor. The Concrete Contractor will also be responsible for additional excavation and backfilling within the building as may be required to accommodate the sloped floors in the auditorium, varying slab thicknesses, depressed slabs and grade changes. Close coordination with the Sitework, Masonry, Mechanical and Electrical Contractors is required.
- 22. Provide and maintain perimeter fall protection at excavated areas per OSHA standards.
- 23. Provide pipe, and associated materials & backfill for foundation drainage.
- 24. Provide dewatering for perimeter waterproofer.
- 25. Provide certified anchor bolt verification drawings to the Construction Manager for review prior to steel erection.
- 26. Equipment bases and foundations shall be the responsibility of the Contractor providing the equipment.
- 27. Asphalt concrete paving and portland cement concrete paving, sidewalks and curbs shall be provided by others.
- 28. All concrete testing will be completed by the Construction Manager, however, it will be the responsibility of this Contractor to furnish all samples.
- 29. Provide offsite disposal of all unsuitable excavated materials.
- 30. The Construction Manager will verify that FF/FL compliance is verified by an independent testing agency within 48 hours of completion of pours, per ACI (Section 8.15.4). This contractor must maintain the specified tolerances as indicated in Section 033000. All costs associated with any grinding or patching required to meet minimal tolerances of flooring finishes will be completed by this contractor at no additional cost to the project.
- 31. Provide specified sloping for floor drains/trenches as needed. (Drains to be furnished by Mechanical Contractor.)

- 32. It is the intent that this contractor provide all interior (Inside the building footprint) concrete and associated expansion materials. All exterior (Outside of building footprint to be completed by the sitework contractor. The cooling tower concrete slab and foundations will be considered outside the building and therefore are to be included in the Sitework contractors scope.
- 33. This Contractor shall include the finishing of concrete slabs around floor penetrations throughout the first and second floor slab areas. These penetrations will consist of electrical boxes, stubbed conduits, sprinkler, mechanical piping and electrical and technology conduit stubs, etc.
- 34. This Contractor shall also include all work included in finishing the concrete floors to all floor drains and/or trench drains. Include all sloping and beveling to create a positive flow to the drains.
- 35. This Contractor shall include a minimum of four additional out of sequence remobilizations for concrete slab installation.
- 36. It is the intent to use on site material. The use of this onsite material shall conform with the compaction requirements as specified on civil drawings and in Specification Division 31. If the on-site material does not meet those requirements or if there is insufficient on site material available, this contractor shall import at no additional expense to the project sufficient material to complete the work.
- 37. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 38. Provide pricing for all alternates as described in Section 012300-Alternates.
- 39. This contractor shall provide rebar shop drawings within 2 weeks of award so that the fully coordinated shop drawings with MEP Trades and BIM Coordinator are submitted within 8 weeks from award of project.
- 40. Provide waterproofing systems at foundations and elevator pit as directed where exterior grade is above the floor elevations. The exterior planter concrete waterproofing will be completed by the Sitework Contractor.
- 41. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.

- 42. This contractor shall maintain, utilize and dispose of materials in the washout area created by Site Contractor. At the completion of the concrete installations, this contractor shall remove all hard concrete and spoils in timely, organized fashion for the Sitework Contractor to complete restoration.
- 43. Prepare concrete SOG at vestibule to proper elevation for walk off mat.
- 44. Provide generators and other means for temporary services for the completion of your work.
- 45. Install steel nosings in stairwells that will be supplied by the steel contractor.
- 46. Provide all means of transporting concrete including, but not limited to: pump trucks, cranes, ramps, chutes, buggies.
- 47. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 48. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 49. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.
- 50. Provide a \$10,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-03 - MASONRY

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements

Division 3 Concrete

Section 034500 Precast Architectural Concrete

Section 042000 Unit Masonry
Section 071900 Water Repellants
Section 072100 Thermal Insulation

Section 072119 Foamed-In Place Insulation Section 078413 Penetrating Firestopping

Section 078443 Joint Firestopping Section 097100 Preformed Joint Seals

Section 079200 Joint Sealants

Section 323158 Unit Masonry for Screen Wall

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 1. Provide concrete masonry units, concrete building brick, decorative masonry units (Splitface brick), clay face brick, associated ties and reinforcing, dowels (including drilling and grout), grout, mortar, (standard, colored and pigmented) bond beams, joint fillers, steel reinforcing bars, masonry joint reinforcement, ties and anchors, control & expansion joints, anchors, fire safing/stopping, insulation, flashings and trim, rigid insulation & vapor barrier, cavity drainage, and all miscellaneous accessories to provide a complete masonry system, accessories and related work.
- Provide caulking of masonry to masonry and to dissimilar materials. Furnish and install
 all sealants, fillers, compressible fillers, backer rod, bonding agents, and sealers, for this
 contractor's materials. Furnish and install all sealants where materials provided by this
 contractor abut similar or dissimilar materials. Provide to all adjacent materials installed
 prior to your work.
- 3. Provide integral masonry flashings, expansion joints, insulation and other related items as required. Include all cavity accessories, including but not limited to: weeps vents, flashing components (including end dams and corners), reglets, termination bars, mortar net, etc. All flashing and sealants must comply with the air/vapor barrier.
- 4. Provide Mock up as required.

- 5. Provide grouting of door frames at masonry openings.
- 6. Provide weather protection and temporary material considerations for Hot/Cold whether installations as required to perform the work and maintain the project schedule.
- 7. Furnish and install any cranes, scaffolding, lifts and/or hydro means as required to complete the work.
- 8. Provide dewatering of work areas.
- 9. Furnish and install layout of the work including responsibility for all elevations and dimensions as they affect other Subcontractor's work.
- 10. Provide lintels either required by this Contract or install loose lintels furnished by others.
- 11. Provide fill at hollow concrete masonry units.
- 12. Provide all setting of reinforcing steel in block walls.
- 13. Provide thermal insulation.
- 14. Provide precast/cast stone work, including all fasteners and flashing and date stone.
- 15. Provide temporary protection for final wash down/cleaning of masonry. Furnish and install final cleaning of masonry provided under this contract after completion of erection and after permission is given. Cleaning will be to the satisfaction of ASD/EDiS Company. Protect work of other Bid Categories from contact with cleaner.
- 16. Flashing Summary:
 - a. Thru wall and cavity flashing below the roof line shall be by the Masonry Contractor.
 - b. Thru wall and cavity flashing above the roof line shall be by the Roofing Contractor.
- 2. Provide necessary cutting, fitting and building into masonry work, embedments provided by others. Coordinate and provide penetrations through wall, floors, etc. including cutting, patching and fire safing. The contractor requiring wall sleeves in concrete & masonry walls will supply and locate these to the concrete and masonry contractors for them to install. Include costs in base bid to install these sleeves supplied by others.
- 17. Provide all firesafing/stopping and fire caulking as required. Work related to masonry work.
- 18. Provide bond beams including reinforcing and fill.
- 19. At elevator entrance, provide toothed in outside walls and add additional temporary lintel above elevator door frame.

- **20.** Provide stone veneer and required attachments and fasteners.
- 21. Provide all masonry veneer anchors and stainless steel reinforcement where required.

22. Provide stucco.

- 23. This contractor will be responsible for providing their own dumpster and masonry debris disposal off site.
- 24. Coordinate with all other trades including but not limited to Metal Stud, Masonry, Carpentry & General Works, Glass & Glazing, Mechanical, Plumbing, Electrical, Fire Protection and Roofing contractors. Masonry openings that are made too large or too small, or in incorrect locations will be corrected at no additional cost to ASD/EDiS. The cost will be absorbed by the Masonry Subcontractor. Coordinate with respective trades before layout of work. Report any discrepancies at a minimum of ahead of installation to EDiS.
- 25. This contractor is responsible for temporary enclosures at mixing station and work areas to continue work through winter conditions. Any materials and or heating equipment for areas or materials will be provided by this contractor. Temporary Heat will NOT be provided by the construction manager.
- 26. Provide pricing for all alternates as described in Section 012300-Alternates.
- 27. Provide sprayed insulation/air barrier system. Provide rigid insulation in cavity and all foamed in place (sprayed insulation) for all areas. This includes areas below grade & areas where the foam overlaps the walls on to dissimilar materials, such as roof decking. Include, at a minimum, 4 out of sequence mobilization and complete as scheduled.
- 28. This contractor shall provide rebar shop drawings and all masonry components with lead times greater than 2 weeks within 2 weeks of award so that the fully coordinated shop drawings with MEP Trades and BIM Coordinator are submitted within 8 weeks from award of project.
- 29. Provide rigid insulation at all voids where indicated. (See typical/similar details like 9/A4.3 or 16/A6.0)
- 30. Provide mortar control nets.
- 31. Provide water repellents as directed to all masonry units as directed.
- 32. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a

- daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 33. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 34. Provide multiple mobilizations.
- 35. Provide the masonry in the street screen walls. The excavation, installation of foundations and backfilling for street screen walls will be completed by the Sitework Contractor. The fence will be provided by Steel contractor.
- 36. Provide generators and other means for temporary services for the completion of your work.
- 37. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 38. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 39. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.
- 40. Provide a \$20,000 allowance to be used at the discretion of the project manager.

CONTRACT NO. A-04 - STRUCTURAL STEEL & MISCELLANEOUS METALS

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 051200	Structural Steel Framing
Section 052100	Steel Joists Framing
Section 053100	Steel Decking
Section 055000	Metal Fabrications
Section 055113	Metal Pan Stairs
Section 055213	Pipe & Tube Railings
Section 107316	Metal Canopies

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 1. Provide structural steel, prefabricated building columns, field-installed shear connections, embeds, joists, shelf angles, loose lintels, steel weld plates, stairs & railings.
- Provide all metal floor and roof decking with the exception of the perimeter roof dormers.
 At the perimeter roof dormers, the steel contractor shall furnish only metal decking to the Metal Stud & Drywall Contractor to install where deck bears on metal studs framing. Add to MS&D
- 3. Continuous bent plate as per typical conditions identified on details 1-2 & 4/A4.2 are to be provided by Metal Stud Contractor. Do not include costs for this work.
- 4. Furnish anchor bolts and leveling plates to the Concrete Contractor for placement in concrete piers.
- 5. Provide as-built verification of all anchor bolts will be required PRIOR to commencing with steel erection.
- 6. Provide roof sump pans and related work.
- 7. Provide framing out for openings (roof drains, mechanical openings, access hatches, stairs, etc.). Assume opening frames will be field installed.
- 8. Prime paint systems, galvanizing, and related finishing of steel items, including touch up. This contractor shall provide primer that is compatible with specified fireproofing materials and finish painting where required.

9. Provide all masonry anchors.

- 10. Furnish, install, and maintain, a two line OSHA safety cable/railing at the perimeter of all levels including the roof, along any column lines that become a perimeter condition, and any interior floor or roof openings due to the erection sequence. Cables are to be installed in two continuous strands with a turn-buckle tightening device every 50′ to allow for proper maintenance to tighten cables. Anchor the cable by using 2″ x 2″ x 5/16″ x 44″ high angle welded to the perimeter steel and columns at 15′ o.c. Include diagonal braces to prevent deflection of the angle at the cable attachment points. The installed cables must be maintained by this contractor for the duration or until the permanent system has been installed to where there is no fall concern. Assume additional mobilizations as needed for maintenance after demobilization and removal when directed by EDiS. All costs associated with the removal, once directed by the Construction Manager, are to be included by this contractor.
- 11. The Steel Contractor will provide all connections to masonry whether they are field welds or shop welds. Conditions that require in field welding and assembly are the responsibility of this Contractor. Field coordination with the masonry installer will be this Contractor's responsibility.
- 12. All steel testing will be the responsibility of the Construction Manager, however, this Contractor will cooperate with the testing agency in the inspection at the fabrication shop and in the field.
- 13. Confirm layout, installation and alignment of attachments at the slab edge condition prior to installation.
- 14. No electrical power for welders will be provided.
- 15. Provide data and submittal information related to the Scope of this Contract signed and sealed by a Professional Engineer as required by the Contract Documents.
- 16. This Contractor shall fabricate, weld and install all reinforcing anchors that connect the structural steel to the masonry systems. Provide all shop fabrication, a field installation and field welding regardless of the weld symbols.
- 17. This Contractor shall include all necessary staging, rigging, matting and remobilizations to accommodate this erection sequence.
- 18. Provide all stairs, handrails, railings, steel ladders and accessories.
- 19. Supply steel nosing's in stairs to concrete contractor to install.
- 20. Furnish loose steel lintels, angles, plates and embedded items to other contractors for them

to install.

- 21. Provide miscellaneous rough hardware, iron shapes, framing and support angles.
- 22. Provide metal decking for slab on deck at stage.
- 23. Bollards will be provided by sitework contractor. Do not include costs in base bid.
- 24. Provide gratings.
- 25. Louvers and grilles will be provided by others.
- 26. Metal Downspout Boots will be supplied by this contractor and installed by Roofing Contractor.
- 27. Provide overhead door frames.
- 28. Provide elevator hoist beam.
- 29. Provide elevator sills
- 30. Provide elevator pit cover
- 31. Provide wrapping of stainless steel opening at elevator doors
- 32. Provide ships ladders.
- 33. Provide galvanizing, as required.
- 34. Provide acoustic metal deck.
- 35. Provide floor stops at all perimeter and interior openings/edges.
- 36. Provide all anchoring devices, fasteners, inserts and other related items associated with the installation of the above within this summary of work section.
- 37. Provide field touch-up paint.
- 38. Provide required labor for verification of field dimensions throughout the project.
- 39. Provide pricing for all alternates as described in Section 012300-Alternates.
- 40. This contractor shall provide all structural shop drawings, including trusses and stairs within 2 weeks of award so that the fully coordinated shop drawings with MEP Trades and BIM Coordinator are submitted within 8 weeks from award of project.

- 41. Provide all cranes, scaffolding and lifts for this work.
- 42. Include all costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 43. Provide premanufactured canopy and all associated finishes and fasteners. Provide shop drawings and coordinate the MEP trade installations within the structure.
- 44. Provide the fence associated with the street screen walls. The excavation, installation of foundations and backfilling for street screen walls will be completed by the Sitework Contractor. The masonry will be provided by Masonry contractor.
- 45. Sequencing and fabrication must follow agreed-to construction, based on the schedule provided in project manual. Any deviations from this plan must be approved prior to contract award.
- 46. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 47. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 48. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 49. Provide a \$40,000 allowance to be used at the discretion of the project manager.

CONTRACT NO. A-05 - CARPENTRY AND GENERAL WORK

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 061000	Rough Carpentry
Section 061600	Sheathing
Section 072100	Thermal Insulation
Section 078413	Penetrating Firestopping
Section 078443	Joint Firestopping
Section 079200	Joint Sealants
Section 079513.13	Interior Expansion Joint Cover Assemblies
Section 081113	Hollow Metal Doors & Frames
Section 081416	Flush Wood Doors
Section 083323	Overhead Coiling Doors
Section 083513.23	Accordion Folding Fire Doors
Section 087100	Door Hardware
Section 096723	Resinous Flooring
Section 097723	Tackable Wall Panels
Section 098433	Sound-Absorbing Wall units
Section 100600	Specialty Schedule
Section 101100	Visual Display Units
Section 101416	Plaques
Section 101419	Dimensional Letter Signage
Section 101423	Panel Signage
Section 102113	Plastic Toilet Compartments
Section 102123	Cubicle Curtains and Track
Section 102600	Wall and Corner Protection
Section 102800	Toilet, Bath and Laundry Accessories
Section 104413	Fire Extinguisher Cabinets
Section 104416	Fire Extinguishers
Section 105113	Metal Lockers
Section 107516	Ground-Set Flagpoles
Section 110000	Miscellaneous Equipment
Section 115213	Projection Screens
Section 116143	Stage Curtains
Section 116623	Gymnasium Equipment
Section 122413	Roller Window Shades
Section 124813	Entrance Floor Mats and Frames

the following:

- 1. Provide labor and materials to perform the work related to all carpentry and general work.
- 2. All rough carpentry related to the exterior skin of the building including wood nailers, sheeting and blocking. Include all fire treating or exterior grade materials as required.
- 3. All rough carpentry related to the interior of the building including blocking, sheathing wood nailers, etc. for the installation of fire extinguishers, doors, door stops, hold opens, instructions boards, tac boards, brackets, lockers, railings windows, signage, stage or gymnasium equipment, window shades, toilet accessories, cabinets, toilet partitions, casework, millwork, etc. including fire treating, as required.
- 4. Roof curbs, pipe, hoods and vent equipment & supports are to be supplied by contractor in which the units, piping, etc. are being supplied. The openings for the curbs in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by the contractor in which the units are being provided. The roofing contractor shall provide all flashing and sealing of the curbs. Any wood blocking required will be provided by Carpentry & General Works Contractor.
- 5. Furnish and install hollow metal, steel and wood doors, frames, vision panels, and finish hardware.
- 6. Provide hardware for all doors. (Aluminum, FRP, hollow metal, steel and wood) The aluminum and FRP doors will be provided by the Glass & Glazing Contractor. Install finish hardware at all hollow metal, steel and wood doors. All low voltage wiring within the wood, steel and hollow metal doors and frames is to be installed by this contractor. All low voltage wiring within the Aluminum & FRP doors and frames is to be installed by the Glass & Glazing contractor. Final connection and power supply to be provided by Electrical Contractor. Attend Hardware Coordination Meetings with security contractor, electrical contractor and owner in order to insure complete system is being provided.
- 7. All door, frame & hardware materials are to be stored by this Contractor until delivery is requested. Material to be delivered within the site and off loaded to hardware room or room to be installed by this contractor. Once on site, this contractor must maintain a door & hardware room on-site that maintains climate requirements. The room security will be this contractor's responsibility.
- 8. Provide insulated & non insulated overhead coiling doors.
- 9. Hardware for permanent exterior gates will be provided by Carpentry & General Works Contractor and the security will be provided by the Special Services Contractor. These locations are indicated on the Architectural and Civil Drawings. The Sitework Contractor shall provide the gates and associated adjacent fencing. The balance of hardware will be provided by the Carpentry & General Works Contractor, as indicated on the door

- hardware schedule. The Electrical & Special System Contractors shall provide all power and coordination with fire alarm integration.
- 10. Provide Fire rated accordion folding fire doors. This shall include all hardware, trim, fasteners, warranties, etc.
- 11. Coordinate electrical requirements with any automatic door operations, magnetic hold opens or card readers.
- 12. Provide all keying for all doors. All lock sets (Hollow Metal, Wood Doors, Aluminum Entrances). Provide Owner with copy of pin schedule.
- 13. Provide wood stairs to stage.
- 14. Provide construction cylinders.
- 15. Furnish and install hold open closers with fire alarm interface: Power wiring by Electrical Contractor. Fire alarm ties in by Electrical Contractor.
- 16. Coordinate card reader requirements with electrical hardware.
- 17. Provide all field trimming required to adjust to existing conditions.
- 18. All material to be stored by this Subcontractor until delivery is requested. Material to be delivered to the site and off loaded by others. Deliveries to correspond to the construction schedule. Provide 48 hour notice prior to delivery.
- 19. Coordinate electrical requirements with any automatic door operations (include overhead doors). Provide low-voltage wiring required for overhead and automatic door operations.
- 20. Provide field assistance to Electrical and Glazing Subcontractors.
- 21. Provide recessed walk-off entrance mats and frames.
- 22. All Kitchen Equipment identified on K-Series drawings will be provided by Kitchen Equipment Contractor.
- 23. Provide new theatrical and stage equipment. This shall include: stage curtains, scrims and drops, draw curtain tracks and curtain rigging. Coordinate electrical requirements with the Electrical Contractor.
- 24. Provide resinous flooring and integral base. Coordinate slab tolerances with concrete contractor. Engage installer who is certified at resinous floor installations. Provide protection, maintenance and the removal of finished products once accepted by Construction Manager. Protection shall consist of kraft paper, taped down on all areas of

floor and masonite over high traffic areas on top of the kraft paper.

- 25. Provide all visual display boards, white boards, marker boards, marker wall, chalk boards, tack boards, tack walls, tack strips, display rails, sound-absorbing wall units and all angles, fasteners & adhesives. Provide acoustical wall absorber wall panels. (A formal shop drawing for acoustical wall absorber wall panels will be required)
- 26. Provide Projection screens. Included in this work shall be consist of, but not be limited to: coordination of all structural or MEP components, controls, mounting supports, fasteners and trim associated. Electric service is the responsibility of the Electrical Subcontractor. All other control wiring, as specified, will be the responsibility of this Subcontractor.
- 27. Provide Lockers and bases, including but not limited to: blocking, fasteners, filler/trim pieces hardware hooks/shelves & caulking.
- 28. Provide Toilet partitions including hardware, blocking, fasteners and caulking as needed. Coordinate any structural requirements with the structural steel and carpentry contractors.
- 29. Provide Fire extinguishers, extinguisher cabinets and accessories.
- 30. Provide defibrillator and cabinet. Alarm power wiring will be provided by Electrical Contractor.
- 31. Provide Knox Box. The location of the Knox Box must be coordinated and confirmed by local Fire Chief prior to installation.
- 32. Provide cubicle curtains and track system. Include all accessories including hardware, blocking, fasteners and caulking as needed. Coordinate any structural requirements with the structural steel and carpentry contractors.
- 33. Provide Toilet and bath accessories including keys, blocking, fasteners and caulking as needed. This shall include, but not be limited too washroom accessories, underlavatory guards, custodial accessories and electric hand dryers. (Power to hand dryers will be provided by Electrical Contractor)
- 34. Provide all signage (interior and exterior) with all fasteners, brackets, adhesives and finishes.
- 35. Provide building plaque with all fasteners, brackets, adhesives and finishes. Coordinate location with substrates to ensure proper mounting.
- 36. Provide Window treatments and all associated fasteners, blocking, hardware, etc.
- 37. Provide flagpole, cables, pulleys and American flag. Include all costs associated with excavation, concrete, anchor bolts, bases and other support as required by the

manufacturer's instructions.

- 38. Provide wall and corner protection. This shall include all shop drawings, warranties, attic stock and fasteners and adhesives.
- 39. Provide wall pads.
- 40. Provide all gymnasium equipment, including chin up bars and safety pads and specified demonstrations.
- 41. Provide all cranes, scaffolding and lifts for this work
- 42. Smartboards will be supplied by Owner. The brackets and associated blocking for these units will be provided by this contractor. Coordinate locations for blocking and brackets closely with Special Systems Contractor.
- 43. Provide interior architectural expansion joint systems, including joint covers materials at walls, floors & ceilings. This contractor must coordinate installations with Metal Stud & Drywall & Acoustical Ceiling contractors. Exterior expansion joints will be by others.
- 44. Provide all Mirrors.
- 45. Provide generators and other means for temporary services for the completion of your work.
- 46. Verification of field dimensions is the responsibility of this Subcontractor.
- 47. Provide all anchoring devices, fasteners, inserts and other related items associated with the installation of the above items.
- 48. This Subcontractor shall at a minimum provide and maintain for the length of the project, one temporary fire extinguisher for each 3,000 sq. ft. of the protected building area. Fire extinguishers shall be 10lb, Multi-Purpose (ABC) dry chemical, UL labeled, with a rating of 3a:40bc.
- 49. Provide all temporary barricades at all openings in floors, staircases and duct chases and maintain throughout completion of project. Include removal and disposal at completion of project. Protection, at a minimum will consist of (3) 2 x 4 rails and 1/2" plywood framed at all openings. Rails shall be at top, middle and toe boards to meet or exceed OSHA requirements.
- 50. Provide pricing for all alternates as described in Section 012300-Alternates.
- 51. Provide attic stock as indicated for all above items provided by this contractor.

- 52. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 53. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 54. Hardware for permanent exterior gates will be provided by Carpentry & General Works Contractor and the security will be provided by the Special Services Contractor. These locations are indicated on the Architectural and Civil Drawings. The Sitework Contractor shall provide the gates and associated adjacent fencing. The balance of hardware will be provided by the Carpentry & General Works Contractor, as indicated on the door hardware schedule. The Electrical & Special System Contractors shall provide all power and coordination with fire alarm integration.
- 55. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 56. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 57. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.
- 58. Provide \$25,000 allowance to be used at the discretion of the Construction Manager for temporary window enclosures
- 59. Provide \$25,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-06 - ROOFING

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements Section 055000 Metal Fabrications

Section 061600 Sheathing

Section 072100 Thermal Insulation Section 073113 Asphalt Shingles

Section 074113.13 Formed Metal Roof Panels

Section 075323 Ethylene-Propylene-Diene-Monomer (EPDM) Roofing

Section 076200 Sheet Metal Flashing and Trim

Section 077100 Roof Specialties Section 077200 Roof Accessories

Section 078413 Penetrating Firestopping

Section 078443 Joint Firestopping Section 079200 Joint Sealants

- 1. Provide Furnish and install all roofing, including accessories for a complete and watertight installation. System shall include, but not be limited to: tapered insulation, PVC materials, adhesives and fasteners, sealants, insulation (including design), flashings, cants, copings, reglets and counter flashings, roof-edge specialties, crickets, walkway pads, downspouts, lamb tongue, mechanical & plumbing penetrations, roof overflow drains, temporary openings at all penetrations and temporary and permanent flashing at all mechanical equipment curbs.
- 2. Provide elastomeric membrane roofing system (EPDM), including rigid and tapered insulation and all related accessories.
- 3. Provide asphalt shingle roofing system, including insulation and all related accessories.
- 4. This contractor shall carefully review the edge of roof details to determine if the roof can be placed before the exterior wall assembly is complete. This contractor shall include <u>all</u> costs associated with returning to the jobsite to complete the roof perimeter after wall assembly is complete.
- 5. Bentonite and Foamed-in place insulation will be by others.

- 6. Provide caulking related to roofing, flashing and roof accessories.
- 7. The roof drains and associated plumbing shall be provided by the Mechanical Contractor. Flashing **and installation** of the roof drains shall be by the Roofing Contractor. Openings for the roof drains in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by others.
- 8. Provide all metal parapet coping and fasteners & sealants.
- 9. Provide roof hatches. Roof hatches should also include the safety rails (guard rails) as indicated on 8/A4.0 & Section 077200. Blocking to be provided by Carpentry & General Works Contractor.
- 10. Provide walk pads (Traffic pads).
- Perform cutting, patching and maintenance of temporary patch at all roof openings prior to roof completion. This includes, but is not limited to openings for MEP RTU units, drains, hatches, etc.
- 12. Provide metal drip edges.
- 13. Roof curbs, pipe, hoods and vent equipment & supports are to be supplied by contractor in which the units, piping, etc. are being supplied. The openings for the curbs in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by the contractor in which the units are being provided. The roofing contractor shall provide all flashing and sealing of the curbs. Any wood blocking required will be provided by Carpentry & General Works Contractor.
- 14. Provide expansion joints and associated insulation that are integral to the roof.
- 15. Provide all gutters and downspouts.
- 16. Metal Downspout Boots will be supplied by the Structural Steel Contractor and installed by this contractor.
- 17. Provide all flashing, copings, roof edge components, base flashing, sealing, and insulation around floor curbs, parapets, pitch pockets, vents, stacks, drains, roof hatches, ducts, and other structural, architectural, mechanical, and electrical penetrations in the roof to form a watertight roofing system as indicated. Provide all counter flashing to roof and to walls.
- 18. Wood blocking shall be provided by Carpentry & General Works Contractor.
- 19. Flashing and sheet metal. Flashing Summary:
 - a. Thru wall and cavity flashing below the roof line shall be by the Masonry Contractor.
 - b. Thru wall and cavity flashing above the roof line shall be by the Roofing Contractor.

- 20. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 21. Provide pricing for all alternates as described in Section 012300-Alternates.
- 22. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 23. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 24. Provide all cranes, scaffolding and lifts for this work
- 25. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 26. Provide a \$20,000 allowance to be used at the discretion of the project manager.

CONTRACT NO. A-07 - METAL STUDS & DRYWALL

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 034900	Glass-Fiber-Reinforced Concrete (GFRC)
Section 053100	Steel Decking
Section 054000	Cold-Formed Metal Framing
Section 055000	Metal Fabrications
Section 062013	Exterior Finish Carpentry
Section 072100	Thermal Insulation
Section 074293	Soffit Panels
Section 074646	Fiber-Cement Siding
Section 076200	Sheet Metal Flashing and Trim
Section 078100	Applied Fireproofing
Section 078413	Penetrating Firestopping
Section 078443	Joint Firestopping
Section 097100	Preformed Joint Seals
Section 079200	Joint Sealants
Section 083113	Access Doors & Frames
Section 092216	Non-Structural Metal Framing

Gypsum Board

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 1. Provide structural stud assembly for the exterior skin of the building.
- 2. Provide steel stud construction related to the roof details at dormers.
- Provide steel stud construction related to framing out for openings in interior and exterior walls.
- 4. Provide secondary support framing.

Section 092900

- 5. Provide clips, anchors, supports and other accessories that interface between steel framing and steel studding.
- 6. Provide metal studs, insulation, gypsum wallboard, taping and spackling.
- 7. Provide tile backing board for ceramic tile. All walls shall meet or exceed NTCA tolerances

for ceramic tile installations. Any additional reworking required to meet these tolerances will be this contractor's responsibility in cost and schedule.

- 8. Provide all metal stud framing required to back up EIFS Manufactured Molding and Trim, cementitious siding, brick, etc.
- 9. Provide metal furring.
- 10. Provide all glass fiber reinforced gypsum work including materials, taping.
- 11. Provide batt insulation, both thermal and acoustical and related work.
- 12. Include molded shapes.
- 13. Provide acoustical sealant of penetrations in insulated drywall partitions.
- 14. Provide access doors & frames installations in both masonry & drywall walls (assume 30 total).
- 15. Include fire taping and sealing at perimeter edge and as shown on the Drawings.
- 16. Provide all cranes, scaffolding and lifts for this work.
- 17. Comebacks and out-of-sequence work may be required and as such should be included.
- 18. Include all necessary field measurements.
- 19. Engineered shop and installation drawings as required.
- 20. Install metal decking at mansard trusses. Metal decking and trusses are to be supplied by steel contractor.
- 21. Provide all exterior wall sheathing (DensGlass, flashings, etc.), asphalt felts and Tyvek on structural steel studs.
- 22. Provide cementitious siding, fascia's, trim pieces, etc. Confirm nothing else is required here
- 23. Installation of masonry veneer anchors are not to be included in this work. They will be provided by the Masonry Contractor.
- 24. No power for welding equipment will be provided.
- 25. Provide fire resistant joint systems at floors and walls.
- 26. Include two (2) passes per floor to "touch-up" mechanical penetrations to ensure ratings

- required. The first pass will be required prior to ceiling grid installation and the second pass will be required prior to final inspection for Certificate of Occupancy.
- 27. Bidders are advised to pay particular attention to top of wall conditions, fire and smoke safing of slabs and acoustical sealants.
- 28. Provide pricing for all alternates as described in Section 012300-Alternates.
- 29. This contractor shall provide all structure shop drawings within 2 weeks of award so that the fully coordinated shop drawings with MEP Trades and BIM Coordinator are submitted within 8 weeks from award of project.
- 30. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 31. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 32. Provide GFRC decorative columns and balusters.
- 33. Provide Exterior Insulated Finish System (EIFS). Manufactured Molding and Trim. Exterior metal studding, insulation, gypsum board and Tyvek will be provided by Contract A-07.
 - a. Provide EIFS Manufactured Molding and Trim as field applied or panelized.
 - i. Provide caulking of the following:
 - 1. EIFS Manufactured Molding and Trim to EIFS Manufactured Molding and Trim
 - 2. EIFS Manufactured Molding and Trim to Masonry
 - 3. EIFS Manufactured Molding and Trim to Aluminum
 - b. Provide flashing required at EIFS system Manufactured Molding and Trim.
 - c. Provide any rough blocking built into panelized EIFS Manufactured Molding and Trim is the responsibility of this Contractor.
 - d. Provide hoisting and scaffolding as required.
 - e. Provide anchors for supporting EIFS panels Manufactured Molding and Trim.
 - f. Provide scoring, beads and joints as required and as detailed on the contract documents.
- 34. Provide fireproofing, both exposed and concealed.
 - a. Provide clean up on a daily basis, all over spray materials. Provide perimeter protection around areas of fireproofing installation to protect surrounding materials

- and public properties. Any damages caused by overspray of fireproofing materials will be repaired and compensated for by this contractor.
- b. Inspection of the fireproofing will be the responsibility of the Construction Manager.
- c. Protect fireproofing according to advice of fireproofing manufacturer and installer from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion.
- d. Coordinate installation of fireproofing with other work in order to minimize the need for other trades to cut or remove fireproofing. As other trades successively complete installation of their work, maintain protection of structure afforded by fireproofing by patching any areas which have been removed or damaged prior to concealment of fireproofing by other work.
- e. Repair or replace work which has not been successfully protected.
- f. Prepare all surfaces including priming substrate, if needed.
- g. Provide all required steel frame fireproofing whether clearly shown or not on the drawings. Do not include concrete fire proofing.
- 35. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 36. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 37. The steel contractor will provide all metal floor and roof decking with the exception of the perimeter roof dormers. At the perimeter roof dormers, the steel contractor shall furnish only metal decking to the Metal Stud & Drywall Contractor to install where deck bears on metal studs framing. All labor and materials to install it are the responsibility of the Metal Stud & Drywall Contractor.
- 38. Expansion joints integral to the metal stud & drywall systems will be provided by Carpentry & General Works contractor. This contractor must coordinate the installation to ensure layout is consistent with wall installation.
- 39. Provide continuous bent plates as indicated in typical condition details 1-2 & 4/A4.2. The steel contractor will not include any costs for this work.
- 40. Provide a \$20,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-08 – GLASS & GLAZING

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements
Section 078413 Penetrating Firestopping

Section 078443 Joint Firestopping Section 079200 Joint Sealants Section 081613 FRP Flush Doors

Section 084113 Aluminum-Framed Entrances and Storefronts

Section 085113 Aluminum Windows

Section 088000 Glazing

Section 088813 Fire-Resistant Glazing

- 1. Provide all storefront and all glass and glazing systems.
- 2. Provide manual aluminum door systems and handling.
- 3. Provide automatic aluminum door systems, including hardware.
- 4. Install finish hardware for aluminum and FRP doors only. Hardware for all doors will be supplied by Contract A-05, Carpentry & General Works and installed by this subcontractor. This contractor is responsible for coordinating door hardware with their aluminum entrances to ensure each opening is properly prepped for hardware being supplied by Contract A-08. All low voltage wiring within the aluminum doors and frames is to be installed by this contractor. Final connection and power supply to be provided by Contract A-20 Electrical Contractor.
- 5. Provide all glass and glazing at exterior of building.
- 6. Provide all interior glass and glazing systems.
- 7. Provide all interior door, partition, vision panel and window glass. The door frames and doors will be provided by the Carpentry & General Works Contractor
- 8. Coordinate glass types with partition and door fire ratings. Contact Construction Manager with any discrepancies. This contractor will provide fire-resistant glass & glazing system.

- 9. Provide caulking related to all glass. This includes all interior and exterior glass systems.
- 10. Provide mock-ups as required by the Drawings and Specifications.
- 11. Provide custom break metal trim and infill.
- 12. Provide all hoisting/scaffolding related to the work of this Contract.
- 13. Coordinate edge of slab tolerances and field verify all rough openings.
- 14. Provide caulk between the materials supplied under this section and the adjacent surfaces.
- 15. Provide pricing for all alternates as described in Section 012300-Alternates.
- 16. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 17. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 18. Provide doors and frames for all aluminum and FRP doors. The hollow metal, steel and wood doors will be provided by the Carpentry & General Works Contractor. All low voltage wiring within aluminum and FRP doors and frames is to be installed by this contractor. Final connection and power supply to be provided by Electrical Contractor.
- 19. All door, frame & hardware materials are to be stored by this Contractor until delivery is requested. Material to be delivered within the site and off loaded by this contractor. Once on site, this contractor must maintain a door & hardware room on-site. The room security will be this contractor's responsibility.
- 20. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 21. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 22. Provide a \$10,000 allowance to be used at the discretion of the project manager.

Division 0

CONTRACT NO. A-09 - CASEWORK AND MILLWORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

Bidding and Contract Requirements

• Technical Specification sections:

Division 1	General Requirements
Section 062023	Interior Finish Carpentry
Section 064023	Interior Architectural Woodwork
Section 079200	Joint Sealants
Section 120600	Plastic Laminate Casework Schedule

Section 123216 Manufactured Plastic-Laminate-Faced Casework

Section 123623 Plastic-Laminate-Clad Countertops

Section 123661.16 Solid Surface Countertops

- 1. Provide labor and materials to perform the work related to all casework and millwork.
- 2. Provide all field trimming required to adjust to existing conditions.
- Provide all millwork, casework, trim and hardware and including all toe kicks, student cubbies, shelves, enclosures at lockers, filler strips and window stools were indicated in the project document.
- 4. Provide all wardrobe and closet specialties such as hardware, hooks, shelves, etc.
- 5. Coordinate power and data requirements and locations with the electrical contractor for locations and sizes of holes needed.
- 6. Comply with AWI quality certifications.
- 7. Provide solid surface column wraps, countertops, filler strips and backsplashes were indicated in the project documents. Provide slotted aluminum picture rail where integral with solid surface wall coverings.
- 8. Provide solid surface base. Solid surface base was eliminated. Any rubber base will be completed by the flooring contractor.
- 9. Coordinate cutting holes in casework with other trades.
- 10. Coordinate blocking requirements with Contract A-05: Carpentry & General Works.

- 11. Provide caulking and joint sealers integral to casework/millwork and to dissimilar materials.
- 12. Provide pricing for all alternates as described in Section 012300-Alternates.
- 13. Provide all keying to all cabinets as specified.
- 14. Provide main reception desk, stage front, proscenium opening.
- 15. Provide specified warranties.
- 16. Provide mockups as specified.
- 17. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 18. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 19. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 20. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 21. Provide \$5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-10 - FOLDING PANEL PARTITIONS

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements

Section 079200 Joint Sealants

Section 102239 Folding Panel Partitions

Division 26 Electrical

- 1. Provide labor and materials to perform the work related to all work associated with completing Folding Panel Partitions.
- 2. Provide all field trimming required to adjust to existing conditions.
- 3. Provide coordinated shop drawings that reflect all structural requirements with the structural steel, metal studs, ceilings, electrical power, lighting and communication systems, etc.
- 4. Provide all trim components, hardware, hinges, operators for electrical units, appropriate finishes, sensors, key switches and pocket doors for concealing doors when not in use.
- 5. Electrical connections will be provided by Electrical Contractor. This contractor shall provide assistance to Electrical Contractor for coordination and installation of necessary connections.
- 6. Provide any required signage for safe operations
- 7. Provide attic stock, warranty and demonstrations for all materials and types of panels.
- 8. Provide specified testing, adjusting, warranty and training demonstrations on the operation.
- 9. Provide pricing for all alternates as described in Section 012300-Alternates.
- 10. Contrary to specification section 102239.2.3.J, base bid should include panel faces that are 4′-0″ high, not full height as indicated.
- All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.

- 12. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 13. Provide all supplementary steel as needed to hang partitions from structural support steel, provided by the Structural Steel Contractor, as shown in partition details 1 & 2/A9.10. It is assumed, no additional steel will be required below structural support steel. If so, it will be provided by this contractor.
- 14. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 15. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.

CONTRACT NO. A-11 - PAINT

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements

Section 079200 Joint Sealants

Section 090600 Room Finish Schedule – Color Legend

Section 099123 Paints and Coatings

- 1. Provide all painting (all walls, floors and ceilings indicated on the finish schedule).
- 2. Provide sealing all interior joints between dissimilar materials that require sealants.
- 3. Provide all preparation and painting of exterior elements as described in the Schedule Section 099123 and the finish schedule.
- 4. Paint all exposed block work and concrete work as shown on the room finish schedule. Epoxy Flooring will be provided by Carpentry & General Works contractor.
- 5. Prime, stain or seal all wood trim and doors. It is the intent of the specifications that all wood doors are factory stained/painted.
- 6. Provide supplementary ventilation as required in enclosed spaces.
- 7. Provide paint and caulk to all hollow metal frames and doors as shown on the door schedule.
- 8. Provide painting of all metal stairs and railings.
- 9. Prefinished items <u>will not</u> be painted by this Contractor.
- 10. Paint all semi-exposed wood blocking as indicated on the drawing.
- 11. Provide protection of adjacent surfaces.
- 12. Provide minor patching prior to application of finishes.
- 13. Provide attic stock for all materials provided by this contract.

- 14. Final coat of paint is to be installed after ceilings are installed, if directed by Construction Manager.
- 15. Provide pricing for all alternates as described in Section 012300-Alternates.
- 16. This Contractor to allow 200 man hours and all equipment and required paint materials for these man hours to be used as directed by the Construction Manager.
- 17. Provide all cranes, scaffolding and lifts for this work
- 18. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 19. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 20. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 21. Provide \$10,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-12 - ACOUSTICAL CEILINGS

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements
Section 072100 Thermal Insulation
Section 079200 Joint Sealants

Section 095113 Acoustical Panel Ceilings

- 1. Provide acoustical panel ceilings, suspension system and hangers.
- 2. Provide supplemental suspension hangers at large ducts above ceilings and at openings for lighting fixtures.
- 3. Provide continuous acoustical sealant on back of vertical leg before installing moldings where required by the project documents.
- 4. Provide hold down clips where required by governing regulations for fire resistant ratings.
- 5. Expansion joints integral to the acoustical ceiling systems will be provided by Carpentry & General Works contractor. This contractor must coordinate the installation to ensure layout is consistent with ceiling grid installation
- 6. Provide reflected ceiling layout as depicted on the Reflected Ceiling Plans. Report any conflicts with MEP obstructions prior to commencing with any work.
- 7. Provide paint to all cut edges. All colors are to be supplied by manufacturer for matching purposes.
- 8. This Contractor shall cut openings in ceilings for architectural penetrations, sprinkler heads, lights, mechanical diffusers and grilles, etc. All trades must provide layout to Sprinkler Contractor.
- 9. Provide attic stock.
- 10. Provide fire rated assemblies where indicated.

- 11. This contractor shall pay particular attention to the layout, colors and types of ceilings. All acoustical ceiling tiles are to be installed as indicated on Architectural Drawings.
- 12. Provide pricing for all alternates as described in Section 012300-Alternates.
- 13. Provide coordinated shop drawing for review and approval prior to installation.
- 14. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 15. Provide all cranes, scaffolding and lifts for this work.
- 16. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 17. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 18. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 19. Provide \$5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-13 - FLOORING

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements

Section 079200 Joint Sealants

Section 090600 Room Finish Schedule – Color Legend

Section 096400 Wood Flooring

Section 096513 Resilient Base and Accessories

Section 096519 Resilient Tile Flooring

Section 096813 Tile Carpeting

- Provide all flooring, with exception of epoxy floor, in accordance with the finish schedule and specifications. Epoxy Floor Paint will be provided by Carpentry & General Works contractor.
- 2. Prepare subfloor for finished flooring including leveling and patching. Base bid shall include all flashing/patching and surface preparation required to perform the work of this Contractor.
- 3. Provide wood flooring, thresholds and all underlayments, including but not limited to: sleepers, vapor barriers, reducer strips and fasteners and leveling compounds. Provide protection of all wood flooring, maintenance of and the removal of products once accepted by Construction Manager. Protection shall consist of kraft paper, duct taped down on all areas of wood floor and Masonite over high traffic areas on top of the kraft paper.
- 4. Provide all resilient flooring, thresholds reducer strips, leveling compounds and accessories. This work shall include all flooring (VCT, Polyester, LVT & rubber floor tiles), base, stair treads, moldings, adhesives, fasteners and accessories. Per ASD, the floor polishing of resilient flooring will be completed by ASD. Do NOT include costs in base bid for polishing of these floors.
- 5. Provide all carpeting. Include all patching, adhesives, edge strips, reducer strips, leveling compounds and fasteners.
- 6. Provide all transition, thresholds and reducer strips at edges of flooring systems except when they terminate at ceramic. Ceramic Tile contractor shall provide ceramic thresholds.

- 7. Provide cleaning and protection upon completion of rooms or areas.
- 8. Provide attic stock of each material as specified.
- 9. Provide finish floor material in elevator cab. See Alternate pricing for this work.
- 10. Provide cutting and fitting around work of others.
- 11. Provide pricing for all alternates as described in Section 012300-Alternates.
- 12. Provide coordinated shop drawing for all flooring materials as indicated in flooring technical specifications.
- 13. All ceramic tile will be the responsibility of the ceramic tile contractor. This contractor will only be responsible for modifying work to meet thresholds of ceramic tile installations.
- 14. Provide mock ups as specified.
- 15. Provide multiple moisture tests, of all flooring systems, prior to installation.
- 16. Provide in base bid all costs for the storage of all material off site until environmental conditions allow for delivery to site and/or delivery is directed by Construction Manager.
- 17. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 18. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 19. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 20. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 21. Provide \$10,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-14 - CERAMIC TILE

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements

Section 079200 Joint Sealants

Section 090600 Room Finish Schedule – Color Legend

Section 093013 Tile

- 1. Provide ceramic tile, quarry tile, porcelain tile, glazed wall tile, stone thresholds and associated membranes, setting materials, epoxy grouts (where indicated), sealers and strips. Epoxy Floor Paint will be by provided by Carpentry & General Works contractor.
- 2. Provide quarry tile system, grout, underlayments, edge strips and sealers.
- 3. Provide porcelain tile and related components.
- 4. Provide setting beds and thin set applications as directed.
- 5. Provide crack suppression membrane for this tile installation.
- 6. Provide waterproofing and anti-fracture membrane at all tile locations as specified by the project documents.
- 7. Provide metal trim pieces (schluter strips, etc.) integral to the tile installations.
- 8. Provide metal strips installed as part of the tile installation.
- 9. Provide vapor retarding sealer prior to tile application.
- 10. Provide grout sealant according to manufacturer's directions.
- 11. Provide cutting and fitting around work installed by others.
- 12. Provide patching and leveling.
- 13. Provide expansion joints.

- 14. Provide mock ups as specified.
- 15. Provide protection, maintenance and the removal of finished products once accepted by Construction Manager. Protection shall consist of kraft paper, taped down on all areas of floor and masonite over high traffic areas on top of the kraft paper. (If recommended by tile manufacturer, provide coat of protective cleaner to all floors and walls. Do not remove until Construction Manager Direction. Upon notice from Construction Manager, remove protective cleaner from the tile surfaces for final inspection.
- 16. Provide attic stock.
- 17. Provide pricing for all alternates as described in Section 012300-Alternates.
- 18. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 19. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 20. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 21. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.
- 22. Provide \$5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-15 - KITCHEN EQUIPMENT

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements
Section 078433 Joint Fire Stopping
Section 079200 Joint Sealants

Section 114000 Food Service Equipment

Division 21 Fire Suppression

Division 22 Plumbing
Division 26 Electrical

- 1. Provide all materials, services, equipment and appliances necessary to provide all foodservice equipment to its final installation location as specified.
- 2. All final connections shall be made by the Electrical and Mechanical Contractors. Provide coordination with Special Systems, Electrical and Mechanical contractor to prevent any additional cost to the Owner.
- 3. Provide the labor, equipment and materials to uncrate, assemble, install in place, level & plumb and completely install all food service equipment with exception of electrical and plumbing installations which will be completed by others.
- 4. Any discrepancies between the Drawings, Specifications and site conditions or ambiguities in the documents shall immediately be reported to the Construction Manager in writing. Inconsistencies shall be corrected in writing or by reissuing the drawings. If the Contract Documents disagree with the quality or quantity of work required, the better quality or greater quantity shall be supplied unless otherwise instructed in writing by the Construction Manager. Any work performed by the Contractor at locations in question after his discovery of discrepancies, inconsistencies, ambiguities, or errors, without securing resolution, shall be at the Contractor's risk.
- 5. This Contractor shall verify all measurements at the site and assume full responsibility for their correctness before proceeding with his work. No extra compensation will be allowed because of differences between site conditions and those indicated on the drawings.
- 6. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer and shall be

protected from damage until acceptance. Prefinished products which are damaged before or after installation shall be replaced with new and perfect materials. Materials finished after installation which are damaged shall be refinished or replaced as the Construction Manager may direct. No additional charge will be honored by the Construction Manager for repair or replacement of finished materials.

- 7. Should this Contractor feel that the Contract Documents call for work which he cannot guarantee, he shall so state, in writing, prior to bidding. Proceeding with any operation shall be construed as acceptance of all guarantee conditions.
- Secure certificates of inspection and occupancy required by authorities having jurisdiction.
 Deliver copies of certificates to the Construction Manager prior to filing application for final payment.
- 9. It is this Contractor's responsibility to make certain statutes, building codes, and regulations including those of the appropriate health agencies having jurisdiction over this type of facility are met.
- 10. Provide protection of all equipment during and after installation has been completed.
- 11. Provide coordinated shop drawings that indicate all MEP requirements and accurately reflect the actual conditions and spacing of the area.
- 12. Provide specified warranties.
- 13. All foodservice components consist of those items identified in Section 114000 and the "K" Series drawings that identify the Food Service items. All items are to be included in the base bid of this contract to completely provide all systems in their entirety. This contractor shall pay particular attention to the "Standard Details" section of typical drawings within Specification section 114000.
- 14. Welding of materials must comply with all specified acceptable means.
- 15. Any items furnished as part of this Scope of Work that require mechanical or electrical rough ins or services that are different from those shown on the Contract Drawings shall be so noted at the time of bid. Failure to do so shall make this Contractor liable for costs of any changes required by same.
- 16. Provide all caulking and sealants for proper installation and in accordance with public health regulations.
- 17. Provide startup, testing and demonstrate all equipment installed under this category of work. Provide proposed schedule, including names and telephone numbers of attending representatives at least (3) three weeks in advance of demonstration.

- 18. Obtain approvals and permits and coordinate inspections and testing with governing local and state agencies.
- 19. Provide pricing for all alternates as described in Section 012300-Alternates.
- 20. Provide licensed electrician to make all interconnections within equipment furnished by this contractor.
- 21. This contractor shall provide all equipment shop drawings within 2 weeks of award so that the fully coordinated shop drawings with MEP Trades and BIM Coordinator are submitted within 8 weeks from award of project.
- 22. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 23. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 24. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 25. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 26. Provide \$5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-16 – ELEVATOR & WHEEL CHAIR LIFTS

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements
Section 078413 Penetrating Firestopping

Section 142123.16 Machine Room-Less Electric Traction Passenger Elevators

Section 144200 Wheel Chair Lifts
Division 21 Fire Suppression
Division 22 Plumbing

Division 23 Heating, Ventilating and Air Conditioning

Division 26 Electrical

Division 27 Communications

- 1. Provide passenger elevator complete.
- 2. Provide new vertical wheelchair lifts complete.
- 3. Electric service and disconnect switch for the elevators are the responsibility of the Electrical Subcontractor. All other control wiring, as specified, will be the responsibility of this Subcontractor.
- 4. This Contractor shall cooperate with the Construction Manager in laying out the core dimensions and sill elevations.
- 5. Provide demonstration/training for both elevator and wheel chair lifts.
- 6. Provide specified warranties and maintenance services.
- 7. The grouting of all elevator sill angles will be the responsibility of the Concrete Contractor.
- 8. This Contractor to furnish and install all rough wiring necessary for the installation of emergency telephones. All communication devices will be furnished and installed by the Owner.
- 9. The Carpentry & General Works Contractor will furnish and install temporary barricades at all openings in the building, including the elevator. It is the responsibility of this contractor to maintain this temporary protection and railings at hoist ways after

installation of elevator has commenced throughout certification/testing.

- 10. Provide pricing for all alternates as described in Section 012300-Alternates.
- 11. Provide card reader operation system. Special Systems Contractor will provide final terminations.
- 12. Provide start up and training of elevator and lifts.
- 13. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 14. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 15. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 16. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 17. Provide wall pads on all sides of elevator prior to turnover of elevator.
- 18. Provide in base bid all costs associated with moving/operating car to leave cab in pit or to top of shaft so that other trades can provide access for their work to be completed once cab installation is underway. Provide a minimum of 8 Hours of time in base bid.
- 19. Provide \$5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-17 - FIRE PROTECTION

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0 Bidding and Contract Requirements

Division 1 General Requirements

Division 3 Concrete

Section 078413 Penetrating Firestopping

Section 078443 Joint Firestopping Section 079200 Joint Sealants

Section 210170 Fire Suppression Sprinkler System

Section 210171 Fire Pump – Electric

Section 220000 General Provisions – Plumbing/Fire Protection

Division 22 Plumbing
Division 26 Electrical

Division 27 Communications

Division 28 Electronic Safety and Security

Division 31 Earthwork

- 1. Provide piping, fittings, couplings, valves and sprinkler heads.
- 2. Excavation and backfill related to fire protection work as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with Del Dot standard specifications.
- 3. Backfilling is the responsibility of this Contractor. Soil types shall be in accordance with project documents.
- 4. Provide as-built drawings.
- 5. Provide concrete equipment pads, curbs and thrust blocks for fire protection work.
- 6. Provide testing and inspections.
- 7. Provide cutting and patching.
- 8. Provide firesafing.
- 9. Provide design.

- 10. Flow and tamper switches to be supplied by this Contractor and wired by the Electrical Contractor. It is this Contractors responsibility to provide flow and tamper switches to meet applicable state and local codes.
- 11. Provide preaction suppression system, controller, jockey pumps, flow meter and related work. Wiring of pump and controller to be by the Electrical Contractor.
- 12. Provide fire pump and accessories.
- 13. Provide meter, if required, and all applicable fees.
- 14. This Contractor to coordinate the need for and compatibility of his system to the emergency generator, supplied by others.
- 15. Provide pipe identification.
- 16. Provide flow tests of fire hydrants around site in preparation of hydraulic design.
- 17. Provide fire main from +/- 5 feet outside building including connection in the building. This Contractor shall coordinate building entry location with the Site Contractor to eliminate any additional cost to Owner.
- 18. Provide the necessary coordination with trade to avoid interferences with other work and make corrections at no extra charge.
- 19. Provide specified warranties.
- 20. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.
- 21. Provide start up training and demonstration of new system.
- 22. Provide attic stock as specified.
- 23. Provide fully coordinated shop drawings with MEP Trades and BIM Coordinator within 8 weeks from award of project.
- 24. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.

- 25. All heads to be located center of tile.
- 26. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 27. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 28. Provide \$5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-18 - HVAC AND PLUMBING

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0	Bidding and Contract Requirement	s

Division 1 General Requirements

Division 3 Concrete

Section 078413 Penetrating Firestopping

Section 078443 Joint Firestopping Section 079200 Joint Sealants Division 11 Equipment

Division 14 Conveying System
Division 21 Fire Suppression

Division 22 Plumbing

Section 220000 General Provisions – Plumbing/Fire Protection Section 220010 Basic Materials and Methods – Plumbing

Section 220030 Insolation & Covering - Plumbing Section 220110 Drainage Systems - Plumbing

Section 220120 Domestic Water Systems – Plumbing Section 220130 Gas Piping Systems – Plumbing

Section 220140 Fixtures – Plumbing
Section 220150 Equipment – Plumbing
Section 220190 Testing – Plumbing
Section 220191 Balancing – Plumbing
Section 230200 General Provisions – HVAC

Section 230210 Basic Materials and Methods – HVAC

Section 230215 Valves

Section 230230 Insulation & Covering – HVAC
Section 230300 Vibration Isolation – HVAC
Section 230400 Heating Generation Equipment

Section 230410 Heating Generation Auxiliary Equipment

Section 230450 Refrigeration Equipment – HVAC
Section 230500 Piping Systems and Accessories
Section 230510 Water Treatment (HVAC)

Section 230600 Air Distribution & Accessories - HVAC

Section 230605 Fans

Section 230725 Thermal heating Units
Section 230760 Air Handling Equipment
Section 230861 Air Purification System

Division 26 Electrical

Division 27 Communications

Division 28 Electronic Safety and Security

Division 31	Earthwork
D1V151011 51	Lartiwork

Division 32 Exterior Improvements

Division 33 Utilities

- 3. Provide a complete mechanical, plumbing and piping system as indicated on the Drawings and in the Specifications.
- 4. Division 26 of the specifications should be reviewed as it relates to the power wiring and other requirements for HVAC equipment including the coordination of furnishing and installing motor starters as provided in the specifications.
- 5. This Contractor shall be responsible to designate an individual within his organization, intimately familiar with this project and assigned on site, to act as the System Start-up Coordinator. This individual must be pre-approved by the Construction Manager. This individual's responsibilities shall include, but not be limited to, coordinating the start-up of all mechanical equipment, including the coordination between the Electrical Contractor, the Controls Contractor, and all testing, adjusting and balancing work. This individual shall report on a weekly basis, in written form, to the Construction Manager. These reports shall include a summary of current conditions including manufacturers' start-ups, systems' deficiencies noted to date and the remediation of same, coordination issues between trades, system interfacing and forecasting, as necessary to project the completion of each individual system within the building.
- 6. Provide excavation and backfill for underground mechanical/plumbing work as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with Del Dot standard specifications. Refer to Division 31 and 33 of the specifications.
- 7. Backfilling is the responsibility of this Contractor. Soil types shall be in accordance with project documents.
- 8. Provide all Equipment bases and housekeeping pads related to plumbing and HVAC equipment.
- 9. Provide permits/meters.
- 10. Provide pipe and duct insulation.
- 11. Coordinate and provide penetrations through wall, floors, etc. including cutting, patching and fire safing. The contractor requiring wall sleeves in concrete & masonry walls must supply and locate these to the concrete and masonry contractors for them to install.
- 12. Coordinate with the Testing and Balancing Contractor.

- 13. All guarantees and warranties to begin at the substantial completion of the entire project. Maintain equipment prior to substantial completion.
- 14. Provide all cranes, scaffolding and lifts for this work including any rigging.
- 15. Provide coordination with Building Management Systems Contractor.
- 16. Provide ductwork, flex duct, grilles and diffusers.
- 17. Provide roof drains. Contract A-06 Roofing shall cut the roofing membrane and provide flashings for the drains.
- 18. Provide louvers and vents related to HVAC operations.
- 19. Coordinate damper size, location and type of damper with architectural drawings.
- 20. Provide piping work associated with the emergency generator (including fuel piping and exhaust piping). Include initial fill up of fuel tanks.
- 21. Provide temporary heat and ventilation installation, maintenance and removal. Refer to Division 1, Specification Section 015123 TEMPORARY HEATING, COOLING, & VENTILATION, for specific scope. The new equipment WILL NOT be used for temporary heating. This Subcontractor will furnish, install, and maintain the temporary heating equipment. Included in the base bid for this contract is a \$50,000 allowance. (See note#42) Temporary heating fuel consumption associated with the temporary heating will utilize a portion of these costs. All unused portions of the allowance will be returned at the end of the project.
- 22. Provide gas piping, meter and pressure regulator valve.
- 23. Provide electric baseboard heat.
- 24. Provide duct testing to be verified by the TAB Contractor.
- 25. Provide precast mop receptors
- 26. Provide grease interceptor and vault Include excavation & backfill and any stone, tie-downs or foundation requirements.
- 27. Provide trap priming system.
- 28. Provide fuel detection/monitoring system in accordance with local codes.
- 27. Roof curbs, pipe, hoods and vent equipment & supports are to be supplied by contractor

in which the units, piping, etc. are being supplied. The openings for the curbs in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by the contractor in which the units are being provided. The roofing contractor shall provide all flashing and sealing of the curbs. Any wood blocking required will be provided by Carpentry & General Works Contractor.

- 29. All utilities will be brought to within +/- 5 feet of the building line by others. The Mechanical Contractor is responsible for connecting the utilities from +/- 5 feet outside the building line and completing the system within the building.
- 30. Install Owner prepurchased equipment, if applicable.
- 31. Provide access panels for all access to Mechanical or Plumbing components or equipment.
- 32. Provide final connection of kitchen equipment and appliances.
- 33. Provide as-built drawings.
- 34. Provide pricing for all alternates as described in Section 012300-Alternates.
- 35. Coordinate with Sitework Contractor, who will provide all tie-ins to the downstream side of grease trap and Electrical Contractor. This contractor, shall provide all excavation, backfill and piping from building to grease trap. It is the intent that no additional costs will be provided for lack of coordination that requires relocation of newly installed site utilities for the installation of the grease trap.
- 36. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 37. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.
- 38. Provide fully coordinated shop drawings with MEP Trades and BIM Coordinator within 8 weeks from award of project.
- 39. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 40. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the

project site.

- 41. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 42. Provide \$50,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-19 – BUILDING MANAGEMENT SYSTEMS

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification sections:

Division 0	Bidding and Contract Requirements		
Division 1	General Requirements		
Section 078413	Penetrating Firestopping		
Section 078443	Joint Firestopping		
Section 079200	Joint Sealants		
Division 11	Equipment		
Division 14	Conveying System		
Division 21	Fire Suppression		
Division 22	Plumbing		
Division 23	Heating, Ventilating and Air Conditioning		
Section 230900	Automatic Temperature Controls (DDC)		
Division 26	Electrical		
Division 27	Communications		
Division 28	Electronic Safety and Security		
Division 33	Utilities		

- 1. Provide automatic temperature controls for equipment whose main purpose include all items in the automatic temperature control scope. Provided, however, that the controls do not directly switch the power lines to the equipment; the wiring of such controls to remain the responsibility under Contract Scope 16000.
- 2. Provide environmental controls for the building mechanical system for a complete & operational system. System shall control all mechanical equipment systems & components per plans and specifications.
- 3. Provide ventilation controls.
- 4. Provide cooling controls.
- 5. Provide humidification controls.
- 6. Provide refrigeration controls.
- 7. Motorized dampers when not specified as part of the factory packaged equipment supplied to job site for distribution and installation by others.

- 8. Provide both reading and remote reading gauges, transmitters and recorders for automatic temperature controls.
- 9. Provide building centralization controls including centralized temperature, humidity, pressure and flow indication and recorders, centralization of air conditioning, heating, ventilation, humidification and refrigeration equipment operation.
- 10. Provide building life safety control and equipment safety control including: fire alarm, fan shut downs, operators and controls for motorized smoke dampers, operators and controls for motorized fire dampers, firestats, freeze protection thermostats, shut down safety devices forming part of automatic temperature control.
- 11. Provide permits as required for work under this contract scope.
- 12. Provide inspections as required under this contract scope.
- 13. Provide electrical thermostats intended for automatic temperature controls complete with subbases or adapter plates to mount on standard electrical box.
- 14. Provide remote reading gauges, transmitters and recorders for automatic temperature control.
- 15. Provide access doors when specifically requires for access to automatic temperature controls.
- 16. Provide control wiring and/or air piping required for all automatic temperature controls supplied under this contract scope.
- 17. Provide wiring for remote thermostats and remote prewired auxiliary control panels for packaged equipment.
- 18. Provide boiler feed water control wiring.
- 19. Provide the magnetic starter coil and relay coils intended for automatic temperature controls, including interlocking between starters and/or relays when controlled automatically.
- 20. Provide access panels directly associated with this work if not included by other division.
- 21. Exclude direct reading temperature and pressure gauges connected directly to non-potable water systems.
- 22. Exclude motorized dampers when specified as integral part of packaged equipment.
- 23. Exclude automatic temperature controls when specified as integral part of packaged equipment.

- 24. Exclude flow measuring and control devices.
- 25. Exclude direct reading temperature and pressure gauges connected directly to refrigeration systems.
- 26. Exclude filter gauges directly connected to duct systems.
- 27. Provide electrical wiring for thermostats and controls which directly switch the power line to the equipment (directly shall mean not through magnetic coil) is by Electrical Contractor.
- 28. Power wiring will be provided by the Electrical Contractor.
- 29. Control power supply outlets are to be provide by the Electrical Contractor.
- 30. Provide pricing for all alternates as described in Section 012300-Alternates.
- 31. Provide transmitters for ATC.
- 32. Start, test and demonstrate all equipment installed under this category of work. Provide proposed schedule, including names and telephone numbers of attending representatives at least (3) three weeks in advance of demonstration.
- 33. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.
- 34. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 35. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 36. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 37. Contractor shall provide a \$1,500 allowance to be used at the direction of the Construction Manager. Any unused allowance will be returned to the owner.

CONTRACT NO. A-20 - ELECTRICAL

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification Sections:

Division 0	Bidding and Contract Requirements
DIVIDION 0	brading and contract requirements

Division 1 General Requirements

Division 3 Concrete
Section 078400 Fire Stopping
Section 078443 Joint Firestopping
Section 079200 Joint Sealants
Division 11 Equipment

Division 14 Conveying System
Division 21 Fire Suppression

Division 22 Plumbing

Division 23 Heating, Ventilating and Air Conditioning

Section 260000 General Provisions – Electrical

Section 260055 Electrical Identification

Section 260110 Raceway

Section 260120 Wires & Cables

Section 260135 Electrical Boxes & Fittings

Section 260140 Wiring Devices Section 260155 Motor Starters Section 260160 Panelboards Section 260165 Switchboards

Section 260170 Motor and Circuit Disconnects
Section 260180 Overcurrent Protective Devices

Section 260190 Supporting Devices
Section 260195 Power System Studies
Section 260430 Metering Equipment

Section 260452 Grounding Section 260460 Transformers

Section 260470 Distribution Circuits
Section 260471 Feeder Circuits
Section 260472 Branch Circuits

Section 260475 Elevator Electrical Systems

Section 260510 Building Lighting

Section 260520 Roadway & Parking Area Lighting

Section 260601 Lightning Protection System
Section 260740 Network Cabling Systems

Section 260930 Dimming Controls
Division 27 Communications

Division 28	Electronic Safety and Security
Division 31	Earthwork
Division 32	Exterior Improvements
Division 33	Utilities

- 1. Provide a complete electrical system as indicated on the drawings, schedules and in the specifications.
- Divisions 22 and 23 of the specifications should be reviewed as it relates to the power wiring and other requirements for Plumbing and HVAC equipment including the coordination of furnishing and installing motor starters and controllers as detailed in the Specifications and on the Drawings.
- 3. Excavation and backfill for underground electrical work as required below is the responsibility of this Contractor. Soil types shall be in accordance with Del DOT standard specifications. Backfilling is the responsibility of this Contractor. Soil types shall be in accordance with project documents.
- 4. Provide concrete for duct banks, light standards, above ground conduit encasement, equipment bases and any other concrete work specifically related to the electrical work. Include requirements of New Castle County, State and local codes for concrete encasement.
- 5. Provide temporary electric installation, maintenance and removal. Refer to Division 1, Specification Section 015113 TEMPORARY ELECTRIC, for specific scope.
- 6. Provide pad mounted transformer, and new conduit and transformer pad and wiring from existing primary switch for new incoming service. New transformer and service must be ordered immediately as this will be used for temporary power service. The service provider will supply the transformer, electrical contractor shall be responsible for installation and terminations of the transformer.
- 7. Provide new communications ductbank from existing communications manhole.
- 8. Provide permits and inspections.
- 9. Provide penetrations through walls, floors, etc. including cutting, patching and fire safing.
- 10. Electric service and disconnect switch for the elevators are the responsibility of this contractor. All other control wiring, as specified, will be the responsibility of the Elevator Contractor.

- 11. Provide testing.
- 12. The Concrete Contractor shall furnish, install and maintain stone fill under slab. The Sitework Contractor shall leave the building pad site at subgrade to within +/- ¼" in preparation to receive stone fill. The Mechanical and Electrical Contractors shall complete their work under the slab on grade and shall be responsible to return the pad to the subgrade elevation left by the Sitework Contractor. The Concrete Contractor shall then adjust the select material to final subgrade, fine grade the slab and place the vapor barrier and stone fill.
- 13. All guarantees and warranties to begin at the substantial completion of the entire project. Maintain equipment prior to substantial completion.
- 14. Provide hoisting, rigging and scaffolding.
- 15. Provide all primary service work, including all utility company related costs/fees for this work.
- 16. Provide all heat tracing.
- 17. Special systems (CCTV, intercom, **classroom sound enhancement**, telecommunications, fire alarm, area rescue system, intrusion detection, cafetetoium sound reinforcement system, sound, security, time clock,) will be the responsibility of the Special Systems Contractor. However, this contractor must coordinate with Special Systems Contractor as indicated on the drawings and as specified. This contractor shall provide all device boxes, conduit to **volt circuits above accessible ceilings with pull strings** for special systems as indicated and also to provide 120 Volt circuits for all Special Systems.
- 18. Cable distribution will be installed by the Special Systems Contractor.
- 19. This contractor shall be responsible for to coordinate with door hardware contractor and provide all required wiring from the electrical transfers to the door hardware locks and up to the power supplies. This contractor shall be responsible for all 120 Volt circuits indicated on the floor plans for power supplies and the interconnection between the two power supplies along with the integration of the card access system.
- 20. Provide all required wiring for door release at Doors A123, A124A, EXC111 & EXC 102. Door release is only on Doors EXB101, B120A, B115A and B115B from the receptions desk.
- 21. This contractor shall also be responsible to coordinate and extend the existing district wide card access system to cover entire building to be integrated with the intrusion system for card arm/disarm system. This contractor to provide all device boxes, conduit to above accessible ceiling with pull strings.

- 22. Provide lightning protection with master UL certification.
- 23. Provide grounding of building columns and interior spaces as required.
- 24. Provide pull strings and boxes for voice/data boxes.
- 25. Provide network cabling system
- 26. Provide as-built drawings.
- 27. Provide rough-in and final connection and related work for equipment provided under other contracts (i.e. kitchen, elevators, HVAC, sprinkler, motorized doors, etc.). Provide power to automatic hardware. Low voltage wiring from the controller to hardware shall be provided by the Doors, Frames and Hardware Contractor; Final connections to be by this contractor.
- 28. Provide complete audio and audiovisual systems. **Above accessible ceilings with pull strings.**
- 29. Provide all required boxes, conduit and pull strings to accessible locations for Simplex-Grinnell systems.
- 30. Provide rough-in and final connection of kitchen equipment and appliances. Refer to Specification Section 114000 Food Service Equipment for specifics. Coordinate power/plug requirements with rough in for equipment with the Kitchen Equipment Contractor.
- 31. Provide stage lighting systems including coordination, fixtures, controls, wiring, light grids, supports and attachments.
- 32. Roof curbs, pipe, hoods and vent equipment & supports are to be supplied by contractor in which the units, piping, etc. are being supplied. The openings for the curbs in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by the contractor in which the units are being provided. The roofing contractor shall provide all flashing and sealing of the curbs. Any wood blocking required will be provided by Carpentry & General Works Contractor.
- 33. Carpentry & General Works contractor shall provide defibrillators and cabinets. Alarm connection and power wiring will be provided by Special Systems Contractor.
- 34. Provide pricing for all alternates as described in Section 012300-Alternates.
- 35. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.

- 36. Provide fully coordinated shop drawings with MEP Trades and BIM Coordinator within 8 weeks from award of project.
- 37. Projection screens and the control wiring associated, will be provided by the Carpentry & General Works contractor. Electric power to these gates the screens are the responsibility of the Electrical Subcontractor.
- 38. All costs for barricades, arrows, pedestrian protections, flag men, etc. will be part of this Contract. It shall be assumed there is at least 1 marked flagger to escort trucks through the project site.
- 39. Provide power to hand dryers. The hand dryers will be supplied and installed by Carpentry & General Works Contractor.
- 40. Provide site lighting and all reinforced lighting bases and associated conduit.
- 41. Coordinate with Sitework Contractor, who will provide all tie-ins to the downstream side of grease trap and the Plumbing Contractor, who will provide all excavation, backfill and piping from building to grease trap. It is the intent that no additional costs will be provided for lack of coordination that requires relocation of newly installed site utilities for the installation of the grease trap.
- 42. Provide installation for all wireless access points furnished by owner
- 43. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 44. Provide conduits and pull strings to Special System Contractor for card access systems. The Special System contractor shall provide wiring from panel to door contact and from panel to power transfer. Electrical Contractor shall provide conduit to door frame.
- 45. Hardware for permanent exterior gates will be provided by Carpentry & General Works Contractor and the security will be provided by the Special Services Contractor. These locations are indicated on the Architectural and Civil Drawings. The Sitework Contractor shall provide the gates and associated adjacent fencing. The balance of hardware will be provided by the Carpentry & General Works Contractor, as indicated on the door hardware schedule. The Electrical & Special System Contractors shall provide all power and coordination with fire alarm integration.
- 46. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

- 47. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.
- 48. Provide \$40,000 allowance to be used at the discretion of the Construction Manager.
- 49. Per drawing E4.2 issued with Addendum #3, See General Electrical Note #4. Include the \$275,000 allowance as part of the base bid. The actual costs will be verified by the provider prior to installation. If the costs are more/less a change order will be issued for the difference.

CONTRACT NO. A-21 – SPECIAL SYSTEMS

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:
 - Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 078400	Fire Stopping
Section 078443	Joint Firestopping
Section 079200	Joint Sealants
Division 11	Equipment
Division 14	Conveying System
Division 21	Fire Suppression
Division 22	Plumbing
Division 23	Heating, Ventilating and Air Conditioning
Division 26	Electrical
Section 260731	Wireless Clock System
Section 260771	Intercom/Telecom Communication and Clock System
Section 260772	Cafetorium Sound Reinforcement System
Division 27	Communications
Section 280721	Fire Alarm and Detection System
Section 280724	Area Rescue System
Section 280725	— Intrusion Detection System
Section 280725	Intrusion System
Section 280728	CCTV Network Digital Video Management System
Section 280727	Integrated Access Control & Security Management System
Division 31	Earthwork
Division 32	Exterior Improvements
Division 33	Utilities

- 1. Provide a complete Life Safety System including Fire Alarm, Area Rescue System, Intrusion and Detection and Sound System. Provide intercom/telecommunication and clock system.
- 2. Provide complete audio/audiovisual system.
- 3. Provide a complete CCTV, intercom, telecommunications, area rescue system, intrusion detection, cafetetoium sound reinforcement system, sound, security, time clock systems. However, this contractor must coordinate with Electrical Contractor as indicated on the drawings and as specified. The Electrical Contractor shall provide all device boxes, conduit and pull strings to circuits for special systems as indicated and also to provide 120 Volt circuits

for all Special Systems.

- 4. Provide complete fire alarm system is to be provided by this contractor. Water flow devices are supplied and installed by the Sprinkler Contractor and wired by this Contractor. Include tie-in to fire sprinkler flow and tamper switch.
- Provide card access system. Provide coordination with door and frame installation for a complete system. This contractor shall provide wiring from panel to door contact and from panel to power transfer. Electrical Contractor shall provide conduit to door frame.
- 6. Provide penetrations through walls, floors, etc., including cutting, patching and fire safing.
- 7. Provide video/local origination and distribution system.
- 8. Provide and coordinate for inspections and testing.
- 9. Provide permits for work of this contract.
- 10. Provide coordination of the work of this contract with the Electrical Contractor, including final equipment locations.
- 11. Smart boards TVs will be supplied by Owner and mounted and terminated by this contractor. The Carpentry & General Works Contractor will install the clips and blocking to the wall for hanging.
- 12. Provide fire resistive sealants for the work of this contract.
- 13. Provide pricing for all alternates as described in Section 012300-Alternates.
- 14. Provide locking.
- 15. Provide digital keypad access control devices. This Contractor to expand the existing district wide card access system to cover this entire building as indicated.
- 16. Carpentry & General Works contractor shall provide defibrillators and cabinets. The electrical Contractor will provide power and raceway. Provide alarm connection.
- 17. Provide card reader terminations and programming at elevator.
- 18. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.
- 19. Provide fully coordinated shop drawings with MEP Trades and BIM Coordinator within 8 weeks from award of project.

- 20. The hardware for exterior gates will be provided by the Carpentry & General Works Contractor. These gates and locations are indicated on the Civil Drawings. The Sitework Contractor shall provide the gates, associated adjacent fencing and balance of hardware as indicated on the door hardware schedule. The Electrical & Special System Contractors shall provide all power and coordination with fire alarm integration.
- 21. Provide all special systems (CCTV, sound, security, time clock,). This contractor must coordinate with Electrical Contractor as indicated on the drawings and as specified.
- 22. Provide cable distribution for all Special Systems Contractor.
- 23. Provide all required devices for door release at Doors A123, A124A, EXC111 & EXC 102. **Door** release is only on Doors EXB101, B120A, B115A and B115B from the receptions desk.
- 24. Provide daily fine cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Daily Fine clean up, on a daily basis, shall be defined as those means/methods utilized to perform the daily cleaning tasks without producing dust, noise and stacking of stored materials. Furnish fine clean up on a daily basis. All debris must be removed from the work area at the end of each work day to the appropriate dumpster.
- 25. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 26. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.

CONTRACT NO. A - 22: TESTING & BALANCING

- A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials, and equipment for:
 - Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 11	Equipment
Division 14	Conveying System
Division 21	Fire Suppression
Division 22	Plumbing
Division 23	Heating, Ventilating and Air Conditioning
Section 230950	Testing & Balancing of Mechanical Systems
Division 26	Electrical
Division 27	Communications
Division 28	Electronic Safety and Security

- 1. Provide water and air testing and balancing.
- 2. Contractor shall prepare, at a minimum, a preliminary balance report for the New Castle County Final Inspection.
- 3. Provide pricing for all alternates as described in Section 012300-Alternates.
- 4. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.
- 5. Provide complete signed and sealed testing report prior to substantial completion and final inspection as required by county L&I.
- 6. This contractor has been allotted 30 days to complete all work and provide final, sealed balancing report by the Construction Manager. This contractor will need to work closely with the Construction Manager and all MEP trades to sequence work so that the completion of the balancing is completed in a manner that does not delay acceptance from NCC or ASD.
- 7. Provide confirmation of duct testing completed by Mechanical Contractor.
- 8. This contractor must provide all lifts or scaffold means to access all elements.

- 9. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
- 10. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. ASD and EDiS will not be responsible for any lost tools, materials or equipment.

END OF SECTION

BIM EXECUTION PLAN

Whitehall Elementary School

Appoquinimink School District



EDiS Company and EDiS BIM Services



BIM PROCESS IS MANDATORY

SECTION 013700 - BIM COORDINATION

1. CONTRACTOR 3D MODEL RESPONSIBILITY

The purpose of this three dimensional construction model is to aid in project review at a level of detail 200. Contractors, as part of the Whitehall Elementary School project, hold direct responsibility to adhere to AIA G202-2013 Project Building Information Modeling Protocol Form Matrix while creating their BIM model respectively. BIM models developed by Contractors shall reflect the two dimensional contract drawings provided in bidding package. EDiS Company's referenced and shared three dimensional model is only utilized as a visual aid to begin Level 400 LOD required by Contractor. EDiS Company relieves themselves from all responsibility of any conflicts within the LOD 200 model delivered as a reference model to Contractors.

2. DEFINITIONS

- 2.1. **Base Structural Model** the structural steel mill order drawing file showing all structural elements. This model is not necessarily fully detailed with all connections.
- 2.2. **Base Architectural Model** a combination of the Base Structural Model and key architectural elements. This model is to be used by all coordination participants as the background file in which to develop their work. No information within this model will be changed through the coordination process. It is for reference only.
- 2.3. **Base Composite Model** this model includes all trade drawing files within the Base Architectural Model as a representation of the completed systems. This model is used to run the intermediate clash reports and is considered a work in progress.
- 2.4. **Final Coordination Model** this model shows all trades' systems fully coordinated within the Base Architectural Model. All clashes have been resolved. No further coordination is required. The work shown within this model represents the upcoming installations of each system.
- 2.5. **Completed Coordination Model** this model is the close-out submittal to the Owner and includes the information within the Final Coordination Model as well as any project updates that have taken place during installations such as RFI responses, as-built conditions, etc.
- 2.6. **Building Information Model -** A Building Information Model(s) is a digital representation of the physical and functional characteristics of the Project and is referred to in this document as the "Model(s)," which term may be used herein to describe a Model Element, a single Model or multiple Models used in the aggregate. "Building Information Modeling" means the process and technology used to create the Model.
- 2.7. **Level of Development** The Level(s) of Development (LOD) describes the level of completeness to which a Model Element is developed.
- 2.8. **Model Element** A Model Element is a portion of the Building Information Model representing a component, system or assembly within a building or building site. Model Elements are represented by the Construction Specifications Institute (CSI) UniFormatTM classification system in the Model Element Table in Exhibit 1 Article 3.
- 2.9. **Model Element Author** The Model Element Author is the party responsible for developing the content of a specific Model Element to the LOD required for a particular

- phase of the Project. Model Element Authors are identified in the Model Element Table in Exhibit 1 Article 3.
- 2.10. **Model User** The Model User refers to any individual or entity authorized to use the Model on the Project for analysis, estimating, or scheduling.
- 2.11. **TCD** Trade contract drawings developed by MEP contractor.

3. COORDINATION DRAWING PROCESS – GENERAL REQUIREMENTS.

- 3.1. The coordination model shall be derived from the design base composite model which shall be in a (Program File Format Ex: Revit 2017) format and utilized by all coordination participants. The A/E is to provide this base composite model as needed at each plan deliverable for coordination efforts. This model will be utilized to establish field installation sequence, resolve trade coordination issues prior to installation, and to make the most efficient use of installation space without sacrificing system performance for mechanical, electrical, structural and architectural systems. (Program File Format Ex: NAVISWORKS or IFC) design review software will be used to document, identify and resolve interferences between all trades.
- 3.2. Communication is a critical element to the success of this coordination process. All project team members must be in constant communication to keep the process moving forward according to the sign-off schedule (5.1). Constant collaboration is expected of all team participants and each participant should be proactive in identifying and resolving design, engineering, and model interferences. Contractors avoiding the coordination process shall receive liquidated damages for missing meetings and negatively impacting project completion.
- 3.3. All trade contractors own their respective modeling for their contract work. EDiS Company will facilitate and lead the 3D coordination modeling process. It is the responsibility of all coordination participants to resolve discrepancies pertaining to their own model. All trades shall be responsible for collisions/clashes/coordination issues involving their respective trade(s) and proposed work. Coordinated work takes precedence over field routed systems. Each Contractor to provide LOD 400 total coordination models for sign off.
- 3.4. Coordination meetings will occur weekly starting TBD. Selected coordination team members are required to generate a clash-free model inclusive of all systems. The following participants are required to attend the weekly coordination meetings:
- 3.5. A mandatory coordination kick-off meeting for all participants will review; team collaboration, the execution process, the coordination schedule, establishing zones per system, use of the coordinated elements during construction, project specific information and requirements, and model/document standards.
- 3.6. Coordination meetings will be held at Virtual Goto Meeting to review the model's progress per the schedule and process indicated.
- 3.7. Utility corridors and above ceiling space for each trade, will be established by the group at the beginning of the process. These zones will be adjusted through the coordination process to meet installation requirements and feasibility.
- 3.8. All participants are required to identify the submittals required for accurate detailing of the coordination model (such as equipment, light fixtures, etc.) and to obtain final approval so the information can be incorporated into the modeling process.

- 3.9. The 3D coordination modeling process does not replace the standard submittal process and will not be considered as a submittal. Exceptions: The submittals issued to reflect the 3D model content issued to A/E.
- 3.10. Meeting Procedures:

Meeting Type	Project Stage	Frequency	Participants	Location
BIM Requirement	Construction	Once	EDiS Team &	Whitehall Elem
Kick-off			Contracts #	School Site Trailer
BIM	Construction	Weekly	EDiS Team &	Whitehall Elem
Coordination			Contracts #	School Site Trailer
BIM Clash	Construction	Weekly	EDiS Team Issue	Whitehall Elem
Detection			to Contracts	School Site Trailer
Field Installation	Construction	Weekly	EDiS Team &	Whitehall Elem
Process			Contracts #	School Site Trailer
Coordination				
Meetings				
TCD Drawings	Construction	Weekly	Contracts	Whitehall Elem
			Mechanical	School Site Trailer
Sign off on TCD	Construction	At	All Parties	Whitehall Elem
Drawings		completion	w/Contract	School Site Trailer

NOTES: all contracted parties involved with coordination are required to sign off on all coordinated models via sign off TCD drawings.

- 3.11. The coordination meeting:
 - 3.11.1. The purpose is to review and resolve items on the current clash report in conjunction with the project coordination schedule. The meetings will focus on clashes that cannot be resolved by internal collaboration. EDiS Company will facilitate the meeting and will make final decisions on clash resolution that are the least impact to the project as a whole. COORDINATION MEETINGS

 WILL NOT BE USED TO RESOLVE INDIVIDUAL

 MODELER'S/ENGINEER'S/ARCHITECTURE'S/CONTRACTOR'S WORK. If a Contractor does not post a clash-free system of its own work or that only contains a very limited number of clashes internally (Example: Fire Sprinkler Clashing with Fire Sprinkler), that Contractor will be considered unprepared for the meeting and will be responsible for any delays to the project schedule and any associated costs due to that delay which shall be determined by EDiS Company.
 - 3.11.2. Each team participant will review the clash report prior to the subsequent coordination meeting in order to clean up any clashes that can be made without review by all participants.
 - 3.11.3. All project participants are expected to be prepared for the meeting with new drawing work of the next area to be coordinated per the coordination schedule and any drawing changes based on the published clash report. Each participant will have available any shop model, submittals or other materials required to solve identified or potential conflicts.

- 3.11.4. The coordination schedule will be maintained and all identified conflicts addressed and resolved per the construction schedule. The coordination schedule may change as a result of design and/or model changes requested and made by the Owner, Architect or Engineer. In addition, the coordination schedule assumes selection of equipment is made within the time frame of the construction schedule as needed so it is incorporated into the coordination efforts without delay.
- 3.11.5. All agreed upon corrections to identified clashes determined by the team at the Coordination Meeting are to be updated and resolved prior to the next meeting.
- 3.12. When an area of the model is fully coordinated and clash-free, each participant agrees:
 - 3.12.1. That each trades work is fully coordinated and will be installed per the signed off area as reflected in the coordination model. Sign off drawings from each trade are turned over in PDF form with projects title block. EDiS Company will include legend and title block for trade PDF file.
 - 3.12.2. All trades to provide Total Coordination drawings at the time of sign off. TCD's are drawings which include all trades sign off models. Models are submitted for turn over to EDiS Company. The purpose for TCD's is to provide coordinated building models for jobsite coordination. Models from Contractors to include all but not limited to: item elevations, product type and all equipment tags.
 - 3.12.3. During the installation of each trade's work, EDiS Company will refer to the signed off report and the 3D model to resolve any conflicts. Each installation firm agrees to install all work per the signed off drawings/model, without deviation. If a deviation, during installation, takes place without prior approval from all detailing parties, it will be the responsibility of the installing contractor to tear out the work and install it as shown on the signed off drawings/coordination model. The cost of this work will be evaluated when the issues arise; however, the party responsible for the conflict will be responsible for the cost of the fix, including the additional detailing time of all parties involved.
 - 3.12.4. The model is not considered to be the final coordination model until the BIM Coordinator, EDiS Company's Project Manager, A/E, and Owner has approved all clash free systems and routings and documents are signed off by all parties (contractors).
- 3.13. Should a conflict arise during installation that was missed during the coordination process, and not a result of deviating from the signed off area, the coordination team will work together to find a solution that is optimal for all trades and the project.
- 3.14. The final coordination model shall be kept up to date by all participants during construction to include as-built information and any other pertinent data that is essential to the project. The data will be submitted electronically in Revit, AutoCAD, NWC, PDF format. Items to be included are:
 - 3.14.1. RFI responses.
 - 3.14.2. Design change orders or designs that are in addition to the original contract documents.

- 3.14.3. Equipment will be tagged with all (Owner required) identification information within the model (ex. Equipment schedule information and O&M Manuals). This identification information will be the same and correspond to all other close-out documentation. This close-out documentation including O&M manuals, maintenance information, etc. will be included in PDF form.
- 3.14.4. EDiS will provide a location for the Contractor to submit the required documentation at a later time. EDiS will generate the completed coordination model based on these documents for turn-over to the owner.
- 3.14.5. Tekla or Navisworks will be utilized to link PDF closeout documents, select RFI's, select Images, etc., to the closeout model. Contractors need to provide closeout documents in the format requested by EDiS for the closeout model as well as adding smart data to other model type files as determined necessary by EDiS within the time frame A/E dictates. For example, if Revit files are needed to produce the closeout model, EDiS may direct Contractor to set up certain Revit views for the exporting of files which make up the as-built models. A/E may also request that the Contractor create viewpoints for their equipment in as-built model.
- 3.15. Data for coordination will be available on the Box.com, to be referenced by the other participants. Models and drawing files will never be tampered with by non-owners of the file. If a mistake occurs and a drawing is inadvertently modified, the responsible party is required to alert the project team. (See attachment)
- 3.16. The Owner's commissioning agent can attend the coordination meeting to review the detailing effort for commissioning related items.
- 3.17. All trades will provide Level of Development (LOD) (400) models for weekly coordination meeting.

4. REQUIREMENTS OF THE LEAD COORDINATOR

- 4.1. The Lead Coordinator will be EDiS Company.
- 4.2. Identification of a common insertion point for all drawing files. (Utilize Revit Models origin)
- 4.3. A/E to provide Lead Coordinator model exports to 2D/3D CAD of each trade component as needed to coordination. Origins to be maintained in exports.
- 4.4. Using the A/E's files, the Lead Coordinator will utilize & maintain the base architectural model.
 - 4.4.1. The base architectural model is a combination of the base structural model and other architectural elements. These architectural elements will include all elevated 3D architectural elements including, but not limited to, all walls that extend to the deck, fire and smoke walls, soffits and associated framing, ceiling planes, and finish floor planes.
 - 4.4.2. This model will consist of cleaned-up floor plans void of any excessive notations, leaders, bubbles, marks, grid lines, etc. that are not required for detailing development and that may potentially cause a conflict in the base composite model.
 - 4.4.3. In the event of changes to the A/E's contract documents, the A/E must revise the base architectural model/MEP/structural models and distributed to all

- coordination participants. This will require Contractor participation as need by A/E to complete the revised models for directive. Revision work will be directed by Owner through an executed change order.
- 4.4.4. The base architectural models will be distributed and maintained by EDiS Company.
- 4.5. Collation of all trades' detailing models as posted to the project's web-based posting site into a Base Composite Model thru the use of Navisworks 2017.
 - 4.5.1. Establish a standard two inch (2") soft tolerance within the clash detection software. This tolerance will result in a reported clash for any elements drawn closer than two inches (2") to one another.
 - 4.5.2. Assess and include most current clash files including the generation of a clash reports and distribution to all project participants per the coordination schedule.
 - 4.5.3. Collect final as-built files from all trades and generate a Final Coordination Model to submit to CM as part of the close-out requirements.
 - 4.5.4. Coordination meeting minutes shall be kept by EDiS Company Lead Coordinator or EDiS' Project Manager showing issues and resolution dates.

5. REQUIREMENTS OF THE STRUCTURAL STEEL CONTRACTOR

- 5.1. Obtain from the A/E Structural Revit files to be used in the generation of the base structural model.
- 5.2. The structural Contractor will develop and provide the base structural model within the time frame dictated by EDiS and provide structural model updates to ensure the coordination team is coordinating the MEP/FP to the most up-to-date structural model.
- 5.3. All structural framing members in the final sizes and locations (typically referred to as a "mill order" or "procurement" model) will be shown in the model as 3D objects with surfaces. At the discretion of the lead coordinator, this model may be void of all hardware and secondary structural steel but should include the major components: primary steel, metal decking, slab on metal decking, and gusset plates.
- 5.4. The structural insertion/datum point must match the architectural insertion/datum location. No detailing work shall take place until the insertion points of the architectural and structural models match.
- 5.5. The steel Contractor is responsible for resolving their own modeling issues (i.e.: steel not to scale, missing key structural components, missing surface data, and model showing as wire frame data, model exported to proper file format, etc.). The steel Contractor is responsible to provide a steel design model in a usable format for all coordination participants to reference as the base structural model.
- 5.6. A FINAL 3D steel model and 2D shop drawings shall be submitted to the structural engineer of record, and used for field erection. It must be completed and submitted in accordance to the BIM schedule. This model shall consist of:
 - 5.6.1. All primary and secondary steel including metal deck, slab on metal deck, actual gusset plate sizes, connection details, edge of slab details (pour stop), brick relief angles, embeds, anchor bolts, and other miscellaneous metals. Curtain Wall embeds modeled by others.

5.6.2. Submit final approved files to Lead Coordinator for insertion into the coordinated model, and to the design team in the form of shop drawings and/or Navisworks compatible model.

6. DETAILING REQUIREMENTS OF ALL PARTICIPANTS

- 6.1. File sharing information:
 - 6.1.1. The in-progress (Coordination Software Ex: IFC/NWC/Cad) naming convention will be: project-trade-level. Example:

Project Designation - MechPipe-1

Project Designation -HVAC-1

Project Designation -Fire Protection-1

Project Designation - Elec-1

Project Designation -Plumbing-1

Project Designation -TeleCom-1 or AV-1

Project Designation –Pneumatic Tube-1, etc.

Additional designations may be added based on project specific scope and deliverable requirements and/or deemed as a critical component to the coordination process.

6.1.2. Each model posted by the contractor shall contain sub-layers for the purpose of system identification and isolation during the clash detection process. Example:

HVAC-1 shall contain sub-layers for:

- Supply
- Return
- Exhaust
- Fire Smoke-Dampers
- VAV clearance
- AC Door Access
- Fan Coil Units
- FCU Access
- Equipment
- Equipment Pads
- Equipment Clearances
- Hangers (designated per system)

MechPipe-1 shall contain sub-layers for:

- Hydronic Pipe Supply
- Hydronic Pipe Return
- Chilled Pipe Supply
- Chilled Pipe Return
- Shutoff Access
- Equipment
- Equipment Pads
- Equipment Clearances
- Hangers

Plumbing-1 shall contain sub-layers for:

Domestic Water Supply

- Domestic Water Return (with additional layer designations for hot and cold)
- Gas
- Med-Gas
- Shutoff Access (designated per system)
- Sanitary
- Vent
- Roof Drain
- Rain Conductors
- Equipment
- Equipment Pads
- Equipment Clearances
- Hangers (designated per system)

Elec-1 shall contain sub-layers for:

- Lights
- Light Clearance
- Conduit (with additional layer designation for power and data)
- Cable Tray
- Cable Tray Access Clearance
- Pull Boxes
- Pull Box Access Clearance
- J-Boxes
- Elec. Panels
- Elec. Panel Access Clearance
- Elec. Troughs
- Elec. Trough Access Clearance
- Equipment
- Equipment Clearances
- Equipment Pads
- Hangers

Fire Protection1 shall contain sub-layers for:

- Mains
- Branches
- Shutoff Access
- Hangers

Pneumatic Tube-1 shall contain sub-layers for:

- Equipment
- Equipment Access
- Hangers

Additional sub layers may be added based on project specific scope and deliverable requirements and/or deemed as a critical component to the coordination process.

6.1.3. Clash detection files will be posted to BuildingBlok.com before 12:00 PM, on Wednesday and Friday by each of the trades. The lead coordinator will also post updated coordination models as needed. The lead coordinator will maintain the master coordination files. The weekly coordination model will be name abbreviated Project Name-Floor-Coordination Model-Month-Day-Year.

All coordination participants will maintain a current control copy of their own drawing files outside of the project's web-based posting site. Control drawings are to include all previously posted files.

- 6.2. Trade Colors in the Coordination environment:
 - Duct Supply Dark Green
 - Duct Return- Light Blue
 - Duct Exhaust –Light Green
 - Mech Pipe- Orange
 - Pressure lines/Gas Tan
 - Sanitary/Vent Brown
 - Rain Conductors/Roof Drains Maroon
 - Domestic Water- Blue
 - Fire Red
 - Pneumatic Purple
 - Electrical Yellow
 - All Base Architectural Elements (walls, soffits, ceiling & floor planes, etc.) will
 assume Arch model color scheme saved in the export or Lead Coordinator will
 modify select color scheme in the coordination model.
 - Steel Dark Grey
 - Any hangers and equipment (that is fed per the designated system) will assume
 the same color of that system it is associated with. Additional color schemes may
 be added based on project specific scope and deliverable requirements and/or
 deemed as a critical component to the coordination process.
- 6.3. When posting drawing files for coordination:
 - 6.3.1. Posted Contractor coordination files of each trades system should be clash-free with in their respective data. To clarify; trades should refrain from posting data that shows their systems clashing with itself.
 - 6.3.2. When coordination of an area is completed there should not be any unresolved clashes remaining.
 - 6.3.3. These files should be void of any text, dimensions or any other notations.
- 6.4. Each coordination participant is required to submit three (3) complete sets of installation drawings as well as electronic PDF's prior to any work being installed in the field. If A/E spec requires more or less than that will govern over this document. These complete drawings are to be fully dimensioned and notated. Items to be noted in the final, fully coordinated drawing paper and electronic files of each system include:
 - 6.4.1. Bottom and top elevations of duct, pipe, conduit racks, cable trays etc. must be indicated (where applicable).
 - 6.4.2. Dimensions shall be shown from the gridlines to the centerline of each element drawn (round duct, pipe, cable tray, etc.) and from finished floor.
 - 6.4.3. Height to top of light housing assembly must be indicated.
 - 6.4.4. Labeling of all equipment.
- 6.5. During the coordination drawing effort, priority will be given to those systems that have the least flexibility. The following list is a descending order of the system priority and

shall be used as a general guideline. Throughout the coordination drawing effort, adjustments and deviations to this list can be made with the approval of EDiS Company. (0'- 6") clear above the ceiling shall be maintained for access and construction of the ceiling, whenever possible. Required maintenance and/or code access spaces and setbacks take precedence over all systems.

- 6.5.1. Gravity Pipe
- 6.5.2. Plumbing Vent
- 6.5.3. Ductwork and appurtenances
- 6.5.4. Cable tray
- 6.5.5. Recessed light fixtures
- 6.5.6. Fire protection piping and fixtures
- 6.5.7. Electrical conduit over (3/4") in diameter
- 6.5.8. Pneumatic tube and other record or material conveying systems
- 6.5.9. HVAC piping
- 6.5.10. Plumbing, supply and medical gas piping
- 6.5.11. Electrical conduit smaller than 3/4" in diameter
- 6.5.12. Above ceiling miscellaneous metal supports
- 6.5.13. Provide all copper tube routes (racks) for mechanical systems, including valves, clearance zones and hangers.
- 6.6. Items to be included in the detailed drawing progress include:
 - 6.6.1. All systems must be fully detailed and shown as individual elements including ductwork, all piping 3/4" and larger, pneumatic tubing, exterior wall connections, any piping that is smaller than ½" that is racked or banked, etc.
 - 6.6.2. Ductwork is to include size, layout and routing of all metal and flex ductwork, reheat coils, terminal units, filters registers, grilles, diffusers, and similar features; provide notation for diffuser boot sizes and heights and any other special features
 - 6.6.3. All valves, dampers and VAV's or heat pumps will note any items requiring access for service and maintenance as well as access doors in inaccessible ceilings.
 - 6.6.4. All piping valves, boxes, supports, etc. are to be fully detailed
 - 6.6.5. Sprinkler head locations shall be shown on ceiling plans.
 - 6.6.6. All electrical conduits two inches (2") or more in diameter are to be modeled and shown in addition to smaller diameter conduit that is racked or banked.
 - 6.6.7. Electrical items such as hangers, supports, electrical fixtures, lights, speakers, detectors, sensors, cable trays, raceways, sleeves, pull boxes, and access space claims, etc. must be shown.
 - 6.6.8. If an element is not shown, under the lead coordinators approval, it will be assumed to be field routed and to not interfere with the other elements that are shown or within code clearances. Contractors who field route their elements are responsible to ensure their installation will be feasible and void of creating a clash in the field. Coordinated items take precedence over field routing.
 - 6.6.9. All major hangers and supports (including sway bracing, equipment bracing, hangers, etc.), penetrations, openings must be shown for all systems. Sharing of supports with other systems is discouraged, but can be accomplished with prior owner and/or field inspector approval.

- 6.6.10. All insulation must be shown with appropriate thicknesses. All insulation & clearance zones will be modeled or accounted for during the clash detection process.
- 6.6.11. Fire spray: If required by your building type, establish a safe thickness from all structural objects with which to run your clashes. Assume fire spray will be two inches (2") thick.
- 6.6.12. Engineered stud framing must be modeled for king studs and doors.
- 6.6.13. Code clearances and maintenance access clearances must be shown and maintained; these include, but are not limited to access to VAVs, air handling units, egresses around pumps and tanks, smoke FDs, electrical panels, pneumatic tube transfer units, cable tray access, pull boxes, valve access, etc.
- 6.6.14. All trades must coordinate and detail their systems with the intent of installing each system at the optimal elevation above ceiling, taking into consideration, access to equipment for maintenance, repairs, connections, filters and removal while eliminating or minimizing the impact to surrounding components.
- 6.7. Established Clash Files are to be incorporated to ensure proper coordination. List of those files to be provided by the Lead Coordinator.
- 6.8. Refer to Appendix B Soft Clash Requirements for additional soft-clash requirements.

7. SCHEDULE OF DRAWING COMPLETION AND SIGN-OFF

7.1. The participants should plan on the coordination process taking three (3) months. The coordination schedule is as follows:

This table will be populated at the BIM Coordination Kick-off Meeting. OR Schedule to be developed as part of the master construction schedule development (see Section 00230).

Zone	Floor	Coordination Meeting	Sign-Off Date

- 7.2. At the completion of each floor, the team will determine the specific "priority walls" that will be constructed full-height ahead of other interior partitions and MEP installations.
- 7.3. 3D MEP/FP Coordination Team
 - 7.3.1. The goal of the coordination team will be to integrate the architectural, structural, mechanical, electrical, fire protection, and project specific elements into a collaborative 3D model to identify and resolve issues pertaining to MEP/FP systems and to ensure succinct and expedited field installations of these systems following the release of each zone/floor after clash free conditions are met. (Filled out at BIM Coordination Kick-off Meeting)

7.3.2.

BIM Coordinator	EDiS Company	
Main Contact	Chris Donahue	
Phone Number	302-421-2963	
Email Address	cdonahue@ediscompany.com	
Project Manager	EDiS Company	
Main Contact	Mark Grunza	
Phone Number	302-383-5154	
Email Address	Mgrunza@ediscompany.com	
Assist. Project Manager	EDiS Company	
Main Contact	Dan Lyons	
Phone Number	302-740-3213	
Email Address	dlyons@ediscompany.com	
Duoi oat Campaintan Jani	EDic Commons	
Project Superintendent Main Contact	EDiS Company Dave Breakiron	
Phone Number	302-218-4846	
Email Address		
Email Address	dbreakiron@ediscompany.com	
HVAC	TBD	
Main Contact		
Phone Number		
Email Address		
Electrical	TBD	
Main Contact		
Phone Number		
Email Address		
Concrete	TBD	
Main Contact	100	
Phone Number		
Email Address		
Eman Address		
Plumbing and Piping	TBD	
Main Contact		
Phone Number		
Email Address		
Architectural	TBD	
Main Contact		

Phone Number		
Email Address		
MEP/FP Engineers	TBD	
Main Contact		
Phone Number		
Email Address		
Structural Steel	TBD	
Main Contact		
Phone Number		
Email Address		
Miscellaneous Steel	TBD	
Main Contact		
Phone Number		
Email Address		

EXHIBIT 1

ARTICLE 1: GENERAL PROVISIONS

- 1.1 This document defines protocols, expected levels of development, and authorized uses of Building Information Models on this Project. It assigns specific responsibility for the development of each Model Element to a defined Level of Development at each Project phase. Where a provision in this Exhibit conflicts with a provision in the Agreement into which this Exhibit is incorporated, the provision in this Exhibit will prevail.
 - 1.1.1 The parties agree to incorporate this Exhibit by reference into any other agreement for services or construction for the Project.

ARTICLE 2: LEVEL OF DEVELOPMENT (LOD)

2.1 The following LOD descriptions identify the specific content requirements and associated authorized uses for each Model Element at five progressively detailed levels of completeness. Each subsequent LOD builds on the previous level and includes all the characteristics of previous levels.

2.2 LOD 100

2.2.1 Model Content Requirements. Overall building massing indicative of area, height, volume, location, and orientation may be modeled in three dimensions or represented by other data.

2.2.2 Authorized Uses

- 2.2.2.1 **Analysis**. The Model may be analyzed based on volume, area and orientation by application of generalized performance criteria assigned to the representative Model Elements.
- 2.2.2.2 **Cost Estimating**. The Model may be used to develop a cost estimate based on current area, volume or similar conceptual estimating techniques (e.g., square feet of floor area, condominium unit, hospital bed, etc.).
- 2.2.2.3 **Schedule**. The Model may be used for project phasing and overall duration.

2.3 LOD 200

2.3.1 Model Content Requirements. Model Elements are modeled as generalized systems or assemblies with approximate quantities, size, shape, location, and orientation. Non-geometric information such as object name and quantities should be attached to Model Elements.

2.3.2 Authorized Uses

- 2.3.2.1 **Analysis**. The Model may be analyzed for performance of selected systems by application of generalized performance criteria assigned to the representative Model Elements.
- 2.3.2.2 **Cost Estimating**. The Model may be used to develop conceptual cost estimates based on the approximate data provided and conceptual estimating techniques (e.g., volume and quantity of elements or type of system selected).

2.3.2.3 **Schedule**. The Model may be used to show ordered, time-scaled appearance of major elements and systems.

2.4 LOD 300 and 350

- 2.4.1 **Model Content Requirements**. Model Elements are modeled as specific assemblies accurate in terms of quantity, size, shape, location, and orientation. Existing building elements are modeled as shown on building record drawings. Non-geometric information such as object description and object tags (door number, equipment number, etc) and quantities should be included with each object. Examples of the details required for systems modeled to LOD 300 include, but are not limited to:
 - Site Utilities
 - Masonry
 - Steel decking
 - Correct slopes for gravity piping for sanitary, storm or wet fire suppression systems.
 - Piping materials specifically called out on documents included with model element attributes (generic manufacturer for system components are acceptable).
 - Insulation around Pipe and Ducting.
 - Duct dampers included with the duct system.
 - Doors/Frames (hollow metal and storefront)
 - Owner Furnished Fixtures, Equipment, etc. generically modeled as space claims by the Model Element Author (MEA).
 - Concrete
 - Anchor bolts
 - Structural steel
 - Steel stairs, handrails
 - Floor/roof penetration steel
 - Significantly sized support hangers and sleeves for all systems
 - Uni-Strut associated with system components if it is located in a tight overhead space (case by case basis)
 - Architectural millwork/casework
 - Metal panels and support steel
 - Curtainwall system
 - Steel stud framing including kickers and trusses at floor penetrations.
 - Valve locations (clearance)
 - Access panels (these should be modeled with the system they provide access to).
 - Conduit racks or other substantially wide / bundled electrical routing. (these can be generically modeled, i.e. extruded boxes, space claims)
 - Single conduit runs associated with any system (lighting, power, controls, etc) if needed to coordinate concrete coring.
 - Kitchen equipment
 - MEP/FP & Low Voltage Equipment
 - MEP/FP & Low Voltage Systems
 - Pull box locations and any extra space claims for their access.

Telecom & Data

2.4.2 Authorized Uses

- 2.4.2.1 **Construction**. Suitable for the generation of traditional construction documents. Contractors may utilize this model for coordination purposes and creation of shop drawings.
- 2.4.2.2 **Analysis**. The Model may be analyzed for performance of selected systems by application of specific performance criteria assigned to the representative Model Elements.
- 2.4.2.3 **Schedule**. The Model may be used to show ordered, time-scaled appearance of detailed elements and systems.

ARTICLE 3: MODEL ELEMENTS

3.1 Reliance on EDiS Company's Model Element Matrix

- 3.1.1 The EDiS Company Model Element Matrix at the end of this section identifies (1) the LOD required for each Model Element at the end of each Project phase, and (2) the Model Element Author responsible for developing the Model Element to the LOD identified. Each Model Element Author's content is intended to be shared with subsequent Model Element Authors and Model Users throughout the course of the Project.
- 3.1.2 It is understood that while the content of a specific Model Element may include data that exceeds the required LOD identified in the Model Element Table for a particular phase, Model Users and subsequent Model Element Authors may rely on the accuracy and completeness of a Model Element consistent only with the content required for a LOD identified in the Model Element Table.
- 3.1.3 Any use of, or reliance on, a Model Element inconsistent with the LOD indicated in the Model Element Table by subsequent Model Element Authors or Model Users shall be at their sole risk and without liability to the Model Element Author. To the fullest extent permitted by law, subsequent Model Element Authors and Model Users shall indemnify and defend the Model Element Author from and against all claims arising from or related to the subsequent Model Element Author's or Model User's modification to, or unauthorized use of, the Model Element Author's content.

3.2 Table Instructions

- 3.2.1 The Model Element Table at the end of this section indicates the LOD to which each Model Element Author (MEA) is required to develop the content of the Model Element at the conclusion of each phase of the Project. EDiS Company holds the rights of this table and all ownership right for edits are performed via EDiS Company.
- 3.3 EDiS Company's Model Element Matrix AIA Document G202-2013 (attached).
- 3.4 Insertion Point (attached).



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Appoquinimink School District Whitehall Elementary School Project Building Information Modeling (BIM) Scope Participant List

Contract: A-01: Sitework Contract: A-02: Concrete Contract: A-03: Masonry

Contract: A-04: Structural Steel & Misc. Metals Contract: A-05: Carpentry & General Works

Contract: A-06: Roofing

Contract: A-07: Metal Studs & Drywall and Sprayed Fire Protection

Contract: A-09: Casework & Millwork Contract: A-10: Folding Partitions Contract: A-12: Acoustical Ceilings Contract: A-15: Kitchen Equipment

Contract: A-16: Elevator & Wheel Chair Lifts

Contract: A-17: Fire Protection Contract: A-18: HVAC & Plumbing

Contract: A-20: Electrical



Project Building Information Modeling Protocol Form

PROJECT: (Name and address) Whitehall Elementary School 280 Mapleton Avenue Middletown, Delaware 19709

PROTOCOL VERSION NUMBER:

DATE: October 13, 2017

PREPARED BY: Christopher Donahue/Jackie McKee

DISTRIBUTION TO: (List each individual to whom this protocol is distributed. Include individuals listed in Section 1.1, or reference Section 1.1, along with any additional recipients.)

TABLE OF ARTICLES

1 **GENERAL PROVISIONS**

2 LEVEL OF DEVELOPMENT

3 **MODEL ELEMENTS**

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 For each Project Participant that has incorporated the Project specific AIA Document E203TM–2013, Building Information Modeling and Digital Data Protocol Exhibit, dated October 13, 2017 into its agreement for the Project, identify and provide the contact information for individuals responsible for implementation of the Modeling protocols. If, for any Project Participant, more than one individual will be responsible for implementation of the Modeling protocols, list each individual separately and describe the unique Modeling Role assigned to each individual.

Modeling Role	Project Participant	Individual Responsible	Contact Information
BIM Manager	EDIS BIM Services	Chris Donahue	EDis Company 110 S Poplar Street, Suite 300 Wilmington, De 19801 302-421-2963 cdonahue@ediscompany.com

§ 1.2 This document establishes the Modeling protocols for the Project. For purposes of these protocols, the Model is comprised of the following information and other data sets: (Indicate disciplines, separate models, and other data that will be included within the Model and governed by the Modeling protocols.)

§ 1.3 Collaboration Protocols. The Project Participants' protocols for the collaborative utilization of the Model, if any, including communications protocols, a collaboration meeting schedule and colocation requirements, are as follows:

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AlA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with a Project specific AIA Document E203TM-2013, Building Information Modeling and Digital Data Exhibit, which the Parties will incorporate into their agreement for the Project, and a Project specific AIA Document G201 TM_2013, Project Digital Data Protocol Form.

- § 1.4 Technical Requirements. The technical requirements relating to the utilization of Building Information Modeling, including specific software and hardware requirements are as follows:
- § 1.5 Training and Support. NOT USED
- § 1.6 Model Standard. The Model shall be developed in accordance with the following Model Standard, if any:

§ 1.7 Model Management Protocols and Processes

The following Model Management Protocols and Processes shall apply to the Project only if specifically designated in the table below as being applicable.

(Designate the Model Management Protocols and Processes applicable to the Project in the second column of the table below. In the third column, indicate whether the detailed description of the Model Management Protocol or Process is located in Section 1.8 or in an attached exhibit. If in an exhibit, identify the exhibit.)

Model Ma	nagement Protocols and Processes	Applicability to Project (Applicable or Not Applicable)	Location of Detailed Description (Section 1.8 below or in an attachment to this exhibit identified below)
§ 1.7.1	Model origin point, coordinate system, precision, file formats and units	Applicable	0, 0, 0
§ 1.7.2	Model file storage location(s)	Applicable	EDiS BIM Services
§ 1.7.3	Processes for transferring and accessing Model files	Applicable	Drop Box & BuildingBlok
§ 1.7.4	Naming conventions	Applicable	EDiS Standard
§ 1.7.5	Processes for aggregating Model files from varying software platforms		Autodesk CAD MEP & Navisworks
§ 1.7.6	Model access rights	N/A	
§ 1.7.7	Design coordination and clash detection procedures.	Applicable	EDiS
§ 1.7.8	Model security requirements	Applicable	Confidential

§ 1.8 Insert a description of each Model Management Protocol and Process identified in Section 1.7, if not further described in an exhibit attached to this document:

See attached document.

§ 1.9 Terms in this document shall have the same meaning as those in AIA Document E203-2013.

ARTICLE 2 LEVEL OF DEVELOPMENT

§ 2.1 The Level of Development (LOD) descriptions, included in Section 2.2 through Section 2.6 below, identify the specific minimum content requirements and associated Authorized Uses for each Model Element at five progressively detailed levels of completeness. The Parties shall utilize the five LOD descriptions in completing the Model Element Table at Section 3.3.

§ 2.2 LOD 100

§ 2.2.1 Model Element Content Requirements. The Model Element may be graphically represented in the Model with a symbol or other generic representation, but does not satisfy the requirements for LOD 200. Information related to the Model Element (i.e., cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.

§ 2.2.2 Authorized Uses

- **§ 2.2.2.1 Analysis.** The Model Element may be analyzed based on volume, area and orientation by application of generalized performance criteria assigned to other Model Elements.
- § 2.2.2.2 Cost Estimating. The Model Element may be used to develop a cost estimate based on current area, volume or similar conceptual estimating techniques (e.g., square feet of floor area, condominium unit, hospital bed, etc.).
- § 2.2.2.3 Schedule. The Model Element may be used for Project phasing and determination of overall Project duration.
- § 2.2.2.4 Other Authorized Uses. Additional Authorized Uses of the Model Element developed to LOD 100, if any, are as follows:

§ 2.3 LOD 200 (DM) Design Model

§ 2.3.1 Model Element Content Requirements. The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.

§ 2.3.2 Authorized Uses

- § 2.3.2.1 Analysis. The Model Element may be analyzed for performance of selected systems by application of generalized performance criteria assigned to the representative Model Elements.
- § 2.3.2.2 Cost Estimating. The Model Element may be used to develop cost estimates based on the approximate data provided and quantitative estimating techniques (e.g., volume and quantity of elements or type of system selected).
- § 2.3.2.3 Schedule. The Model Element may be used to show ordered, time-scaled appearance of major elements and systems.
- § 2.3.2.4 Coordination. The Model Element may be used for general coordination with other Model Elements in terms of its size, location and clearance to other Model Elements.
- § 2.3.2.5 Other Authorized Uses. Additional Authorized Uses of the Model Element developed to LOD 200, if any, are as follows:

§ 2.4 LOD 300 and 350 - Refer to Section 01370 - BIM Coordination (attached)

§ 2.4.1 Model Element Content Requirements. The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.

§ 2.4.2 Authorized Uses

- § 2.4.2.1 Analysis. The Model Element may be analyzed for performance of selected systems by application of specific performance criteria assigned to the representative Model Element.
- § 2.4.2.2 Cost Estimating. The Model Element may be used to develop cost estimates suitable for procurement based on the specific data provided.
- § 2.4.2.3 Schedule. The Model Element may be used to show ordered, time-scaled appearance of detailed elements and systems.
- **§ 2.4.2.4 Coordination.** The Model Element may be used for specific coordination with other Model Elements in terms of its size, location and clearance to other Model Elements including general operation issues.

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Addendum No 3 1 Decembe 2017

§ 2.4.2.5 Other Authorized Uses. Additional Authorized Uses of the Model Element developed to LOD 300, if any, are as follows:

(Paragraphs deleted)

ARTICLE 3 MODEL ELEMENTS

§ 3.1 Reliance on Model Elements

§ 3.1.1 At any particular Project milestone, a Project Participant may rely on the accuracy and completeness of a Model Element only to the extent consistent with the minimum data required for the Model Element's LOD for that Project milestone as identified below in the Model Element Table, even if the content of a specific Model Element includes data that exceeds the minimum data required for the identified LOD.

§ 3.1.2 Coordination and Model Refinement

Where conflicts are found in the Model, regardless of the phase of the Project or LOD, the Project Participant that identifies the conflict shall promptly notify the Model Element Authors and the Project Participant identified in AIA Document E203–2013 Section 4.8 as being responsible for Model management. Upon such notification, the Model Element Author(s) shall act promptly to evaluate, mitigate and resolve the conflict in accordance with the processes established in Section 1.7.7, if applicable.

(1733445195)

User Notes:

§ 3.2.1 Table Instructions
§ 3.2.1 The Model Element Table in Section 3.3 indicates the LOD to which each Model Element shall be developed at each identified Project milestone and the Model Element

§ 3.2.2 Abbreviations for each Model Element Author to be used in the Model Element Table are as follows: (Provide abbreviations, such as "A—Architect," or "C—Contractor.")

GA Gilbert Architects BIA Baker, Ingram & Associates VL Vandemark & Lynch DM Design Model		Bid Package	EDiS Company	Abbreviation Model Element Author (MEA)
---	--	-------------	--------------	---

§ 3.3 Model Element Table Identify (1) the LOD required for ea Author, and (3) references to any a Insert abbreviations for each MEA	§ 3.3 Model Element Table Identify (1) the LOD required for each Model Element at each Project milestone, (2) the Model Element Author, and (3) references to any applicable notes found in Section 3.4. Insert abbreviations for each MEA identified in the table below, such as "A – Architect," or "C –	ruction Model	ctor specific)	(†'8 :
Contractor. NOTE: LODs must be adapted for t	Contractor. NOTE: LODs must be adapted for the unique characteristics of each Project.	denoo		sətoN 598 598)
Model Elements Utilizing CSI UniFormativa	rnati ⁿ a	LOD MEA	MEA Notes	
A SUBSTRUCTURE			•••••	
A10 FOUNDATIONS				
A1010 Standard Foundations	ions	ļ		
A1010.10 Wall Fo	Wall Foundations	350	A-02	
A1010.30 Column	Column Foundations	350	A-02	
A1010.90 Standard	Standard Foundation Supplementary Components		A-02	
A1020 Special Foundations	SI			
A1020.10 Driven Piles	Piles		·····	
A1020.15 Bored Piles	Piles	ļ		The state of the s
A1020.20 Caissons	313	ļ		
A1020.30 Special	Special Foundation Walls			
A1020.40 Foundat	A1020.40 Foundation Anchors (anchor bolts)	350	A-04	
A1020.50 Underpinning	ining			

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A9010 S	Substructure Excavation N/A	vation N/A			
¥	9010.10 Backfil	A9010.10 Backfill and Compaction			
A9020 C	Construction Dewatering N/A	tering N/A			***************************************
A9030 E	Excavation Support N/A	rt N/A			
A	А9030.10 Апсног	Anchor Tiebacks			***************************************
A	A9030.20 Cofferdams	larius			
V	A9030.40 Cribbin	Cribbing and Walers	ļ		
A	A9030.60 Ground	Ground Freezing	······		
A	A9030.70 Slurry Walls	Walls	†		**************************************
A9040 S	Soil Treatment				
B SHELL	-				
B10 SUPERSTRUCTURE	RUCTURE				
B1010 F	Floor Construction		350	A-02	
B	B1010.10 Floor S	Floor Structural Frame	350	A-04	
В	B1010.20 Floor D	Floor Decks, Slabs, and Toppings	350	A-02	
В	B1010.30 Balcon	Balcony Floor Construction	•••••		
В	B1010.40 Mezzan	Mezzanine Floor Construction	***********		
В	B1010.50 Ramps		350	A-05	
В	B1010.90 Floor C	Floor Construction Supplementary Components	350	A-05	-
B1020 R	Roof Construction		er ir iusemien		
B	B1020.10 Roof St	Roof Structural Frame	350	A-04	
B	B1020.20 Roof D	Roof Decks, Slabs, and Sheathing	350	A-04	
	B1020.30 Canopy	Canopy Construction	350	A-04	
В	B1020.90 Roof C	Roof Construction Supplementary Components	350	A-04	
B1080 St	Stairs				
В	B1080.10 Stair Cc	Stair Construction	350	A-04	
В	B1080.30 Stair Soffits	Affits	350	A-04	

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B1080.50	Stair Railings	350	A-04	
B1080.60	Fire Escapes	·	A-04	
B1080.70	Metal Walkways	*****	A-04	
B1080.80	Ladders		A-04	
B20 EXTERIOR VERT	EXTERIOR VERTICAL ENCLOSURES	· [· · · · · · · · · · · · · · · · · ·		
B2010 Exterior Walls	Aalls			
B2010.10	Exterior Wall Veneer	350	A-03	
B2010.20	Exterior Wall Construction	 	A-07	
B2010.30	Exterior Wall Interior Skin	ţ	A-07	
B2010.40	Fabricated Exterior Wall Assemblies	· · · · · · · · · · · · · · · · · · ·	ļ	
B2010.50	Parapets	350	A-07	
B2010.60	Equipment Screens	********	A-05	
B2010.80	Exterior Wall Supplementary Components			
B2010.90	Exterior Wall Opening Supplementary Components	***************************************		
B2020 Exterior Windows	Vindows			
B2020.10	B2020.10 Exterior Operating Windows			
B2020.20	Exterior Fixed Windows			
B2020.30	Exterior Window Wall			
B2020.50	Exterior Special Function Windows			
B2050 Exterior D	Exterior Doors and Grilles	 		
B2050.10	Exterior Entrance Doors	350	A-05	
B2050.20	Exterior Utility Doors	350	A-05	
B2050.30	Exterior Oversize Doors	·····	A-05	
B2050.40	Exterior Special Function Doors	350	A-05	
B2050.60	Exterior Grilles	·····	A-05	
B2050.70	Exterior Gates	350	A-05	
B2050.90	Exterior Door Supplementary Components	350 A-05	A-05	

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B3060.50	Vents and Hatches			
B3060.90	Horizontal Opening Supplementary Components			
B3080 Overhead	Overhead Exterior Enclosures	350	A-07	
B3080.10	Exterior Ceilings	350	A-07	
B3080.20	Exterior Soffits	350	A-07	**************************************
B3080.30	Exterior Bulkheads	350	A-07	
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C10 INTERIOR CONSTRUCTION	TRUCTION			
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C1010.10	Interior Fixed Partitions	350	A-07	
C1010.20	Interior Glazed Partitions	350	A-07	
C1010.40	Interior Demountable Partitions	350	A-07	
C1010.50	Interior Operable Partitions	350	A-07	
C1010.70	Interior Screens	. **** *********		
C1010.90	Interior Partition Supplementary Components	350	A-07	
C1020 Interior Windows	Vindows			
C1020.10	Interior Operating Windows	350	A-05	
C1020.20	Interior Fixed Windows	350	A-05	•
C1020.50	Interior Special Function Windows	350	A-05	
C1020.90	C1020.90 Interior Window Supplementary Components	350	A-05	
C1030 Interior Doors	100rs			
C1030.10	Interior Swinging Doors	350	A-05	
C1030.20	Interior Entrance Doors	350	A-05	
C1030.25	Interior Sliding Doors	350	A-05	
C1030.30	Interior Folding Doors	350	A-05	
C1030.40	Interior Coiling Doors	350	A-05	
C1030.50	Interior Panel Doors	350	A-05	

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Ö	1030.70	C1030.70 Interior Special Function Doors	350	A-05	
[]	C1030.80	Interior Access Doors and Panels	350	A-05	
Ü	C1030.90	Interior Door Supplementary Components	~~~~~	A-05	
C1040 In	terior G	Interior Grilles and Gates	7		
Ü	C1040.10	Interior Grilles			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
IJ.	C1040.50	Interior Gates			AND THE REAL PROPERTY OF THE P
C1060 R2	aised Flo	Raised Floor Construction	***************************************		
CJ	1060.10	C1060.10 Access Flooring	***********		
Ü	1060.30	C1060.30 Platform/Stage Floors	350	A-05	
C1070 Su	spended	Suspended Ceiling Construction	·		
CI	C1070.10	Acoustical Suspended Ceilings	350	A-12	
CJ	C1070.20	Suspended Plaster and Gypsum Board Ceilings	,	A-07	
C	C1070.50	Specialty Suspended Ceilings	350	A-12	
5	C1070.70	Special Function Suspended Ceilings	350	A-12	
5	1070.90	C1070.90 Ceiling Suspension Components	350	A-12	
C1090 In	Interior Specialties	oecialties			
CJ	C1090.10	Interior Railings and Handrails	***************************************	••••	
CI	C1090.15	Interior Louvers			
C	C1090.20	Information Specialties			
CI	C1090.25	Compartments and Cubicles (casework)	350	A-09	
ū	C1090.30	Service Walls	350	A-05	
CI	C1090.35	Wall and Door Protection	j		
CI	C1090.40	Toilet, Bath, and Laundry Accessories			
CI	C1090.45	Interior Gas Lighting			
IJ	C1090.50	Fireplaces and Stoves			
CI	C1090.60	Safety Specialties	······		
Ü	C1090.70	Storage Specialties	***********		

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	C1090.90	C1090.90 Other Interior Specialties			
C20 INTER	INTERIOR FINISHES	HES			
C2010	Wall Finishes	hes			
	C2010.10	Tile Wall Finish			***************************************
	C2010.20	Wall Paneling		ļ	A PART OF THE PART
	C2010.30	Wall Coverings			
	C2010.35	Wall Carpeting		ļ	
	C2010.50	Stone Facing			A SALALA A.
	C2010.60	Special Wall Surfacing		ļ	
	C2010.70	Wall Painting and Coating			
	C2010.80	Acoustical Wall Treatment		ļ	
	C2010.90	Wall Finish Supplementary Components		ļ	
C2020	Interior Fabrications	abrications			**************************************
C2030		Flooring - ALL RECESSED FLOORS IDENTIFIED IN MODEL			***************************************
	C2030.10	Flooring Treatment			
	C2030.20	Tile Flooring			
	C2030.30	Specialty Flooring			
	C2030.40	Masoury Flooring			
	C2030.45	Wood Flooring			
	C2030.50	Resilient Flooring	***********		
	C2030.60	Terrazzo Flooring			
	C2030.70	Fluid-Applied Flooring			
	C2030.75	Carpeting			
	C2030.80	Athletic Flooring			
	C2030.85	Entrance Flooring			
	C2030.90	Flooring Supplementary Components			
C2040	Stair Finishes	ihes			

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C2040.20	Tile Stair Finish	1		
C2040.40	Masonry Stair Finish	•		
C2040.45	Wood Stair Finish	*		
C2040.50	Resilient Stair Finish			
C2040.60	Terrazzo Stair Finish	e jarener og en		
C2040.75	Carpeted Stair Finish			
C2050 Ceiling Finishes	ishes			
C2050.10	Plaster and Gypsum Board Finish	350	A-07	
C2050.20	Ceiling Paneling	†	A-12	
C2050.70	Ceiling Painting and Coating	ł		
C2050.80	Acoustical Ceiling Treatment	350	A-12	
C2050.90	Ceiling Finish Supplementary Components	350	A-12	
C2090 Interior Fin	Interior Finish Schedules			
D SERVICES		***********		
D10 CONVEYING		************		
D1010 Vertical Conveying Systems	пичеуіng Systems	·***********		
D1010.10 Elevators	Elevators	350	A-12	
D1010.20	Lifts	350	A-12	
D1010.30	Escalators	***************************************		
D1010.50	Dumbwaiters			
D1010.60	Moving Ramps			•
D1030 Horizontal Conveying	Conveying			
D1030.10	Moving Walks			
D1030.30	Turntables	**********		
D1030.50	Passenger Loading Bridges	************		
D1030.70	People Movers	****		
D1050 Material Handling	andling	**********		

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D1050.10	Cranes		
D1050.20	Hoists		
D1050.30	Demicks		***************************************
D1050.40	Conveyors		
D1050.50	Baggage Handling Equipment		
D1050.60	Chutes		
D1050.70	Pneumatic Tube Systems		
D1080 Operable	Operable Access Systems		
D1080.10	Suspended Scaffolding		
D1080.20	Rope Climbers		
D1080.30	Elevating Platforms		***************************************
D1080.40	Powered Scaffolding		
D1080.50	Building Envelope Access		
D20 PLUMBING			
D2010 Domestic	Domestic Water Distribution	*********	
D2010.10	Facility Potable-Water Storage Tanks	350 A-18	
D2010.20	Domestic Water Equipment	350 A-18	
D2010.40	Domestic Water Piping	350 A-18	
D2010.60	Plumbing Fixtures	350 A-18	
D2010.90	Domestic Water Distribution Supplementary Components	350 A-18	
D2020 Sanitary Drainage	Drainage		
D2020.10	Sanitary Sewerage Equipment	350 A-18	-
D2020.30	Sanitary Sewerage Piping	350 A-18	
D2020.90	Sanitary Drainage Supplementary Components	***********	
D2030 Building	Building Support Plumbing Systems		
D2030.10	Stormwater Drainage Equipment	350 A-18	
D2030.20	Stormwater Drainage Piping	350 A-18	

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Model Elements Utilizing CSI UniFormatim	CSI UniFormati ^{1M}	LOD MEA	dEA Notes	
D2030	D2030.30 Facility Stormwater Drains	350	A-18	
D2030.60	60 Gray Water Systems	350	A-18	
D2030	D2030.90 Building Support Plumbing System Supplementary Components	350	A-18	
D2050 Gener	General Service Compressed-Air	·		
D2060 Proces	Process Support Plumbing Systems			
D2060.10	10 Compressed-Air Systems			
D2060.20	20 Vacuum Systems			
D2060.30	30 Gas Systems			
D2060.40	40 Chemical-Waste Systems			
D2060.50	50 Processed Water Systems			
D2060.90	90 Process Support Plumbing System Supplementary Components			
D30 HEATING, VE	HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)			
D3010 Facility	Facility Fuel Systems			
D3010	D3010.10 Fuel Piping	350	A-18	
D3010	D3010.30 Fuel Pumps			
D3010.50	50 Fuel Storage Tanks			
D3020 Heatin	Heating Systems			
D3020.10	10 Heat Generation	350 /	A-18	
D3020.30	30 Thermal Heat Storage	*********		
D3020.70	70 Decentralized Heating Equipment	350 /	A-18	
D3020	D3020.90 Heating System Supplementary Components	350 /	A-18	
D3030 Cooling Systems	g Systems	**********		
D3030.10	10 Central Cooling	350 /	A-18	
D3030.30	30 Evaporative Air-Cooling			
D3030.50	50 Thermal Cooling Storage	·******		•
D3030.70	70 Decentralized Cooling			
D3030.90	90 Cooling System Supplementary Components	350 7	A-18	

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Model Elements Utilizing CSI Unif	SI UniFormatto	LOD		Notes
D3050 Facility HVAC I	HVAC Distribution Systems			
D3050.10 Facil	Facility Hydronic Distribution	350	A-18	
D3050.30 Facil	Facility Steam Distribution	350	A-18	
D3050.50 HVA	HVAC Air Distribution	350	A-18	
D3050.90 Facil	Facility Distribution Systems Supplementary Components			
D3060 Ventilation				
D3060.10 Supply Air	ply Air	350	A-18	
D3060.20 Retu	Return Air	350	A-18	
D3060.30 Exha	Exhaust Air	350	A-18	
D3060.40 Outs	Outside Air	350	A-18	
D3060.60 Air-t	Air-to-Air Bnergy Recovery	350	A-18	
D3060.70 HVA	HVAC Air Cleaning	350	A-18	
D3060.90 Vent	Ventilation Supplementary Components	350	A-18	
D3070 Special Purpose HVAC Systems	HVAC Systems	<u> </u>		
D3070.10 Snow	Snow Melting	***************************************	ļ	
D40 FIRE PROTECTION		**********		
D4010 Fire Suppression	D4010 Fire Suppression - (Contract A-17 owner is required to maintain coordination progress)			
D4010.10 Wate	Water-Based Fire-Suppression	350	A-17	
D4010.50 Fire-	Fire-Extinguishing	350	A-17	
D4010.90 Fire	Fire Suppression Supplementary Components	350	A-17	
D4030 Fire Protection Specialties	Specialties			
D4030.10 Fire J	Fire Protection Cabinets	<u>}</u>		
D4030.30 Fire]	Fire Extinguishers	350	A-17	
D4030.50 Breat	Breathing Air Replenishment Systems	*******	*********	
D4030.70 Fire]	Fire Extinguisher Accessories			
D50 ELECTRICAL		*********		
D5010 Facility Power G	Power Generation	Ì.		

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	D5010.10	Packaged Generator Assemblies	350 A	A-20	
			350 A	A-20	
			350 A	A-20	
	D5010.40	Fuel Cells	350 A	A-20	
	D5010.60	Power Filtering and Conditioning	350 A	A-20	
	D5010.70	Transfer Switches	350 A	A-20	
	D5010.90	D5010.90 Facility Power Generation Supplementary Components	350 A	A-20	
D5020	1	Electrical Service and Distribution	ł		
	D5020.10	Electrical Service (from main connection)	350 A	A-20	
	D5020.30	Power Distribution	ţ	A-20	
winerensessassassassassassassassassassassassass	D5020.70	Facility Grounding	3mmmm	A-20	
	D5020.90	Electrical Service and Distribution Supplementary Components	350 A	A-20	
D5030		General Purpose Electrical Power			
	D5030.10	Branch Wiring System	350 A	A-20	
	D5030.50	Wiring Devices	350 A	A-20	
	D5030.90	General Purpose Electrical Power Supplementary Components			
D5040	Lighting		***************************************		
	D5040.10	Lighting Control	•••••		
	D5040.20	Branch Wiring for Lighting	**********		
	D5040.50	Lighting Fixtures	350 A	A-20	
	D5040.90	D5040.90 Lighting Supplementary Components	350 A	A-20	
D5080		Miscellaneous Electrical Systems			
	D5080.10	Lightning Protection			
	D5080.40	Cathodic Protection			
-	D5080.70	Transient Voltage Suppression			
	D5080.90	D5080.90 Miscellaneous Electrical Systems Supplementary Components	350 A	A-20	
	Lighting Clearances	earances	350 A	A-20	

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NOTE: LODs must be adapted for the unique characteristics of each Project.	. p.b.		JON
D60 COMMUNICATIONS		OD MEA INC	Oct.
D6010 Data Communications			
D6010.10 Data Communications Network Equipment			
D6010.20 Data Communications Hardware			
D6010.30 Data Communications Peripheral Data Equipment			
D6010.50 Data Communications Software			
D6010.60 Data Communication Program and Integration Services			
D6020 Voice Communications			
D6020.10 Voice Communications Switching and Routing Equipment	ent		
D6020.20 Voice Communications Terminal Equipment			
D6020.30 Voice Communications Messaging			
D6020.40 Call Accounting			
D6020.50 Call Management			
D6030 Audio-Video Communication			
D6030.10 Audio-Video Systems			
D6030.50 Electronic Digital Systems			
D6060 Distributed Communications and Monitoring			
D6060.10 Distributed Audio-Video Communications Systems			
D6060.30 Healthcare Communications and Monitoring			
D6060.50 Distributed Systems			
D6090 Communications Supplementary Components		-	
D6090.10 Supplementary Components			
D70 ELECTRONIC SAFETY AND SECURITY			
D7010 Access Control and Intrusion Detection			
D7010.10 Access Control		***********	
D7010.50 Intrusion Detection			
D7030 Electronic Surveillance			

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NOTE: LODs must be adapted for the unique characteristics of each Project. Model Elements Utilizing CSI UniFormat ^{ra} LOD	<u> </u>	
D7030.10 Video Surveillance		
D7030.50 Electronic Personal Protection		
D7050 Detection and Alarm		
D7050.10 Fire Detection and Alarm		***************************************
D7050.20 Radiation Detection and Alarm		
D7050.30 Fuel-Gas Detection and Alarm		
D7050.40 Fuel-Oil Detection and Alarm		
D7050.50 Refrigeration Detection and Alarm		
D7050.60 Water Intrusion Detection and Alarm		
D7070 Electronic Monitoring and Control		
D7070.10 Electronic Detention Monitoring and Control		
D7090 Electronic Safety and Security Supplementary Components	•	
D7090.10 Supplementary Components		
D80 INTEGRATED AUTOMATION		
D8010 Integrated Automation Facility Controls		
D8010.10 Integrated Automation Control of Equipment		
D8010.20 Integrated Automation Control of Conveying Equipment		
D8010.30 Integrated Automation Control of Fire-Suppression Systems		
D8010.40 Integrated Automation Control of Plumbing Systems		
D8010.50 Integrated Automation Control of HVAC Systems		
D8010.60 Integrated Automation Control of Electrical Systems		
D8010.70 Integrated Automation Control of Communication Systems		
D8010.80 Integrated Automation Control of Electronic Safety and Security Systems		
D8010.90 Integrated Automation Supplementary Components		
E EQUIPMENT AND FURNISHINGS		
E10 EQUIPMENT		
E1010 Vehicle and Pedestrian Equipment		

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	E1010.10	Vehicle Servicing Equipment				
	E1010.30	Interior Parking Control Equipment		 		
	E1010.50	Loading Dock Equipment		ļ		**************************************
	E1010.70	Interior Pedestrian Control Equipment				
E1030	١.	Commercial Equipment				
	E1030.10	Mercantile and Service Equipment	350	A-15		**************************************
	E1030.20	Vault Equipment			ļ	***************************************
	E1030.25	Teller and Service Equipment			ļ	
	E1030.30	Refrigerated Display Equipment				
	E1030.35	Commercial Laundry and Dry Cleaning Equipment				O CONTRACTOR DE
	E1030.40	Maintenance Equipment			 	
	E1030.50	Hospitality Equipment				
	E1030.55	Unit Kitchens	350	A-15		
	E1030.60	Photographic Processing Equipment				
	E1030.70	Postal, Packaging, and Shipping Equipment			ļ	
	E1030.75	Office Equipment		*******		
	E1030.80	Foodservice Equipment	350	A-15		
E1040	Institution	Institutional Equipment				
	E1040.10	Educational and Scientific Equipment				
	E1040.20	Healthcare Equipment				
	E1040.40	Religious Equipment				
	E1040.60	Security Equipment		†		
	E1040.70	Detention Equipment				
E1060	Residentia	Residential Equipment				
	E1060.10	Residential Appliances				
	E1060.50	Retractable Stairs				
	E1060.70	Residential Ceiling Fans		ļ		nerron same en eftet bestekel belekkel med en den det forten greget filtet forten greget geldte either filtet

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E1070 Entertainment	E1070 Entertainment and Recreational Equipment			
E1070.10 The	Theater and Stage Equipment	350	A-05	- Control of the Cont
E1070.20 Musical Equipment	isical Equipment	†		
E1070.50 Athl	Athletic Equipment			
E1070.60 Rec	Recreational Equipment	ļ		
E1090 Other Equipment	ent			
E1090.10 Soli	Solid Waste Handling Bquipment			
E1090.30 Agri	Agricultural Equipment	······		
E1090.40 Hort	Horticultural Equipment	ļ		
E1090.60 Dec	Decontamination Equipment	-		
E20 FURNISHINGS				
E2010 Fixed Furnishings	និប			
E2010.10 Fixe	Fixed Art			
E2010.20 Win	Window Treatments	•••		
E2010.30 Case	Casework	350	A-09	
E2010.70 Fixe	Fixed Multiple Seating	***************************************		
E2010.90 Othe	Other Fixed Furnishings	**********		
E2050 Movable Furnishings	shings	**********	***********	
E2050.10 Mov	Movable Art			
E2050.30 Furn	Funiture	~~~~		
E2050.40 Acc	Accessories			
E2050.60 Mov	Movable Multiple Seating			
E2050.90 Othe	Other Movable Furnishings			
F SPECIAL CONSTRUCTION AND DEMOLITION	ION AND DEMOLITION	**********		
F10 SPECIAL CONSTRUCTION	TION	0.4r4r4440333		
F1010 Integrated Construction	struction			
F1010.10 Buil	Building Modules	***************************************		

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	F1010.50	Manufactured/Fabricated Rooms		
-	F1010.70	Modular Mezzanines		
F1020	Special Structures	ructures		***************************************
	F1020.10	Fabric Structures		
	F1020.20	Space Frames		
	F1020.30	Geodesic Structures		
	F1020.40	Manufacturer-Engineered Structures		
	F1020.60	Manufactured Canopies		***************************************
	F1020.65	Rammed Earth Construction		
	F1020.70	Towers		
F1030	Special Fr	Special Function Construction		***************************************
	F1030.10	Sound and Vibration Control		
	F1030.30	Seismic Control		
	F1030.50	Radiation Protection		
F1050	Special Fa	Special Facility Components		
	F1050.10	Pools		
	F1050.20	Interior Fountains		
	F1050.30	Interior Water Features		
	F1050.40	Aquatiums		
	F1050.50	Amusement Park Structures and Equipment		
	F1050.60	Ice Rinks		
	F1050.70	Animal Containment		
F1060	Athletic a	Athletic and Recreational Special Construction		
	F1060.10	Indoor Soccer Boards		
	F1060.20	Safety Netting		
	F1060.30	Arena Football Boards		
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	Athletic and Recreational Court Walls		
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F1080 Special In	Special Instrumentation		
F1080.10	Stress Instrumentation		
F1080.20	Seismic Instrumentation		
F1080.40	Meteorological Instrumentation		\$-1
F1080.60	Earth Movement Monitoring		
F20 FACILITY REMEDIATION	EDIATION		
F2010 Hazardot	Hazardous Materials Remediation		***************************************
F2010.10	Transportation and Disposal of Hazardous Materials		
F2010.20	Asbestos Remediation		
F2010.30	Lead Remediation		
F2010.40	Polychlorinate Biphenyl Remediation		
F2010.50	Mold Remediation		
F30 DEMOLITION			
F3010 Structure Demolition	Demolition		
F3010.10	Building Demolition		
F3010.30	Tower Demolition	**********	
F3010.50	Bridge Demolition		
F3010.70	Dam Demolition		
F3030 Selective	Selective Demolition		
F3030.10	Selective Building Demolition		
F3030.30	Selective Interior Demolition		
F3030.50	Selective Bridge Demolition		
F3030.70	Selective Historic Demolition		
F3050 Structure Moving	Moving		
F3050.10	F3050.10 Structure Relocation		MONTH OF THE PROPERTY OF THE P

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F3050.30 Structure Raising		
G SITEWORK		
G10 SITE PREPARATION		
G1010 Site Clearing		
G1010.10 Clearing and Grubbing		
G1010.30 Tree and Shrub Removal and Trimming		
G1010.50 Earth Stripping and Stockpiling		
G1020 Site Elements Demolition		
G1020.10 Utility Demolition		
G1020.30 Infrastructure Demolition		
G1020.50 Selective Site Demolition		
G1030 Site Element Relocations		
G1030.10 Utility Relocation		
G1050 Site Remediation		
G1050.10 Physical Decontamination	-	
G1050.15 Chemical Decontamination		
G1050.20 Thermal Decontamination		
G1050.25 Biological Decontamination		
G1050.30 Remediation Soil Stabilization		
G1050.40 Site Containment		
G1050.45 Sinkhole Remediation		
G1050.50 Hazardous Waste Drum Handling		
G1050.60 Contaminated Site Material Removal		
G1050.80 Water Remediation		
G1070 Site Earthwork		
G1070.10 Grading		

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Model Element	s Utilizing CS	Model Elements Utilizing CSI UniFormat ^{ra}	LOD MEA Notes	Notes	
	G1070.20	Excavation and Fill			
	G1070.30	Embankments			
-	G1070.35	Erosion and Sedimentation Controls			
	G1070.40	Soil Stabilization			
	G1070.45	Rock Stabilization			
	G1070.50	Soil Reinforcement			
***************************************	G1070.55	Slope Protection			
	G1070.60	Gabions			
	G1070.65	Riprap	***************************************		anderstanderstanderstanderstanderstanderstanderstanderstanderstanderstanderstanderstanderstanderstanderstander
	G1070.70	Wetlands	-		
	G1070.80	Earth Dams	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<u></u>	
	G1070.90	Site Soil Treatment			
G20 SITE	SITE IMPROVEMENTS	ENTS			
G2010	Roadways				
	G2010.10	Roadway Pavement			
	G2010.20	Roadway Curbs and Gutters			
	G2010.40	Roadway Appurtenances			
	G2010.70	Roadway Lighting			
	G2010.80	G2010.80 Vehicle Fare Collection			
G2020	Parking Lots	ots			
	G2020.10	Parking Lot Pavement			
	G2020.20	Parking Lot Curbs and Gutters	·········	***********	
	G2020.40	Parking Lot Appurtenances	~~~		
	G2020.70	Parking Lot Lighting	*****************************		
	G2020.80	Exterior Parking Control Equipment	~~		
G2030		Pedestrian Plazas and Walkways	***************************************	*****	
	G2030.10	G2030.10 Pedestrian Pavement	***************************************		

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G203	ement Curbs and Gutters	8	2000	
G2030.30				
G2030.40	0.40 Pedestrian Pavement Appurtenances			
G2030.70	0.70 Plaza and Walkway Lighting			
G2030.80	0.80 Exterior Pedestrian Control Equipment		***************************************	
G2040 Airfields	spic		***************************************	***************************************
G2040.10	0.10 Aviation Pavement			-
G204	G2040.20 Aviation Pavement Curbs and Gutters			***************************************
G204	G2040.40 Aviation Pavement Appurtenances			
G2040.70	0.70 Airfield Lighting			NAVA CONTRACTOR CONTRA
G2040.80	0.80 Airfield Signaling and Control Equipment			
G2050 Athle	Athletic, Recreational, and Playfield Areas			
G205	G2050.10 Athletic Areas			
G205	G2050.30 Recreational Areas			
G205	G2050.50 Playfield Areas			
G2060 Site I	Site Development			
G2060.10	0.10 Exterior Fountains			
G2060.20	0.20 Fences and Gates			
G2060.25	0.25 Site Furnishings			-
G2060.30	0.30 Exterior Signage			
G2060.35	0.35 Flagpoles			
G2060.40	0.40 Covers and Shelters			-
G2060.45	0.45 Exterior Gas Lighting			
G2060.50	0.50 Site Equipment			
G2060.60	0.60 Retaining Walls			
G2060.70	0.70 Site Bridges			
G206	G2060.80 Site Screening Devices			

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	G2060.85	G2060.85 Site Specialties			
G2080	Landscaping	Sq			
**************************************	G2080.10	Planting Irrigation			
	G2080.20	Turf and Grasses			
***************************************	G2080.30	Plants ·			
	G2080.50	Planting Accessories			
	G2080.70	G2080.70 Landscape Lighting			
***************************************	G2080.80	G2080.80 Landscaping Activities			
C30 LIQUI	D AND GAS	G30 LIQUID AND GAS SITE UTILITIES			
G3010	G3010 Water Utilities	lties			***************************************
	G3010.10	G3010.10 Site Domestic Water Distribution	350	A-01	
	G3010.30	Site Fire Protection Water Distribution	350	A-01	
	G3010.50	Site Irrigation Water Distribution			
G3020	Sanitary S	Sanitary Sewerage Utilities			
	G3020.10	Sanitary Sewerage Utility Connection	350	A-01	
	G3020.20	Sanitary Sewerage Piping	350	A-01	-
	G3020.40	Utility Septic Tanks			
	G3020.50	Sanitary Sewerage Structures		••••	
	G3020.60	Sanitary Sewerage Lagoons			
C3030	•	Storm Drainage Utilities			
	G3030.10	Storm Drainage Utility Connection			
	G3030.20	Storm Drainage Piping			
	G3030.30	Culverts			
	G3030.40	Site Storm Water Drains			
	G3030.50	Storm Drainage Pumps			
	G3030.60	Site Subdrainage			
	G3030.70	Storm Drainage Ponds and Reservoirs			

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G3050 Site Energy Distribution	tion		
G3050.10 Site Hydro	Site Hydronic Heating Distribution		
G3050.20 Site Steam	Site Steam Energy Distribution		
G3050.40 Site Hydra	Site Hydronic Cooling Distribution		
G3060 Site Fuel Distribution	1		
G3060.10 Site Gas I	Site Gas Distribution		
G3060,20 Site Fuel-	Site Fuel-Oil Distribution		
G3060.30 Site Gasol	Site Gasoline Distribution		
G3060.40 Site Diese	Site Diesel Fuel Distribution		
G3060.60 Site Aviat	Site Aviation Fuel Distribution		
G3090 Liquid and Gas Site L	Liquid and Gas Site Utilities Supplementary Components		
G3090.10 Supplementary Components	entary Components		
G40 ELECTRICAL SITE IMPROVEMENTS	VEMENTS		
G4010 Site Electric Distribution Systems	tion Systems		-
G4010.10 Electrical	Electrical Utility Services	350 A-20	
G4010.20 Electric Ti	Electric Transmission and Distribution	350 A-20	
G4010.30 Electrical	Electrical Substations	350 A-20	
G4010.40 Electrical	Electrical Transformers	350 A-20	
G4010.50 Electrical	Electrical Switchgear and Protection Devices	350 A-20	
G4010.70 Site Grounding	nding	~ *********	
G4010.90 Electrical	Electrical Distribution System Instrumentation and Controls	350 A-20	
G4050 Site Lighting			
G4050.10 Area Lighting	ting		
G4050.20 Flood Lighting	hting		
G4050.50 Building Illumination	Ulumination		
G4050.90 Exterior L	Exterior Lighting Supplementary Components		
G50 SITE COMMUNICATIONS		**********	

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Model Elements Utilizing CSI UniFormat TM	UniFormatin	LOD MEA Notes	
G5010 Site Communications Systems	unications Systems	***********	
G5010.10	G5010.10 Site Communications Structures		
G5010.30	G5010.30 Site Communications Distribution		
G5010.50	G5010.50 Wireless Communications Distribution		A CONTRACTOR OF THE PROPERTY O
G90 MISCELLANEOUS	G90 MISCELLANEOUS SITE CONSTRUCTION		
G9010 Tunnels			
G9010.10	G9010.10 Vehicular Tunnels		
G9010.20	G9010.20 Pedestrian Tunnels	***************************************	
G9010.40	Service Tunnels		
G9010.90	G9010.90 Tunnel Construction Related Activities		

§ 3.4 Model Element Table Notes

(List by number shown on table.)

Model Element Table is an add on document to all bid package noted above and relating to all contractors scope of work. The table identifies all bid package requirements to Contractors are required to attend coordination meetings, submit and post to BuildingBlok and maintain the BIM schedule production process. In the event contractors do not provide Building Information Models (BIM) during the BIM coordination process. In addition, refer to BIM protocol instruction to see LOD descriptions. Contractors refer back to Bid Package 'A' BIM Coordination Specification Section 01370

participate they will impact the final completion of the project and liquidated damages will be applied.

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User Notes:



Project Digital Data Protocol Form

PROJECT: (Name and address) Whitehall Elementary School 820 Mapleton Avenue Middletown, Delaware 19709

PROTOCOL VERSION NUMBER:

DATE: December 1, 2017

PREPARED BY: Christopher Donahue/Jackie McKee

DISTRIBUTION TO: (List each individual to whom this protocol is distributed. Include individuals listed in Section 1.2, or reference Section 1.2, along with any additional

recipients.)

TABLE OF ARTICLES

- GENERAL PROVISIONS REGARDING USE OF DIGITAL DATA
- 2 DIGITAL DATA MANAGEMENT PROTOCOLS
- 3 TRANSMISSION AND USE OF DIGITAL DATA

ARTICLE 1 GENERAL PROVISIONS REGARDING USE OF DIGITAL DATA

§ 1.1 List each Project Participant that has incorporated AIA Document E203TM–2013, Building Information Modeling and Digital Data Exhibit, dated , into its agreement for the Project:

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form, An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with a project specific AIA Document E203™_2013, **Building Information Modeling and** Digital Data Exhibit, which the Parties will incorporate into their Agreement for the Project.

Project Participant	Discipline

§ 1.2 Project Participants. For each Project Participant listed in Section 1.1, identify and provide contact information for the individuals responsible for implementation of the Digital Data protocols.

Project Participant	Individual Responsible	Contact Information

§ 1.3 Terms in this document shall have the same meaning as those in AIA Document E203-2013.

ARTICLE 2 DIGITAL DATA MANAGEMENT PROTOCOLS

§ 2.1.1 Electronic Document Management System. If, pursuant to Section 3.5.1 of the Project specific version of AIA Document E203–2013, the Project Participants indicated an intent to use a centralized electronic document management system on the Project, the requirements for the centralized electronic document management system are as follows:

(The requirements for the system shall address, among other things, access to and security of Digital Data.)

§ 2.1.2 System Startup Requirements. Initial training and other startup requirements to be implemented with respect to the use or management of Digital Data, if any, are as follows:

(Describe in detail any initial training or other startup requirements.)

§ 2.1.3 Ongoing System Requirements. Ongoing training or support programs to be implemented with respect to the use or management of Digital Data, if any, are as follows:

(Describe in detail any ongoing training or support programs to be implemented.)

§ 2.2 Digital Data Storage Requirements. The procedures and requirements for storing Digital Data during the course of the Project, if any, are as follows:

(Describe in detail the procedures and requirements for storing Digital Data during the course of the Project.)

§ 2.3 Digital Data Archiving Requirements. The procedures and requirements for archiving and preserving Digital Data during the course of the Project and following final completion of the Project, if any, are as follows: (Describe in detail the procedures and requirements for archiving and preserving Digital Data during the course of the Project and following final completion.)

§ 2.4 Other Digital Data Management protocol requirements, if any, are as follows: (Describe in detail any other requirements.)

ARTICLE 3 TRANSMISSION AND USE OF DIGITAL DATA

§ 3.1 Digital Data Protocol Table. The Project Participants shall comply with the data formats, transmission methods and Authorized Uses set forth in the Digital Data Protocol Table below when transmitting or using Digital Data on the Project.

(Complete the Digital Data Protocol Table by entering information in the spaces below. Adapt the table to the needs of the Project by adding, deleting or modifying the listed Digital Data as necessary. Use Section 3.2 Digital Data

User Notes:

(1668445818)

Protocol Table Definitions and Notes to define abbreviations placed, and to record notes indicated, in the Digital Data Protocol Table.)

Digital Data	Digital Data Format	Transmission Method	Authorized Uses	Note Number (See Sec. 3.2)
§ 3.1.1 Project Agreements and Modifications	PDF	Email		<u> </u>
§ 3.1.2 Project communications	GOTO Meeting	Email & BB		
General communications	8	Email & BB		
Meeting notices	PDF	Email & BB		
Agendas	PDF	Email & BB		
Minutes	PDF	Email & BB		
Requests for information	BuildingBlok	Email & BB		
Architect's Supplemental Instructions	AIA G201 & Contract	Email & BB		
§ 3.1.3 Architect's pre-construction submittals	PDF & BB	Email & BB		
Schematic Design Documents		Email & BB		
Design Development Documents		Email & BB		
Construction Documents	PDF	Email & BB		
§ 3.1.4 Contract Documents	PDF	Email & BB		
Architect's Drawings	PDF/Revit	Email & BB		
Architect's Specifications	PDF	Email & BB		
§ 3.1.5 Contractor's submittals	PDF	Email & BB		
Product data	PDF	Email & BB		
Submitted by Contractor	PDF	Email & BB		
Returned by Architect	PDF	Email & BB		
Shop drawings	PDF/DWG	Email & BB		
Submitted by Contractor	PDF	Email & BB		
Returned by Architect	PDF	Email & BB		
§ 3.1.6 Subcontractor's submittals	Physical & PDF BB	Email & BB		
Product data	PDF & BB	Email & BB		
Submitted by Subcontractor	PDF & BB	Email & BB		
Returned by Contractor	BuildingBlok	Email & BB		
Shop drawings	PDF/DWG	Email & BB		
Submitted by Subcontractor	PDF	Email & BB		
Returned by Contractor	PDF	Email & BB		
§ 3.1.7 Modifications				
(Rows deleted)				
Architect's order for a minor change in the Work	PDF	Email & BB		
		Email & BB		
Construction Change Directives	PDF	Email & BB		
Change Orders	PDF	Email & BB		
§ 3.1.8 Project payment documents				
§ 3.1.9 Notices and Claims				
§ 3.1.10 Closeout documents	Electronic Navisworks			
Record documents	PDF			
Operations and Maintenance Manual				

§ 3.2 Digital Data Protocol Table Definitions and Notes

Digital Data Format:

(Provide required data format, including software version, if applicable.)

Digital Data Format Revit and Navisworks Definition

Transmission Method:

(Below are suggested abbreviations and definitions. Delete, modify or supplement, as necessary.)

Abbreviation	Definition
CD	Delivered via Compact Disk
EM	Via e-mail
DMS	Centralized Electronic Document Management System

Authorized Uses of Digital Data:

(Below are suggested abbreviations and definitions. Delete, modify or supplement, as necessary.)

Abbreviation	Definition
I	Integrate (incorporate additional digital data without modifying data received)
M	Modify as required to fulfill obligations for the Project
R	Reproduce and distribute
S	Store and view only

Notes:

(List by number shown on table.)

(1668445818)



Building Information Modeling and Digital Data Exhibit

This Exhibit dated the 1st day of December in the year 2017 is incorporated into the agreement (the "Agreement") between the Parties for the following Project: (Name and location or address of the Project)

Whitehall Elementary School 820 Mapleton Avenue Middletown, DE 19709

TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 TRANSMISSION AND OWNERSHIP OF DIGITAL DATA
- 3 DIGITAL DATA PROTOCOLS
- 4 BUILDING INFORMATION MODELING PROTOCOLS
- 5 OTHER TERMS AND CONDITIONS

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 This Exhibit provides for the establishment of protocols for the development, use, transmission, and exchange of Digital Data for the Project. If Building Information Modeling will be utilized, this Exhibit also provides for the establishment of the protocols necessary to implement the use of Building Information Modeling on the Project, including protocols that establish the expected Level of Development for Model Elements at various milestones of the Project, and the associated Authorized Uses of the Building Information Models.

§ 1.2 The Parties agree to incorporate this Exhibit into their agreements with any other Project Participants that may develop or make use of Digital Data on the Project. Prior to transmitting or allowing access to Digital Data, a Party may require any Project Participant to provide reasonable evidence that it has incorporated this Exhibit into its agreement for the Project, and agreed to the most recent Project specific versions of AIA Document G201 TM_2013, Project Digital Data Protocol Form and AIA Document G202 TM_2013, Project Building Information Modeling Protocol Form.

§ 1.2.1 The Parties agree that each of the Project Participants utilizing Digital Data on the Project is an intended third party beneficiary of the Section 1.2 obligation to incorporate this Exhibit into agreements with other Project Participants, and any rights and defenses associated with the enforcement of that obligation. This Exhibit does not create any third-party beneficiary rights other than those expressly identified in this Section 1.2.1.

§ 1.3 Adjustments to the Agreement

§ 1.3.1 If a Party believes that protocols established pursuant to Sections 3.2 or 4.5, and memorialized in AIA Documents G201–2013 and G202–2013, will result in a change in the Party's scope of work or services warranting an adjustment in compensation, contract sum, schedule or contract time, the Party shall notify the other Party. Failure to provide notice as required in this Section 1.3 shall result in a Party's waiver of any claims for

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be incorporated into an agreement between the parties and used in conjunction with AIA Documents G201™—2013, Project Digital Data Protocol Form, and G202™—2013, Building Information Modeling Protocol Form. It is anticipated that other Project Participants will incorporate a project specific E203—2013 into their agreements, and that the Parties and other Project Participants will set forth the agreed-upon protocols in AIA Documents G201—2013 and G202—2013.

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adjustments in compensation, contract sum, schedule or contract time as a result of the established protocols.

- § 1.3.2 Upon such notice, the Parties shall discuss and negotiate revisions to the protocols or discuss and negotiate any adjustments in compensation, contract sum, schedule or contract time in accordance with the terms of the Agreement.
- § 1.3.3 Notice required under this Section 1.3 shall be provided within thirty days of receipt of the protocols, unless otherwise indicated below:
- (If the Parties require a notice period other than thirty days from receipt of the protocols, indicate the notice period below.)

§ 1.4 Definitions

- § 1.4.1 Building Information Model. A Building Information Model is a digital representation of the Project, or a portion of the Project, and is referred to in this Exhibit as the "Model," which term may be used herein to describe a Model Element, a single model or multiple models used in the aggregate, as well as other data sets identified in AIA Document G202–2013, Project Building Information Modeling Protocol Form.
- § 1.4.2 Building Information Modeling. Building Information Modeling or Modeling means the process used to create the Model.
- § 1.4.3 Model Element. A Model Element is a portion of the Model representing a component, system or assembly within a building or building site.
- § 1.4.4 Level of Development. The Level of Development (LOD) describes the minimum dimensional, spatial, quantitative, qualitative, and other data included in a Model Element to support the Authorized Uses associated with such LOD.
- § 1.4.5 Authorized Uses. The term "Authorized Uses" refers to the permitted uses of Digital Data authorized in the Digital Data and/or Building Information Modeling protocols established pursuant to the terms of this Exhibit.
- § 1.4.6 Model Element Author. The Model Element Author is the entity (or individual) responsible for managing and coordinating the development of a specific Model Element to the LOD required for an identified Project milestone, regardless of who is responsible for providing the content in the Model Element. Model Element Authors are to be identified in Section 3.3, Model Element Table, of AIA Document G202–2013.
- § 1.4.7 Digital Data. Digital Data is information, including communications, drawings, specifications and designs, created or stored for the Project in digital form. Unless otherwise stated, the term Digital Data includes the Model.
- § 1.4.8 Confidential Digital Data. Confidential Digital Data is Digital Data containing confidential or business proprietary information that the transmitting party designates and clearly marks as "confidential."
- § 1.4.9 Written or In Writing. In addition to any definition in the Agreement to which this Exhibit is attached, for purposes of this Exhibit and the Agreement, "written" or "in writing" shall mean any communication prepared and sent using a transmission method set forth in this Exhibit, or the protocols developed pursuant to this Exhibit, that permits the recipient to print the communication.
- § 1.4.10 Written Notice. In addition to any terms in the Agreement to which this Exhibit is attached, for purposes of this Exhibit and the Agreement, "written notice" shall be deemed to have been duly served if transmitted electronically to an address provided in this Exhibit or the Agreement using a transmission method set forth in this Exhibit that permits the recipient to print the communication.
- § 1.4.11 Party and Parties. The terms "Party" and "Parties" refer to the signing parties to the Agreement.
- § 1.4.12 Project Participant. A Project Participant is an entity (or individual) providing services, work, equipment or materials on the Project and includes the Parties.

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ARTICLE 2 TRANSMISSION AND OWNERSHIP OF DIGITAL DATA

- § 2.1 The transmission of Digital Data constitutes a warranty by the Party transmitting Digital Data to the Party receiving Digital Data that the transmitting Party is the copyright owner of the Digital Data, or otherwise has permission to transmit the Digital Data for its use on the Project in accordance with the Authorized Uses of Digital Data established pursuant to the terms of this Exhibit.
- § 2.2 If a Party transmits Confidential Digital Data, the transmission of such Confidential Digital Data constitutes a warranty to the Party receiving such Confidential Digital Data that the transmitting Party is authorized to transmit the Confidential Digital Data. If a Party receives Confidential Digital Data, the receiving Party shall keep the Confidential Digital Data strictly confidential and shall not disclose it to any other person or entity except as set forth in Section 2.2.1.
- § 2.2.1 The receiving Party may disclose Confidential Digital Data as required by law or court order, including a subpoena or other form of compulsory legal process issued by a court or governmental entity. The receiving Party may also disclose the Confidential Digital Data to its employees, consultants or contractors in order to perform services or work solely and exclusively for the Project, provided those employees, consultants and contractors are subject to the restrictions on the disclosure and use of Confidential Digital Data as set forth in this Exhibit.
- § 2.3 By transmitting Digital Data, the transmitting Party does not convey any ownership right in the Digital Data or in the software used to generate the Digital Data. Unless otherwise granted in a separate license, the receiving Party's right to use, modify, or further transmit Digital Data is specifically limited to designing, constructing, using, maintaining, altering and adding to the Project consistent with the terms of this Exhibit, and nothing contained in this Exhibit conveys any other right to use the Digital Data.
- § 2.4 Where a provision in this Article 2 conflicts with a provision in the Agreement into which this Exhibit is incorporated, the provision in this Article 2 shall prevail.

ARTICLE 3 DIGITAL DATA PROTOCOLS

§ 3.1 Anticipated Types of Digital Data. The anticipated types of Digital Data to be used on the Project are as follows: (Indicate below the information on the Project that shall be created and shared in a digital format. If the Parties indicate that Building Information Modeling will be utilized on the Project, the Parties shall also complete Article 4.)

		Location of Detailed Description
	Applicability to the Project	(Section 3.1.1 below or in an
A (I.I. 4) POLY IN ((Indicate Applicable or	attachment to this exhibit
Anticipated Digital Data	Not Applicable)	and identified below)
Project Agreements and Modifications	Applicable	
Project communications	Via Email & BuildingBlok	
Architect's pre-construction submittals	Not Applicable	Via Email & BuildingBlok
Contract Documents	Applicable	
Contractor's submittals	Applicable	
Subcontractor's submittals	Applicable	
Modifications	Applicable	
Project payment documents	Applicable	
Notices and claims	Applicable	
Building Information Modeling	Applicable	

§ 3.1.1 Insert a detailed description of the anticipated Digital Data identified in Section 3.1, if not further described in an attachment to this Exhibit.

See attached Exhibit

§ 3.2 As soon as practical following execution of the Agreement, the Parties shall further describe the uses of Digital Data, and establish necessary protocols governing the transmission and Authorized Uses of Digital Data, in consultation with the other Project Participants that are expected to utilize Digital Data on the Project.

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§ 3.2.1 Unless another Project Participant is identified below, the Architect shall prepare and distribute to the other Project Participants Digital Data protocols for review, revision and approval.

(If a Project Participant other than the Architect shall be responsible for preparing draft and final Digital Data protocols, identify that Project Participant.)

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- § 3.2.2 The agreed upon Digital Data protocols shall be set forth in AIA Document G201-2013 and each Project Participant shall memorialize their agreement in writing to such Digital Data protocols.
- § 3.2.3 The Parties, together with the other Project Participants, shall review and, if necessary, revise the Digital Data protocols at appropriate intervals as required by the conditions of the Project.
- § 3.3 The Parties shall transmit, use, store and archive Digital Data in accordance with the Digital Data protocols set forth in the latest version of AIA Document G201–2013 agreed to by the Project Participants.

§ 3.4 Unauthorized Use

§ 3.4.1 Prior to Establishment of Digital Data Protocols

If a Party receives Digital Data prior to the agreement to, and documentation of, the Digital Data protocols in AIA Document G201-2013, that Party is not authorized to use or rely on the Digital Data. Any use of, or reliance on, such Digital Data is at that Party's sole risk and without liability to the other Party and its contractors, consultants, agents and employees.

§ 3.4.2 Following Establishment of Digital Data Protocols

Following agreement to, and documentation of, the Digital Data protocols in AIA Document G201-2013, if a Party uses Digital Data inconsistent with the Authorized Uses identified in the Digital Data protocols, that use shall be at the sole risk of the Party using the Digital Data.

§ 3.5 Digital Data Management

§ 3.5.1 Centralized electronic document management system use on the Project shall be:

(Check the appropriate box. If the Parties do not check one of the boxes below, the default selection shall be that the Parties will not utilize a centralized electronic document management system on the Project.)

- [X] The Parties intend to use a centralized electronic document management system on the Project.
- [] The Parties do not intend to use a centralized electronic document management system on the Project.
- § 3.5.2 If the Project Participants intend to utilize a centralized electronic document management system on the Project, the Project Participants identified in Section 3.5.3 shall be responsible for managing and maintaining such system. The Project Participants responsible for managing and maintaining the centralized electronic document management system shall facilitate the establishment of protocols for transmission, use, storage and archiving of the centralized Digital Data and assist the Project Participants identified in Section 3.2.1 above in preparing Digital Data protocols. Upon agreement to, and documentation of, the Digital Data protocols in AIA Document G201-2013, the Project Participants identified in Section 3.5.3 shall manage and maintain the centralized electronic document management system consistent with the management protocols set forth in the latest version of G201-2013 approved by the Project Participants.
- § 3.5.3 Unless responsibility is assigned to another Project Participant, the Architect shall be responsible for managing and maintaining the centralized electronic document management system. If the responsibility for management and maintenance will be assigned to another Project Participant at an identified Project milestone, indicate below the Project Participant who shall assume that responsibility, and the Project milestone.

(Identify the Project Participant responsible for management and maintenance only if the Parties intend to utilize a centralized electronic document management system on the Project.)

Responsible Project Participant

Project Milestone

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ARTICLE 4 BUILDING INFORMATION MODELING PROTOCOLS

§ 4.1 If the Parties indicate in Section 3.1 that Building Information Modeling will be used on the Project, specify below the extent to which the Parties intend to utilize Building Information Modeling and identify the provisions of this Article 4 governing such use:

- [] The Parties shall utilize Building Information Modeling on the Project for the sole purpose of fulfilling the obligations set forth in the Agreement without an expectation that the Model will be relied upon by the other Project Participants. Unless otherwise agreed in writing, any use of, transmission of, or reliance on the Model is at the receiving Party's sole risk. The remaining sections of this Article 4 shall have no force or effect.
- [] The Parties shall develop, share, use and rely upon the Model in accordance with Sections 4.2 through 4.10 of this Exhibit.
- § 4.2 Anticipated Building Information Modeling Scope. Indicate below the portions of the Project for which Modeling will be used and the anticipated Project Participant responsible for that Modeling.

Project Portion for Modeling

See AIA G202 Building Information Modeling Protocol Form Matrix

Responsible Project Participant Christopher D. Donahue

§ 4.3 Anticipated Model Authorized Uses. Indicate below the anticipated Authorized Uses of the Model for the Project, which Authorized Uses will be agreed upon by the Project Participants and further described for each LOD in AIA Document G202–2013.

§ 4.4 Ancillary Modeling Activities. Indicate additional Modeling activities agreed upon by the Parties, but not to be included in AIA Document G202–2013, if any.

(Describe any Modeling activities, such as renderings, animations, performance simulations, or other similar use, including the anticipated amount and scope of any such Modeling activities.)

All parties identified in contract scopes and AIA E203 4.2 are required to provide 3D modeled electronic document in Autocad, Navisworks and /or Revit to participate in Building Information Modeling construction coordination process.

- § 4.5 Modeling Protocols. As soon as practical following execution of the Agreement, the Parties shall, in consultation with the other Project Participants that are expected to utilize Building Information Modeling on the Project, further describe the Authorized Uses of the Model and establish necessary protocols governing the development of the Model utilizing AIA Document G202–2013.
- § 4.5.1 The Modeling protocols shall address the following:
 - .1 Identification of the Model Element Authors;
 - .2 Definition of the various LOD for the Model Elements and the associated Authorized Uses for each defined LOD;
 - .3 Identification of the required LOD of each Model Element at each identified Project milestone;
 - .4 Identification of the construction classification systems to be used on the Project;
 - .5 The process by which Project Participants will exchange and share the Model at intervals not reflected in Section 3.3, Model Element Table, of AIA Document G202–2013;
 - .6 The process by which the Project Participants will identify, coordinate and resolve changes to the Model;
 - .7 Details regarding any anticipated as-designed or as-constructed Authorized Uses for the Model, if required on the Project;
 - .8 Anticipated Authorized Uses for facilities management or otherwise, following completion of the Project; and
 - .9 Other topics to be addressed by the Modeling protocols: (*Identify additional topics to be addressed by the Modeling Protocols.*)

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§ 4.5.2 Unless responsibility is assigned to another Project Participant identified below, the Architect shall prepare and distribute Modeling protocols to the other Project Participants for review, revision and approval. (If a Project Participant other than the Architect shall be responsible for preparing draft and final Modeling protocols, identify that Project Participant.)

- § 4.5.3 The agreed upon Modeling protocols shall be set forth in AIA Document G202–2013 and each Project Participant shall memorialize their agreement in writing to such Modeling protocols.
- § 4.5.4 The Parties, together with the other Project Participants, shall review, and if necessary, revise the Modeling protocols at appropriate intervals as required by the conditions of the Project.
- § 4.6 The Parties shall develop, use and rely on the Model in accordance with the Modeling protocols set forth in the latest version of AIA Document G202–2013, which document shall be included in or attached to the Model in a manner clearly accessible to the Project Participants.

§ 4.7 Unauthorized Use

§ 4.7.1 Prior to Establishment of Modeling Protocols

If a Party receives any Model prior to the agreement to, and documentation of, the Modeling protocols in AIA Document G202–2013, that Party is not authorized to use, transmit, or rely on the Model. Any use, transmission or reliance is at that Party's sole risk and without liability to the other Party and its contractors, consultants, agents and employees.

§ 4.7.2 Following Establishment of Modeling Protocols

Following agreement to, and documentation of, the Modeling protocols in AIA Document G202–2013, if a Party uses or relies on the Model inconsistent with the Authorized Uses identified in the Modeling protocols, such use or reliance shall be at the sole risk of the Party using or relying on the Model. A Party may rely on the Model Element only to the extent consistent with the minimum data required for the identified LOD, even if the content of a specific Model Element includes data that exceeds the minimum data required for the identified LOD.

§ 4.8 Model Management

§ 4.8.1 The requirements for managing the Model include the duties set forth in this Section 4.8. Unless assigned to another Project Participant, the Architect shall manage the Model from the inception of the Project. If the responsibility for Model management will be assigned to another Project Participant, or change at an identified Project milestone, indicate below the identity of the Project Participant who will assume that responsibility, and the Project milestone.

Responsible Project Participant

Project Milestone

Christopher D. Donahue, Contract Coordinator

§ 4.8.2 Model Management Protocol Establishment. The Project Participant responsible for managing the Model, in consultation with the other Project Participants that are expected to utilize Building Information Modeling on the Project, shall facilitate the establishment and revision of Model management protocols, including the following:

- 1 Model origin point, coordinate system, precision, file formats and units
- .2 Model file storage location(s)
- .3 Processes for transferring and accessing Model files
- .4 Naming conventions
- .5 Processes for aggregating Model files from varying software platforms
- .6 Model access rights
- .7 Identification of design coordination and clash detection procedures.
- .8 Model security requirements
- .9 Other: (*Identify additional Model management protocols to be addressed.*)

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- § 4.8.3 Ongoing Responsibilities. The Project Participant responsible for managing the Model shall do so consistent with the Model management protocols, which shall also include the following ongoing responsibilities:
 - .1 Collect incoming Models:
 - .1 Coordinate submission and exchange of Models
 - .2 Create and maintain a log of Models received
 - .3 Review Model files for consistency with Sections 4.8.2.1 through 4.8.2.5
 - .4 Maintain a record copy of each Model file received
 - .2 Aggregate Model files and make them available for Authorized Uses
 - .3 Maintain Model Archives and backups consistent with the requirements of Section 4.8.4 below
 - .4 Manage Model access rights
 - .5 Other: (Identify additional responsibilities.)
 - .6 Attend and participate in BIM coordination meetings is mandatory, liquidated damages apply for avoiding BIM process.
- § 4.8.4 Model Archives. The individual or entity responsible for Model management as set forth in this Section 4.8 shall compile a Model Archive at the end of each Project milestone and shall preserve it without alteration as a record of Model completion as of that Project milestone.
- § 4.8.4.1 Additional Model Archive requirements, if any, are as follows:
- § 4.8.4.2 The procedures for storing and preserving the Model(s) upon final completion of the Project are as follows:
- § 4.9 Post-Construction Model. The services associated with providing a Model for post-construction use shall only be required if specifically designated in the table below as a Party's responsibility.

(Designate below any anticipated post-construction Model and related requirements, the Project Participant responsible for creating or adapting the Model to achieve such uses, and the location of a detailed description of the anticipated scope of services to create or adapt the Model as necessary to achieve such uses.)

Post-Con	struction Model	Applicability to Project (Applicable or Not Applicable)	Responsible Project Participant	Location of Detailed Description of Requirements and Services (Section 4.10 below or in an attachment to this exhibit and identified below)
§ 4.9.1	Remodeling	Not Applicable	r roject r articipant	identified below)
§ 4.9.2	Wayfinding and Mapping	Not Applicable		
§ 4.9.3	Asset/FF & E Management	Not Applicable		
§ 4.9.4	Energy Management	Not Applicable		
§ 4.9.5	Space Management	Not Applicable		
§ 4.9.6	Maintenance Management	Not Applicable		

§ 4.10 Insert a detailed description of the requirements for each Post-Construction Model identified in Section 4.9 and the anticipated services necessary to create each Post-Construction Model, if not further described in an attachment to this Exhibit.

ARTICLE 5 OTHER TERMS AND CONDITIONS

Other terms and conditions related to the transmission and use of Digital Data are as follows:

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SECTION 015113 - TEMPORARY ELECTRICITY

1. GENERAL

A. RELATED WORK SPECIFIED ELSEWHERE

1. Electrical Basic Materials and Methods, Division 16 or 26.

B. <u>DESCRIPTION OF SYSTEM</u>

1. Power Source

a. Suppliers: Delmarva Power

- b. The Construction Manager shall provide 277/480 volt, three phase, 60 cycle power service to the site. Electrical Contractor shall provide temporary electric service from the transformer on the corner of Mapleton Avenue and Raleigh Street into the building and to the trailer to be located by the Handicapped Parking spots. Electrical Contractor to terminate and install power to both the building and trailer.
- c. The Construction Manager will make all arrangements for bringing the power supply to the site and for installation of appropriate temporary transformers to provide for the power supply in 1.B.1.b, above.
- d. The source will be adequate to service temporary electrical needs of the proposed construction.

2. Electrical Service

- a. Contractor will be responsible to pay for all costs associated with providing electrical service from the power source to their respective site office, temporary storage facilities or temporary construction buildings as appropriate.
- b. Prior to issuance of the Notice to Proceed for the electrical contract, the Construction Manager will be responsible for providing temporary electrical service as provided in 1.B.2.c, below. After issuance of the Notice to Proceed for the electrical contract, the Electrical Contractor shall become responsible for maintaining all electrical power supply and service facilities installed by the Construction Manager. The Electrical Contractor shall also, from that date forward, be responsible for <u>providing</u> and maintaining temporary electrical service to the site as provided in 1.B.2.c, below.
- c. The Construction Manager or Electrical Contractor, as provided in 1.B.2.b,

above, shall install temporary electric service for items below, throughout the construction period, such that power can be secured at any desired point with no more than a 60 foot extension:

- (1) Power Centers for miscellaneous tools and equipment used in the construction work shall be provided with a minimum of four 20-amp, 120 volt grounding type outlets. These power centers will be spaced no more than 100' apart and installed on each floor. Each outlet shall be provided with ground fault detecting circuit breaker protection.
- (2) Adequate lighting for safe working conditions shall be provided and maintained on a 24 hour per day basis throughout the building, tunnels, and stairways per OSHA requirements. Each lamp must be rated at least 100 watts. Voltage of each socket must be at least 110 volts.
- (3) Power for testing and checking equipment must be supplied.

3. Capacity

- All electrical power supply and service lines installed shall be of adequate capacity for construction use by all trades during the construction period at the locations necessary.
- b. The Electrical Contractor shall notify the Power Company if unusually heavy loads, such as welding units, are anticipated.

4. Power Costs

- a. The Construction Manager will pay all costs of temporary electrical power used during construction.
- b. The Owner will pay all costs of power used in the permanent wiring.

C. REQUIREMENTS AND REGULATORY AGENCIES

- 1. The Electrical Contractor will obtain permits as required by local governmental authorities.
- 2. The temporary electrical service shall comply with National Electrical Code, 1990 Edition and applicable local codes and utility regulations.

D. USE OF PERMANENT SYSTEM

1. The Electrical Contractor shall regulate any part of the permanent electrical system which is used for construction purposes to prevent interference with safety and

orderly progress of the Work.

2. Contractors shall leave permanent electrical services in a condition as good as new and clean.

2. PRODUCTS

A. <u>MATERIALS</u>

1. General

a. The materials may be new or used, but must be adequate in capacity for the purposes intended and must not create unsafe conditions or violate the requirements of applicable codes.

2. Conductors

- a. Use wire, cable, or busses of appropriate type, sized in accordance with the National Electrical Code for the applied loads.
- b. Use only UL labeled wire and devices.

B. EQUIPMENT

1. Provide appropriate enclosure for the environment in which used in compliance with NEMA standards.

3. <u>EXECUTION</u>

A. GENERAL

- 1. Install all work with a neat and orderly appearance.
- 2. Make structurally sound throughout.
- 3. Maintain to give continuous service and to provide safe working conditions.
- 4. Modify temporary power and light installation as job progress requires.

B. INSTALLATION

1. Locate so that interference with storage areas, traffic areas and work under other Contracts is avoided.

C. <u>REMOVAL</u>

- 1. Remove all temporary equipment and materials completely upon completion of construction.
- 2. Repair all damage caused by the installation and restore to satisfactory condition.

END OF SECTION

SECTION 015123 - TEMPORARY HEATING, COOLING AND VENTILATING

1. GENERAL

A. RELATED REQUIREMENTS SPECIFIED ELSEWHERE

1. Temporary Electric: Section 015113

2. Temporary Facilities: Section 015200

3. Heating Requirements for Cold Weather Installation and Protection of Materials: Respective specification section for each item of work.

B. DEFINITIONS

- Temporary Enclosures: Sufficient preliminary enclosures of an area of structure, or of an entire building, to prevent entrance or infiltration of rain water, wind or other elements and which will prevent undue heat loss from within enclosed area.
- 2. Permanent Enclosure: Stage of construction at which all moisture and weather protection elements of construction have been installed in accordance with Contract Documents, either for a portion of structure, or for an entire building.

C. DESCRIPTION OF SYSTEM

- Prior to the building or portion of building being permanently enclosed, the contractor shall provide temporary heat and ventilation and weather protection necessary for its work, as described below. After permanent enclosure, the Construction Manager will arrange for and coordinate temporary heat and ventilation in enclosed areas required to:
 - a. Facilitate progress of Work.
 - b. Protect Work and products against dampness and cold.
 - c. Prevent moisture condensation on surfaces.
 - d. Provide suitable ambient temperatures and humidity levels for installation and curing of materials.
 - e. Provide adequate ventilation to meet health regulations for safe working environment.

2. Temperatures Required

- a. Generally, 24 hours a day: Minimum of 40 degrees F.
- b. 24 hours a day during placing, setting and curing of cementitious materials: As required by specification section for each product.
- c. 24 hours a day, seven days prior to, and during, placing of interior finishes: woodwork, resilient floors, painting and finishing: As required by specification section for each product.
- d. 24 hours a day after application of finishes, and until Substantial Completion: Minimum of 50 degrees F.

3. Ventilation Required:

- a. Contractors shall prevent hazardous accumulations of dusts, fumes, mists, vapors or gases in areas occupied during construction.
 - (1) Provide local exhaust ventilation to prevent harmful dispersal of hazardous substances into atmosphere of occupied areas.
 - (2) Dispose of exhaust materials in manner that will not result in harmful dispersal of hazardous substances into atmosphere of occupied areas.
 - (3) Continuously ventilate storage spaces containing hazardous or volatile materials.
 - (4) Contractor must provide and use equipment which is furnished with Exhaust Purifiers/Scribbers or is electrically power driven when any such equipment produces airborne containments and will be used in an enclosed building.
 - (5) The Contractor shall verify air quality by the use of air monitoring equipment and document the verified air quality on the daily report. The monitoring equipment shall, at a minimum, be designed with an auditory alarm and shall provide continuous monitoring of those four gasses, Oxygen, Hydrogen Sulfide, Carbon Monoxide and Combustible gasses.
- 4. Contractors shall provide adequate ventilation for:
 - a. Curing installed materials.
 - b. Dispersal of humidity.

c. Temporary sanitary facilities.

5. Duration of Operations:

a. For Personnel:

- (1) At all times personnel occupy an area subject to hazardous accumulations of harmful elements.
- (2) Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful elements.
- b. For curing installed materials: As required by specification section for respective materials.
- c. For humidity dispersal: Continuously ventilate to provide suitable ambient conditions for work.
- d. The Contractor shall maintain supervision and operation of temporary heating and ventilating equipment in order to:
 - (1) Enforce conformance with applicable codes and standards.
 - (2) Enforce safe practices.
 - (3) Prevent abuse of services.

D. COSTS OF INSTALLATION AND OPERATION

- 1. The Contractor shall be responsible for all installation and operating costs for any heat and ventilation as required in this section until the permanent HVAC system is in operation.
- 2. After the permanent HVAC system is operational, the Owner will pay the costs of fuel for temporary heat and ventilation. The Contractor will pay the costs for maintaining the system until final acceptance by the Owner.
- 3. The Contractor shall be responsible for all installation and operating costs for any heat required to supplement that which is to be supplied by the Construction Manager in 1.C.1, above.

E. REQUIREMENTS OF REGULATORY AGENCIES

1. The Construction Manager will obtain and pay for permits as required by governing authorities for those activities required by this Section.

2. Contractor shall comply with Federal, State and local codes, and utility company regulations.

2. PRODUCTS

A. MATERIALS

1. General

a. Materials may be new or used, but must be adequate for purposes intended and must not create unsafe conditions nor violate requirements of applicable codes.

B. EQUIPMENT

- 1. Standard products, meeting code requirements.
- 2. Provide required facilities, including piping, wiring and controls.
- 3. Portable Heater: Standard Units, meeting code requirements.
 - a. Safety Controls against explosion, overheating, and carbon monoxide build up.
 - b. Vent direct-fired units to outside.
 - c. Provide adequate combustion air.
- 4. Oil-Fired heaters will not be allowed.

3. EXECUTION

A. GENERAL

- 1. Comply with applicable sections of Division 15 Mechanical.
- 2. Install work in neat and orderly manner.
- 3. Make structurally, mechanically and electrically sound throughout.
- 4. Maintain to give safe, continuous service at required times and to provide safe working conditions.
- 5. Modify and extend system as work progress requires.

B. INSTALLATION

- 1. Locate units to provide equitable distribution of heat and air movements.
- 2. Locate to avoid interference with, or hazards to:
 - a. Work or movement of personnel.
 - b. Traffic areas.
 - c. Materials handling.
 - d. Storage areas.
 - e. Work of other Contractors.
 - f. Finishes.

C. OPERATION OF PERMANENT EQUIPMENT

- 1. The Construction Manager will coordinate with Contractor.
- 2. The Contractor will place permanent HVAC system in operation only upon written authorization by the Construction Manager.
- 3. Before operating the permanent HVAC equipment, the Contractor shall confirm to the Construction Manager that:
 - a. Inspection has been made by proper authorities.
 - b. Systems, equipment piping, strainers, filters and associated operating items are sufficiently complete, cleaned, and ready for operation.
 - c. Controls and safety devices are complete and tested, or adequate temporary controls are provided.
 - d. Before operating the permanent HVAC equipment, the Contractor shall install temporary filters:
 - (1) For air handling units.
 - (2) For permanent ducts.

D. REMOVAL

- 1. The Contractor shall completely remove temporary materials and equipment when no longer required, or on completion of construction.
- 2. The Contractor shall clean and repair damage caused by temporary installation, and restore equipment to specified or original condition.
- 3. The Contractor shall remove temporary filters and install new filters, or clean permanent filters, in the permanent HVAC system prior to final acceptance by the Owner.

END OF SECTION

SECTION 017329 - CUTTING AND PATCHING

1. GENERAL

- A. <u>Definition</u>: "Cutting and Patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.
- B. <u>Refer to Other Sections</u> of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
- C. <u>Structural Work:</u> Do not cut and patch structural work in a manner resulting in a reduction of load carrying capacity or load deflection ratio. Submit proposal and request and obtain Architect's/Engineer's approval before proceeding with cut and patch of structural work.
- D. <u>Operational/Safety Limitations:</u> Do not cut and patch operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance. Submit proposals and requests and obtain Architect's/Engineer's approval before proceeding with cut and patches of structural work.
- E. <u>Visual/Quality Limitations</u>: Do not cut and patch work exposed to view (exterior and interior) in manner resulting in noticeable reduction of aesthetic qualities and similar qualities, as judged by Architect/Engineer.
 - 1. Engage the original Installer/Fabricator, or (if not available) an acceptable equivalent entity, to cut and patch the following categories of exposed work but not limited to
 - 2. Exterior wall materials, ie., curtain wall
 - 3. Finish floor materials, ie., substrate, carpet, ceramic tile
 - 4. Walls
 - 5. Ceilings
- F. <u>Limitation on Approvals</u>: Architect's/Engineer's approval to proceed with cutting and patching does not waive right to later acquire removal/replacement of work found to be cut and patched in an unsatisfactory manner, as judged by Architect/Engineer.

2. MATERIALS

A. General: Use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal or better

performance characteristics.

3. EXECUTION

- A. <u>Inspection</u>: Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.
- B. <u>Temporary Support:</u> To prevent failure provide temporary support of work to be cut.
- C. <u>Protection:</u> Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
 - 1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 - 2. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.
- D. <u>Cutting:</u> Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer's recommendations.
 - Where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut and drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
- E. <u>Patching:</u> Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
 - 1. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and finishing.

END OF SECTION

SECTION 087100 – DOOR HARDWARE (Addendum No. 3 – Section replaced in its entirety)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC International Building Code.
 - 3. NFPA 70 National Electrical Code.
 - 4. NFPA 80 Fire Doors and Windows.
 - 5. NFPA 101 Life Safety Code.
 - 6. NFPA 105 Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- D. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards A156 Series
 - 2. UL10C Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.

- g. Door and frame sizes and materials.
- h. Warranty information for each product.
- 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 - Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 - 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary Integrated Wiegand Access Control Products.
- E. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- F. Informational Submittals:
 - Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.3 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

- D. Integrated Wiegand, Wireless, and IP-Enabled Access Control Products Supplier Qualifications: Integrated access control products and accessories are required to be supplied and installed through current members of the ASSA ABLOY "Authorized Channel Partner" (ACP) and "Certified Integrator" (CI) programs. Suppliers are to be factory trained, certified prior to project bid, and a direct purchaser of the specified product. Installers are to be factory trained, certified prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Twenty five years for manual surface door closer bodies.

1.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

- C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- D. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - 1. Permanent cylinders, cores, and keys to be installed by Owner.
- E. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 - 3. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all outswinging lockable doors.
 - 4. Acceptable Manufacturers:
 - a. Hager Companies (HA).
 - b. McKinney Products (MK).
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cutouts.
 - 1. Acceptable Manufacturers:
 - a. Bommer Industries (BO).
 - b. McKinney Products (MK).
 - c. Pemko Manufacturing (PE).
- C. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 certified pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed teflon coated stainless pin, and twin self lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 - 1. Acceptable Manufacturers:
 - a. Markar Products (MR).
 - b. McKinney Products (MK).
 - c. Pemko Manufacturing (PE).

2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 - 1. Acceptable Manufacturers:
 - a. Hager Companies (HA) ETW-QC (# wires) Option.
 - b. McKinney Products (MK) QC (# wires) Option.
- B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 - 1. Acceptable Manufacturers:
 - a. Pemko Manufacturing (PE) EL-CEPT Series.
 - b. Securitron (SU) EL-CEPT Series.
 - c. Von Duprin (VD) EPT-10 Series.
- C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to throughdoor wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 - 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney Products (MK) Electrical Connecting Kit: QC-R001.
 - b. McKinney Products (MK) Connector Hand Tool: QC-R003.
 - 2. Acceptable Manufacturers:
 - a. McKinney Products (MK) QC-C Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.
 - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 5. Acceptable Manufacturers:
 - Door Controls International (DC).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.

- 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
- 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
- 5. Acceptable Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
 - 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 5. Keyway: Match Facility Restricted Keyway.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware. Provide removable core (small or large format) as specified in Hardware Sets.
- E. Security Cylinders: ANSI/BHMA A156.5, Grade 1, patterned security cylinders and keys able to be used together under the same facility master or grandmaster key system. Cylinders are to be factory keyed.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin (RU) Pyramid PS Series.
 - b. No Substitution.
- F. Keying System: Each type of lock and cylinders to be factory keyed.
 - Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. Existing System: Key locks to Owner's existing system.
- G. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Two (3)
 - 2. Master Keys: Ten (10) top master, Five (3) of each lower master.
 - 3. Construction Keys (where required): Ten (10).
 - 4. Construction Control Keys (where required): Two (2).
- H. Construction Keying: Provide temporary keyed construction cores.
- I. Key Registration List (Bitting List):
 - Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

- Provide transcript list in writing or electronic file as directed by the Owner.
- J. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
 - 1. Acceptable Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).
- K. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into "Key Wizard" software.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) ML2000 Series.
 - b. Sargent Manufacturing (SA) 8200 Series.
 - c. Schlage (SC) L9000 Series.
- B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
 - 1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
 - 2. Locks are to be non-handed and fully field reversible.
 - 3. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) CL3300 Series.
 - b. Sargent Manufacturing (SA) 10 Line.
 - c. Schlage (SC) ND Series.

2.7 INTEGRATED WIEGAND OUTPUT LOCKING DEVICES – MULTI-CLASS READER

- A. Integrated Wiegand Output Multi-Class Mortise Locks: Wiegand output ANSI A156.13, Grade 1, mortise lockset with integrated card reader, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
 - Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
 - 2. Integrated reader supports the following credentials:
 - a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
 - b. 13.56 MHz proximity credentials: HID iClass, HID iClass SE, SE for MIFARE Classic, DESFire EV1.
 - 3. 12VDC external power supply required for reader and lock, with optional 24VDC lock solenoid. Fail safe or fail secure options.
 - 4. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

- 5. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
- 6. Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.
- 7. Acceptable Manufacturers:
 - a. Corbin Russwin (RU) ML2000 SE-LP10 Series.
 - b. Sargent Manufacturing (SA) M1 8200 Series.

2.8 AUXILIARY LOCKS

- A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) DL4100 Series.
 - b. Sargent Manufacturing (SA) 4870 Series.
 - c. Schlage (SC) L460 Series.

2.9 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

- 5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
- 6. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
- 7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
- 8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
- 9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
- 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
- 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) 80 Series.
 - c. Von Duprin (VD) 35A/98 XP Series.

2.11 INTEGRATED WIEGAND OUTPUT EXIT DEVICES – MULTI-CLASS READER

- A. Integrated Wiegand Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated proximity card reader, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
 - 1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).
 - 2. Integrated reader supports the following credentials:
 - a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
 - b. 13.56 MHz proximity credentials: HID iClass, HID iClass SE, SE for MIFARE Classic, DESFire EV1.
 - 3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
 - 4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
 - 5. Competitor Alternates Allowed Option>Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.
 - 6. Acceptable Manufacturers:
 - a. Corbin Russwin (RU) ED5000 SE-LP10 Series.
 - b. Sargent Manufacturing (SA) M1 80 Series.
- B. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.
 - 1. Provide keyed removable feature where specified in the Hardware Sets.

- 2. Provide stabilizers and mounting brackets as required.
- 3. Provide electrical quick connection wiring options as specified in the hardware sets.
- 4. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) 700/900 Series.
 - b. Sargent Manufacturing (SA) 980S Series.
 - c. Von Duprin (VD) 9954 Series.

2.12 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
 - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 - 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 - 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) DC6000 Series.
 - b. Sargent Manufacturing (SA) 351 Series.
 - c. Norton Door Controls (NO) 7500 Series.

2.13 ARCHITECTURAL TRIM

- A. Door Protective Trim
 - General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
 - Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
 - 3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
 - 4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.

- 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
- 6. Acceptable Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).

2.14 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - Acceptable Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Manufacturing (RO).
 - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 - 1. Acceptable Manufacturers:
 - a. Rixson Door Controls (RF).
 - b. Rockwood Manufacturing (RO).
 - c. Sargent Manufacturing (SA).

2.15 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

- F. Acceptable Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko Manufacturing (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.16 ELECTRONIC ACCESSORIES

- A. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 - 1. Acceptable Manufacturers:
 - a. Corbin Russwin Hardware (RU) 782.
 - b. Sargent Manufacturing (SA) 3500 Series.
 - c. Securitron (SU) BPS Series.
 - d. Von Duprin (VD) PS.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Integrated Wiegand access control products are required to be installed through current members of the ASSA ABLOY "Certified Integrator" (CI) program.
- D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Manufacturer's Abbreviations:
 - 1. MK McKinney
 - 2. PE Pemko
 - 3. MR Markar
 - 4. RO Rockwood
 - 5. SA Sargent
 - 6. RU Corbin Russwin
 - 7. SU Securitron
 - 8. RF Rixson
 - 9. NO Norton

Hardware Sets

Set: 1.0

Doors: B128A, C119A, C123B, C123C, EXC004, EXC011

0 All Hardware BY DOOR SUPPLIER OT

Set: 2.0

Doors: EXB102, EXC002

2	Continuous Hinge	CFM_SLF-HD1 PT - DOOR HEIGHT		PE
1	Removable Mullion	L980A	US28	SA
2	Rim Exit Device	LC 16 55 56 8810 862	US32D	SA

3	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
3	Removable Core	8020	630	RU
2	Conc Overhead Stop	6-X36	630	RF
2	Door Closer	J7500	689	NO
1	Threshold	272A MSES25SS		PE
1	Rain Guard	346C		PE
1	Gasketing (mullion)	5110BL		PE
2	Sweep (w/drip edge)	3452CNB		PE
2	Frame Harness	QC-C1500P		MK
2	Door Harness	QC-C LENGTH TO SUIT		MK
2	Switch	3287		SA
2	Electric Power Transfer	EL-CEPT		SU
1	Power Supply	3540		SA

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Electronic Operation: Valid card at adjacent door retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 3.0

Doors: EXA103, EXB101, EXB103, EXC001

2	Continuous Hinge	CFMSLF-HD1 PT - DOOR HEIGHT		PΕ
1	Removable Mullion	L980A	US28	SA
1	Rim Exit Device	LC 16 55 56 8810 862	US32D	SA
1	Access Control Rim Exit	LC 16 56 M1-8804 862	US32D	SA
1	Cylinder (rim)	3080 CT6R	630	RU
3	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
4	Removable Core	8020	630	RU
2	Conc Overhead Stop	6-X36	630	RF
2	Door Closer	J7500	689	NO
1	Threshold	272A MSES25SS		PE
1	Rain Guard	346C		PE
1	Gasketing (mullion)	5110BL		PE
2	Sweep (w/drip edge)	3452CNB		PE
2	Frame Harness	QC-C1500P		MK
3	Door Harness	QC-C LENGTH TO SUIT		MK
1	Switch	3287		SA
2	Electric Power Transfer	EL-CEPT		SU
1	Power Supply	3540		SA

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Electronic Operation: Valid card (and intercom signal at EXB101, EXC001) or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 4.0

Doors: EXC009

2	Continuous Hinge	CFM_SLF-HD1 PT - DOOR HEIGHT		PE
1	Removable Mullion	L980A	US28	SA
1	Rim Exit Device	LC 16 55 56 8810 862	US32D	SA
1	Access Control Rim Exit	LC 16 56 M1-8804 862	US32D	SA
1	Cylinder (rim)	3080 CT6R	630	RU
3	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
4	Removable Core	8020	630	RU
2	Door Closer	CPS7500	689	NO
1	Threshold	279x224AFGT MSES25SS		PΕ
1	Rain Guard	346C		PE
1	Gasketing (mullion)	5110BL		PE
2	Sweep (w/drip edge)	3452CNB		PΕ
3	Frame Harness	QC-C1500P		MK
2	Door Harness	QC-C LENGTH TO SUIT		MK
1	Switch	3287		SA
2	Electric Power Transfer	EL-CEPT		SU
1	Power Supply	3540		SA

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Electronic Operation: Valid card or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 5.0

Doors: EXA104

2	Continuous Hinge	CFM_SLF-HD1 - DOOR HEIGHT		PΕ
1	Removable Mullion	L980A	US28	SA
2	Rim Exit Device	LD 8810	US32D	SA
2	Conc Overhead Stop	6-X36	630	RF
2	Door Closer	J7500	689	NO
1	Threshold	272A MSES25SS		PΕ
1	Rain Guard	346C		PΕ
2	Sweep (w/drip edge)	3452CNB		PΕ
2	Switch	3287		SA

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Set: 6.0

Doors: EXC003, EXC012

2	Continuous Hinge	CFM_SLF-HD1 - DOOR HEIGHT		PΕ
1	Removable Mullion	L980A	US28	SA
2	Rim Exit Device	LD 8810	US32D	SA
2	Door Closer	CPS7500	689	NO
1	Threshold	272A MSES25SS		PΕ
1	Rain Guard	346C		PΕ

2	Sweep (w/drip edge)	3452CNB	PΕ
2	Switch	3287	SA

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Set: 7.0

Doors: EXA101, EXA102

1	Continuous Hinge	CFM_SLF-HD1 PT - DOOR HEIGHT		PΕ
1	Access Control Mort Lock	ML20608 x SELP10-SEC NSA R0_ PHRR0_ CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	CPS7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Threshold	279x224AFGT MSES25SS		PΕ
1	Rain Guard	346C		PΕ
1	Sweep (w/drip edge)	3452CNB		PΕ
1	Frame Harness	QC-C1500P		MK
1	Door Harness	QC-C LENGTH TO SUIT		MK
1	Electric Power Transfer	EL-CEPT		SU
1	Power Supply	BPS-24-1		RU

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Electronic Operation: Valid card unlocks outside lever, unless deadbolt is projected, or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 8.0

Doors: EXC005, EXC006

1	Continuous Hinge	CFM_SLF-HD1 PT - DOOR HEIGHT		PE
1	Access Control Mort Lock	ML20606 x SELP10-SEC NSA R0_ CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	CPS7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Threshold	279x224AFGT MSES25SS		PE
1	Rain Guard	346C		PE
1	Sweep (w/drip edge)	3452CNB		PE
1	Frame Harness	QC-C1500P		MK
1	Door Harness	QC-C LENGTH TO SUIT		MK
1	Electric Power Transfer	EL-CEPT		SU
1	Power Supply	BPS-24-1		RU

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Electronic Operation: Valid card (and intercom signal EXC006) unlocks outside lever or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 9.0

Doors: EXC007, EXC008

2	Continuous Hinge	CFM_SLF-HD1 - DOOR HEIGHT		PΕ
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt (manual)	555 (or) 557	US26D	RO
1	Storeroom Lock	ML2057 NSA CT6R	626	RU
1	Removable Core	8020	630	RU
2	Door Closer	CPS7500	689	NO
1	Threshold	279x224AFGT MSES25SS		PΕ
1	Rain Guard	346C		PΕ
2	Sweep (w/drip edge)	3452CNB		PΕ
2	Switch	3287		SA

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Set: 10.0

Doors: EXC010

1	Continuous Hinge	CFMSLF-HD1 - DOOR HEIGHT		PE
1	Storeroom Lock	ML2057 NSA CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	CPS7500	689	NO
1	Threshold	279x224AFGT MSES25SS		PE
1	Rain Guard	346C		PE
1	Sweep (w/drip edge)	3452CNB		PE
1	Switch	3287		SA

Notes:

Perimeter/meeting stile seals by frame/door supplier.

Set: 11.0

Doors: B120A

2	Electric Hinge (heavy weight)	T4A3786-QC12	US26D	MK
4	Hinge (heavy weight)	T4A3786	US26D	MK
1	Removable Mullion	L980S	PC	SA
1	Rim Exit Device	LC 16 55 8810 ETL	US32D	SA
1	Access Control Rim Exit	LC 16 M1-8876-24V-IPS ETL	US32D	SA
1	Cylinder (rim)	3080 CT6R	630	RU
3	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
4	Removable Core	8020	630	RU
2	Door Closer	CLP7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Gasketing (head/jamb)	S88BL		PΕ
1	Gasketing (mullion)	5110BL		PΕ
2	Frame Harness	QC-C1500P		MK
2	Door Harness	QC-C LENGTH TO SUIT		MK

1	Switch	3287	SA
1	Power Supply	3520	SA

Notes:

Electronic Operation: Valid card unlocks outside lever or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 12.0

Doors: B120B

6	Electric Hinge (heavy weight)	T4A3786-QC12	US26D	MK
6	Hinge (heavy weight)	T4A3786	US26D	MK
1	Removable Mullion	L980S	PC	SA
2	Rim Exit Device	LC 16 55 8810 ETL	US32D	SA
2	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
2	Removable Core	8020	630	RU
2	Door Closer	CLP7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Gasketing (head/jamb)	S773BL		PΕ
1	Gasketing (mullion)	5110BL		PΕ
1	Frame Harness	QC-C1500P		MK
1	Door Harness	QC-C LENGTH TO SUIT		MK
1	Switch	3287		SA

Set: 13.0

Doors: A101, A102, A109, A110, A114, A115, A117, A118, A128, A129, A133, A134, A201, A202, A209, A210, A214, A215, A217, A218, A228, A229, A233, A234, B208, B209, B216, B217, B219, B220

3	Hinge	TA2714	US26D	MK
1	Rim Exit Device	LC LD 8804 ETL	US32D	SA
1	Cylinder (rim)	3080 CT6R	630	RU
1	Door Closer	R7500H (or) PR7500H	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S773BL		PΕ

Set: 13.1

Doors: C121

3	Hinge	TA2714	US26D	MK
1	Rim Exit Device	LC LD 8804 ETL	US32D	SA
1	Cylinder (rim)	3080 CT6R	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S88BL		PΕ

Set: 14.0

Doors: A116, A130, A216, A230, B218

6	Hinge (heavy weight)	T4A3786	US26D	MK
1	Removable Mullion	L980S	PC	SA
1	Rim Exit Device	LD 8810	US32D	SA
1	Rim Exit Device	LC LD 8804 ETL	US32D	SA
1	Cylinder (rim)	3080 CT6R	630	RU
1	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
2	Removable Core	8020	630	RU
2	Door Closer	R7500 (or) PR7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO
2	Electromagnetic Holder	998 24VDC	689	RF
1	Gasketing (head/jamb)	S88BL		PΕ
1	Gasketing (mullion)	5110BL		PΕ
1	Power Supply	BPS-24-1		RU

Notes:

Coordinate electromagnetic holder to be located on frame mullion with door at 180-degrees. Electromagnetic holders connected to remote release device (by security) for a lockdown event.

Set: 15.0

Doors: A-S1A, A-S1B, A-S2A, A-S2B, B-S1A

6	Hinge (heavy weight)	T4A3786	US26D	MK
1	Removable Mullion	12-L980	PC	SA
2	Rim Exit Device	12 8815 ETL	US32D	SA
2	Door Closer	PR7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO
2	Electromagnetic Holder	998 24VDC	689	RF
1	Gasketing (head/jamb)	S88BL		PE
1	Gasketing (mullion)	5110BL		PE
2	Astragal (split)	297AS		PE

Notes:

Connect holder to fire alarm system to release upon fire alarm.

Set: 16.0

Doors: B121A, C115A, C115B, C116A, C116B

6	Hinge (heavy weight)	T4A3786	US26D	MK
1	Removable Mullion	L980S	PC	SA
2	Rim Exit Device	LC 8816 ETL	US32D	SA
2	Cylinder (rim)	3080 CT6R	630	RU
3	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
5	Removable Core	8020	630	RU
2	Door Closer	R7500 (or) PR7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO

2	Door Stop	403 (or) 441CU	US26D RO
1	Gasketing (head/jamb)	S773BL	PE
1	Gasketing (mullion)	5110BL	PE

Set: 17.0

Doors: B121B

3	Hinge (heavy weight)	T4A3786	US26D MK
1	Rim Exit Device	LC 8816 ETL	US32D SA
1	Cylinder (rim)	3080 CT6R	630 RU
1	Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630 RU
2	Removable Core	8020	630 RU
1	Door Closer	R7500 (or) PR7500	689 NO
1	Kick Plate	K1050 10" HVBEV	US32D RO
1	Door Stop	403 (or) 441CU	US26D RO
1	Gasketing (head/jamb)	S773BL	PE

Set: 18.0

Doors: B124A, B124B, B128B

Continuous Hinge	HG315 - DOOR HEIGHT	630	MR
Removable Mullion	12-L980	PC	SA
Rim Exit Device	12 8810	US32D	SA
Rim Exit Device	LC 12 8804 ETL	US32D	SA
Cylinder (rim)	3080 CT6R	630	RU
Cylinder (mortise)	1080 CT6R - LENGTH/CAM TO SUIT	630	RU
Removable Core	8020	630	RU
Door Closer	PR7500	689	NO
Kick Plate	K1050 10" HVBEV	US32D	RO
Electromagnetic Holder	998 24VDC	689	RF
Gasketing (head/jamb)	S88BL		PΕ
Gasketing (mullion)	5110BL		PΕ
Astragal (split)	297AS		PΕ
	Rim Exit Device Rim Exit Device Cylinder (rim) Cylinder (mortise) Removable Core Door Closer Kick Plate Electromagnetic Holder Gasketing (head/jamb) Gasketing (mullion)	Removable Mullion 12-L980 Rim Exit Device 12 8810 Rim Exit Device LC 12 8804 ETL Cylinder (rim) 3080 CT6R Cylinder (mortise) 1080 CT6R - LENGTH/CAM TO SUIT Removable Core 8020 Door Closer PR7500 Kick Plate K1050 10" HVBEV Electromagnetic Holder 998 24VDC Gasketing (head/jamb) S88BL Gasketing (mullion) 5110BL	Removable Mullion 12-L980 PC Rim Exit Device 12 8810 US32D Rim Exit Device LC 12 8804 ETL US32D Cylinder (rim) 3080 CT6R 630 Cylinder (mortise) 1080 CT6R - LENGTH/CAM TO SUIT 630 Removable Core 8020 630 Door Closer PR7500 689 Kick Plate K1050 10" HVBEV US32D Electromagnetic Holder 998 24VDC 689 Gasketing (head/jamb) S88BL Gasketing (mullion) 5110BL

Notes:

Connect holder to fire alarm system to release upon fire alarm. Electromagnetic holders also connected to remote release device (by security) for a lockdown event.

Set: 19.0

Doors: A126, A226, B115A, B125

1	Electric Hinge (heavy weight)	T4A3786-QC12	US26D	MK
2	Hinge (heavy weight)	T4A3786	US26D	MK
1	Access Control Mort Lock	ML20606 x SELP10-SEC NSA R0_ CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO

1	Gasketing (head/jamb)	S88BL	PΕ
1	Frame Harness	QC-C1500P	MK
1	Door Harness	QC-C LENGTH TO SUIT	MK
1	Power Supply	BPS-24-1	RU

Notes:

Electronic Operation: Valid card (and intercom signal at B115A)l unlocks outside lever or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 20.0

Doors: C136

6	Hinge	TA2714	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt (manual)	555 (or) 557	US26D	RO
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO
2	Door Stop	403 (or) 441CU	US26D	RO
2	Silencer	608 (or) 609	GRY	RO

Set: 21.0

Doors: B215.1, C104

6	Hinge	TA2714	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt (manual)	555 (or) 557	US26D	RO
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
1	Surf Overhead Stop	10-X36	652	RF
1	Door Closer	CLP7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO
2	Silencer	608 (or) 609	GRY	RO

Set: 22.0

Doors: B102, B119

3	Hinge	TA2714	US26D	MK
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 23.0

Doors: A112, A119, A120, A120.1, A131, A132, A137, A212, A219, A222.1, A231, A232, A235, B123, B213

3	Hinge	TA2714	US26D	MK
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Notes:

Set: 24.0

Doors: C103

3	Hinge	TA2714	US26D	MK
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	CLP7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 25.0

Doors: B105, B108, B111, B112, B114, B122, C129

3	Hinge	TA2714	US26D	MK
1	Office Lock	CL3351 NZD CT6D	626	RU
1	Removable Core	8020	630	RU
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 26.0

Doors: B206, C112, C125

3	Hinge	TA2714	US26D	MK
1	Office Lock	CL3351 NZD CT6D	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S773BL		PΕ

Set: 27.0

Doors: B107, B109, B117A

3	Hinge	TA2714	US26D	MK
1	Passage Set	CL3310 NZD	626	RU
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 27.1

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3	Hinge	TA2714	US26D	MK
1	Passage Set	CL3310 NZD	626	RU
1	Door Stop	403 (or) 441CU	US26D	RO
1	Door Bottom	4301CRL		PE
3	Silencer	608 (or) 609	GRY	RO

Set: 28.0

Doors: B206.1, C110, C111, C128

3	Hinge	TA2714	US26D	MK
1	Classroom Lock	CL3355 NZD CT6D	626	RU
1	Removable Core	8020	630	RU
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 28.1

Doors: C133

3	Hinge	TA2714	US26D	MK
1	Classroom Lock	CL3355 NZD CT6D	626	RU
1	Removable Core	8020	630	RU
1	Door Stop	403 (or) 441CU	US26D	RO
1	Door Bottom	4301CRL		PE
3	Silencer	608 (or) 609	GRY	RO

Set: 29.0

Doors: C118

3	Hinge	TA2714	US26D	MK
1	Classroom Lock	CL3355 NZD CT6D	626	RU
1	Door Stop	403 (or) 441CU	US26D	RO
1	Threshold	166A MSES10SS		PΕ
1	Gasketing (head/jamb)	S773BL		PΕ
1	Sweep	315CN		PΕ

Set: 30.0

Doors: B113, B116, B207.1

3	Hinge	TA2714	US26D	MK
1	Classroom Lock	CL3355 NZD CT6D	626	RU
1	Removable Core	8020	630	RU
1	Surf Overhead Stop	10-X36	652	RF
3	Silencer	608 (or) 609	GRY	RO

Set: 31.0

Doors:	C113
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3	Hinge	TA2714	US26D	MK
1	Classroom Lock	CL3355 NZD CT6D	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S773BL		PΕ

Notes:

Set: 32.0

Doors: C117

3	Hinge	TA2714	US26D	MK
1	Classroom Lock	CL3355 NZD CT6D	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	R7500H (or) PR7500H	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Notes:

Set: 33.0

Doors: B103, B118, C127.1

3	Hinge	TA2714	US26D	MK
1	Privacy Set	CL3320 NZD	626	RU
1	Mop Plate	K1050 4" HVBEV	US32D	RO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 34.0

Doors: A111, A125, A211, A225, B214, C134

3	Hinge	TA2714	US26D	MK
1	Privacy Set	CL3320 NZD	626	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Mop Plate	K1050 4" HVBEV	US32D	RO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 35.0

Doors: C124

6	Hinge	TA2714	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt (manual)	555 (or) 557	US26D	RO
1	Deadbolt	DL4117 CT6	626	RU
1	Removable Core	8020	630	RU
2	Flush Pull (set)	94Px94L	US32D	RO
2	Surf Overhead Stop	10-X36	652	RF
2	Kick Plate	K1050 10" HVBEV	US32D	RO
2	Silencer	608 (or) 609	GRY	RO

Set: 36.0

Doors: C119B, C119C, C119D, C119E

2 Continuous Hinge	CFM_SLF-HD1 - DOOR HEIGHT	PE
2 Roller Latch	590	US26D RO
2 Flush Pull (set)	94Px94L	US32D RO
2 Silencer	608 (or) 609	GRY RO

Set: 37.0

Doors: C127

3	Hinge	TA2714	US26D	MK
1	Push Plate	70G (4 x 20)	US32D	RO
1	Door Pull	BF Y110 Mtg-Type 1	US32D	RO
1	Door Closer	R7500 (or) PR7500	689	NO
1	Mop Plate	K1050 4" HVBEV	US32D	RO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609	GRY	RO

Set: 38.0

Doors: C108

6	Hinge	TA2714	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt (manual)	555 (or) 557	US26D	RO
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
2	Door Stop	403 (or) 441CU	US26D	RO
1	Threshold	166A MSES10SS		PΕ
1	Gasketing (head/jamb)	S773BL		PΕ
2	Sweep	315CN		PΕ
2	Astragal (split)	297AS		PΕ

Set: 39.0

Doors: A103, A105, A106, A108, A121, A203, A204, A205, A206, A208, A222, B126, B127, B203, B210, C109

3	Hinge	TA2714	US26D	MK
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S773BL		PΕ

Set: 39.1

Doors: A104, B204, B207, B211

3	Hinge	TA2714	US26D	MK
1	Storeroom Lock	CL3357 NZD CT6R	626	RU
1	Removable Core	8020	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S773BL		PΕ

Set: 40.0

Doors: C107

3	Hinge	TA2714	US26D MK
1	Storeroom Lock	CL3357 NZD CT6R	626 RU
1	Removable Core	8020	630 RU
1	Door Stop	403 (or) 441CU	US26D RO
1	Threshold	166A MSES10SS	PE
1	Gasketing (head/jamb)	S773BL	PE
1	Sweep	315CN	PE

Set: 41.0

Doors: A113, A127, A213, A227, B101, B106A, B106B, B110, B115B, B117B, B129, B212, C126

3	Hinge (heavy weight)	T4A3786	US26D	MK
1	Classroom Intruder Lock	CL3352 NZD CT6D	626	RU
2	Removable Core	8020	630	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 10" HVBEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S773BL		PΕ

Notes:

Set: 42.0

Doors: C114

6	Hinge (heavy weight)	T4A3786	US26D	MK
2	Push Plate	70G (4 x 20)	US32D	RO
2	Door Closer	PR7500	689	NO
2	Kick Plate	K1050 10" HVBEV	US32D	RO
DOOR HARDWARE				- 28

THE NEW WHITEHALL	FLEMENTARY SCHOOL	- APPOQUINIMINK SCHOOL	DISTRICT - #162	1
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2 Door Stop2 Silencer	403 (or) 441CU 608 (or) 609	US26D RO GRY RO			
	<u>Set: 43.0</u>				
Doors: C101A, C101B					
 6 Hinge (heavy weight) 2 Push Plate 2 Door Pull 2 Door Closer 2 Kick Plate 2 Silencer 	T4A3786 70G (4 x 20) BF Y110 Mtg-Type 1 CLP7500T K1050 10" HVBEV 608 (or) 609	US26D MK US32D RO US32D RO 689 NO US32D RO GRY RO			
Doors: C123E	<u>Set: 44.0</u>				
1 Continuous Hinge 1 Classroom Lock 1 Removable Core 1 Door Closer 1 Mop Plate 1 Armor Plate 1 Door Stop 3 Silencer	HG305 - DOOR HEIGHT CL3355 NZD CT6D 8020 R7500H (or) PR7500H K1050 4" HVBEV K1050 34" HVBEV 403 (or) 441CU 608 (or) 609	630 MR 626 RU 630 RU 689 NO US32D RO US32D RO US32D RO US26D RO GRY RO			
Doors: C123A, C123D	<u>Set: 45.0</u>				
1 Continuous Hinge 1 Classroom Lock 1 Removable Core 1 Door Closer 1 Mop Plate 1 Armor Plate 3 Silencer	HG305 - DOOR HEIGHT CL3355 NZD CT6D 8020 CLP7500T K1050 4" HVBEV K1050 34" HVBEV 608 (or) 609	630 MR 626 RU 630 RU 689 NO US32D RO US32D RO GRY RO			
D 04TE 4 04TE 0	Set: 46.0				
Doors: GATE-1, GATE-2					
 Gate Lock Cylinder (mortise) Removable Core Door Pull Gate Closer Door Loop Electromechanical Bar Power Supply 	GL1-FSM 1080 CT6R - LENGTH/CAM TO SUIT 8020 BF Y110 Mtg-Type 1 1351 TSB-C WEMB-CL BPS-24-1	SU 630 RU 630 RU US32D RO 689 RF SU SU RU			

Notes: Balance of hardware by gate supplier. Connect power supply to fire alarm system.

Card reader by security integrator.

Electronic Operation: Valid card or key releases gate lock. Free egress at all times. In case of power loss or fire alarm, door remains unlocked and unlatched.

END OF SECTION 087100

SECTION 210171: FIRE PUMP - ELECTRIC

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

1.2 DESCRIPTION OF WORK

- A. This Section shall include all work necessary and/or required and furnish all materials and equipment for construction of a complete automatic fire pump system for the building. Such work includes but is not limited to the following:
 - 1. Furnish and install where shown on plans a vertical in-line Aurora Fire Pump System complete with pump, electric motor driver, controller and accessories. The pumping unit shall be listed by Underwriters' Laboratories, Inc. and/or shall be fully approved by the Associated Factory Mutual Fire Insurance Companies, where applicable. The pumping unit shall meet all requirements of the National Fire Protection Association Pamphlet No.20. The Fire Pump shall be designed to deliver 500 G.P.M. when operating at 50 PSIG. The pump shall also deliver not less than 150% of rated capacity at a pressure not less than 65% of rated pressure. The shut off pressure shall not exceed 140% of rated pressure. Minimum suction pressure at the fire pump suction flange is 46 PSIG. The pump shall operate at a maximum synchronous speed of 3500 R.P.M., and have a minimum case working pressure of 175 PSIG.
 - 2. Include all associated valves, piping and equipment so that the fire pump will function as a unit in compliance with NFPA 20. The fire pump piping arrangement will include a water supply bypass arrangement.
 - 3. Included in this section:

Fire Pump and Driver Package Electric Jockey Pump Related Controllers and Transfer Switch Fire Pump Accessories

1.3 REFERENCE STANDARDS

- A. Refer to Section 210000 for a general description of requirements applying to this section.
- B. NFPA 20: Installation of Centrifugal Fire Pumps.
- C. NFPA 70: National Electric Code
- D. UL: Fire Protection Equipment Directory.
- E. UL 448: Pumps for Fire Protection Service
- F. UL 1478: Fire Pump Relief Valves
- G. UL1004-5: Standard for Fire Pump Motors

1.4 QUALITY ASSURANCE

- A. Refer to Section 220010 and 210170 for a general description of requirements applying to this section.
- B. Contractor shall provide new and complete fire pump system in satisfactory operating condition which shall conform to requirements of the following:

- 1. NFPA Pamphlet 20
- 2. Delaware State Fire Marshal's Office
- 3. Owner's Insurance Agency
- C. Submit working drawings to the Fire Marshal's Office and obtain approval before beginning work.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit shop drawings with Fire Marshal's approval and descriptive data, complete with product designation for the following:
 - 1. Pump layout
 - 2. Associated piping and equipment
 - 3. Dimensional data
 - 4. Weights
 - 5. Clearances
 - 6. Method of assembly
- C. Submit complete pump layout indicating location of fire pump by dimensions from walls, pipe size, and locations of valves, and accessories, with Fire Marshal approval.
- D. Product Data: Provide manufacturer's literature including general assembly, pump curves showing performance characteristics with pump and system, operating point indicated, NPSH curve, controls, wiring diagrams, and service connections.
- E. Manufacturer's Installation Instruction: Include start-up instructions for the fire pump.
- F. Manufacturer's Certificate: Certify that fire pump meet or exceed specified requirements at specified operating conditions.
- G. Field Reports: Indicate summary of hydrostatic test and field acceptance tests performed in accordance with NFPA 20.

1.6 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include manufacturer's instructions, start-up data, and trouble-shooting checklists for pumps and controllers.
- B. Maintenance Data: Include manufacturer's literature, cleaning procedures, replacement parts lists, and repair data for pumps, drivers and controllers.

1.7 WARRANTY/GUARANTEE

A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Accept fire pumps and components at site in factory packing. Inspect for damage. Comply with manufacturer's rigging and installation instructions.
- B. Protect fire pump and components from physical damage, including effects of weather, water and construction debris.
- C. Provide temporary inlet and outlet caps, and maintain in place until installation.

1.9 MAINTENANCE SERVICE

- A. Furnish service and maintenance of fire pump, driver and controller for one year from date of substantial completion.
- B. Furnish service and maintenance of jockey pump, driver and controller for one year from date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with specification requirements, manufacturers offering fire pump system equipment shall be limited to the following:
 - 1. Centrifugal Pump (Main Pump)

Aurora (Basis of Design) Patterson Fairbanks AC Fire Pump

2. Controller

Firetrol Joslyn/Clark Tornatech (Basis of Design) Metron Eaton

3. Jockey Pump

Aurora (Basis of Design) Grundfos

B. Manufacturers identified above shall be selected for this project only as required from Owner's standardization list. No other manufacturers shall be permitted.

2.2 VERTICAL BASE MOUNTED INLINE PUMP

- A. The fire pump shall be Aurora 383 vertical inline mounted size 4-383-7C bronze fitted, single stage, centrifugal pump, or approved equal.
- B. The driver shall be a vertical, open drip-proof (or T.E.F.C.), ball bearing type, AC, induction, squirrel cage "P" face motor: 25 HP maximum, 3500 RPM vertical shaft wound for 480 volts, 3 phase, 60 (50) Hertz. The motor shall be of such capacity that 115% of the full-load ampere rating shall not be exceeded at any condition of pump load. Locked rotor current shall not exceed the values specified in NFPA Pamphlet No.20.
- C. The pump shall be fitted with Teflon lantern ring when the suction pressure is 30 psi or less.
- D. Casings shall be of cast iron having a minimum tensile strength of 35,000 P.S.I. Bearing housing supports, and suction and discharge flanges shall be integrally cast with the lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges.
- E. Impellers shall be of the enclosed type and shall be of vacuum cast bronze. Impellers shall be dynamically balanced, keyed to the shaft, and held in place with threaded shaft sleeves.

- F. The pump shaft shall be made of SAE 1045 Steel or equal, accurately machined to give a true running rotating element. Shaft shall be protected by bronze sleeves which are key locked and threaded so that the sleeves tighten with the rotation of the shaft. An o-ring shall seal between the impeller hub and the shaft sleeve to protect the pump shaft.
- G. Pump shall be equipped with renewable bronze casing rings so designed that hydraulic pressure will seat them against a shoulder in the pump case around the full periphery of the wearing ring. The wearing rings will be locked by dowelling to prevent rotation. The rotating element uses heavy duty grease lubricated ball bearings and shall be equipped with water slingers. Bearing housings shall be so designed to flush lubricant through the bearing. All pumps where the suction pressure is expected to average 40 P.S.I. or below, shall be provided with a lantern ring connected to the pressure side of the pump by a cored passage in the parting flange of the pump. Stuffing boxes shall be equipped with split bronze packing glands designed for easy removal for packing inspection and maintenance.

2.3 FIRE PUMP ACCESSORIES

- A. The fire pump unit shall include the following accessories, as required by NFPA standards (depending on the conditions under which the pumps are to be installed).
 - 1. OS&Y Gate valves with valve tamper switches (Butterfly valves with integral tamper switch may be used where permissible by code.)
 - Fire pump full size bypass fitted with OS&Y valves with tamper switches or butterfly valves with tamper switches and check valve.
 - 3. Flow metering device
 - 4. Eccentric tapered suction reducer
 - 5. Concentric tapered discharge increaser
 - 6. Discharge tee
 - 7. Base elbow
 - 8. Hose valves
 - 9. Caps and chains
 - 10. Hose valve header
 - 11. Blind flange
 - 12. Suction and discharge pressure gauges, 4-1/2" dia. dial with snubber, valve cock and lever handle.
 - 13. Circulation relief valve
 - 14. Automatic air release valve
 - 15. Splash shield (electric drive only)
 - 16. Balldrip valve
 - 17. Coupling guard

2.4 FIRE PUMP CONTROL EQUIPMENT FOR ELECTRIC DRIVE

A. The Fire Pump motor control shall be U.L. (Underwriters Laboratories) Listed and/ or F.M. (Factory Mutual) Approved, where applicable. It shall be completely assembled, wired and tested by the control

manufacturer before shipment from the factory, and shall be labeled "Fire Pump Controller." The controller shall be located as close as practical and within sight of the motor. The controller shall be so located or protected that it will not be injured by water escaping from the pump or connections. The controller shall be of the combined manual and automatic, across-the-line type, and shall be complete with:

- 1. Disconnect switch externally operable, quick-break type.
- 2. Circuit breaker time delay type with trips in all phases set for 300% of the motor full-load current. The interrupting capacity of circuit breaker shall be 100,000 asymmetrical amperes.
- 3. Motor starter across-the-line type capable of being energized automatically through the pressure switch or manually by means of an externally operable handle.
- 4. Pressure switch set to cut in at 10 p.s.i.g. below churn pressure and out at 120 p.s.i.g. churn pressure.
- 5. Running period timer set to keep motor in operation, when started automatically, for a minimum period of one minute for each 10 HP motor rating, but not to exceed 7 minutes.
- 6. Pilot lamp to indicate circuit breaker closed and power available.
- 7. Ammeter test link and voltmeter test studs.
- 8. Alarm relay to energize an audible or visible alarm through an independent source of power to indicate circuit breaker open or power failure.
- 9. Manual selection station a two position station shall be provided on the enclosure marked "Automatic" and "Non-automatic."
- 10. Means shall be provided on the Controller to operate an alarm signal continuously while the pump is running. Control equipment shall meet all requirements of NFPA No.20.
- 11. The following alarm and trouble conditions shall be remotely annunciated/monitored through the facilities fire alarm system:
 - a. Fire pump running.
 - b. Phase reversal-loss of phase
 - c. Controller main switch turned to OFF or manual position.
 - d. Controller power transfer switch position.
- B. Provide the controller with a U.L. (Underwriters Laboratories) Listed and F.M. (Factory Mutual) Approved automatic power transfer switch for fire pump service. The power transfer switch shall be of the same manufacturer of the controller, fully compatible with the fire pump controller. Alternate power to the switch shall be from the facilities emergency back-up power generator system and shall be complete with all the requirements in accordance with NFPA 20 for power transfer switches.
- 2.5 PRESSURE BOOSTER (JOCKEY) PUMP WITH CONTROL PANEL
 - A. The contractor shall furnish and install an Aurora PVM1-5 vertical multi-stage jockey pump to operate at 3450 rpm with a capacity of 5 gpm at a 60 psig boost to existing suction pressure. The pump shall be constructed with 304 stainless steel impellers and diffusers, a high temperature mechanical seal with carbon versus silicon carbide, EPDM elastometers throughout, tungsten carbide vs. ceramic pump bushings, and a cast iron motor bracket.
 - B. Unit shall be coupled with a 3450 rpm motor of ½ HP, 3 phase, 460 volt ODP enclosure using a rigid split coupling. Motor bearings shall be sized to allow a 20,000 minimum hour B10 calculated life.
 - C. The jockey pump control panel shall be NEMA 2, wall-mounted, and contain a fused disconnect switch, control transformer, magnetic across-the-line starter. H-O-A selector switch, overload relays,

and necessary circuitry to provide automatic start and stop from panel mounted pressure switch. Panel wired for 440-480 volts. Manufacturer to be identical to the main fire pump control panel manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all equipment, devices, etc., in strict accordance with manufacturer's instructions and code compliances.
- Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.
- C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For base-mounted pumps, provide supports under elbows on pump suction and discharge.
- D. Provide drains for bases and seals, piped to and discharging to the floor drain.
- E. Provide vibration isolators for the installation.
- F. Provide a fire pump test header with the number of nozzles and valves as required for the fire pump.
- G. Lubricate pumps before start-up, if required by manufacturer.
- H. Qualified manufacturer's representative shall check, align and certify pumps prior to start-up.

3.2 FIELD QUALITY CONTROL/TESTS

- A. The pump and electric motor shall be thoroughly shop-tested by the respective manufacturers as required by NFPA Pamphlet No.20. The control panel shall also be tested as a unit. All such tests shall be conducted prior to shipment.
- B. The pump, driver, controller and all accessories shall be purchased under a unit contract. The pump shall be given a complete performance test with POSITIVE SUCTION PRESSURE. A certified performance curve shall be prepared and submitted. Pumps shall also be hydrostatically tested to twice the shut off pressure, but in no case less than 250 lbs. per sq. inch.
- C. The pump manufacturer shall assume unit responsibility and shall provide the services a factory trained representative to supervise and/or be available to conduct final field acceptance tests.
- D. Perform field acceptance testing under the provisions of NFPA 20.
- E. Hydrostatically test the entire system and piping in accordance with NFPA 20.
- F. Tests shall be witnessed by Delaware State Fire Marshal, Owner's Representative, Fire Pump Representative, and the A/E Representative.

END OF SECTION 210171

SECTION 230450: REFRIGERATION EQUIPMENT - HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes labor, material, equipment and supervision to for the following:
 - 1. Scroll Compressor Water Chillers
 - 2. Fluid Cooler (Closed-Circuit Type)
 - 3. Ductless Split System Heat Pump Units
 - 4. Refrigerant Gas Detection System
- B. Provide complete refrigeration system including chillers, cooling towers, aboveground piping and all required accessories.

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Comply with applicable provisions of:
 - 1. International Mechanical Code
 - 2. ASME Codes for Pressure Vessels
 - 3. A.R.I. Capacity Ratings
 - 4. NFPA Pamphlets
 - 5. ASHRAE Standard 15
 - 6. ASHRAE Standard 90.1, Section 6, Table 6.8.1A thru J, minimum equipment efficiency.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGRTM Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.
- C. Verification of Fluid Cooler Performance:
 - Manufacturer shall have a thermal performance testing program for water cooling towers certified by the Cooling Technology Institute (CTI) in accordance with CTI Specification Standard STD-201. Manufacturer's performance guarantees or performance bonds shall also be accepted.
 - 2. Unit Sound Performance ratings shall tested and certified according to CTI ATC-128 standard. Sound ratings shall not exceed specified ratings.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
 - 1. Shop drawings and product data for all equipment in this section.
 - 2. 1/4" = 1'-0" scale layout of all equipment in Mechanical Room and adjoining tower enclosure.

1.6 SUBSTITUTIONS

A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements. In addition, the following special guarantee applies:
 - 1. Manufacturer shall guarantee all refrigeration equipment including parts, for five (5) years from start-up.

PART 2 - PRODUCTS

2.1 SCROLL COMPRESSOR WATER CHILLERS

- A. General: Install as shown on the schedules and plans, factory assembled, charged, and tested water-cooled scroll compressor chiller as specified herein. Chiller shall be designer, selecered, and construct using a refrigerant with flammability rating of "1", as defined by ANSI/ASHRAE STANDARD-34 Number Designation and Safety Classification of Refrigerants. Chiller shall include, but is not limited to: a complete system with not less than two refrigerant circuits, scroll compressors, direct expansion type evaporator, water-cooled condenser, refrigerant, lubrication system, interconnecting wiring, safety and operating controls including capacity controller, control center, motor starting components, and special features as specified herein or required for safe, automatic operation.
- B. Compressors shall be hermetic, scroll-type, including:
 - 1. Compliant design for axial and radial sealing
 - 2. Refrigerant flow through the compressor with 100% suction cooled motor.
 - 3. Large suction side free volume and oil sump to provide liquid handling capability.
 - 4. Compressor crankcase heaters to provide extra liquid migration protection.
 - 5. Annular discharge check valve and reverse vent assembly to provide low pressure drop, silentshutdown and reverse rotation protection.
 - 6. Initial Oil charge
 - 7. Oil level sightglass
 - 8. Vibration isolator mounts for compressors.
 - 9. Brazed-type connections for fully hermetic refrigerant circuits.
 - 10. Microprocessor controlled, factory installed across-the-line type compressor motor starters.
- C. Each refrigerant circuit shall include: liquid line shutoff valve with charging port, low side pressure relief device, filter-drier, solenoid valve, discharge service valve, system high pressure relief device, sight glass with moisture indicator, expansion valves, and flexible, closed-cell foam insulated suction line.

D. Evaporator

- 1. Evaporator shall be a direct expansion shall and tune construction, dual circuit heat exchanger capable of refrigerant working pressure of 400 PSIG and liquid side pressure of 150 PSIG.
- Evaporator shall be covered with ¾", flexible, closed-cell insulation, thermal conductivity of 0.26 (BTU/HR-Ft2-°F/in.) maximum. Water nozzles shall be insulated by Contractor after pipe installation.
- 3. Heat exchangers shall be ASME pressure vessel code certified.
- 4. Installing contractor must include accommodations in the chilled water piping to allow proper drainage and venting of the heat exchanger.
- The water connections shall be fully accessible and grooved to accept ANSI/AWWA C-606 couplings.

E. Condenser

- Condenser shall be a cleanable thru-table construction with removable heads and integral subcooling. Heat exchanger shall be capable of a refrigerant side working pressure of 560 PSIG and liquid side pressure of 150 PSIG.
- 2. The condenser shall be equipped with relief valves and be capable of holding the full refrigerant charge for pumpdown.
- The water connections shall be fully accessible and grooved to accept ANSI/AWWA C-606 couplings.

F. Controls

- 1. General: Automatic start, stop, operating, and protection sequences across the range of scheduled conditions and transients.
- 2. Microprocessor Enclosure: NEMA 1 (IP32) powder painted steel cabinet with hinged, latched, and gasket sealed door.
- 3. Microprocessor Control Center:
 - a. Automatic control of compressor start/stop, anti-coincidence and anti-recycle timers, automatic pumpdown on shutdown, evaporator pump, and unit alarm contacts. Automatic reset to normal chiller operation after power failure.
 - b. Remote water temperature reset via a Pulse Width Modulated (PWM) input signal or up to two steps of demand (load) limiting.
 - c. Software stored in non-volatile memory, with programmed setpoints retained in lithium battery backed regulated time clock (RTC) memory for minimum 5 years.
 - d. Forty-character liquid crystal display, numeric data in English units. Sealed keypad with sections for setpoints, display, print, entry, unit options and clock, and On/Off switch. Display descriptions and membrane keypad graphics shown in English language.
 - e. Programmable setpoints (within Manufacturer limits): Display language; chilled liquid temperature setpoint and range, remote reset temperature range, set daily schedule/holiday for start/stop, manual override for servicing, number for compressors, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout, anti-recycle timer (compressor start cycle time), and anti-coincident timer (delay compressor starts).
 - f. Display Data: Return and leaving evaporator liquid temperatures, low leaving liquid

temperature cutout setting, English data, suction pressure cutout setting, each system suction pressure, discharge pressure, liquid temperature reset via a 0-20 VDC input, 2-10 VDC input or a 0-20mA input contact closure, anti-recycle timer status for each compressor, anti-coincident system start timer condition, compressor run status, no cooling load condition, day, date, and time, daily start/stop times, holiday status, automatic or manual system lead/lag control, lead system definition, compressor starts/operating hours (each), status of hot gas valves (if supplied), run permissive status, number of compressors running, liquid solenoid valve status, load & unload timer status, water pump status.

- g. System Safeties: Shall cause individual compressor systems to perform auto shut down; manual reset required after the third trip in 90 minutes. Includes: high discharge pressure, low suction pressure, high pressure switch, and motor protector. Compressor motor protector shall protect against damage due to high input current or thermal overload of windings.
- h. Unit Safeties: Shall be automatic reset and cause compressors to shut down if low ambient, low leaving chilled liquid temperature, under voltage, and flow switch operation. Contractor shall provide flow switch installation and wiring per chiller manufacturer requirements.
- i. Alarm Contacts: Low ambient, low leaving chilled liquid temperature, low voltage, low battery, and (per compressor circuit): high discharge pressure, and low suction pressure.
- j. BAS/EMS Temperature Reset: Chiller to accept 4 to 20mA, 0 to 10 VDC, or discrete contact closure input to reset the leaving chilled liquid temperature.
- 4. Pressure Transducers and Readout Capability
 - a. Discharge Pressure Transducers: Permits unit to sense and display discharge pressure.
 - b. Suction Pressure Transducers: Permits unit to sense and display suction pressure.
- 5. Manufacturer shall provide any controls not listed above, necessary for automatic chiller operation. Mechanical Contractor shall provide field control wiring necessary to interface sensors to the chiller control system.

G. Power Panels:

- NEMA 1 (IP32), powder painted steel cabinets with hinged, latched, and gasket sealed outer doors. Provide main power connection(s), control power connections, compressor start contactors, current overloads, and factory wiring.
- 2. Power supply shall enter unit at a single location, be 3-phase of scheduled voltage, and connect to individual terminal blocks per compressor. Separate disconnecting means and/or external branch circuit protection (by Contractor) required per applicable local or national codes.
- H. Exposed compressor and control power wiring shall be routed through liquid tight conduit.
- I. Power Supply Connection shall be:
 - 1. Single Point Power Supply: Single point Terminal Block for field connection and interconnecting wiring to the compressors. Separate external protection must be supplied, by others, in the incoming power wiring, which must comply with the National Electric Code and/or local codes.
 - 2. Single Point Disconnect Switch: Single Point Non-Fused Disconnect and lockable external handle (in compliance with Article 440-14 of N.E.C.) can be supplied to isolate the unit power voltage for servicing. Separate external fusing must be supplied, by others, in the incoming power wiring, which much comply with the National Electric Code and/or local codes.
 - 3. Control Power Transformer (Factory Mounted): Converts unit power voltage to 120-1-60 (500 VA capacity). Factory mounting includes primary and secondary wiring between the transformer and the control panel.

- 4. Differential Pressure Switch (Field Mounted): 3-45 PSIG (0.2-3 bar) range with 1/4" NPTE pressure connections. Provide with evaporator.
- 5. Standard (3/4") insulation. Water nozzles shall be insulated by Contractor after pipe installation.
- 6. ANSI/AWWA C-606 Flange Kit (Field Mounted): ANSI/AWWA C-606 flange adapters included with the water connections on the evaporator and condenser providing raised face flanges for field piping connection.
- 7. Service Isolation Valves (Factory-Mounted): Service suction (ball type) isolation valves are added to unit per circuit in addition to the standard discharge service valve (Factory-mounted)
- 8. Hot Gas By-Pass (Factory Mounted): Permits continuous, stable operation at capacities below the minimum step of unloading to as low as 5% capacity (depending on both the unit and operating conditions) by introducing an artificial load on the evaporator. Hot gas by-pass is installed on only one refrigerant circuit (System #2).
- 9. Sound Reduction (Factory-Mounted)
 - a. Each compressor is individually enclosed in anacoustic sound blankets.
- 10. Vibration Isolation (Field-Mounted)
 - a. One-inch spring isolators, level adjustable, spring and cage type for mounting under the unit base.
- J. Manufacturers: Carrier, McQuay, Trane, York.
 - Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

2.2 FLUID COOLER (CLOSED-CIRCUIT TYPE) – INDUCED DRAFT

- A. Manufacturers: Subject to compliance with requirements, provide closed circuit coolers manufactured by one of the following:
 - EVAPCO Model ATWB
 - BAC Series HXV Hybrid Closed Circuit Cooler
- B. The unit structure shall be designed, analyzed, and constructed in accordance with the latest edition of International Building Code (IBC) Regulations for seismic loads up to 1.0 g or wind loads up to 145 psf

C. Components

- 1. Description: Factory assembled and tested, induced draft counter flow closed circuit cooler complete with fan, coil, fill, louvers, accessories and rigging supports. Unit shall be a maximum of 14 feet high.
- 2. All cold-water basin components including water re-distribution basin, vertical supports, air inlet louver frames and panels up to rigging seam shall be constructed of Type 316 Stainless Steel. "Series 300" Stainless Steel will not be acceptable as equivalent to Type 316 Stainless Steel.
- 3. Upper Casing, channels and angle supports shall be constructed of heavy gauge mill hot-dip galvanized steel. Fan cowl and guard shall be constructed of galvanized steel. All galvanized steel shall be coated with a minimum of 2.35 ounces of zinc per square foot area (G-235 designation). During fabrication, all galvanized steel panel edges shall be coated with a 95% pure zinc-rich compound.

D. Fan(s):

1. Shall be high efficiency axial propeller type with aluminum wide chord blade construction. Each fan shall be statically balanced and installed in a closely fitted cowl with venturi air inlet for maximum fan efficiency.

E. Drift Eliminators

1. The eliminators shall be constructed entirely of Polyvinyl Chloride (PVC) in easily handled sections. Design shall incorporate three changes in air direction and limit the water carryover to a maximum of 0.001% of the recirculating water rate.

F. Water Distribution System

 Spray nozzles shall be precision molded ABS, large orifice spray nozzles utilizing fluidic technology for superior water distribution over the fill media and to minimize water distribution system maintenance. Spray header, branches, and riser shall be Schedule 40 Polyvinyl Chloride (PVC) for corrosion resistance. Branches shall have threaded end caps to facilitate debris removal.

G. Heat Transfer Media

- 1. Heat transfer coil shall be elliptical tubes of prime surface steel, encased in steel framework with entire assembly hot-dip galvanized after fabrication. The coil assembly shall be designed with sloping tubes for liquid drainage and tested to 400psig air under water. Coil shall meet strength requirements of ASME/ANSI B31.5.
- Fill media shall be constructed of Polyvinyl Chloride (PVC) of cross-fluted design and suitable for inlet water temperatures up to 130 F. The bonded block fill shall be bottom supported and suitable as an internal working platform. Fill shall be self-extinguishing, have a flame spread of 5 under A.S.T.M. designation E-84-81a, and shall be resistant to rot, decay and biological attack.

H. Pump

Unit shall have an EISA compliant, close-coupled centrifugal pump with mechanical seal. The
pump shall be installed in a vertical position so that water will drain from the pump when the coldwater basin is emptied. Pump motor shall be totally enclosed with protective canopy for outdoor
operation.

Bleed-off

1. Unit shall have a waste water bleed line with adjustable valve provided.

J. Air Inlet Louvers

 The air inlet louvers shall be constructed from UV inhibited polyvinyl chloride (PVC) and incorporate a framed interlocking design that allows for easy removal of louvers for access to the entire basin area for maintenance. The louvers shall have a minimum of two changes in air direction and shall be of a non-planar design to prevent splash-out, block direct sunlight and debris from entering the basin.

K. Electronic Water Level Control

1. Electronic water level control package shall have five (5) stainless steel water level sensors (one (1) high level, one (1) high level alarm, one (1) low level, one (1) low level alarm and one (1) ground) with a NEMA 4X enclosure mounted in a cleanable Schedule 40 PVC external standpipe with slow closing solenoid valve(s) and "y" strainer(s). Wiring is not included and components must be field mounted. Valves shall be sized for 25 psig (172 kPa) minimum to 125 psig (862 kPa) maximum pressure. Standpipe may require heat tracing by others in cold weather applications.

L. Pan Strainer

 Pan Strainer shall be all type 304 stainless steel construction with large area removable perforated screens.

M. Fan Motor

1. Fan motor(s) shall be totally enclosed, ball bearing type electric motor(s) suitable for moist air service. Motor(s) are Premium Efficient, Class F insulated, 1.15 service factor design. Inverter rated per NEMA MG1 Part 31.4.4.2 and suitable for variable torque applications and constant torque speed range with properly sized and adjusted variable frequency drives.

N. Fan Drive

 The fan drive shall be multigroove, solid back V-belt type with taper lock bushings designed for 150% of the motor nameplate horsepower. The belt material shall be neoprene reinforced with polyester cord and specifically designed for evaporative equipment service. Fan and motor sheave shall be aluminum alloy construction. Belt adjustment shall be accomplished from the exterior of the unit.

O. Fan Shaft

1. Shaft shall be Solid, ground and polished steel. Exposed surface coated with rust preventative.

P. Fan Shaft Bearings

1. Fan Shaft Bearings shall be heavy-duty, self-aligning ball type bearings with extended lubrication lines to grease fittings located on access door frame. Bearings shall be designed for a minimum L-10 life of 75,000 hours.

Q. Maintenance Access

- 1. Fan Section: Access door shall be hinged and located in the upper casing for fan drive and water distribution system access.
- 2. Basin Section: Framed removable louver panels shall be on all four sides of the unit for pan and sump access.
- Internal Working Platform: Internal working platform shall provide for easy access to the fans, belts, motor, sheaves, bearings, all mechanical equipment and complete water distribution system. The fill shall be an acceptable means of accessing these components.
- 4. External Service Platform with Ladder: An OSHA approved external service platform shall be provided at the motor access door of the tower extending the full length of the of the access door. Each platform shall have at least a 36" walking surface. The platforms shall be galvanized steel grating, supported by galvanized steel framework attached to the tower and surrounded by a sturdy handrail, knee rail and kick plate system. Mounting channels shall be the same material as the casing section. A vertical ladder shall be provided from the base of the unit to the platform.
- 5. Motor Davit with Base: Unit shall be provided with mechanical jib-boom assembly which facilitates in removal of larger fan section components. Davit arm shall be constructed of aluminum and base shall be galvanized steel.

R. Accessories

1. Basin Heater Package: Cold water basin shall be fitted with copper-element, electric immersion heater(s) with a separate thermostat and low water protection device. Heaters selected to maintain +40 F pan water at 0 F ambient temperature.

- Sump Sweeper Piping: Cold water basin shall be fitted with schedule 80 PVC sump sweeper piping complete with high-flow eductor nozzles to facilitate in basin cleaning. The system shall contain one inlet connection and one outlet connection per basin.
- S. Evaporative Cooling Water Treatment System Factory Mounted
 - 1. Description
 - a. Work Includes:
 - (1) Furnish all labor, materials, tools, equipment and services for spray water treatment system as indicated, in accordance with provisions of the contract documents.
 - (2) Completely coordinate with work of all other trades.
 - (3) See Division 1 for General Requirements.
 - (4) Services of manufacturer's representative company to provide automatically controlled water treatment programs and equipment as specified herein.
 - (5) Provide chemical treatment and supervision for the spray water treatment program, together with the necessary chemicals, designed to minimize corrosion, scale formation and biological growth in the following mechanical systems:
 - (a) Fluid Cooler Spray Riser Piping System
 - b. Description of System:
 - (1) Riser mounted, scale and corrosion inhibitor feeder by equipment manufacturer.
 - (2) Unit mounted Bio-Control Feeder by equipment manufacturer.
 - (3) Solid, controlled release chemicals as specified below.
 - (4) Factory mounted (by equipment manufacturer) conductivity controller and bleed valve as specified below. System shall be self-draining.

2. Submittals

- a. Submit per the requirements Division 1.
- b. Shop drawings: Show all water treatment equipment, including the following:
 - (1) Piping diagrams of all factory mounted components (show all field piping required, if any).
 - (2) Conductivity control panel and wiring diagrams (show all field wiring required). Include bill of materials showing model number, manufacturer, physical layout drawings, panel and equipment catalog cuts.
- c. Operation and maintenance manuals: Include testing procedures for each of the treated systems.
- d. List of chemicals and methods to be used for each system: Use generic names. Provide Material Safety Data Sheets (MSDS) for each chemical used.
- e. Laboratory make-up water sample analyses: Submit a copy of the project site make-up water analysis to document the water quality available at the project site. Make-up water test analysis to include at a minimum the analysis of the following compositions of the water:

- Calcium Hardness (as ppm CaCO3)
- Total Hardness (as ppm CaCO3)
- Total Alkalinity or m-Alkalinity (as ppm CaCO3)
- nH
- Silica (as SiO2)
- Specific Conductivity (micro S/cm)
- Sulfate (as SO4)
- Chloride (as Cl-)
- Phosphate (as PO4)

3. Quality Assurance

- a. The water treatment supplier shall:
 - Obtain water samples from the site and furnish a laboratory analysis of the water supply with submittal.
 - (2) Review the make-up water analysis to ensure compatibility with the water treatment program.
 - (3) Propose water treatment methods and appropriate chemicals required to minimize scale, corrosion and biological growth. Submit all of the above with shop drawings and other required submittals.
- b. Methods and chemicals selected shall comply with all the requirements of the American Public Health Association (APHA), the Environmental Protection Agency (EPA) and local environmental agencies.

4. Performance Criteria

- a. Maintain the following conditions listed below in the water systems:
 - (1) Conductivity range of 300 to 5,000 micro S/cm.
 - (2) pH range of 6.5 to 9.0.
 - (3) Local environmental regulations may dictate the highest pH permitted for blowdown. The conductivity setting can be adjusted up or down to change the pH by the balancing of fresh make-up water.
 - (4) Total bacteria count (TBC) of less than 10,000 CFU's/ml.
 - (5) Keep condenser water system scale free and corrosion to levels acceptable by AWT guidelines.
- b. Passivation for Galvanized Steel: For the first 60 days of new equipment operation.
 - (1) Calcium Carbonate Hardness: Maintain a minimum value of 50 PPM or more
 - (2) M. Alkalinity: Maintain a maximum value of 300 PPM or less
 - (3) pH: Maintain a value which will minimize the formation of White Rust in combination with the passivation treatment chemistry. In no instance shall pH be permitted to fall below 6.5

4. Water Treatment System

- a. Acceptable Products:
 - (1) Chemical Feed & Control Equipment

- (a) Factory mounted inhibitor feeder
- (b) Factory mounted biocide feeder
- (c) Factory mounted conductivity controller, motorized bleed valve and torodial probe

b. Chemicals

- (1) Chromates, zinc, or any liquid chemicals shall not be used.
- (2) Scale and corrosion inhibitors shall be non-toxic to humans and animals for the intended use and for general storage and handling as required by the application.
- (3) Phosphates are allowed as permitted by EPA and local authorities.
- (4) Scale and corrosion inhibitors will be solid dry product with time released polymer coating for safe handling and easy reloading.
- (5) The automatic chemical feed equipment shall operate and feed chemicals into each system only when the system is operating.
- (6) Biocides shall be dry products fed thru factory mounted feeders and reloaded such that handling of the dry chemistry directly is not required.

c. Spray Water System:

- (1) Chemical feeding and control equipment condenser system: Provide the following apparatus (including all factory piping and wiring).
 - (a) One (1) factory mounted assembly for controlling conductivity and providing automatic chemical treatment to the condenser water systems. The assembly system shall have the following features and capabilities:

Conductivity monitor: Shall provide linear, temperature compensated measurements directly in micromhos over full scale. There will be a range of measurement provided, 100 to 3,000 micromhos. Conductivity measurement will be displayed on a LED display. Controller will have a USB port for downloading 60 days of operating data. USB port shall be used for retrieving operational frequency of bleed valve, output contact, make-up/bleed metering over a 60-day period.

- Inhibitor feed: Inhibitor chemical will be fed directly from the unit riser pipe. A solid chemistry inhibitor shall be used with time released control mechanism. No pumps, timers or liquids shall be accepted.
- ii. Biocide feed: Biocide chemical feeds will be controlled by a factory mounted feeder. Solid biocide will be fed directly into the recirculating stream. No pumps, timers or liquids shall be accepted.
- iii. Basis of design Evapco Smart Shield feeders and controller.
- (b) The conductivity monitor, chemical feeders and sample stream piping assembly shall be mounted on the closed-circuit cooler or evaporative condenser. All components of the package system shall be pre-plumbed and pre-wired to form an operational and ready to install system. The package system shall consist of the following:
 - i. One (1) sample stream piping assembly consisting of:
 - Two (2) ¾-inch inlet/outlet shut-off valves.
 - One (1) conductivity probe of PVC construction, with a temperature compensating torodial probe mounted in the sample stream.

- ii. One (1) pre-piped bleed-off piping assembly consisting of inlet shut-off valve, sample valve, throttling valve and motorized ball valve. Bleed-off piping assembly shall be sized to provide the proper bleed-off rate of the system. Bleed piping and controller should prevent the feed of biocide during the bleed cycle.
- iii. One (1) factory mounted solid chemical inhibitor feeder, shall be provided for feed of the scale and corrosion inhibitor. Feed rate shall be adjustable based on a multiple chamber feeder arrangement.
- iv. One (1) factory mounted solid biocide chemical feeder, shall be provided for feed of the biocide. Feeder shall be completely factory mounted for easy commissioning and refill.
- (2) Water treatment chemicals condenser system: Furnish 1-year supply of the recommended products for control of scale and corrosion in the open recirculating system. Additionally, furnish a 1- year supply of biocide for prevention of microbiological growth in the same system. The one-year supply of chemistry shall be calculated based on the most efficient cycles of concentration the make-up water quality will allow. Biocide products recommended shall be properly registered with the Environmental Protection Agency and EPA registration number shall be clearly shown on all product literature and package labels. To ensure operator safety, all chemical products shall be provided in dry form for direct addition from shipping container to factory mounted feeders.
- d. Testing equipment: Furnish basic water test equipment for maintaining control of program standards in the condenser water systems. Test kits will include the following:
 - (1) Reagents and apparatus for determination of corrosion inhibitor level in the condenser water systems.
 - (2) Reagents and apparatus for determination of pH, total alkalinity, free and total chlorine, and calcium hardness.
 - (3) Apparatus for determination of microbiological colony population and biocide effectiveness.

2.3 DUCTLESS SPLIT SYSTEM HEAT PUMP UNIT

- A. Air conditioning system shall be a ductless split system heat pump. The system shall consist of a compact ceiling-mounted packaged evaporator section and matching outdoor air-cooled condensing unit. The units shall be listed by and bear the ETL label. All wiring should be in accordance with the National Electrical Code (N.E.C.). The units shall be rated in accordance with ARI Standard 240 and bear the ARI label. A full charge of refrigerant for 100 feet of refrigerant tubing shall be provided in the condensing unit. A dry nitrogen holding charge shall be provided in the evaporator. System SEER shall meet or exceed 1992 Federal Standards.
- B. The indoor unit shall be factory assembled and wired. The casing fascia shall have a white or gray finish. The evaporator fan shall be an assembly with line flow fans direct driven by a single motor. The supply fan motor shall be multi-speed, permanent-split capacitor type with thermal overload protection and sealed, lifetime bearing. The fan shall be backward curved, centrifugal design, statically and dynamically balanced and run on permanently lubricated bearings. An adjustable guide vane shall be provided with the ability to change the air flow from horizontal to vertical. A motorized air sweep flow louver shall provide an automatic change in air flow by directing the air from side to side for uniform air distribution. Return air shall be filtered by means of an easily removable washable filter.
- C. The evaporator coil shall be nonferrous construction with smooth plate fins bonded to copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phoscopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan

and drain shall be provided under the coil. The unit shall be furnished with integral condensate pump with 27" minimum lift, factory mounted and wired.

- D. The unit shall be constructed from galvanized steel that is insulated internally and externally with fireresistant acoustic insulation.
- E. The control system shall be microprocessor based. The wall-mounted remote-control enclosure shall include an LCD display providing a continuous display of operating status and condition. A keypad for setpoint/program control, unit ON/OFF, and fan speed shall be located below the display.
 - 1. The auto restart feature shall automatically restart after a power failure.
 - 2. The control shall have temperature control setpoint for cooling function with a minimum 2 deg. F differential. The temperature control setpoint range shall be 60 deg. F to 85 deg. F.
 - 3. The LCD display shall provide an ON/OFF indication, fan speed indication, operating mode indication (cooling, dehumidifying) and current day, time, temperature and humidity (if applicable) indication.
 - 4. Provide BACNet interface to accommodate remote monitoring and adjustment of temperature setpoint.

F. Direct Expansion System Components:

- 1. The evaporative coil shall be constructed of copper tubes and aluminum fins. The coil shall be provided with a drain pan.
- 2. The refrigeration system shall consist of a hermetic compressor, pressure safety switches, externally equalized expansion valve, and a refrigerant sight glass and moisture indicator.
- 3. Low ambient control will allow cooling to 0 deg. F outdoor temperature.
- G. Remote Air-Cooled Condenser: The condenser coil shall be constructed of copper tubes and aluminum fins, and a direct-drive centrifugal fan. No piping, brazing, dehydration or charging shall be required. Condenser electrical connection shall be by a factory wired plug. Fan shall be sized to provide full rated cooling capacity at 95 deg. F entering air. Provide wire guards on condenser coil and fan discharge.

H. Features:

- 1. Branch duct knockouts on the sides of the chassis for remote discharge of supply air.
- 2. Fresh air inlet knockout for connection of ventilation air directly into the unit without the need for an inline booster fan. If the length of ductwork exceeds ten feet, provide a booster fan as scheduled on the drawings.
- 3. Condensate system shall contain a float switch to automatically shut down the cooling operation if the condensate level reaches an overflow condition.
- I. Factory installed controls shall include connections for 24-volt, hard-wired, wall-mounted thermostat, control board featuring anti-short cycle timer, 60 second post purge fan relay, and relays and connectors for condensing unit control. Provide wall-mounted solid-state thermostat for field mounting and wiring to the indoor unit; the thermostat shall be capable of one-stage cooling, one-stage heating with manual changeover, as scheduled on the drawings.
- J. Manufacturers: Airdale, Carrier, Daikin McQuay, EMI, Hitachi, LG HVAC, Mitsubishi Electric, Panasonic, Sanyo Air Conditioning Products.
 - 1. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but

not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

2.4 REFRIGERANT GAS DETECTION SYSTEM

- A. Refrigerant gas detection system supplier/installer shall be familiar with standard practices of safety and installation for refrigerant gas vapor detection systems and shall provide these systems as a normal course of business. Acceptable gas detection supplier shall provide a list of the last five (5) similar projects.
- B. System shall meet or exceed the latest ASHRAE 15 requirement and EPA standard 608CFR. System shall incorporate all latest revisions.
- C. System shall be capable of detecting presence of CFC, HCFC, or HFC refrigerant based on actual approved and installed chiller. System shall be capable of indicating, alarming and shutting down equipment as specified in this section and in governing regulations. Oxygen deficiency monitoring shall not be acceptable in lieu of TLV-TWA monitoring for human safety exposure.
- D. Sequential sampling and multi-point monitoring shall be employed where air flow currents and room size prohibit a representative sample from one sensing point. Diluted samples due to ventilation air flow currents shall employ multi-point monitoring techniques strategically located according to regulation guidelines.
- E. System design considerations shall also be incorporated in leak detection monitoring sensing location(s), for early warning indication to prevent a major loss of refrigerant without alarm, should a leak occur.
- F. Analyzer shall be microprocessor-based and employ infrared (IR) sensor technology. It shall accurately provide sensing down to one part per million (ppm) and shall be compound specific and monitor compound as specified and be calibrated for refrigerant as required by approved chiller. Any installed unit can be switched to monitor, at a future date, to another refrigerant type by changing one part and recalibrating. Adjustable three level alarm for each point shall be supplied with common alarm output contacts. Provide local digital indication of ppm level for four sample points. Alarms shall be identified by an alarm message indicating the point in alarm and the alarm level. Unit shall have self-diagnostics, and supply a common malfunction output for alarm horn-beacon. Loss of sample flow at either sample or ZERO line will indicate system malfunction.
- G. Four-point sequential sampling system shall be integrated into one analyzer enclosure. Microprocessor shall sequentially control required flow valves and communicated output signals to allow monitoring from multiple remote sampling locations. Unit shall read and hold output value of infrared sensor and control the corresponding four-point sequential sampling assembly. Each sampling point shall have adjustable sampling time and adjustable levels of alarm. Sample line capability up to 500 ft. The system shall have add-on sample point expansion capability for future expansion.
- H. The system shall monitor and display accurately within the range of 0 to 25 ppm for refrigerant system and chiller diagnostics, detecting low level refrigerant leaks and deterioration of system efficiency.
- I. Provide NEMA-rated wall mount enclosure with dust-tight door seal. Auto zero calibration shall be initiated at one-hour interval (adjustable) or manually at the monitor and shall automatically zero by drawing air from an uncontaminated air source. Include built-in sample pump and differential pressure flow switch for low flow indication. Provide four separate 4-20 mA dc analog outputs and one RS-485 output of refrigerant level(s). Unit shall be insensitive to vibration and shall provide for a continuous sample. Response time shall be twenty (20) seconds or less to ninety-nine (99%) percent of reading. Malfunction relay shall be energized due to flow loss or electrical malfunction.

- J. The system shall be configured to provide relay board, with dry contacts for each channel, to initiate output signal for three level alarms at local panel, interface with both the Building ADT Security System and the Room Ventilation System. An early leak warning alarm shall be set at 10 ppm, regardless of refrigerant type, to prevent large refrigerant loss and provide chiller diagnostics. Other alarm level shall be set at or below the TLV-TWA level of 1000 ppm, R-410A.
 - At the TLV-TWA level, the system shall activate the purge ventilation system and sound a refrigerant leak alarm. Malfunction alarm indication and horn shall be provided. Provide dry alarm contacts for each alarm level.
- K. Installation: Unit shall be factory calibrated. Field calibration is unacceptable at time of installation.
- L. Maintenance & Calibration: No calibration shall be required for a period of one (1) year from date of installation. Zero filter and end of line filters shall be replaced every six months or sooner, based on usage.
- M. Manufacturers: General Analysis Corporation, Gensis International, Inc., Yokagawa Corporation, Thermal Gas Systems, Inc., MSA Co.

PART 3 - EXECUTION

3.1 REFRIGERATION EQUIPMENT

A. All equipment to be installed in accordance with manufacturer's recommendations.

3.2 DUCTLESS SPLIT SYSTEMS

- A. Install split system units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements. Do not proceed with equipment start-up until wiring installation is acceptable.

3.3 INSTALLATION OF SCROLL COMPRESSOR WATER CHILLER

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.
- C. Provide Neoprene Isolation Pads to reduce vibration transmission.
- D. On units without unit mounted starters provide for connection of electrical wiring between starter and chiller control panel, oil pump, and purge unit.
- E. Provide necessary auxiliary water piping for oil cooling units and purge condensers.
- F. Arrange piping for easy dismantling to permit tube cleaning.
- G. Provide piping from chiller relief valve to outdoors. Size as recommended by manufacturer and ANSI/ASHRAE Standard 15.
- H. Manufacturer's Field Services
 - 1. Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit(s). Representatives shall provide leak testing, evacuation, dehydration, and charging of the

- unit(s) as required. Chiller manufacturers shall maintain service capabilities to promptly respond within 24 hours or less to service calls at the site.
- 2. A start-up log shall be furnished by the manufacturer to document the chiller's start-up date and shall be signed by the owner or his authorized representative prior to commissioning the chillers.
- 3. The manufacturer shall furnish complete submittal wiring diagrams of the chiller(s) starter(s) and associated components such as cooling tower, pumps, interlocks, etc. as applicable.

3.4 FIELD QUALITY CONTROL

A. Start-up all units in accordance with manufacturer's start-up instructions. Replace damaged or malfunctioning controls and equipment.

3.5 REFRIGERANT GAS DETECTION SYSTEM

- A. Install system in accordance with manufacturer's written instructions.
- B. Install sensing lines, alarm lights and horns as shown on the drawings.
- C. On high level alarm, system shall shut down boilers and start emergency ventilation system.

3.6 COOLING TOWERS

- A. Examine proposed route of moving cooling towers into place and verify that it is free of interferences.
- B. Examine elements and surfaces to support cooling tower.
- C. Verify piping and wiring roughing-in locations.
- D. Verify suitability of branch-circuit wiring.
- E. Install cooling towers according to manufacturer's written instructions.
- F. Install cooling towers level and plumb, and fasten to supporting structure with vibration isolators and seismic restraints.
- G. Maintain recommended clearances for service and maintenance.
- H. Electrical Wiring: Install electrical devices furnished by cooling tower manufacturer that are not factory mounted.
- I. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

3.7 TOWER CLEANING SYSTEM

- A. Coordinate with the Mechanical Contractor to ensure equipment is installed in conformance with manufacturer's recommendations and those found in the specification.
- B. Provide factory-designed configuration of HydroBoosters for maximum efficiency and effectiveness.
- C. If deficiencies are noted by the field service representative, the Mechanical Contractor shall make necessary correction and the manufacturer's field service personnel will visit the installation site and oversee any corrections or modifications required. A written report shall be field with the Owner's Representative visit.
- D. The separator shall feature the following access capabilities for either inspection or the removal of unusual solids/debris:

- A hand-hole port at the collection chamber.
 A ½-inch inspection port, located at the lowest point of the upper chamber.
 A grooved coupling in the upper body to provide full access.

END OF SECTION 230450

SECTION 230760: AIR HANDLING EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
 - 1. Fan Coil Air Handling Unit
 - 2. Packaged Air-to-Air Energy Recovery Unit
 - 3. Single Packaged, Gas-Fired Rooftop Air Conditioning Unit
 - 4. Packaged Gas-Fired Rooftop Unit (Kitchen Ventilation)

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. AMCA Standards 210 and 300 for fans.
- C. ARI Standard 410, ASHRAE Standard 33 for Heating and Cooling Coils.
- D. ASHRAE Standard 52.2 and U.L. Standard 900 for media type air filters.
- E. AMCA Standard 511 and 500D for Air Control Dampers.
- F. ARI Standard 1060 and ASHRAE Standard 84 for Air-to-Air Energy Recovery Equipment.
- G. ARI Standard 260 and 430 for Air Handling Units.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGRTM Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

1.5 SUBMITTALS

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive date for all equipment specified in this section.

1.6 SUBSTITUTIONS

A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include,

but not limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items provided by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements. In addition, the following special guarantee applies:
 - 1. Each compressor unit shall be provided with manufacturer's five (5) year parts and labor warranty.

PART 2 - PRODUCTS

2.1 FAN – COIL AIR HANDLING UNIT

A. General:

- 1. Install each unit as shown on the plans in accordance with: The Manufacturer's recommendations, and all applicable national and local codes.
- 2. UL approved.
- 3. Covered by a 1-year limited parts warranty on the complete unit.
- 4. In current production with published literature available to check performance, limitations, specifications, power requirements, dimensions, operation and appearance.

B. Unit Enclosure:

- 1. Exterior panels of minimum18-gauge galvanized steel that have been finished with baked enamel to provide a long-lasting, quality appearance. Casing shall be insulated with ½" thick fiberglass, max k-valve of 0.24 fire resistant and odorless material.
- Removable panels to provide easy access to the internal components for maintenance and service.
- 3. A filter rack with space to accommodate 2" throwaway, pleated filters, 30% standard MERV 6 efficiency, flat or angled arrangement with end covers.
- 4. All concealed units shall have 1-1/4" discharge duct collar, 1" on return.
- C. Fans shall be SWDI, forward-curved, centrifugal blower type equipped with heavy duty adjustable speed direct drive. The fan shaft shall be supported by heavy duty, permanently sealed ball bearings. Fans shall be dynamically balanced.

D. Blower Motor shall:

- 1. Be 1750 RPM, open dripproof, high efficiency, PSC-type with three separate taps.
- 2. Have inherent protection, permanently lubricated ball bearings and a service factor of at least 1.15.
- 3. Be factory mounted within the insulated cabinet and wired to a junction box, factory set to scheduled voltage.
- 4. Be provided with a factory-mounted and wired 3-speed switch and fan speed relay.

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- 5. Factory-mounted and wired disconnect switch.
- 6. Permit the blower RPM to be adjusted to meet the exact CFM requirement of the system.

E. Water Coils:

- 1. Main coils shall be two, four or six row, dual-temp application.
- 2. Coils shall use aluminum fins mechanically bonded to seamless copper tubes, factory tested with 450 psig air under water.
- 3. Maximum operating conditions shall be 300 psig at 200F.
- 4. Sweat type connections shall be standard.
- 5. Include sloped drain pan, stainless steel, fully drainable, main and auxiliary connections of 3/4" PVC or threaded pipe.
- 6. All coils shall be provided with a manual air vent.
- F. Accessories shall include 24VAC control transformer, and control enclosure. Factory mount and wire the DDC controller furnished as part of the work of ATC, coordinate with Section 230900.
- G. Manufacturers: Carrier, International Environmental Corp., Daikin McQuay, Temtrol, Trane, York/JCI.
 - Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

2.2 PACKAGED AIR-TO-AIR ENERGY RECOVERY UNIT (GENERIC)

A. Factory fabricated and assembled unit consisting of constant volume fans, motors, and drive assemblies, coils, plenum casing, filters, energy recovery wheel (with motor and drive), motor-operated outside air and exhaust air dampers, access doors and operating controls.

B. Casing:

- Casing panels shall consist of dual wall, minimum 18-gauge galvanized solid exterior skins and 22-gauge galvanized steel solid interior skins enclosing 2" thick 1.5 pcf fiberglass insulation with a minimum R-value of 10 which meets NFPA 90A and UL181 test standards. All metal-to-metal surfaces exposed to the weather shall be sealed airtight with maximum leakage not-to-exceed 2% at external static pressure of 3" W.C.
- 2. Removable panels shall be provided for energy recovery wheels and fans. The housing shall be supported by an all-welded epoxy-painted structural base. Lifting lugs shall be welded to the base. All frame and panel members shall be G90 galvanized steel.
- 3. Access to all internal devices and sections shall be provided through hinged, sealed doors. Access doors shall be constructed of the same materials as the unit casing. Each door shall be provided with two cam type handles and two heavy duty hinges to achieve maximum sealing. Handles are to be internal and external for opening from the inside or outside of the unit.
- 4. The unit's duct connections shall be arranged to require only minor ductwork offsets or transitions to the packaged heating/cooling unit.
- 5. Unit features and casing shall be of weatherized construction including:
 - a. Continuous 18-gauge galvanized steel, pitched watertight roof with standing seams.
 - b. Gasketed sections requiring no caulking at the job site.

c. Internal galvanized steel drain pans in each section.

C. Fans:

- 1. Fan ratings are based on tests made in accordance with AMCA Standard 210 and shall bear the AMCA Seal. Fans shall be of the centrifugal type, designed with a scroll type housing. Fans shall incorporate a wheel, structural steel frame and shaft and bearings in the AMCA Arrangement 3 configuration to form a heavy duty integral unit. All fan wheels shall provide stable flow and high rigidity. The wheels shall be non-overloading type. The blades shall be continuously welded, dieformed backward curved type, designed for maximum efficiency and quiet operation. Impellers shall be statically and dynamically balanced and the complete fan assembly shall be test balanced at the operating speed prior to shipment.
- Shafts shall be AISI hot rolled steel accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for first critical speed of at least 1.43 times the maximum speed for the class.
- Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for minimum average bearing life (AFBMA L-10) in excess of 100,000 hours at the maximum class RPM.
- 4. Fans shall be mounted on vibration bases with adjustable motor bases, V-belt drives, minimum 1" static deflection spring isolators, and flexible connections. Belts shall be designed for a minimum 1.5 service factor. Drives for motors shall be variable frequency drives.
- 5. Motors shall be standard NEMA frame, design B high efficiency, with 1.15 service factor and open drip-proof enclosures. Motor selections shall be non-overloading over the fan curve from 0 to 150% of design flow, and the design BHP shall not be above 90% of motor horsepower at design condition. Motors shall be rated for inverter duty.

D. Total Energy (Enthalpy) Recovery Wheel:

- The rotor media shall be made of aluminum which is coated to prohibit corrosion. All media surfaces shall be light weight polymer coated with a permanently bonded Silica gel desiccant prior to being formed into the honeycomb media structure to ensure that all surfaces are coated and that adequate latent capacity is provided. Desiccant coatings that must be reapplied over time are not acceptable.
- Sensible and latent recovery efficiencies shall be clearly documented through a certification program conducted in accordance with ASHRAE 84-1991 and the results shall be presented in accordance with ARI 1060-2000 Standards. The certification shall have been conducted by the unit manufacturer.
- Wheel testing to document that the desiccant material utilized does not transfer pollutants typically encountered in the indoor air environment shall be provided. The cross-contamination and performance certification reports shall be provided for as part of the submittals for this project.
- 4. The media shall be cleanable with low temperature steam, hot water or light detergent, without degrading the latent recovery. Dry particles up to 650 microns shall pass freely through the media.

5. Rotor System:

- a. Seals: The rotor shall be supplied with diameter and perimeter seals which shall not make contact with any rotating surface of the exchanger rotor face.
- b. Rotor Support System: The rotor media shall be provided in segmented fashion to allow for field erection or replacement of one section at a time without requiring side access. The media shall be rigidly held by a structural spoke system made of stainless steel.

- c. Rotor Housing: The rotor housing shall be a structural framework which limits the deflection of the rotor due to air pressure loss to less than 1/32". The housing shall be made of galvanized steel to prevent corrosion. The rotor shall be supported by two pillow block bearings which can be maintained or replaced without the removal of the rotor from its casing or the media from its spoke system. Bearings shall be selected for an L-10 life in excess of 30 years.
- d. Drive System: The rotor shall be driven by a self-adjusting flexible, circumferential belt system. A/C motors shall be utilized.
- e. Assembled system shall incorporate the complete wheel assembly, seals, drive motor and belts in an insulated cassette frame within a slide-out track.

E. Filters:

- 1. Provide filters for both inlet air streams, outside air and return air.
- Filters shall be disposable 2" thick, MERV 8. The filter shall be listed by Underwriters' Laboratories as Class 2.
- 3. Provide a bank of galvanized universal holding frames arranged for upstream access.
- F. Electrical: 460-volt, 3 phase, 60 Hz; electrical features shall include single point power feed termination, unit-mounted lockable disconnect, internal circuit breaker type overload protection, starters, 24 VAC control transformer and fusing.
- G. Connections: System field connections shall be limited to:
 - 1. Supply air duct connection from the packaged unit.
 - 2. Return air duct connection to the packaged unit.
 - 3. Field supplied power source.
 - 4. Twisted pair, ATC communications wiring.
 - 5. Piping connections for natural gas system piping and condensate drain.

H. Condenser Section

- The condensing section shall be equipped with direct drive, vertical discharge condenser fan(s).
 The condenser coil shall be sloped at least 30 degrees from horizontal to protect the coil from damage.
- Condenser coil(s) shall be copper tube with aluminum fins mechanically bonded to the tubes.
- 3. Condenser coil(s) to be sized for a minimum of 10 degrees sub-cooling.

I. Evaporator Coil

- 1. Evaporator coil shall be multi-row minimum ½" copper tube with aluminum fins mechanically bonded to the tubes, with galvanized steel end casings, and equalizing type vertical tube distributors.
- Evaporator coils for multi-compressor units shall be circuited with one circuit and expansion valve per compressor.
- 3. Unit shall be equipped with a double sloped, mastic coated drain pan, and outlets on either side of unit.

J. Refrigeration System

1. Compressor(s) shall be of the scroll type with crankcase heater(s), internal thermal overload

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protection, internal spring isolators and mounted on the compressor manufacturer recommended rubber vibration isolators.

- 2. All units over 7 tons shall be multiple stage and shall have a minimum of 2 stages of capacity control.
- 3. Compressor(s) shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the compressor compartment is open.
- 4. Compressor(s) shall be isolated from the base pan and supply air to avoid any transmission of noise from the compressor into the building.
- 5. System shall be equipped with thermostatic expansion valve(s) type refrigerant flow control, automatic re-set low pressure and manual reset high-pressure refrigerant controls, Schrader type service fittings on both the high side and low-pressure sides of the system, refrigerant liquid line driers, and factory charged with refrigerant.
- 6. Unit shall be equipped with five-minute time delay and twenty second staging relays, and hot gas bypass no-load valves and piping for each refrigerant circuit.

K. Gas Heating Section:

- Unit shall be equipped with a fully modulating heating section using natural gas fuel, minimum 4 to 1 turndown.
- 2. Unit shall be provided with a gas heating furnace consisting of an aluminized steel or stainless steel tubular heat exchanger, an induced draft blower, and an electric pressure switch to lock out the gas valve until the combustion chamber is purged and combustion air flow is established.
- 3. Unit shall be provided with a gas ignition system consisting of an electronic ignitor to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
- 4. Unit shall have gas supply piping entrances in the unit base for through the curb gas piping and in the outside cabinet wall for across the roof gas piping.
- 5. Units tubular heat exchanger shall carry a twenty-five (25) year warranty.

L. Power/Electrical Section

- 1. Unit shall be equipped with a single point electrical connection with motor starters, relays, voltage transformer and terminal block for controls interface, factory mounted disconnect switch.
- 2. Unit shall include a laminated, color coded electrical wiring diagram attached to the door of the unit. Damper actuators shall be wired to the units low voltage terminal block. All components are UL listed, approved, or classified.
- BAS Controller: Factory mount and wire the DDC controller furnished as part of the work of ATC. Coordinate with Section 230900.
- M. Roof Curb: Prefabricated galvanized steel mounting curb shall be provided for field assembly on the roof decking prior to unit placement. The roof curb shall be a perimeter type with complete perimeter support of the air handler unit. The curb shall be a minimum of 12" high. Gasketing shall be provided for field mounting between the unit base and roof curb. Curb shall include a 2" x 4" wood nailer.
- N. Manufacturers: Basis of design, Modine. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work are limited to one of the following:

Addison Annexaire CanFab, Inc.
Desert Aire
Greenheck
Innovent
Loren Cook
York/JCI
Temtrol
Thybar Corp.
Valent
VenMar

 Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

2.3 SINGLE PACKAGED, GAS-FIRED ROOFTOP AIR CONDITIONING UNIT

A. Refrigeration System:

- 1. One independent refrigeration circuit with hermetic compressor, crankcase heater, strainer, high and low-pressure control, compressor motor protection, and access valves.
- 2. A direct expansion, draw-thru evaporator coil shall be circuited so that its entire fin surface will be active during part load operation.
- 3. Draw-thru condenser coils with a separate sub-cooling circuit for each refrigeration system shall provide at least 15 F of sub- cooling at design conditions.
- 4. Outdoor air thermostats shall cycle the condenser fan motors to maintain stable operation at ambient temperature down to 35 deg. F. Condenser fan motors shall have inherent protection.

B. 100% Outdoor Air (Economizer Package):

- 1. Outdoor and return air dampers shall be interlocked in position by a fully modulating damper actuator. Actuator shall be spring return so that the outdoor air intake dampers will close when power to the unit is interrupted.
- 2. Maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when fully closed and operating against a pressure differential of 0.5"WC.
- 3. The outdoor intake opening shall be covered with a birdscreen and a rain-hood that matches the exterior of the unit.

C. Exhaust Air Relief Dampers:

- Economizer shall be equipped with barometric dampers that will open to exhaust return air as more outdoor air is supplied to the conditioned space during economizer operation. This relief shall prevent the conditioned space from over-pressurizing during economizer operation.
- 2. Exhaust air opening shall be covered with a birdscreen and a rain hood that matches the exterior of the unit.
- D. Filters shall be 2" thick replaceable type MERV 8 and internal metal frame work.
- E. A 1,750-rpm single supply air blower motor shall have a 1.15 service factor, solid base, Class B insulation and ball bearings with permanent lubrication. All belts and pulleys shall be treated with permanent lubrication. All belts and pulleys shall be rated at least 25% above the nominal drive horsepower. The fan shaft ball bearings shall have minimum average bearing life (AFBMA L-10) in excess of 100,000 hours at the maximum class RPM.

F. Roof Curb:

- Roof curb shall be supplied by the unit manufacturer to provide a watertight seal between the roof and the unit.
- 2. Roof curb shall be approved by the National Roofing Contractor's Association.
- 3. Roof curb shall be full perimeter with all utility and duct connections within the perimeter of the curb eliminating the need for other roof penetrations.

G. Unit Construction:

- 1. All sheet metal parts shall be constructed of a zinc coated, commercial grade galvanized steel. All external surfaces shall be finished with a UL approved coating system.
- 2. Removable side panel shall provide easy access for maintenance, service and adjustment.
- 3. Unit shall be single wall construction with foil faced insulation such that insulation is not exposed to the air stream.
- 4. Unit shall have lifting lugs on each of the four upper corners.
- 5. Condenser coils and fan discharge shall be protected by heavy duty wire guards.
- H. Basic Safety/Operating Controls Unit manufacturer shall supply the following safety/operating control features:
 - A thermostat to deenergize the compressors when the suction line temperature drops below 22 deg. F.
 - 2. A five-minute timer to prevent the compressor from short cycling.
 - 3. A lock out circuit to prevent the compressors from cycling on one of their safety controls.
 - 4. A cutout to protect the compressors during abnormally low voltage conditions.
- Unit shall be completely factory wired, piped, charged and tested by the manufacturer before shipment. BAS Controller: Factory mount and wire the DDC controller furnished as part of the work of ATC. Coordinate with Section 230900.
- J. Gas Heating Section:
 - 1. Manufacturer shall furnish a natural gas furnace constructed of 20-gauge aluminized steel tubes.
 - 2. Furnace shall include the following controls and safety devices:
 - a. Intermittent spark ignition with two stage gas valve with pressure regulator.
 - b. Centrifugal blower to maintain positive flue pressure with air pressure safety switch.
 - c. Electronic ignition with flame sensor and lockout safety valve.
 - d. High temperature limit thermostat with automatic reset.
- K. Manufacturer: Trane, York/Johnson Controls, Carrier, Daikin McQuay, Greenheck.
- L. Manufacturer shall furnish start-up.
 - Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

2.4 PACKAGED GAS-FIRED ROOFTOP UNIT (KITCHEN VENTILATION)

A. Unit Construction:

- 1. All sheet metal parts shall be constructed of 18-gauge commercial grade galvanized steel. All external surfaces shall be finished with manufacturer's standard color enamel coating system.
- 2. Removable side panel shall provide easy access for maintenance, service and adjustment of components within the supply fan section and filter/damper section.
- 3. Unit shall be single wall construction with foil faced insulation minimum 1" thick fiberglass pinned to housing and designed for NPFA 90A requirements.
- 4. Unit shall have lifting lugs on each of the corners, factory assembled, except where larger units require two-piece shipment.
- 5. Modular sections shall include insulated downturn supply plenum, gas-fired heater section, supply fan, filter/damper section and air intake section.
- 6. All modules shall be of weatherproof design, joined with Ductmate connectors.

B. Outdoor Air/Filter/Damper Section:

- 1. Outdoor air damper shall be controlled by a factory mounted and wired damper actuator. Actuator shall be spring return so that the outdoor air intake damper will close when power to the unit is interrupted. Damper actuator shall be mounted inside housing.
- 2. Maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when fully closed and operating against a pressure differential of 0.5" W.C.
- 3. The outdoor intake opening shall be covered with a removable inlet birdscreen and a rain hood that matches the exterior of the unit.
- 4. Filters shall be 2" thick replaceable type MERV 8 and internal metal frame work.
- C. A 1,750-rpm single supply air blower motor shall have a 1.15 service factor, solid base, Class B insulation and ball bearings with permanent lubrication. All belts and pulleys shall be treated with permanent lubrication. All belts and pulleys shall be rated at least 65% above the nominal drive horsepower. The fan shaft ball bearings shall have an average life rating of 100,000 hours of operation. Fan shaft shall be machined from SAE 1020 cold rolled steel. Fans shall be FC Type, DWDI design. Fan and drive assembly shall be mounted on rubber isolators with adjustable motor base.

D. Roof Curb:

- 1. Roof curb shall be supplied by the unit manufacturer to provide a watertight seal between the roof and the unit.
- 2. Roof curb shall be approved by the National Roofing Contractor's Association.
- 3. Roof curb shall be full perimeter with all duct connections within the perimeter of the curb eliminating the need for other roof penetrations.

E. Gas Heating Section:

1. Manufacturer shall furnish a natural gas furnace AGA labeled and constructed of 20-gauge Type 409 stainless steel tubes. Provide Type 409 stainless steel flue collector and side vent with cap.

THE NEW WHITEHALL ELEMENTARY SCHOOL - APPOQUINIMINK SCHOOL DISTRICT - #1621

- 2. Furnace shall be as manufactured by Sterling and include the following controls and safety devices:
 - a. Intermittent spark ignition with two stage gas valve with pilot gas valve pressure regulator.
 - b. Centrifugal blower to maintain positive flue pressure with air pressure safety switch.
 - c. Electronic ignition with flame sensor and lockout safety valve.
 - d. High temperature limit thermostat with automatic reset.
 - e. 24-volt control voltage.
- F. Unit shall be completely factory wired, piped and tested by the manufacturer before shipment.
- G. Unit-mounted motor control center shall be factory installed, wired and include the following components:
 - Single point power connections within NEMA 3R enclosures for fused disconnect switch and motor controls.
 - 2. Magnetic contactors with overload protection in all legs.
 - 3. Reset for supply fan, with interlocking contactor, additional contactor for motor-operated outside air damper.
 - Fused transformer to provide secondary 24 VAC control voltage for heater section control and control panel on face of kitchen hood. Electronic modulating discharge temperature control with internal setpoint selector.
 - 5. All components U.L. listed or classified and wired per N.E.C.
- H. Exhaust fan section shall be field mounted and wired. Fan shall be as scheduled on drawings and as specified in Section 230605.
- Accessories:
 - 1. Remote discharge air temperature setpoint controller for field mounting. Control interface with unit-packaged control center shall be part of the work of Division 23- Mechanical.
 - 2. Provide 24VAC control voltage relays for interface between unit packaged control center and heat detectors furnished with the kitchen type I ventilator package for automatic operation of the makeup air unit and its associated ventilator exhaust fan.
- J. Manufacturer: Kees, Inc., Greenheck, Captive Aire, Weather-Rite.
 - Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- B. Install in accordance with manufacturer's recommendations. Unit and all component sections shall be properly supported and vibration isolated.

3.2 INSTALLATION

A. Verify that coils, filters, motors, drives and other components are matched with the proper unit.

- B. Assemble unit components following manufacturer's instructions for handling, testing and operation. Repair damaged galvanized areas, and paint in accordance with manufacturer's written recommendations.
- C. Vacuum clean interior of units prior to operation.
- D. Repair air leaks from or into casing that can be heard or felt during normal operation.
- E. Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- F. Support: Install and secure roof curb to roof structure, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations and shop drawings. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing.
- G. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- H. The Mechanical Contractor shall own as part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

- I. Provide certified factory start-up and written report on all units.
- 3.3 AUTOMATIC TEMPERATURE CONTROLS
 - A. Coordination of control work with the BAS shall include, but not be limited to, items as described in Section 230900; ATC.

END OF SECTION 230760

SECTION 230900: AUTOMATIC TEMPERATURE CONTROL

2.9 SEQUENCE OF OPERATION

- A. Host Computer and Operator's Work Station (OWS)
 - 1. The host computer and accessories shall be located as shown on the drawings. The computer and all peripheral equipment shall be furnished by the Owner.
 - 2. Coordinate required capacity and features with the Owner's IT representative.
 - 3. All control programs and application features shall reside in the OWS.
 - Control manufacturer shall provide subsequent levels of control capability to whatever extent necessary to achieve performance required for individual units in their respective local control panels.
 - 5. Work with the Owner to establish occupied/unoccupied schedules and setpoints. Enter the schedules and setpoints into the system. Provide the required number of input/output points to achieve the specified sequences of operation and monitoring points.
 - 6. Work with the Owner to determine which points shall be trended and the sampling frequency. Set up the trend logs in the BAS.

B.1 Heating System Control:

- 1. This system consists of two boilers, B-1 and B-2, each with boiler circulating pumps BP-1 and BP-2, primary loop isolation valves, and building dual temperature heating/cooling pumps P-1 and P-2. Each boiler is equipped with a burner suitable for using natural gas.
 - a. Each boiler's combustion system shall be controlled by its integral burner controls. The boilers shall be activated/de-activated via the BAS based on outdoor air temperature, or via manual command at the OWS. Once activated, the boiler's integral controls shall maintain setpoint of the system at the boiler's control panel.
- 2. Whenever the outdoor air temperature is at or below 55°F, adjustable, boilers B-1 shall be enabled and B-2 shall be on standby. On a call for boiler B-1 to operate, the system isolation valves shall be commanded open, on a proof of open via valve end switch the boiler shall be enabled. B-2 shall remain in standby. If boiler B-1 cannot maintain hot water supply setpoint boiler B-2 shall be enabled to operate. The BAS shall stage the boilers to maintain optimum efficiency and hot water supply temperature at setpoint.
- 3. The boiler control panel shall provide boiler modulation, boiler secondary pump operation, and diagnostics. The BAS shall monitor boiler inlet/outlet, outside air temperature, modulation rate setpoint and mixing valve demand percent on the boiler's secondary heat exchanger.
- 4. When the boiler's integral controls are activated, its internal circulating pump and Pump BP-1 or BP-2 shall be activated, and the system isolation valves shall open (proven). A current switch on one phase of power feeding the pumps shall monitor flow status at the OWS. If pump operation is not indicated, and the boiler did not fire or isolation valves open, deactivate the boiler and activate the second (back-up) boiler; generate a boiler alarm at the OWS.
 - a. The BAS shall receive a general boiler failure alarm from a set of dry contacts, which are provided by the boiler manufacturer. This alarm shall be annunciated at the OWS.
 - b. The BAS shall rotate the lead boiler/pump set to equalize the accumulated run time.
- During the unoccupied mode of the building systems, the boilers shall maintain the following status:

Outdoor Temperature Boiler Status Less than 65°F Hot Standby

Above 65°F Off

- a. Whenever any space temperature sensor falls below 45°F, adjustable, during the unoccupied mode, the system shall activate the lead building heating pump and lead boiler to provide heat until the setback space temperature is satisfied. If there is no call for heat after two hours (adjustable), the lead pump and boiler shall be de-activated and return to the off or standby status as scheduled.
- 6. Provide hot water discharge and return temperature sensors for each boiler.
- 7. BAS Contractor shall provide all field control wiring for control panels, combustion controls, header temperature sensors, and boiler controller.
- 8. Provide system software in the OWS to monitor and trend weather and building response time to initiate morning warm-up cycles in sufficient time to establish occupied space temperatures before actual occupancy occurs.
- 9. The following items shall be displayed at the OWS:
 - a. Graphical display of the boilers, pumps, and related piping.
 - b. Boiler activated/de-activated, lead/lag status, each boiler.
 - c. Boiler failure, each boiler.
 - d. Outside air temperature.
 - e. Outside air temperature setpoint for boiler activation (adjustable).
 - f. Boiler discharge temperature, each boiler.
 - g. Boiler return temperature, each boiler.
 - h. Boiler pump water flow status/alarm, each pump via current switch.
 - i. Status of each isolation valve: open/closed.
 - j. Primary loop pump flow status/alarm: via VFD alarm/status contact and frequency feedback signal.

B.2 Make-Up Water Monitoring System Control

- 1. Provide system control for the make-up water serving the dual temp heating and cooling system in the plant.
- 2. Provide a water flow meter on the make-up water supply. When the measured flow exceeds 10 gallons/minute, adjustable, close the normally open solenoid valve, generate an alarm at the OWS, and shut down the boilers, pumps, chiller, and auxiliaries affected.
- 3. Flow sensor, consisting of a removable flow sensor mounted in a cast-bronze housing, available in ½" to 1-1/2" pipe size. Sensor shall be rated for a flow range of 0.5 to 15 feet per second, 220°F max., 400 psig at 100°F maximum pressure; Nylon impeller, Pennlon bearing, tungsten carbide shaft, PPS housing and EPDM seals. Manufacturer: Kele Model 250B.
 - 4. Programmable analog flow transmitter shall be a loop-powered device that converts a flow sensor signal into a linear 4 20mA signal, with electronic signal dampening, computer programmable, and compact size in a metal enclosure. Power input, 9-35 VDC/0-1 kHz, 75 ohms at 24 VDC, accuracy of 0.1% of full scale. Manufacturer: Kele Model 310-02.
 - 5. The following items shall be displayed at the OWS:
 - (1) Water flow in gallons per minute.
 - (2) Command signal to the valve.
 - (3) High flow/equipment shut down alarm.
- C. Primary Dual Temperature Heating/Cooling Water Pumps Control:

- 1. Pumps P-1 and P-2 shall be controlled directly by the BAS per a lead/lag sequence with the designated lead pump alternated on a minimum weekly basis with the boilers, or as reset at the OWS. The designated lead pump shall be activated as part of the heating or cooling system.
 - a. The pumps shall also be subject to a manual command at the OWS. Each pump shall be provided with a VFD as part of the work of Division 26 Electric. The VFD on the pump shall ramp up its speed to maintain the balance of water in the system.
 - b. A water sensor shall be installed 2/3 of the way along the dual temp piping to monitor water flow. Provide differential pressure switches on each floor of Area 'A' where the branch piping connects to the main risers.
 - c. The lead loop pump shall be enabled during the occupied mode or when any zone calls for heating or cooling during the unoccupied mode, as programmed through the system. The loop pump VFD shall modulate the pump speed to maintain the differential pressure setpoint.
 - d. Provide pressure actuated bypass valve at the pumps to maintain minimum flow to prevent the pumps from shutting off as the control valves on the room terminal units close. Set bypass flow equal to approximately 15% of total system flow. Locate bypass in the Room C121.
- 2. Monitor flow status via VFD alarm/status contact and frequency feedback signal at the OWS.
- 3. Once activated, the designated lead pump shall run continuously. If the lead pump fails, after a 20 second time-delay, the lag pump shall be energized after an alarm is sent to the OWS. After the cause of the failure is corrected, a manual command from the OWS is required to restore normal operation.
- 4. The designated lead pump shall be activated automatically according to the following schedule:

Outdoor Temperature Occupied Unoccupied Less than 45°F ON ON 45°F to 65°F ON OFF

- 5. The following items shall be displayed at the OWS:
 - a. Graphical display of pumps and related piping.
 - b. Outside air temperature.
 - c. Designated lead and lag pumps (i.e.: Pump P-1 Lead Pump P-2 Lag).
 - d. Pump command start/stop.
 - e. Commanded status of each pump via VFD alarm/status contact and frequency feedback signal.
 - f. Flow status/alarm.
 - g. Bypass valve status: open/closed.
- D. Chilled Water System Control:
 - 1. This system consists of chiller, CH-1, dual temperature loop pumps P-1 and P-2, chiller pump P-3, condenser pump P-4, and interconnecting piping and accessories. Pumps P-1 and P-2 shall be controlled directly by the BAS per a lead/lag sequence as described in article C. A current switch on one phase of power feeding pump P-3 shall monitor flow status at the OWS.
 - 2. The chiller control sequence shall be activated on a rise in outside air temperature above the programmed setpoint of 70°F, adjustable. The chilled water system shall also be manually activated via a software switch at the OWS.
 - 3. When the chiller control sequence is activated, the chilled water pump and condenser water pump shall be energized. When water flow is proven through each pump, via a current switch, the chiller's factory controller shall be activated to maintain its integral setpoint of 42°F, adjustable.

- 4. When building demand for cooling is satisfied, the BAS shall adjust the chiller's setpoint upwards. The BAS shall provide an analog signal (0-10 vdc or 4-20 ma) to the chiller to reset the chiller's discharge water temperature setpoint based on building demand.
- 5. The BAS shall limit the chiller on-time to a minimum of 10 minutes. The minimum off-time for the chiller shall be 20 minutes. Timing set-points are adjustable, and final setting must be approved by the chiller manufacturer.
- 6. The OWS shall accommodate up to 3 alarm/status inputs from the chiller for monitoring and alarm generation.
- 7. The BAS shall monitor chilled water discharge and return temperatures for display at the OWS.
- 8. BAS Contractor shall provide all field control wiring for operation of the chiller.
- 9. The following items shall be displayed at the OWS:
 - a. Graphic depicting equipment, piping layout and temperature control devices with dynamic display of each status, temperature, etc.
 - b. Chilled water discharge and return temperature at the chiller.
 - c. Common chilled water supply and return water temperatures.
 - d. Up to 3 alarm/status inputs for chiller.
 - e. Chilled water discharge reset setpoint
 - f. Chilled water pump start/stop command and status via current switch.
 - g. Chilled water pump flow/alarm per pump via current switch.
 - h. Condenser water pump start/stop command and status via current switch.
 - i. Condenser water pump flow/alarm per pump via current switch.
 - i. Chiller on/off command.

E. Closed Circuit Fluid Cooler Control:

- 1. This system consists of a two cell, closed-circuit fluid cooler, CT-1, condenser pump P-4, and interconnecting piping.
 - a. Interface with controls furnished with the fluid cooler for operation of the fan motors, fan motor VFD, spray water pump and water treatment system, basin sweeper pump system, basin level controller, and basin sump heaters.
- 2. Upon a rise in condenser water return temperature, the tower fan motors shall be energized and ramp up in unison from minimum to full speed as required to maintain 85°F setpoint temperature leaving the tower. If the tower fans are at full speed and the tower leaving water temperature continues to rise, the spray water pump shall be energized to maintain setpoint. The reverse shall occur on a fall in cooling tower loop temperature.
- 3. Provide a current switch on one phase of power feeding the tower spray pump for monitoring and alarm generation. When current is not established after a delay of twenty seconds, adjustable, on a call for the pump to operate, an alarm shall be activated to the system.
- 4. Provide a water temperature sensor in the cooling tower sump for monitoring and alarm generation to the system. On a fall in sump temperature below the low limit setpoint of 40°F, adjustable, activate the basin sump heaters to maintain water temperature above freezing. On a continued drop in sump water temperature, provide an alarm to the system.
- 5. Monitor "voltage available" to the heat trace circuits on all exterior cooling tower makeup water and sweeper system piping to the cooling tower. Provide an alarm to the system if the outside air temperature is below 35°F, adjustable, and voltage is not available to the heat trace circuits. Coordinate with heat trace system provided as part of the work of Division 26 Electric.
- 6. Provide water inlet and outlet water temperature sensors. Sensors shall be used to monitor and

control the loop temperatures, and high/low temperature alarms.

- 7. Provide control wiring for the sump thermostat, low water cut off, spray water pump and water treatment system, basin sweeper pump system, and sump heater contactor furnished with the fluid cooler. Power wiring shall be provided as part of the work of Division 26 Electric.
- 8. If the condenser loop temperature rises above 95°F, adjustable, at the discharge of pump P-4, an alarm shall be activated to the system.
- 9. The following items shall be displayed at the OWS:
 - a. Outside air temperature and humidity.
 - b. Condenser temperature entering and leaving the fluid cooler.
 - c. Condenser temperature high/low temperature alarms.
 - d. Sump temperature and low temperature alarm.
 - e. Fans status via VFD alarm/status contact and frequency feedback signal.
 - f. Heat trace circuit voltage status/alarm.
 - g. Pumps status via current switch: on/off/alarm.
 - h. Diagram showing the layout of the equipment with major components and dynamic temperatures shown where temperature sensors exist in the system.

F. Dual Temperature Isolation Valves

- 1. Furnish dual temperature isolation valves as shown on the drawings. During heating season, the hot water isolation valves shall be open to the dual temperature piping and the chilled water isolation valves shall be closed. During cooling season, the chilled water isolation valves shall be open and the hot water isolation valves shall be closed. Heating and cooling valves shall be commanded from separate and individual outputs. When switching between heating and cooling, implement an adjustable time delay initially set to 12 hours to allow the dual temperature loop to reach ambient temperature before mixing with primary systems.
- 2. The following items shall be displayed at the OWS:
 - a. Individual zones showing isolation control valves and commanded position.
 - b. Operator selection to set heating/cooling position of each isolation control valve of each zone.
- G. Refrigerant Monitoring System RMS-1 Control:
 - 1. This system consists of a refrigerant monitor and sensors mounted in the Mechanical Room C121. Provide all functions and the following interlocks.
 - 2. Whenever the monitor goes into high-level alarm, shut down the domestic water heater(s). Close the normally open motor-operated gas valve in the supply pipe to the domestic water heater(s).
 - 3. Activate alarm horn and strobe light at each door into MER C121. Provide horn reset switch at each door to allow the horn to be silenced, while strobe light continues to flash until the system is reset.
 - 4. Activate exhaust fan EF-3 after motor operated exhaust damper is open subject to damper limit switch. Open outside air damper at OAI-3.
 - 5. Exhaust fan shall continue to run until the monitoring system resets. Once reset, the exhaust fan shall stop, dampers shall close, and the strobe lights shall turn off.
 - 6. Provide alarm and system status at the OWS with remote alarm call out through the building Fire Alarm System.
- H. Domestic Water Heater System Control
 - 1. The domestic water heaters shall be activated by their integral temperature controls. Each unit is

equipped with sealed combustion system to support the gas burner.

- 2. Provide a hot water discharge sensor for monitoring, high/low limit alarms for the heater and for each hot water circulating loop. The OWS shall receive a general status/failure alarm from the domestic water heater for monitoring and alarm generation at the OWS. Set the high/low limit alarms to suit system operation and each water loop.
- 3. Provide on/off control of the two, domestic hot water circulating pumps based on a schedule furnished by the Owner. Provide a current switch across each pump for monitoring and alarm generation. If the pump is commanded on and flow is not detected, after a 20-second delay, provide an alarm at the OWS.
- 4. The following items shall be displayed at the OWS:
 - a. Domestic water heaters activated/deactivated.
 - b. Domestic hot water discharge temperature.
 - c. High/Low discharge temperature alarm, heaters and each loop.
 - d. General failure signal.
 - e. Commanded status of domestic hot water circulator pumps.
 - f. Pump flow status/failure alarm via current switch.
- I. Energy Plant Mechanical Room C121 Heating and Ventilation System Control
 - 1. This system consists of unit heater UH-2, roof mounted exhaust fan EF-3, and outside air intake OAI-3. Provide motor operated dampers and actuators for control of exhaust and outside air in the room. Provide space temperature sensor as shown on the drawings.
 - 2. On a rise in space temperature above 80°F, adjustable, the exhaust air and outside air dampers shall open. Subject to a limit switch on the exhaust air damper, the exhaust fan shall start. On a fall in space temperature below setpoint, the fan shall be de-energized and all dampers shall close.
 - 3. On a fall in space temperature below 60°F, adjustable, room sensors shall energize the fans on the unit heaters to run in unison. On a rise in space temperature, the reverse shall occur.
 - 4. Coordinate operation of EF-3 and OAI-3 with paragraph G.
 - 5. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. Low temperature alarm, 40°F, adjustable.
 - c. High temperature alarm, 100°F, adjustable.
 - d. Heating setpoint.
 - e. Ventilation setpoint.
 - f. Commanded status of exhaust fan and dampers.
 - g. Commanded status of unit heater fans.
- J. Room Fan Coil Unit Control
 - Each unit shall be controlled by an individual DDC Controller. The DDC Controller shall be wired
 to a space temperature sensor with setpoint adjustment and override switch (Microtouch).
 Provide all sensors required for operation, monitoring and control of each unit; interface with the
 24-volt control transformer furnished with the unit. Provide a 2-way control valve for the dual
 temperature coil for installation by the Mechanical Contractor.
 - a. Provide flat plate space sensors for units that serve stairways, as well as corridors; no override switch is required in these locations.
 - 2. During the programmed occupied mode, the fan shall run continuously.
 - a. Provide motor operated dampers and actuators for units which are directly connected to a

source of outside air for ventilation. Each damper shall open fully during the occupied mode and remain closed during the unoccupied mode.

- b. Heating mode: On a fall in space temperature below the programmed heating setpoint of 70°F, adjustable, the coil control valve shall modulate open to the coil. On a rise in space temperature, the valve shall modulate closed. The valve shall be under further control of a high limit discharge air temperature sensor with setpoint at 100°F, adjustable, to prevent damage to the unit's components. Provide an alarm at the OWS if the discharge air temperature rises above the high limit setpoint.
- c. Cooling mode: On a rise in space temperature above the programmed cooling setpoint of 75°F, adjustable, the coil control valve shall modulate open. On a fall in space temperature, the valve shall modulate closed to the coil.
- 3. During the programmed unoccupied mode, the fan shall cycle and the control valve shall modulate in sequence to maintain the programmed unoccupied space temperature setpoints of 60°F (heating) and 85°F (cooling), all adjustable. When the override switch on the room sensor is activated, the unit shall be controlled as outlined in item 2 above for a minimum 2-hour period, adjustable at the OWS. Once the override cycle times out, the unit shall reset to the unoccupied mode of operation.
- 4. If the discharge temperature fails to rise to a programmed minimum temperature during a call for heating, a low temperature alarm shall be activated at the OWS. If the discharge temperature fails to fall to a programmed minimum temperature on a call for cooling, a high temperature alarm shall be activated at the OWS.
- Provide a current switch on one phase of power feeding the supply fan for status indication at the OWS.
- 6. Provide a condensate sensor in the auxiliary drain pan below each unit. When condensate is detected in the pan, close the coil control valve, deactivate the unit supply fan, and provide an alarm at the OWS.
- 7. The following items shall be displayed at the OWS:
 - a. Global outside air temperature.
 - b. Space temperature.
 - c. Space temperature setpoint.
 - d. Discharge temperature.
 - e. High and low limit discharge air setpoints.
 - f. Commanded status of fan.
 - g. Operational status of fan via current switch.
 - h. Commanded status of each control valve.
 - i. Low discharge temperature alarm.
 - j. High discharge temperature alarm.
 - k. Condensate alarm.
 - I. Diagram showing the layout of the unit with major components and dynamic temperatures shown where temperature sensors exist in the system.

K. Cabinet Unit Heater Control

- 1. Each cabinet unit heater shall be controlled by the BAS via a space temperature sensor.
 - a. Provide a separate DDC controller and flat plate space sensor for each unit; no override switch is required.
 - b. Provide a 2-way, hot water control valve for installation in the unit by the Mechanical Contractor.
- 2. During the programmed occupied mode, the unit fan shall cycle. On a fall in space temperature below the programmed setpoint of 65°F, adjustable, the hot water coil control valve shall open.

THE NEW WHITEHALL ELEMENTARY SCHOOL - APPOQUINIMINK SCHOOL DISTRICT - #1621

On a rise in temperature above setpoint, the valve shall close.

- 3. During the programmed un-occupied mode, the fan shall cycle and the hot water coil control valve shall open to maintain the programmed temperature setpoint of 60°F, adjustable.
- 4. If the discharge temperature fails to rise to a programmed minimum temperature during a call for heating, a low temperature alarm shall be activated at the OWS.
- 5. Provide a current switch on one phase of power feeding the supply fan for status indication at the OWS.
- 6. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. Space temperature setpoint.
 - c. Discharge temperature.
 - d. Commanded status of fan.
 - e. Operational status of fan via current switch.
 - f. Commanded status of control valve.
 - g. Low discharge temperature alarm.
 - h. Diagram showing the layout of the unit with major components and dynamic temperatures shown where temperature sensors exist in the system.

L. Unit Heater Control

- 1. Each unit heater shall be controlled by the BAS via a space temperature sensor.
 - a. Provide a separate DDC controller and flat plate space sensor for each unit; no override switch is required.
- 2. The unit fan shall cycle to maintain the programmed setpoint of 65°F, adjustable.
- Provide a current switch on one phase of power feeding the unit fan for status indication at the OWS.
- 4. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. Space temperature setpoint.
 - c. Commanded status of fan.
 - d. Operational status of fan via current switch.

M. Zone Heating Duct Coil Control

- 1. Duct coils, DC-1 through DC-9, shall be controlled by an individual DDC Controller and space temperature sensor. Provide space sensor and two-way control valve for each coil.
- 2. Sensor shall modulate the heating coil control valve to maintain space temperature at 75°F, adjustable.
- 3. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. Space temperature setpoint.
 - c. Discharge air temperature.
 - d. Commanded status of control valve.

N. Hydronic Fintube Radiation Control:

1. The hydronic fin tube radiation shall be controlled by a two-way, hot water control valve.

- 2. Provide a control valve and actuator for installation in piping for each unit or group of units. Provide blank plate stainless steel sensor for each unit or groups of units in one room. Valve shall open/close to maintain space at 65°F, adjustable.
- O. Ductless Split System Unit Control:
 - 1. The following sequence is typical for:
 - a. AC-1 and ACC-1 which serves the IDF Room.
 - b. AC-2 and ACC-2 which serves the MDF Room.
 - c. AC-3 and ACC-3 which serves the IDF Room.
 - 2. Each unit shall be controlled by its factory controls. Adjust factory controls to allow the indoor unit fan to cycle off once space temperature is achieved. Mount and wire the thermostat, which is furnished by the equipment manufacturer, and interlock the controls from the indoor unit to the outdoor unit. Set to maintain 75°F, adjustable.
 - 3. Provide a space mounted temperature sensor for monitoring and alarm generation at the OWS. On a rise in space temperature above the programmed high limit setpoint of 80°F, adjustable, an alarm shall be activated. On a fall in space temperature below the programmed low limit setpoint of 50°F, adjustable, an alarm shall be activated.
 - 4. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. High and low limit alarms and setpoints.
- P. Kitchen Hood Exhaust Fan EF-2 & Make-Up Air Unit MAU-1 Control
 - 1. The hood exhaust fan and make-up air unit shall be energized automatically by temperature sensor(s) provided as part of the hood. Interface with these sensor(s) in accordance with hood manufacturer's written instructions.
 - 2. The kitchen equipment manufacturer shall provide the BAS Contractor with wiring diagrams for the hood. The BAS Controller shall provide the interconnecting control wiring indicated on these wiring diagrams.
 - 3. The following items shall be provided by the make-up air unit manufacturer:
 - a. Motor starters and overload protection.
 - b. Outside air damper and actuator.
 - c. Terminal blocks for all wiring connections between equipment and control devices.
 - 4. Provide a current switch on one phase of the power feeding the exhaust fan. When current is sensed, indicating that the exhaust fan has been energized, the make-up air unit outside air damper shall open 100% and the supply fan shall be energized. On a fall in discharge air temperature below setpoint of 65°F, adjustable, the gas heat shall stage and modulate through its unit-mounted controls to maintain setpoint.
 - 5. Provide a current switch on one phase of power feeding the supply fan for monitoring and alarm generation at the OWS.
 - 6. The system shall prevent the circulation of smoke. Upon activation of the duct smoke detector in the supply air duct at the discharge of MAU-1, the unit shall stop and all dampers shall close.
 - a. The Mechanical Contractor shall install duct smoke detector furnished as part of the work of Division 26 Electric.
 - 7. Interface with a common fire alarm input to the BAS system from the fire alarm system (FAS). The fire alarm contact shall be provided by the fire alarm system vendor at the FAS

panel. The status of the alarm contact shall be communicated throughout the BAS. When the fire alarm contact indicates an alarm condition, the BAS shall de-energize the supply fan, exhaust fan, gas heat and damper motors. When de-energized, the damper motor shall spring return the outside air damper closed. NOTE: the FAS shall also shut down unit MAU-1 whenever the room CO (carbon monoxide) detector goes into alarm.

- a. If the kitchen ventilator exhaust fan is running and the hood fire suppression system is activated manually, the exhaust fan shall continue to run until deactivated by the FAS or manually shut down at the hood.
- b. MAU-1 shall shut down whenever the hood suppression system or fire alarm system is activated. Provide interface with each system.
- 8. The following items shall be displayed at the OWS:
 - a. Discharge air temperature.
 - b. Discharge air temperature setpoint.
 - c. Discharge low limit alarm.
 - d. Fire alarm system status alarm.
 - e. Commanded status of fans.
 - f. Supply fan operational status via current switch.
 - g. Exhaust fan operational status via current switch.
 - h. Smoke detector status/alarm.
 - i. Diagram showing the layout of the equipment with major components and dynamic temperatures shown where temperature sensors exist in the system.

Q.1 Exhaust Fan EF-4 and EF-5 Control

- 1. Each exhaust fan shall be energized by a motion sensor provided by Division 26 Electric.
- 2. Provide a motor operated damper and actuator for each exhaust fan as shown on the drawings. The damper shall be installed by the Mechanical Contractor.
- 3. Subject to a limit switch on the exhaust air damper, the fan shall run continuously when activated.
- 4. The following items shall be displayed at the OWS:
 - a. Fan status via current switch: on/off.
 - b. Commanded status of fan and damper.

Q.2 Exhaust Fan EF-1 Control

- Provide a motor operated damper and actuator as shown on the drawings. The damper shall be installed by the Mechanical Contractor. Fan shall run subject to a limit switch on the exhaust air damper, once activated.
- Provide a current switch on one phase of power feeding the dishwasher unit. Upon activation of the dishwasher, the exhaust fan shall start and run continuously as long as the dishwasher is energized.
- 3. Provide a current switch on one phase of power feeding the fan for status indication at the OWS. Provide an alarm if the fan is commanded on and flow is not proven after a 20-second delay.
- 4. Interface with a common fire alarm input to the BAS system from the fire alarm system (FAS). When the FAS indicates an alarm condition, the BAS shall de-energize the fan and close the exhaust air damper.
- 5. The following items shall be displayed at the OWS:
 - a. Fan status via current switch: on/off/alarm.
 - b. Commanded status of fan and damper.

R. Energy Recovery Unit Control

- The following sequence is typical for units ERU-1 through ERU-4. Each unit consists of supply fan, exhaust fan, packaged DX cooling system, package indirect fired gas heating system, energy recovery wheel and drive, filters, air control dampers and actuators, drives for each fan, and unit controls.
- 2. The ERU shall be controlled by an individual DDC Controller, the DDC Controller and all required sensors shall be provided by the BAS Contractor. The DDC Controller shall be wired to sensors which shall include, but are not limited to, a discharge air temperature sensor, exhaust air temperature sensor, return air temperature sensor, outside air temperature sensor.
- 3. The equipment manufacturer shall provide the BAS Contractor with wiring diagrams for the equipment. The BAS Contractor shall then provide wiring diagrams detailing installation and wiring requirements for the DDC Controls.
- 4. The occupied/unoccupied schedule shall correspond to the occupancy schedule for the zone that is served by each unit. Delay startup of the unit until the zone temperature has recovered from its previous setback or setup temperature during the unoccupied mode.
- 5. Once activated, supply fan, exhaust fan, and energy recovery wheel shall run continuously with the outside air and exhaust air dampers open. The gas heating section and DX cooling system shall be staged to maintain minimum 70m degrees F, adjustable in the return air duct based on a temperature sensor at the unit return. On a rise in discharge air temperature, the DX cooling system shall be staged to provide cooling. On a fall in temperature the reverse shall occur.
 - a. When the unit is deactivated, the fans, heating and cooling shall be off and all dampers shall be closed.
- 6. The DDC controller shall receive input from the unit's factory installed energy wheel rotation sensor for monitoring and alarm generation at the OWS.
 - a. Unit shall continue to run in manual mode until the unit is shut down manually or at the OWS whenever the energy wheel fails.
 - b. Whenever the outside air temperature is +/- 5°F, adjustable, of return air temperature in the unit, the energy recovery wheel shall stop.
- 7. Interface with a common fire alarm input from the fire alarm system. The fire alarm contact shall be provided at the fire alarm panel by the fire alarm contractor. The status of the alarm contact shall be communicated throughout the BAS. When the fire alarm contact indicates an alarm condition, the BAS shall de-energize the unit. When de-energized, the damper motors shall spring return the outside and exhaust air dampers closed. Provide an alarm at the OWS to indicate fire alarm status. NOTE: the FAS shall also shut down the unit whenever a classroom CO (carbon monoxide) detector goes into alarm.
- 8. The Mechanical Contractor install duct smoke detectors in the supply and return air ducts at the unit as furnished by the FAS vendor as part of the work of Division 26 Electric. When wired to the fire alarm system as required by the Division 26 contractor, the duct smoke detectors shall alarm the FAS, which shall signal the BAS to de-energize the unit in a manner similar to item 7.
- 9. The following items shall be displayed at the OWS:
 - a. Discharge air temperature.
 - b. Discharge air temperature setpoint.
 - c. Return air temperature.
 - d. Exhaust air temperature.
 - e. Fire alarm system status alarm.
 - f. Commanded status of fans.
 - g. Supply fan operational status via a current switch.

- h. Exhaust fan operational status via a current switch.
- i. Energy recovery wheel commanded status and alarm.
- j. Smoke detector status/alarm.
- k. Diagram showing the layout of the equipment with major components and dynamic temperatures shown where temperature sensors exist in the system.

S.1 Packaged Rooftop Unit Control: General

- 1. The sequence that follows is typical for units RTU-1 through RTU-5. Each unit consists of a supply fan, packaged air-cooled DX cooling system, gas fired heating section, air filters, air control dampers and actuators, and unit controls.
 - Each unit is a constant volume system with minimum outside air and economizer mode of operation.
 - b. Each unit shall be controlled by an individual DDC Controller. The DDC Controller and all required sensors shall be provided by the BAS Controller. The DDC Controller shall be wired to sensors which shall include, but are not limited to, a discharge air temperature sensor, mixed air temperature sensor, return air temperature sensor, return air humidity sensor, global outside air temperature/humidity/enthalpy, CO2 sensors, and space temperature sensors.
- 2. The following items shall be provided by the equipment manufacturer:
 - a. Motor starters and overload protection.
 - b. Control transformers.
 - c. Dampers and damper motors.
 - d. Terminal blocks for all wiring connections between equipment and control devices.
 - e. Standard factory control modules for unit DX and natural gas functions.

The following items shall be provided by ATC:

- a. Space temperature sensors.
- b. Discharge air temperature sensor.
- c. Return air temperature and humidity sensors.
- d. Global outside air temperature and humidity sensors.
- e. Current switch for one phase of the power feeding the fan.
- f. Mixed air average temperature sensor.
- g. CO2 sensors.
- h. DDC Controller.
- 3. During the programmed occupied mode, the supply fan shall run continuously with the outside air damper closed. When fan fails to start once activated, initiate an alarm to the system after a twenty second delay. Monitor fan status with a current switch on one leg of power feeding the fan motor. Delay opening the outside air damper to its minimum position until the zone space temperature has recovered from the setback or setup temperature setting.
 - a. Outside air damper shall remain closed until return air CO2 level rises to 700 ppm. The outside air damper shall step open from the closed to full scheduled open position to maintain CO2 level at or below 700 ppm. The return air and relief air dampers in the system shall modulate in unison to maintain the balance of air in the system.
 - b. On a continued rise in CO2 level above 900 ppm, activate an alarm at the OWS. On a decrease in CO2 level below 700 ppm, the outside air damper shall step closed.
- 4. On a drop-in space air temperature below the programmed setpoint of 70°F, adjustable, the unit gas heating section shall be activated through its unit controls and stage to maintain setpoint. Use space sensors to maintain temperature setting.
- 5. On a rise in space air temperature above setpoint, the mixing box economizer sequence shall be

activated. On a further rise or if the economizer sequence is deactivated, the unit air-cooled DX system hall be activated through its unit controls to maintain setpoint. On a fall in temperature the reverse shall occur. Maintain 75°F, adjustable.

- 5. The mixing box economizer sequence shall be activated as the first stage of cooling. The DDC Controller shall receive input from the global outside air temperature and humidity sensors to calculate outside air enthalpy. If the outside air enthalpy is at 25 BTU/lb, adjustable, the mixing box dampers shall modulate to maintain the mixed air temperature setpoint of 55°F, adjustable. The outside air damper shall continue to open up to 100% outside air to satisfy cooling demand. The return/relief dampers in the unit shall move in unison to maintain the balance of air in the unit. The outside air damper shall not close below the minimum position during the occupied period.
- 7. During the programmed un-occupied mode, the fan, heating, cooling and mixing box dampers shall be cycled/modulated to maintain the un-occupied setpoints of 60°F (heating) and 85°F (cooling), all adjustable. Unless required for economizer cycle, the outside air and relief air dampers shall remain closed with the return air damper fully open.
- 8. Interface with a common fire alarm input from the fire alarm system. The fire alarm contact shall be provided at the fire alarm panel by the Fire Alarm Contractor. The status of the alarm contact shall be communicated throughout the BAS. When the fire alarm contact indicates an alarm condition, the BAS shall de-energize the unit. When de-energized, the damper motors shall spring return the outside and relief air dampers closed. Provide an alarm at the OWS to indicate fire alarm status. NOTE: the FAS shall also shut down the unit whenever the room CO (carbon monoxide) detector goes into alarm.
- 9. The Mechanical Contractor install duct smoke detectors in the supply and return air ducts at the unit as furnished by the FAS vendor as part of the work of Division 26 Electric. When wired to the fire alarm system as required by the Division 26 contractor, the duct smoke detectors shall alarm the FAS, which shall signal the BAS to de-energize the unit in a manner similar to item 8.
- 10. The following items shall be displayed at the OWS:
 - a. Average space temperature.
 - b. Average space temperature setpoint.
 - c. Mixed air temperature.
 - d. Mixed air temperature setpoint.
 - e. Global outside air temperature, humidity and enthalpy.
 - f. Fire alarm system status/alarm.
 - g. Duct smoke detectors status: normal/alarm.
 - h. Commanded status of fan.
 - i. Supply fan operational status via current switch.
 - j. Diagram showing the layout of the equipment with major components and dynamic temperatures shown where temperature sensors exist in the system

T. Outdoor Lighting Control

- 1. Division 26 Electric shall provide multiple lighting contactors for control of outdoor lighting. The lighting will be divided into two or more zones. The lighting contactors shall be located adjacent to each other as shown on the electrical drawings.
- 2. Provide an outdoor, ambient light level sensor. During the programmed operation period, the outdoor lighting shall be activated when the outdoor ambient light level falls below the programmed setpoint. Each zone shall have independent light level setpoints and time schedules. Set time schedules and light level setpoints as directed by the owner. All time schedules and setpoints shall be adjustable at the OWS.
- 3. The following items shall be displayed at the OWS:
 - a. Ambient light level.
 - b. Time schedule per zone.

c. Commanded status of each zone.

U. Biohazard Shut Down System Control

- 1. Provide a biohazard shutdown system including an emergency shut down switch, a "normal" pilot light and an emergency pilot light. The switch/pilot light assembly shall be located as directed by the Owner. Provide labeling of all components.
- 2. When the emergency switch is activated, a signal shall be sent to the BAS to shut down all air handling equipment and to close all dampers controlled by the BAS. Provide an alarm at the OWS when the switch is activated.
- 3. The alarm shall be manually reset at the switch and at the OWS before normal system operation resumes.
- 4. The status of switch/system normal or alarm shall be displayed at the OWS.

SECTION 260130: MANHOLES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of manholes and manhole installation work is indicated by drawings and specifications.
- B. Types of manholes in this section shall include the following:
 - 1. Precast concrete
 - 2. Poured in place

1.2 SUBMITTALS

A. Submit manufacturer's data on manholes including, but not limited to, roughing-in drawings, construction details and structural support data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide manholes with frame and cover, and cable accessories of one of the following:
 - 1. Manholes A.C. Miller Concrete Products, Inc.
 - Gillespie Precast, LLC
 - 2. Frame and Cover Neenah Foundry Co.

2.2 STANDARD MANHOLES

- A. Manholes shall be a precast concrete box with interior dimensions of 48" wide x 48" long x 48" deep with 6" walls, floor and top.
- B. Floor shall be provided with a ground rod hole, pulling irons and a 12" diameter x 12" deep sump.
- C. Top shall be a precast 6" slab with a circular opening suitable for a manhole frame opening of 32-1/2.
- D. The precast 6" top slab shall be sealed where it joins the manhole. The entire exterior surface of the manhole shall be coated with a bitumastic type waterproof coating prior to installation.

2.3 MANHOLE FRAME AND COVER

- A. Frame and cover shall be a round, heavy duty, cast iron frame and solid cover with machined horizontal bearing surfaces. Total weight to be approximately 365 pounds.
- B. Frame and cover dimensions shall be as follows:
 - 1. Overall frame size = 38-1/2"
 - 2. Clear opening size = 32-1/2"
 - 3. Overall frame height = 4"
- C. Cover shall have the word, "Electric", cast into it.
- D. Frame and cover shall be similar in manufacture to Neenah Foundry Company Model No. R-1792-HL.

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2.4 GROUND ROD AND CLAMP

- A. Ground rod shall be a rigid steel rod with a heavy duty, uniform, non-porous copper coating. Rod to be 3/4" dia. x 10'-0" long. Clamp to be cast of high copper content bronze alloy.
- B. Ground rod assembly to consist of the following:
 - 1. Ground rod Blackburn Cat. No. W5810
 - 2. Ground Clamp Blackburn Cat. No. J-JR.

PART 3 - EXECUTION

3.1 INSTALLATION OF MANHOLES

- A. Install manholes in accordance with manufacturer's written instructions and complying with applicable portions of NEC and NECA's "Standard of Installation."
- B. Manholes shall be oriented in accordance with duct bank requirements as indicated on the electrical site plan. The depth of the manhole shall be as required to allow the frame and cover to set level with finished grade.
- C. Manholes shall not be set in an area or at an elevation which will allow surface water or runoff to enter manhole through the cover. Should this occur, this Contractor will be required to raise the frame and cover and regrade the area.

3.2 FIELD QUALITY CONTROL

- A. Contractor shall inspect the conduit entrances into the manhole looking for broken ducts and/or rough edges and repairing the findings. Contractor shall also check that conduit entrances are sealed to keep out ground water.
- B. All manholes shall be cleaned of dirt and construction debris. All spare conduits shall have a nylon pull cord installed for future use.

END OF SECTION 260130

MANHOLES 260130-2

SECTION 280727: INTEGRATED ACCESS CONTROL & SECURITY MANAGEMENT SYSTEM

PART I - GENERAL

1.1 GENERAL DESCRIPTION

- A. The Security Management System (SMS) shall be a powerful, flexible, multi-function and object-oriented security and event management system that features a variety of customizable interfaces for maintaining the system and for monitoring the desired secure sites. The SMS shall provide an option to display these management and monitoring interfaces in the native languages of the people using the system. The security and event management system shall be flexible in order to meet specific requirements and quickly respond to evolving security challenges. The SMS shall be a scalable platform, simple and economical enough to support a single site, yet upgradeable enough to manage a multi-site network. The SMS shall use an open, distributed architecture, where database servers could reside in geographically separate locations.
- B. The SMS shall provide extensive information management capability using Microsoft .NET Framework V4.6. It shall operate in a Client / Server configuration on personal computers with a Windows-based platform. Its distributed client-server architecture shall be capable of supporting up to 256 simultaneous clients, multiple types of controllers, and over 20,000 input devices, including cameras and multiple types of card readers. The SMS shall be constructed to be database independent and shall support at a minimum Microsoft SQL Server 2008R2 (Express, Standard, or Enterprise), for data protection, redundancy and manageability.
- C. The SMS shall have true multi-tasking, multiprocessor and remote client support; allowing independent activities and monitoring to occur simultaneously at different locations. The operator workstation (Client) shall be user friendly, employing icon-based menus and providing a mouse-driven interface for system operation and the creation of color graphic maps. The user interface shall be customizable, capable of delivering a unique look and feel without a unique version release. It shall be an intuitive user interface that is similar to Microsoft's Outlook and Explorer with its easy navigation and tree structures. A practical application layout editor shall let users drag and drop any application onto one screen and create a customized hub for all activities via a single "command and control" center.
- D. Field devices such as card readers, alarm inputs, control points, etc. shall be connected to fully distributed intelligent field controllers or directly through a Software Development Kit or Web Services, and be capable of operating without host computer intervention. All objects within the SMS, i.e. doors, readers, time intervals, etc. shall be addressed by a unique name as opposed to point numbering or mnemonics. The SMS shall have badge generation tools to create and manage badges using a graphical interface and convenient query features to manage large numbers of badges.

1.2 SUBMITTALS

A. Shop Drawings

- 1. Prior to assembling or installing the SMS, the Contractor shall provide complete shop drawings which include the following:
 - a....Architectural floor plans indicating all system device locations.
 - b....Full schematic wiring information for all devices. Wiring information shall include cable type, cable length, conductor routings, quantities, and point-to-point termination schedules.
 - c....Complete access control system one-line block diagram.
 - d....Statement of the system sequence of operation.
 - e....Riser diagrams showing interconnections.
 - f.....Detail drawings showing installation and mounting.
 - g....Fabrication drawings for console arrangements and equipment layout.
- 2. All drawings shall be fully dimensioned and prepared in DWG format using any CAD-based software capable of exporting the format (such as AutoCAD).

B. **Product Data**

- 1. Prior to assembling or installing the SMS, the Contractor shall provide the following:
 - a....Complete product data and technical specification data sheets that include manufacturer's data for all material and equipment, including terminal devices, local processors, computer equipment, access cards, and any other equipment provided as part of the SMS.
 - b....A system description, including analysis and calculations used in sizing equipment required by the SMS. The description shall show how the equipment shall operate as a system to meet the performance requirements of the SMS. The following information shall be supplied as a minimum:

Central processor configuration and memory size.
Description of site equipment and its configuration.
Protocol description.
Rigid disk system size and configuration.
Backup/archive system size and configuration.
Start up operations.
System expansion capability and method of implementation.

-(8) System power requirements and UPS sizing.
-(9) A description of the operating system and application software.

C. As-Built Drawings

1. At the conclusion of the project, the Contractor shall provide "as built" drawings. The "as built" drawings shall be a continuation of the Contractor's shop drawings as modified, augmented, and reviewed during the installation, check out and acceptance phases of the project. All drawings shall be fully dimensioned and prepared in DWG format using any CAD-based software capable of exporting the format (such as AutoCAD).

D. Manuals

1. At the conclusion of the project, the Contractor shall provide copies of the manuals as described herein. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each security system integrator installing equipment and systems and the nearest service representatives for each item of equipment for each system. The manuals shall have a table of contents and labeled sections. The manuals shall include all modifications made during installation, checkout, and acceptance. The manuals shall contain the following:

a....Hardware Manuals

(1)	The hardware manuals shall describe all equipment furnished including:
(2)	General description and specifications.
(3)	System layout drawings and schematics.
(4)	Manufacturers' repair parts list indicating sources of supply.

- b....Software Manuals: The software manuals shall describe the functions of all software and shall include all other information necessary to enable proper loading, testing, and operation. The manual shall include:
-(1) Definition of terms and functions.(2) Use of system and applications software.(3) Initialization, start-up, and shut down.(4) Alarm reports.(5) Reports generation.(6) Database format and data entry requirements.

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- c....Operator Manual: The operator manual shall fully explain all procedures and instructions for the operation of the system including:
-(1) Computers and peripherals.(2) System start-up and shut down procedures.(3) Use of system, command, and applications software.(4) Recovery and restart procedures.
-(5) Graphic alarm presentation.
-(6) Use of report generator and generation of reports.
-(7) Data entry.
-(8) Operator commands.
-(9) Alarm messages and reprinting formats.
-(10)System access requirements.
- d....Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.3 **QUALITY ASSURANCE**

Manufacturer Qualifications Α.

1. The manufacturers of all hardware and software components employed in the SMS shall be established vendors to the access control/security monitoring industry for no less than five (5) years and shall have successfully implemented at least 5 systems of similar size and complexity.

B. Contractor / Integrator Qualifications

- 1. The security system integrator shall have been regularly engaged in the installation and maintenance of integrated access control systems and have a proven track record with similar systems of the same size, scope, and complexity.
- 2. The security system integrator shall supply information attesting to the fact that their firm is an authorized product integrator certified with the SMS. A minimum of one technician shall be a Certified SMS installer.
- 3. The security system integrator shall supply information attesting to the fact that their installation and service technicians are competent factory trained and certified personnel capable of maintaining the system and providing reasonable service time.
- 4. The security system integrator shall provide a minimum of three (3) references whose systems are of similar complexity and have been installed and maintained by the security system integrator in the last five (5) years.
- 5. There shall be a local representative and factory authorized local service organization that shall carry a complete stock of parts and provide maintenance for these systems.

C. **Testing Agencies**

- 1. The SMS shall be tested and listed by Underwriters Laboratories (UL) for UL/cUL 294 for Access Control System Units.
- 2. The SMS shall be tested and listed by Underwriters Laboratories (UL) for UL/cUL 1076 for Proprietary Burglar Alarm Units.
- 3. The SMS shall employ a FIPS 197-listed AES 256-bit encryption between the SMS Servers. Clients, and iSTAR Ultra/eX/Edge Controllers.
- 4. The SMS shall include full support for FIPS 201 initiative:

- a....Ability to customize a system-wide Card Holder Unique Identification number (CHUID).
- b....Ability to configure custom, extended card formats, including GSA 75-bit Wiegand standard, and to download them to the card access panels.
- c....Ability to use Hashed Message Authentication Codes (HMAC) for medium assurance profile.
- d....Enhanced data fields per the FIPS 201 standard, including Agency Code, System Code, Credential Series and Credential Issue Code.
- 5. The SMS hardware shall comply with the following regulatory requirements:
 - a....FCC Class A.
 - b....FCC Class B.
 - c....CE.
 - d....Canadian Radio Emissions requirements.
 - e....Restriction of Hazardous Substances Directive (RoHS) 2002/95/EC.
 - f.....FIPS 140-2 encryption (certified for the iSTAR Ultra/Edge/eX controllers).
- 6. The SMS shall support Americans with Disabilities Act (ADA) compliance in door and access operation.
- D. Licensing: Licensing shall be required for the SMS software. The licensing shall include:
 - 1. Series (Model).
 - 2. Number of online readers.
 - 3. Number of online inputs.
 - 4. Number of online outputs.
 - 5. Number of card holders.
 - 6. Number of simultaneous clients.
 - 7. Number of simultaneous badging stations.
 - 8. Optional Features.

1.4 WARRANTY

A. The SMS shall be provided with a 14-month product warranty from date of shipment or 1 year from date of registration, whichever is shorter. The SMS Hardware shall be provided with a 5-year product warranty from date of manufacture. Software version upgrades shall be available for no charge during this warranty. The software media warranty shall be 90 days per the C•CURE software licensing agreement.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The SMS shall be the Software House C•CURE 9000 system. The Badging Solution shall be Software House C•CURE ID. The SMS field controllers shall be the Software House iSTAR family of controllers. The hardware manufacturer shall be an ISO 9001:2000 registered company.

2.2 DESCRIPTION

A. The SMS shall be an integrated system that utilizes a single, industry-standard relational database management system for the storage and manipulation of related data. The SMS shall include a server with operating system and applications software, operator and administrator terminals with appropriate software, hard copy printers and fixed magnetic storage media. The security devices shall communicate with the field panels via a dedicated cable network. The field panels shall communicate to the server via a Fast Ethernet 10/100 or 1 Gb, TCP/IP network.

B. The SMS shall allow for growth and scalability from a low-end or entry level system to a high end or enterprise system by increasing CPU power, memory and database. The SMS shall be modular in nature, allowing system capacities to be easily expanded without requiring major changes to system operation. All defined system data as well as historical information shall be maintained. Customizable user interfaces shall allow management of system information and activity for administrators and operators. The SMS shall include an intuitive .NET based badging solution with a WYSIWYG badge layout editor and GUI for badge design.

2.3 SMS Functionality

A. Partitioning

- The SMS shall allow system administrators to separate the creation and viewing of objects into partitions. SMS operators shall be associated with partitions and this shall determine which objects operators have the ability to create and or view. The SMS shall support an unlimited number of partitions.
 - a....The SMS partitions shall include but not be limited to the following objects:

(1)	Personnel
: :	Clearances
(3)	Doors
(4)	Controllers with all associated hardware (readers, inputs, outputs, etc)
(5)	Video servers with all associated objects (cameras, tours, views, etc)
(6)	Application layouts
(7)	Events
(8)	Dynamic views
(9)	Maps
(10	Reports, forms, results
(11)Holidays
(12)Badge layouts
(13	Queries
•)Images

- 2. Through the use of privileges, the SMS System Administrator shall be able to determine which objects are associated with a particular partition. These objects shall then be assigned to System Operators with the appropriate privilege.
- 3. The SMS shall support a super-user assigned the 'System All' privilege who shall have full access to all objects in all partitions.
- 4. Any operator shall have the ability to be assigned access rights to any partition. Individual Access rights shall be created and have the ability to be assigned to any users of the SMS.
- 5. The SMS shall allow objects to be created in any partition. The SMS shall have the ability to grant or remove permission from any object in any partition.
- 6. The SMS shall provide the ability to move objects from one partition to another partition without the requirement of deleting and recreating.
- 7. The SMS shall provide the ability to import/export any configured object.
- 8. The SMS shall support the display of all associated objects contained within a partition.

B. Enterprise Architecture

 The SMS shall provide an Enterprise Architecture, licensable option that allows you to configure multiple Satellite Application Servers (SAS) to communicate with a Master Application Server (MAS). The Master Application Server shall provide a platform for global management of the personnel, video, and access control security objects on two or more Satellite Application Servers (SAS) in an enterprise.

- 2. The Enterprise Architecture shall work by synchronizing each SAS system's database with the MAS database. The MAS shall contain the global data that is used across every server, such as global personnel records, global clearances, and global schedules. The global data shall be synchronized to each SAS to provide enterprise-wide security. The MAS shall be used to remotely monitor and manage controllers and video servers attached to SAS's in the enterprise, however it shall not support any directly connected controllers or video servers.
- 3. The MAS shall provide the capability for Central Monitoring of the entire enterprise, using the Monitoring Station application. From a Central Monitoring Station connected to the MAS, the system shall be capable of viewing events, activities, and status of every SAS in the enterprise. Alternatively, you can connect to an individual SAS to monitor that system and its connected hardware. In addition, the MAS shall provide the ability to integrate with external sources via LDAP, XML, CSV or ODBC imports both manually or automatically through scheduled processes.
- 4. Each SAS shall contain database records for all connected video and access control devices, as well as local personnel, clearances, privileges, and other related data. Each SAS shall synchronize with the MAS so that SAS local data is replicated to the MAS for central management and monitoring. In addition, the MAS shall provide central reporting capability for replicated SAS objects including journal and audit transactional data. [Note, for Connected Program integrations, SAS local data is not replicated to the MAS and central reporting is limited.]
- 5. All local data shall be synchronized immediately to the MAS or queued if a server is offline. All queued data shall be replicated automatically upon restoral of communication. Global data that is created or changed at the SAS/MAS shall be replicated to all locations. Journal and Audit data shall be synchronized either manually or on a configurable schedule, providing the ability to manage bandwidth usage and load balancing.
- 6. Operators in the enterprise architecture shall be configured as local or global. Global operators shall be subject to the user privileges as defined on each SAS.
- 7. The Enterprise Architecture shall support a Standalone to SAS Migration Utility that shall be used to merge a standalone SMS server into an existing SMS Enterprise site.
- 8. The Enterprise Architecture option shall include:
 - a....Global Administration of Personnel and Clearances, Images, Card formats, CHUID Formats, Holidays, Personnel groups, and Operators and Privileges
 - b....Centralized Reporting
 - c....Central Monitoring of Events and Activities across the Enterprise
 - d....Central Management of Access Card Enrollment
 - e....Central Badging and Image processing
 - f.....Global Management of Badge Layouts
 - g....Single Card Access across the Entire Enterprise
 - h....Increased Scalability of Security Hardware and Video
 - i. End-to-End Encryption
 - j.....Automated Synchronization of Enterprise Security Databases
 - k....Central Management of Video and Hardware Resources
 - I.....Remote Editing of Global and Local Data
- 9. The SMS Enterprise model shall not restrict the addition and/or configuration of over 40 regional application servers configured to a master application server. Testing and qualification has been completed for up to 40 regional servers. However, the SMS shall have no technical restrictions to regional server capacity limits other than system performance.

- 10. The SMS shall support the configuration of multiple Global partitions in addition to the default Global partition providing the SMS more organization options for objects within the Enterprise system.
- 11. The Enterprise Architecture option shall provide Multi-Version support. Multi-Version support shall allow SASs running a prior version of the SMS software to continue to synchronize with the MAS allowing for a phased deployment during an Enterprise-wide upgrade. Client connectivity between MAS and Multi-version SASs for monitoring and administration is supported

C. Graphical User Interface (GUI)

 The SMS shall employ a standard Windows graphical user interface (GUI). A mouse and keyboard shall be the primary operator interface with the system. Operator screens shall utilize all standard Windows-style functions such as drop-down menus, context menus, radio buttons, and lists, as appropriate. The interface shall utilize a 'tree structure' similar to Windows Explorer.

D. Administration Operator Interface

- 1. The SMS shall employ an Administration Operator Interface to control the following:
 - a....Hardware (readers, inputs, outputs, video systems, door controls, CCTV, and other systems).
 - b....Configuration of personnel records, operators and operator privileges.
 - c....Graphical Maps.
 - d....Application Layouts.
 - e....Dynamic Views.
 - f.....Queries.
 - g....Import/Export of objects, including images.
 - h....System Variables.
 - i.Reports (either periodic or one-time).
 - j.....System functions (event command and control, actions, schedules).
 - k....Display of a list of objects in a grid that can have their values modified and respond to real-time status changes.
 - I.....Scheduling of backups.
 - m...Monitoring of system settings and performance.
 - n....Designing of and printing of badges.
- 2. The GUI shall be configurable by the system administrator to control the views and access of each Monitoring Station operator.

E. Monitoring Operator Interface / Activity Monitoring

- 1. The SMS shall contain a monitoring component that is capable of, among other things, displaying the current state of any object in the system. Additionally the monitoring station shall be capable of displaying a log of all activity that occurs in the system, from object state changes, to access control information. All text for events (alarms) in the system shall be configurable to be displayed in color based on the user-specified priority of the event.
- The Monitoring Station shall be capable of showing all changes occurring to an object without requiring the associated activity messages for that object to be routed to that monitoring station. The SMS shall require the operator to have appropriate permissions to view and/or control any object.
- 3. The monitoring station interface shall be user-customizable. The SMS shall support the ability of the end user to create a customized application layout for the monitoring station. The monitoring station shall support multiple application layouts that can be assigned to the operators. Each application layout can have multiple panes in the same window. The panes can have multiple tabs so that different objects such as cameras and tours can be displayed in

the same pane. The panes shall have the ability to include: General activity; Event (Alarm) activity; Dynamic card swipe information; Video cameras and tours; Maps; Dynamic Views; Reports; and links to external applications. Each pane shall have the ability to be moved to a specific screen.

- 4. The SMS monitoring station shall support a Swipe and Show Viewer. The Swipe and Show Viewer shall monitor a configurable list of Doors, and shall display a portrait or multiple portraits of personnel who present an access credential at a Reader on an included Door or Elevator. The SMS shall allow multiple Swipe and Show Viewers to be added to an Application Layout. The Swipe and Show Viewer shall provide configurable image border colors that shall correspond to access transaction states (Admit, Reject etc.,). The Swipe and Show Viewer shall display the date and time of the transaction, the location, area, Cardholders name and the status of the transaction. The Swipe and Show Viewer shall allow an Operator with the appropriate Privileges to perform the following functions from the Viewer:
 - a....View/Edit the Cardholder record
 - b....Perform a momentary unlock of the associated door
 - c....Grace the Cardholder (allow the cardholder into an APB area)
 - d....Perform an Area Lockout Grace of the cardholder
 - e....Perform an APB reset on the cardholder
- 5. The SMS shall support the ability to configure an Operator's Application Layouts to open in separate instances of the Monitoring Station to enhance the performance of multiple displays. Each Application Layout shall support the assignment of a monitor number. The Operator opening the Monitoring Application shall automatically open a separate instance of the Monitoring Application on each assigned Monitor. The SMS shall support up to Ten (10) assigned monitors for Application Layouts.
- 6. The SMS shall provide the Monitoring Operator with following functional capabilities:
 - a....Shall provide a scrolling list of lines or tiles showing current activity on the system.
 - b....Shall display activity in real-time as data is being transmitted by field hardware.
 - c....Shall include icons that indicate the type of activity and textual description of the activity.
 - d....The color of the frames of the tiles, icons, and/or text shall indicate the type or importance of the information contained therein.
 - e....A series of menus, driven by drop-down or trees, shall allow the Monitoring Station operator to perform manual actions, such as "momentary door unlock" for a given door.
 - f.....As part of the manual action capability, the system shall provide screens or boxes that query the operator on specifics, such as start and end time, and offer guidance on performing the manual actions.
 - g....Ability to view a sortable list of active alarms or events and recently active alarms or activity.
 - h....Ability to view video from DVMS systems within the same GUI. The video screen GUI shall be able to display multiple panes of live or recorded video and have on-screen camera controls for each live window, providing PTZ control of individual cameras.
 - i.....A GUI that minimizes the number of operator mouse clicks or keyboard strokes.
 - j.....Mouse controls include "right-click" pop-ups and highlighted default selections.
 - k....Objects shall be displayed to the operator based on his/her assigned operator privilege. The operator shall only be able to monitor/command those objects for which he or she has been assigned privilege.

- I.....When an operator logs out of a workstation and a new operator logs on, the objects displayed on the workstation screen shall by dynamically updated to display only those objects for which the new operator has privilege.
- m...Allow the customization of columns as defined by the operator privilege, including:
-(1) Adjusting width (on the fly or pre-programmed).
-(2) Not displaying Columns (on the fly or pre-programmed).
-(3) Sorting on selected columns (to follow standard Windows conventions).
- n....Allow for a "freeze" function. This includes a configurable "freeze time-out" that permits an activity to be selected and temporarily prevents the display of subsequent activities which push the selected activity off the screen. A break-through event disables the freeze function. The freeze function shall provide a graphic bar where the remaining time available in the freeze timeout shall be displayed. Selecting the freeze timeout icon before the time elapses shall extend the freeze timeout to the maximum.
- o....Provide Acknowledge All, Acknowledge and Clear All and Silence All buttons for events.
- p....Support multiple panes for the display of events, activities, video, personnel images, and maps.
- q....Display the number of active causes of an event.
- r.....Support the ability to attach a log message to an event, even after the event has been acknowledged.
- s....Provide the ability to attach Predefined Log Messages to an event upon acknowledgement.
- t.....Shall allow a Monitoring Operator to select on-screen transactions (both events and system activity) and Email the transactions with a single mouse click.
- 7. Pre-defined Alarm Acknowledgement Messages
 - a....The SMS shall provide the ability to create Predefined Log Messages. Each log message shall have a Name, Description, Label and Message Text. These messages shall be assigned to any event providing the ability to select the appropriate response that resolved the event. The SMS shall provide the ability to group multiple log messages and then assign the group to an event. Each group shall contain up to one hundred messages and each event shall support up to one hundred messages. The SMS shall allow only users with specified operator privileges to add, modify, or delete messages or message groups. Predefined messages shall be editable by an operator with the proper privilege and may be appended as required by the operator.
 - b....Messages shall have the following characteristics:
 -(1) Message Name shall be configured with up to 500 characters
 -(2) Message Description shall be configured with up to 500 characters
 -(3) Message Label shall be configured with up to 100 characters
 -(4) Message Text shall be configured with up to 3000 characters
- 8. The SMS shall support audible alarm annunciation at operator workstations (operator configurable audio [WAV] files associated with alarms).
- 9. The activity monitoring screen shall be capable of displaying the following features:
 - a....System clock.
 - b....Date/time when the activity actually occurred and the date/time when the activity was received by the server shall be displayed (when they are different).
 - c....Real time event counters.

- d....Count of the active events.
- e....Count of the events requiring operator acknowledgment.
- f.....Name of operator logged on at the workstation.
- g....Real-time display of the current activity on the system in chronological order.
- h....Acknowledge All and Silence All buttons for events.
- i.....Manual Action command buttons.
- j.....Pre-defined and configurable acknowledgement messages.
- k....Log message.
- I.....Clear event.
- m...Clear group of events.
- n....Event action message (automatically display selected message for event).
- o....Dynamic views.

F. Web Client

- 1. The SMS shall support a Thin Client to provide remote access to the SMS Server via a web browser. The Thin Client shall support Microsoft® Internet Explorer 7.0 and Mozilla Firefox® 3.0 or greater. The Thin Client shall support 128-bit AES encryption to the SMS Server.
- 2. The Thin Client shall support Single Sign-on utilizing Windows Authentication. The privileges of the SMS operator shall be propagated to the Thin Client User allowing only access to Security Objects for which the SMS Operator is authorized. The Thin Client shall provide support for Partitioning of the system and utilize the Partitions assigned to the Operator.
- All changes made to the SMS database via the Thin Client shall be recorded in the Audit Trail Database.
- 4. The Thin Client shall provide Personnel Management including:
 - a....Shall allow the operator to create and modify personnel data (includes adding/removing clearances, schedules, and expiration dates).
 - b....Operator shall have the ability to enable and disable cards.
 - c....Operator shall have the ability to search for, edit, add, and delete Personnel records from the SMS database.
 - d....Search function shall allow wildcards and shall include First name, Last name, card number, and user defined text.
 - e....Shall support the Auto-increment Card Number feature for Credentials created using the Web Client.
 - f.....Shall support a Change CHUID Format button on the Credentials tab that allows you to change the CHUID format of a Credential.
 - g....Shall support an Auto Generate button that allows you to randomly generate a PIN for PIN-only Credentials.
 - h....The SMS thin client shall provide a personnel image tab that includes image display, Image capture from a file or a local USB camera, and the capability to crop the Image and save it to the SMS personnel record.
 - i.....The SMS thin client shall support the previewing/printing of badges.
- 5. The Thin Client shall support an Activity Monitor to provide a scrolling display of system activity. Activity shall be restricted based upon the Operator's Privilege and Partition assignments. Display controls shall include page up, page down, and a freeze function.
- 6. The Thin Client shall support acknowledgement of an Event from the Event Dynamic View.

- 7. The Thin Client shall support for logging an Event Message from the Event Dynamic View
- 8. The Thin Client shall support Manual Actions to include the Locking/unlocking of doors, and the Activation/deactivation of events.
- 9. The Thin Client shall support the display of Dynamic Views as defined by the SMS. Dynamic Views shall provide a real time view of SMS data including Journal and Audit Trail history. Viewing of Multiple Dynamic Views shall be supported.
- 10. The Thin Client shall support creating, configuring, loading and saving of reports. Reports shall consist of personnel history activity or audit data. The report data shall allow sorting within the thin Client view page by any displayed field in ascending or descending order. The Thin Client shall allow reports to be saved in the following formats: XLS, CSV, XML, TXT or PDF. The operator shall have the option to save the report to a file or send it via email.
- 11. The Thin Client shall support Manual Action Challenges. The Manual Action Challenge shall require an operator to enter their login credentials (User name and password) when executing a manual action, such as a door unlock, from within the Thin client.
- 12. The Thin Client shall support the ability to query on a specific cardholder or a group of cardholders for the purpose of assigning clearances to multiple cardholders at once. Once the query is complete, the operator shall have the ability to assign a single access clearance or a group of clearances to all cardholders.
- 13. The Thin Client shall support the ability to display a door activity report from the web client cardholder record configuration view. In addition, it shall provide the ability to display the Activation / Expiration Date and Time for each credential assigned to a cardholder. The thin client shall display all user-defined personnel fields and the details of each assigned access clearance in a separate window.
- 14. The Thin Client shall support Auto-Logoff based upon inactivity. The Thin Client shall monitor user activity and shall automatically log a user out of the workstation after a user defined timeout period.
- 15. The Thin Client shall support the ability to assign or remove clearances to multiple cardholders simultaneously.

G. SMS Mobile Application

- 1. The SMS shall support a Mobile Application allowing operators to monitor or administer the SMS system by way of mobile device. The device shall be connected via the phone network and a VPN or via Wi-Fi to the SMS server utilizing Web Service (IIS Web Service).
- 2. The SMS Mobile software shall be available for download from the following locations:
 - a....Apple App Store
 - b....Google Play
- 3. The Mobile Application shall support mobile phones and tablets running the following operating systems.
 - a....Apple iOS 7.1 and higher (iPhone, iPad, iPod Touch)
 - b....Android OS 4.0 and higher
- 4. The Mobile Application shall connect to a standalone SMS server, including an Enterprise Satellite Application Server (SAS) and Site Server (Appliance).
- 5. The SMS Mobile Application shall support connection to the SMS system through a 3G (minimum), 4G, or Wi-Fi connection.

- 6. The number of mobile connections allowed by the SMS server shall be based on the SMS licensing model. Each connection made through the SMS Web service shall be considered a simultaneous client connection.
- 7. Operator login to the SMS Mobile Application shall be consistent with the SMS thick client application, authenticating login credentials via Windows Single Sign-On (SSO).
- 8. The SMS Web Service shall require Internet Information Services (IIS) be installed on the target system. The SMS Web Service shall be installed on the IIS server during installation.
- 9. The SMS Mobile Application user interface shall be localized with supported SMS languages: Arabic, Czech, Danish, Dutch, English, French, German, Hungarian, Italian, Japanese, Korean, Polish, Portuguese (Brazilian), Russian, Simplified Chinese, Spanish, Swedish, Traditional Chinese, and Turkish.
- The SMS Mobile Application shall support SSL-encrypted communications with the remote Mobile Web Service.
- 11. The SMS Mobile Application shall provide a search and filter option to refine query results.
- 12. The SMS Mobile Application shall provide a link to a context menu while viewing objects, providing the operator the ability to perform SMS operations consistent with the SMS administration and monitoring applications.
- 13. The SMS Mobile Application shall provide the following core features:
 - a....The SMS Mobile Application shall provide operators with the appropriate privilege, access to tools used for inspecting the SMS Journal and Audit Logs.
 - b....The SMS Mobile Application shall provide a collection of tools to monitor SMS events and other objects. Monitoring shall show active SMS events in real time.
 - c....The SMS Mobile Application shall provide a collection of tools to manage personnel and shall allow for the following:
 -(1) Create/Update Personnel Records
 -(2) Assign/Remove a card/credential to personnel.
 -(3) Capture an image and associate that image with personnel.
 -(4) Grace personnel, Antipassback Card Reset, Area Lockout Grace, and remove personnel from an Area
- 14. The SMS Mobile Application shall provide tools used to explore, edit and control the following objects:

Favorite Filters

Favorite Monitors

Query

Events

Manual Actions

Operators

Controllers

Doors

Elevators

Inputs

iSTAR Clusters

Outputs

Readers

15. The SMS Mobile Application shall provide an editor for local application preferences such as:

- a....Login Parameters Encryption, Inactivity Timer, etc.
- b....Data Collection Page Size
- c....Monitoring Polling Intervals, etc.

H. Graphic Maps

- 1. The SMS shall support unlimited graphic maps and icons to be displayed on the operator workstation monitor.
- 2. The system shall support an operator-programmable, color graphic map display that:
 - a....Shall be capable of showing the floor plan, the location of alarm devices, and alarm instructions for a facility.
 - b....Shall be centralized in the system configuration and displayed on the operators' workstations.
 - c....Shall allow various maps to be associated with different areas to create a hierarchy of maps.
 - d....Shall support graphic maps having a resolution of 1024x768 Pixels or greater.
- 3. Operators shall be able to use drag-and-drop mouse technique to place dynamic system level object icons of all objects such as: cameras, video servers, inputs/outputs, events, maps, reports, dynamic views, and door/elevator icons. These dynamic object icons shall allow a system operator to perform tasks and issue commands related to the object by double-clicking on the icon.
- 4. The SMS shall allow the addition of new layers to the drawing (such that if the drawing must ever be reloaded due to an update of the drawing, the layer(s) created within the SMS will be added back automatically without additional reconfiguration).
- 5. The SMS shall be able to directly import the following file formats for the map:

AutoCAD (.DWG) DXF JPEG (.JPG) PNG

- 6. The Maps feature shall include two operational modes: an administrative mode to allow configuring of the facility floor plans or site plans that show exterior features and a runtime mode to allow monitoring and interacting with the configured facility layouts or site plans.
- I. Information Storage, Backup and Transfer
 - 1. All programmed information, as well as transactional history, shall be automatically stored in the database for later retrieval and backup. The SMS shall support configurations where the SMS database(s) may be installed on a hard drive on the SMS server, on an independent database server, or in an existing corporate database server.
 - 2. The SMS shall be capable of backing up and restoring all system data and transactional history. The server shall be capable of transferring all programmed data and transactional history to CD-ROM, DVD, or Hard Drive (including networked drives).
 - 3. The SMS shall allow activity history to be written to a database. The system shall have the capacity to store a minimum of 50 million transactions. There shall be a method of backing up the activity history on external media and then restoring and replaying it.
 - 4. The SMS shall support AES 256-bit encrypted communications between server and user client.

5. The SMS shall support AES 256-bit encrypted communications between server and controller. The encryption shall support both local and third-party digital certificates.

J. Communication Ports

- The SMS shall be able to support multiple serial devices. In addition to COM1 and COM2, up
 to [8, 16, 32, to 256] additional ports may be configured through the use of a port expander or
 its equivalent. These serial ports may be used for connection to CCTV matrix switchers, or apC
 panels.
- 2. The SMS shall support the use of Ethernet networks as the communications path between the host computer and field devices such as, iSTAR, apC, apC 8/x, controllers, and CCTV matrix switchers. This communications path shall be the same network used for communications between the host server and the operator workstations. The communications between the host computer and the field devices shall be encapsulated in a TCP/IP network/transport layer. The SMS shall support IPv6. (IPv6 shall be supported only on iStar Ultra controllers.)

K. Printers

1. The SMS shall support report printing. The report printer(s) may be connected directly to the client PC, or shared over a network. The SMS shall support as report printer(s) any printer for which a printer driver exists within the Operating System supported by the current SMS version.

L. Software Configuration

- 1. The SMS configuration tools shall utilize intelligent configuration controls. The system shall be structured so an operator is unable to perform configuration functions that are invalid based on the configuration used. The system shall support the ability to search within browser lists using filtering operators such as "begins with", "ends with", "contains", etc. The system shall also allow an operator to do searches using filtering operators on any class of object in the system, both in the Administration application and the Monitoring Station application.
- 2. The SMS shall allow text description of all configured objects. The SMS shall allow the renaming of an existing title description without removing the sub-components of that configuration object. The SMS shall automatically remove from the system all configuration references to an object being deleted. The SMS shall automatically provide default names for all inputs, outputs, readers, and extension boards. The SMS shall clearly display which hardware objects (inputs, outputs, readers) on a controller are configured, and which are not.
- 3. The SMS shall provide for the configuration of templates. Templates of supported objects shall be operator-configurable to provide default values by pre-populating commonly used data fields.
- 4. The SMS shall support an unlimited number of groups for any object type. The SMS shall support unlimited object group definitions. In general, a group shall be usable wherever an individual object is referenced in the SMS. For example, a group may be used instead of an object when configuring a schedule/object pair in a clearance, and a group may be used instead of an object when performing a manual action to unlock a door.
- 5. The SMS shall generally allow any object in the system to be grouped including personnel, doors, inputs, outputs and clearances.
- 6. The SMS shall restrict the viewing and controlling of objects in the administration and monitoring stations via operator privileges. The SMS shall support the configuration of operator restrictions on an object class basis, and on an object-by-object basis. The SMS shall maintain a distinction between objects that are being monitored and objects that are being controlled, preventing operators from issuing object manual actions to objects for which the operator does not have manual action privileges. There shall be different levels of controls within the system for administration privileges versus monitoring privileges.

- 7. The SMS shall support unlimited operator accounts with unlimited definable privilege levels.
- 8. The SMS shall allow configuration of controllers using hierarchical tree-based navigation and context menus.
- 9. The SMS shall support the ability to download firmware updates to the controllers.
- 10. The SMS shall support the following methods for Operator authentication and authorization:
 - a....Windows Single Sign-On (SSO).
 - b....Basic User Authentication with locally defined user names and passwords with strong password rule enforcement.
- 11. The SMS shall provide an automatic client update process for quick distribution of application updates.
- 12. The SMS shall have context sensitive online help (at the screen level) available at any point requiring operator input.

M. Personnel Records

- 1. The SMS shall provide Personnel Templates that shall eliminate repetitive data entry by preconfiguring Personnel Records with data common to all Personnel.
- 2. The SMS Personnel records shall provide multiple tabbed pages of personnel data containing default system and user-defined fields. The SMS shall support an unlimited number of tabs allowing an unlimited number of user-defined fields. Labels for user-defined field tabs shall be customizable by the System Administrator with the appropriate privileges. Each user-defined field shall allow a name, description and label. A default language shall be selectable by the System Administrator for the user-defined field labels.
- 3. User-defined fields shall be definable as Mandatory or Unique and shall support the following field types:

Character

Integer

Logical

Date/Time

Date

Time

Enumerated List

Multi Line

Decimal

Identity

4. User-defined fields shall support masking to provide consistency of data entry across all system operators. Custom masks, as well as the following predefined masks, shall be available:

Alphabetic Alphanumeric Numeric Phone Number – USA Zip Code Zip Code +4 Alpha – All Caps Alpha – All Lower case

- 5. The SMS shall provide a "Personnel Record Document Object" option which allows the operator to assign / attach up to two (2) documents (such as URL, PDF, or TXT files) to the personnel record. The document may be applied to the record as a:
 - a....'Shared' Document added to the SMS via the Documents Editor.
 - b....'Private' Document imported from outside the system, such as a birth certificate or a diploma.
- 6. The SMS shall include a "Documents" tab to user-defined personnel views as well as the default view "Personnel View with Portrait in Header" to support the association of documents. The documents are available for viewing by operators with appropriate privilege.
- 7. The SMS shall support the generation of a unique random card number for an access credential for all Personnel records. The unique card number shall contain up to the maximum number of digits for the CHUID format chosen for the credential.
- 8. The SMS shall support the configuration of a trigger for a Personnel record that pulses an Event whenever a 'Card Admitted'/'Card Rejected' message is logged to the Journal for that person at a defined Door/Elevator.
- 9. The SMS shall support an email address field for each Personnel Record and shall support the sending of emails to Personnel Groups.

N. Credentials

- The SMS shall support a minimum of five (5) credentials (cards) per Personnel record and shall only count Active and/or Expired Cards towards the maximum assignable Cards per Person. Cards designated as Lost, Stolen and Disabled shall not count towards the maximum assignable Cards per Person.
- 2. The SMS shall support the ability to define the default period of time (in Days, Hours or Years) from a Credential's Activation Date until its Expiration. The SMS shall support an override of the default Expiration time period for individual Personnel Types.
- 3. The SMS shall support Temporary Credentials. Temporary Credentials shall be available for general re-use without being associated to specific Personnel records. Temporary Credentials shall be assignable to visitors and can also serve as temporary replacement cards for Personnel who misplaced or forgot their regular Credentials. The SMS shall support the configuration of a default number of days for Temporary Credentials to remain active after they are created.
- 4. The SMS shall provide the ability to define background colors for the Active/Expired Credential Status fields in the Personnel Record.
- 5. The SMS shall support a system-wide setting to automatically disable Personnel Credentials that have not been used for a specified period of time. The Disable by Inactivity process shall support a user configurable daily scan time.

O. Personnel Views

- 1. The SMS shall support user-defined Personnel Views. Personnel Views shall provide the ability to customize the Personnel record by adding and/or removing certain objects from the operator's view. Personnel Views shall be assignable to SMS operators via the operator's assigned privilege and shall be definable for use in the creation and/or editing of the Personnel record. All Personnel Views enabled for an operator shall be selectable from the current view to allow an operator to switch views in real time. Personnel Views shall support the following:
 - a....Adding/Removing Fields (including all user-defined fields)
 - b....Custom Field Labels
 - c....Adding Boxes to group together common fields

- d....Adding/Removing tabs to organize fields
- e....Custom Tab Labels
- f.....Customization of Tab display order
- g....Background/Foreground color control of fields and labels
- h....Personnel Record Document Object to associate up to two (2) documents to the record

P. Language Localization

- 1. The SMS shall be configured so the information presented to system operators is displayed in a language native to the system operator provided that the proper translation files exist.
- 2. It shall be possible to translate the SMS into any left-to-right or right-to-left language supported by Unicode and by the Microsoft Windows operating system.
- 3. Languages shall include English, Arabic, Brazilian Portuguese, Dutch, French, German, Italian, Polish, Simplified Chinese, Spanish and Japanese.

Q. Inputs

- The SMS shall monitor both supervised and unsupervised hardware inputs as well as virtual
 inputs such as predefined system messages. These inputs include door / elevator inputs and
 monitor points. The SMS shall also monitor controller inputs such as tamper, AC fail, and low
 battery.
- 2. The SMS shall have the ability to name and allow for user-defined descriptions for individual inputs, outputs, and readers as well as input and output modules.
- 3. There shall be three separate and distinct states for inputs, which can be defined on the input configuration screen: Disabled, Enabled / Disarmed and Enabled / Armed.
- 4. The SMS shall allow configuration to link the state of an input to an output. The system shall allow multiple inputs to activate a single output or group of outputs.

R. Outputs

- 1. The SMS shall have outputs, also known as Control points, which associate an input or event action with a relay output. These output uses include doors / elevators, alarms and industrial control.
- 2. There shall be three types of outputs available: dry contact / Form C relays, wet or voltage sourced relays and Open Collectors. Outputs shall be configured such that they can be activated, deactivated or pulsed by system actions.

S. Card and Reader Support

- The SMS shall be designed to support multiple card formats and card reader types.
- 2. The SMS shall support the following features for directly connected readers:
 - a....OSDP. (Open Suprevised Device Protocol), v2.1.6 or higher. OSDP shall only be supported with the iStar Ultra and qualified OSDP capable readers, using OSDP Secure Channel AES128 encryption.
 - b....User defined card formats up to 256 bits.
 - c....Unlimited number of SMS card formats.
 - d....The ability to assign up to 10 card formats per reader.
 - e....The ability to show reader status on RM LCD.

- f.....Support Wiegand and 3x4 matrix keypads.
- g....The enrollment of biometric templates to smartcards.
- h....Custom CHUID FIPS201-compliant supporting full 256-bit data.
- i.....The SMS shall support readers that provide Wiegand signaling and magnetic signaling to include:
-Software House RM readers.
- Software House Multi-technology readers.
-Wiegand swipe/insert readers.
-Proximity readers.
-Biometric readers.
-Smart card readers.
-Wireless readers.
- Magnetic readers.

T. Advanced Door Monitoring

- The SMS shall support Advanced Door Monitoring allowing additional monitoring inputs and lock sensing equipment at all doors. Advanced Door Monitoring shall allow integration with third-party lock release inputs, such as fire and crash bar devices, that control emergency egress.
- 2. Advanced Door Monitoring shall include:
 - a....Multiple inputs Advanced Doors shall support up to 16 inputs.
 - b....Single and double-leaf doors with multiple DSM or Request To Exit (RTE) inputs.
 - c....Shall support Lock sensing devices to monitor locking on magnetic bonds, bolts, and cams.
 - d....Integrated lock releases to integrate door unlocking with fire, crash bar, power fail, and key switch inputs.
 - e....Special events and actions to create keypad commands that lock, unlock, and secure doors for a specific time period.
 - f.....Alarm Suppression and RTE control on a per door basis.
 - g....Enhanced Shunt control.
 - h....Grace and change timing options to fine tune the SMS timing to avoid the effects of 'door bounce'.
 - i.....Journal reports and Monitor Station activities to manage the system and monitor door activity.
 - j.....Additional Event Actions related to Advanced Doors

U. Keypad Commands

- The SMS shall support keypad commands. Keypad commands shall be up to Nine digits in length. Keypad commands shall be entered at a keypad connected to an iSTAR controller and shall be used to activate system events. The event shall be configurable to activate any allowable event action.
- Keypad Commands shall support Personnel Permission options to accompany the command and validate the issuer's identity. Keypad Commands shall be configurable to require a valid credential or a valid credential plus a PIN. Keypad Commands shall also be available to all Personnel or only selected Personnel as part of a Personnel Group.
- The SMS shall support the assignment of certain users as Keypad Command Administrators.
 These users shall be able to issue all Keypad Commands and shall not be required to be part of a Personnel Group assigned to a Keypad Command.

- Keypad commands shall have the ability to be limited to specific doors as part of a Door Group within an iSTAR Cluster. In addition, specific readers shall be configured to allow or disallow keypad commands.
- 5. Keypad Commands shall support segmentation of the nine-digit code in the form of Prompt Codes. Prompt Codes shall allow the user to utilize some digits of the Keypad Command to correspond to a command such as a door unlock, and the remaining digits to correspond to an object such as a door. When using Prompt Codes, the first segment shall be entered and the SMS shall prompt the user on the reader LCD module to enter the remaining digits. The SMS shall support two Prompt Codes per keypad command.

V. RM Reader LCD Messages

The SMS shall provide custom LCD messages to be displayed on the LCD screen of RM readers. All messages, as well as date and time formats, shall be downloaded to the controller and will be used on all supported readers configured on that panel. The ability for the System Administrator to change the Language for LCD messages shall be provided. (The reader LCD supports Western character sets only. No double-byte languages are supported.)

W. Wireless Reader Devices

- 1. The SMS shall provide for a Wireless Lock solution. The SMS shall interface to the wireless lock via panel interface modules. The panel interface modules (PIM) shall support a direct connect Wiegand or RS-485 interface to the Intelligent Controller.
- 2. The SMS shall support up to 16 wireless readers per controller. The readers shall support communicating to a single panel interface module (PIMs) or up to 16 PIMs depending on reader type and physical location of reader.
- 3. The SMS shall provide a Wireless Reader configuration tab within the Intelligent Controller UI for the setup of the RS-485 version of panel interface modules.
- 4. The wireless reader editor shall support the following input configuration:

Wireless DSM Wireless RTE

Wireless Reader Tamper

Wireless Reader Communication Fail

Low Battery

The wireless reader editor shall support the following output configuration:

Door Latch Relay

The SMS shall also support a Wiegand interface module to communicate to the iSTAR and apC family of controllers as a standard Wiegand reader signal.

X. Door Configurations / Elevator Control

- The SMS shall allow doors to be configured to operate in any of the following access control modes:
 - a....Unlocked
 - b....No Access (Secure mode)
 - c....Any combination of the following, as defined by schedule, event: card only, PIN only, Card + PIN, Card entry through keypad.
- 2. The SMS shall allow a door to be configured to operate using the following functions:
 - a....Readers shall read cards while the door is in the open position.
 - b....Door lock relay shall automatically lock upon the door being opened.
 - c....Allow for a user-defined delay relock time period.

- d....Allow for a user-defined door unlock time and door held open time.
- e....A separate (alternate) shunt timer for ADA flagged cardholders
- f.....The operator shall be able to specify a shunt expiration output to be triggered for a configurable time (in hh:mm:ss) before the expiration of the door open or alternate shunt. Can be enabled for ADA only, or all the time.
- g....Allow for a user-defined door unlock and door held time, in seconds.
- h....PIN-only access (keypad).
- i.....PIN-entry on the reader keypad shall be required during a specified schedule after a card access (unless a manual action or event has disabled PIN).
- j. Card entry through keypad.
- The SMS shall allow each door to be configured to cause a variety of events such as alarms to occur based on activity at that door.
- 4. The SMS shall support the activation of an event after a user-defined number of consecutive cards are rejected at a door. A user-configurable timer shall be available to determine the timeframe for the consecutive rejects. The timer shall restart after a valid card read. Separate triggers shall be available for inbound and outbound directions on doors with in and out readers.
- 5. The SMS shall support configuration of unlimited elevators.
- 6. The SMS shall support an extended unlock function initiated via two valid card presentations to a single reader or a 'double swipe'. The double swipe feature provides the ability to designate doors at which cardholders with double swipe privileges may perform an extended lock or unlock of the door. The double swipe feature shall support the following:
 - a....Toggle mode the first double swipe shall unlock the door and the second shall relock it. Toggle mode shall support the assignment of a cardholder group that can perform the double swipe.
 - b....Cardholders shall be required to have proper clearance to perform double swipe action.
 - c....Each SMS door shall be uniquely configurable for double swipe.
 - d....Reset of a double swipe unlock (relock) via a scheduled event.
 - e....Event activation to reflect double swipe state (Lock, Unlock).
 - f.....Modified reader beeper pattern to reflect the extended unlock mode.
- 7. The SMS shall support a two-person mode for unlocking certain doors two-person mode shall require two cardholders to present valid cards to unlock a door. Two-person mode shall support the assignment of separate cardholder groups for each cardholder that can perform the unlock. (Two person mode shall only be available on doors connected to iStar Ultra Controllers)

Y. Maintenance Mode

- 1. The SMS shall support a Maintenance Mode to facilitate the installation, testing and maintenance of selected SMS objects. Maintenance Mode shall be used to limit information about an object displayed on the SMS Monitoring Station. An SMS System Operator, with the appropriate Privileges, shall be able to place SMS objects into Maintenance Mode. Placing an object into Maintenance Mode shall not prevent SMS actions associated with that object from occurring. Maintenance Mode shall only affect the Monitoring Application and shall allow the System Operator to:
 - a....Only view those objects in Maintenance Mode
 - b....Exclude those objects in Maintenance Mode from an Operator's view
 - c....View information about all System objects, including those in Maintenance Mode
- 2. Operator Privilege and Application Layout Filtering assignments shall determine whether or not an object in Maintenance Mode is viewable as being in Maintenance Mode on the Monitoring Station. Only Monitoring Station operators with the correct privilege and Application Layout Filtering shall be able to view objects in Maintenance Mode. Maintenance Mode shall only be reported in Journal messages when an object is placed in Maintenance Mode.

- 3. The following objects shall be supported in Maintenance Mode (at a minimum):
 - a....iSTAR Clusters
 - b....Controllers
 - c....Doors
 - d....Readers
 - e....Input/Output Modules
 - f.....Inputs
 - g....Outputs

- h. Elevators
- i. Events
- j. Areas
- k. Intrusion Zones
- I. Keypad Commands

X. Area Control and Antipassback

- 1. The SMS shall support the ability to define Area configurations. Areas are defined as physical regions bounded by doors. An area shall consist of a room, a specific location(s) within a building, or an entire building
- 2. All configured areas shall have in/out access doors providing the ability to run reports showing all present cardholders in each area. There shall be no way to leave an area without presenting a credential to a reader/door.
- 3. The SMS shall support Global Antipassback and shall allow an area to be configured to cross multiple clusters (groups of controllers) to enforce Global Antipassback decisions.
- 4. The SMS shall provide the ability to run a Roll Call report. The host shall maintain a current area for each personnel record, and the time at which the area was entered (AreaAccessTime). The current area shall represent the last area entered by the cardholder based on a valid admit.
- 5. The SMS shall support Area control to provide the ability for tracking personnel. With this function, an operator shall obtain the current location of cardholders. Dynamic views and or reports can be generated to show specific cardholders who are present in each defined area.
- 6. Each cardholder's record shall provide easy access to view and maintain their current area location. This card record property will be updated as a person moves from one area to another using a valid credential.
- 7. The SMS shall support the configuration of an area as a Mustering area. A Mustering area is an area where Personnel gather in an emergency. A Roll Call report shall be supported for the tracking of Personnel present during an emergency. The SMS shall also support the definition of a De-Mustering area. The De-Mustering area shall be used to place all Personnel in a neutral area to accurately track Personnel as they re-enter a facility.
- 8. The local controller shall provide the ability to manage and control the Area configuration in the event that it loses communication with the SMS system server.
- 9. The SMS Area configuration shall have three modes of operations: None, Antipassback, and Timed Antipassback.
- 10. Antipassback shall control access based on the cardholder's location. The SMS shall deny access to cardholders who are in violation of antipassback rules. In the event that a cardholder leaves an area without presenting their credential to the out access reader/door and then tries to enter back into the area by swiping the In access reader/door, a denial of access will occur. The SMS shall provide the ability to grace individual cardholders who have violated antipassback rules. The Grace option shall also provide the ability to grace all cardholders.
- 11. Antipassback shall continue to be enforced during communications failure. SMS controllers shall have the ability to be clustered in a group. The master controller in the group and all other controllers within that group shall have full access to the existing antipassback information. The

cluster can be configured for 'No Access' Communications Failure mode or for 'Local' Communications Failure mode.

- 12. Clustered controllers configured in 'Local' mode that are disconnected from the master controller shall grace all cardholders from antipassback violations. The disconnected controller shall then follow antipassback rules specific to the areas defined on that controller. If the controller does not know if a cardholder is in antipassback violation based on areas that are configured between controllers, access will be granted.
- 13. Clustered controllers configured in 'No Access' mode that are disconnected from the master controller mode shall not grace all cardholders from antipassback violations. All cardholders will receive a denial of access until communications is restored.
- 14. The SMS shall support Timed Antipassback. Areas configured for Timed Antipassback shall require a cardholder use an exit reader to exit an area. Cardholders who do not exit properly shall be required to wait for a predetermined period of time before re-entering the area.
- 15. The SMS shall support Pass-through Areas. Area Pass-through shall serve to restrict the length of time that Personnel can remain in an Area before being required to exit or pass through to another area. The SMS shall support a user-defined time period for the Pass-through area. Personnel Groups shall be configurable with Pass-through Restrictions and each Personnel Group shall support a separate, user-defined time period that may be different than the Area-wide time interval. Personnel Groups shall be configurable to be exempt from Pass-through Restrictions.
- 16. The SMS shall provide occupancy restrictions for areas. Restrictions shall be applied to individual cardholders (personnel) or user defined groups of cardholders. Areas shall be configurable to provide limits for the maximum and minimum number of personnel who can access an area at one time. It shall be possible to trigger an event based upon a violation of either of these rules. Events shall be configurable based upon the following criteria:

Maximum occupancy status
Minimum occupancy status
Group Maximum occupancy status
Group Minimum occupancy status
Personnel Count (user-defined)
Violation status (Antipassback entry/exit violation etc.)

- 17. The SMS shall support Soft occupancy restrictions for both maximum and minimum occupancy to allow reporting of violations while still allowing access to the area.
- 18. The SMS shall support Area Lockout. Area Lockout shall restrict or lockout certain cardholders from an area once they have accessed another area. The cardholder shall be locked out of the designated target Area or Group of Areas for a specified period of time. The maximum time period for lockout shall be five (5) days. The target locked-out Area shall be any of the following:

Same Area Another Area Area group

19. The SMS shall allow a System Operator with the appropriate privileges to cancel the lockout time (lockout grace) for all or individual cardholders, thereby canceling the area lockout.

AA. Dynamic Area Manager

 The SMS shall support the Dynamic Area Manager feature. The Dynamic Area Manager feature shall allow the first qualified person admitted to the Area to act as the Area Manager. This person shall be the first to enter the area and shall be required to be the last to leave the area.

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- 2. An area designated for the Dynamic Area Manager feature shall have an entry reader and an exit reader.
- 3. The SMS shall deny any exit request from the area manager until all other occupants have left the area.
- 4. The Dynamic Area Manager feature shall support the use of the Conditional Access feature for the designated area.
- 5. The Area status display shall show the following Personnel counts:

Area Manager count Managed Personnel Count (All Personnel admitted after the Dynamic Area Manager) Conditionally Admitted Personnel Count

BB. Carpool Antipassback

1. The SMS shall provide Carpool Antipassback to facilitate parking lot area controls. Carpool Antipassback shall support the organization of Personnel into Carpool Groups which shall be permitted to park in designated Carpool Areas. The SMS shall move Carpool Groups in and out of Carpool areas based upon the driver's credential. The Carpool Antipassback feature shall allow the monitoring of vehicle counts in the Carpool Area to facilitate parking lot area Occupancy Restrictions. The SMS shall support Timed Antipassback for Carpool Antipassback areas.

CC. Escorted Access

- The SMS shall provide an Escorted Access feature that gives the ability to control, track, and report on the movements of Personnel designated as Escorted Visitors. An Escorted Visitor shall be a visitor who can only move around a facility in tandem with an employee designated as an Escort.
- 2. There shall be two Escort Visitor modes: Companion mode and Remote Escort Mode. In Companion mode the system shall allow multiple Escorted Visitors to be accompanied by one escort. In Remote Escort mode the system shall allow Escorted Visitors and the Escort to present their credentials on opposite sides of a door to gain access.
- 3. The SMS shall have the ability to configure a designated Area to allow an Escorted Visitor to enter/exit the area without an Escort.

DD. Conditional Access

- 1. The SMS shall support Conditional Access that shall allow an occupant on one side of a door to grant temporary access to a cardholder who does not have clearance and was denied access to that door.
- 2. The SMS shall support the configuration of an event to be used to notify the occupant that a cardholder is attempting to gain access through the door.
- 3. The SMS shall support the configuration of a second event to be used to unlock/grant access to the door based upon a response from the occupant or a privileged SMS Operator.
- 4. The Conditional Access function shall support an Operator configurable timer that shall be used to cancel the Conditional Access request if the occupant is unavailable or chooses to deny access
- 5. The SMS shall support the use of Conditional Access in conjunction with the Dynamic Area Manager feature.

EE. After Hours Enabling Reader

- 1. The SMS shall support an After Hours Enabling Reader that shall be used to allow a cardholder access to a group of readers during off hours.
- 2. The SMS shall support the definition of a group of readers (the After Hours Reader Group) that shall be disabled during a pre-defined after hours period.
- 3. The SMS shall support the definition of a schedule to be assigned to the after hours reader group defining the time the readers shall be disabled.
- 4. The SMS shall allow a cardholder access to all readers in the after hours reader group once the cardholder presents a card at the enabling reader.
- The SMS shall require the cardholder to have proper clearance for any reader before granting access.

FF. Intrusion Zones

- 1. The SMS shall support the configuration of Intrusion Zones. An Intrusion Zone is a user-defined group of Doors and Inputs on the same local Controller that delineates a physical area. This area shall be monitored and produce an alarm during any violation of the objects associated with the Zone.
- 2. The local controller shall provide the ability to manage and control the Intrusion Zone in the event that it loses communication with the SMS system server.
- 3. The Intrusion Zone shall have 2 modes of operations: Armed or Disarmed. When an Intrusion Zone is in an armed mode, the state of the Intrusion Zone shall either be Violated or Not Violated based on the state of the inputs and doors associated with the Zone. If the Zone is violated the SMS shall provide the ability to execute any defined event(s) within the SMS.
- 4. The SMS shall provide the ability to display the "Ready to Arm State" of any configured Zone. The "Ready to Arm State" shall be able to be displayed from any SMS monitoring application or from a local reader with an LCD display. All off-normal points/doors shall be able to be displayed from both locations. If any point or door associated with a Zone is not in a normal state, the Zone shall show a "Not Ready to Arm State".
- 5. When a door is placed in a Zone, the operation of the door shall be configured based on the state of the Zone (unlocked, locked, secure). Specific doors assigned to the Intrusion Zone shall be configured as entrance or exit points for the Zone. When the Zone is being armed or disarmed, a user-definable time shall be set for exit or disarm operations. Specific readers/doors shall have the ability to be defined as arm/disarming stations.
- 6. The Intrusion Zone shall be configured such that when an input configured in a Zone is active, the Zone cannot be armed without executing a force arm. When a Zone is force armed, the input(s) that were in an active state shall not function as part of the Zone until they are placed back in a normal state and the Zone is disarmed and rearmed.
- 7. Inputs configured in a Zone shall have the ability to be configured as Controlled Inputs or Monitored Inputs. A Controlled Input shall follow the state of the Zone. If the Zone is disarmed, the Controlled Input shall be disarmed as well. A Monitored Input shall have the ability to cause a Zone violation even if the Zone is in a disarmed state.

GG. Schedules

- 1. The SMS shall support unlimited operator configurable schedules. Each schedule shall allow unlimited individual time intervals.
- 2. Each system controller shall support a minimum of 128 schedules and a minimum of 18 time intervals per schedule.

- 3. Each schedule shall consist of operator-defined time segments. Each time segment shall be day(s) of the week and include holidays and starting and ending times. The system shall provide grouping of days.
- 4. Recurring schedules shall be supported and provide hourly, daily, weekly, bi-weekly, monthly, quarterly, annual and semi-annual intervals. Recurring schedules shall support a start date and shall be configurable to end by a certain date or after a pre-defined number of occurrences.
- 5. Recurrence patterns shall be supported to allow:
 - a....Schedule recurs every X year(s)
 - b....Schedule activates on the last day of each month
 - c....Schedule activates on the specified day of each month
 - d....Schedule activates on the first, second, third etc. weekday of each month

HH. Holidays

- 1. The SMS shall support unlimited holidays.
- 2. The SMS shall support holiday type designations as Recurring Day of Month, Recurring Relative Monthly, Non-Recurring or Day of Week. The SMS shall allow assignment of duration to each holiday.
- 3. Holiday groups can be assigned to a Schedule.

II. Time Zones

- 1. The SMS shall maintain time zones to be used when configuring certain system objects. A time zone shall adhere to standard international Time Zone behavior, and the system shall support all time zones supported by the Windows OS.
- 2. The SMS shall allow time zones to be assigned to IP devices, controllers, CCTV matrix switchers, DVRs, and scheduled Manual Actions.

JJ. Clearances

- 1. The SMS shall support configuration of unlimited Clearances.
- 2. The iSTAR controllers shall support up to 150 clearances per person except for the iSTAR Ultra controller, which shall support up to 1000 clearances per person.
- 3. The SMS shall support clearance activation and expiration date and time.
- 4. The SMS shall support unique activation and expiration dates and times for clearances for each Cardholder. (This functionality requires the iStar Ultra Controller)
- 5. The SMS shall support the ability to select multiple personnel from a Dynamic View and assign clearance(s) to the selected personnel.
- 6. The SMS shall support the ability to select multiple personnel from a Dynamic View and remove clearance(s) from the selected personnel.

KK. Custom Clearances

 The SMS shall support the configuration of up to 20 Custom Clearances per Personnel record and up to 100,000 system-wide. Custom clearance shall give unique individualized access to Doors/Door Groups and Elevators/Elevator Groups during an assigned schedule. The SMS Custom Clearances shall also support the assignment of activation and expiration dates. 2. The SMS shall support a process to remove expired custom clearances from personnel records. The process shall be configured as a system-wide event action with the option to activate by schedule.

LL. Clearance Filters

1. The SMS shall support Clearance Filters. Clearance Filters shall provide the ability to dynamically change the access rights of personnel (cardholders) or groups of personnel. Personnel with a lower Clearance Filter level than that assigned to a card reader shall be denied access to that card reader (door). Clearance Filter levels shall be assignable to card readers either manually or automatically via event logic or a time schedule.

MM. Events

- 1. The SMS shall support unlimited operator configurable events, including the scheduling of events, and action-based trigger of events.
- 2. The system shall provide 8 configurable event priority levels with a total of 200 numbered event priorities. The system shall allow the operator to define custom colors and labels per individual priority level.
- 3. The system shall allow an event to be configured to:
 - a....Be sortable by event name, date/time, priority, state, and any other displayable information.
 - b....Be routed to operators by operator privileges, including support for the routing by time of day feature.
 - c....Require or not require operator acknowledgment.
 - d....Require or not require operator clearing.
 - e....Require or not require a log message to be entered by the system operator acknowledging the event.
 - f.....Require or not require a log message to be entered by the system operator clearing the event.
 - g....Display or not display the event activation.
 - h....Require the object(s) causing the event activation to reset before the operator may acknowledge the event.
 - i. Display an operator-defined text message upon event activation.
 - j.....Display an operator-defined text message when the event is deactivated.
 - k....Be associated with a map so the map opens automatically on the monitoring station when the event activates.
 - I.....Activate a second event when the first event activates and is unacknowledged for a specified period of time.
 - m...Activate a second event when the first event activates, is acknowledged and is not cleared for a specified period of time.
 - n....Allow the operator to associate an audio wave file with the event.
 - o....Allow for minimum activation time and delayed activation time for events.
 - p....Download events to the iSTAR controllers.
 - q....Run imports and exports.
 - r.....Run reports and remove report results.
- 4. Event Instructions: .. Each event shall support event instructions to be displayed in the Event Details Screen. Event instructions shall support a maximum of five hundred characters and shall support website addresses, UNC addresses and local file paths.
- 5. Latch, Unlatch, Toggle, and Pulse for Event: The SMS shall support Event Actions and Manual Action buttons that can be used to Latch, Unlatch, Toggle, and Pulse other Events.
 - a....The SMS shall support a "Latch" Event Action which shall cause it to activate and remain activated.

- b....The SMS shall support an "Unlatch" Event Action which shall cause it to deactivate and remain inactive.
- c....The SMS shall support a "Toggle" Event Action which shall reverse an Event's Latch-Unlatch state: switching a Latched Event to an Unlatched Event and vice versa.
- d....The SMS shall support a "Pulse" Event Action which shall cause an event to activate momentarily.
- 6. The SMS shall allow an operator to create a copy of an existing event from within the event editor.

Event Assessment:

- a....The SMS shall provide an Event Assessment Feature which allows an operator to quickly view all objects associated with an event in a user defined Event Assess Application Layout.
- b....The SMS shall not require the operator to navigate away from the event assessment window to review objects associated with the event.
- c....The SMS shall provide an Event Editor "Assess Configuration" to allow an operator to configure the objects available during the assessment of an event in the Monitoring Station.
- d....The Assess Event Application Layout shall have the following capabilities:
-(1) View any documents associated with the Event.
-(2) View live video associated with the Event.
-(3) View recorded video associated with the Event.
-(4) View Event details.
-(5) View a Map associated with the Event.
-(6) View a Journal Replay of the event, based on a query associated with the Event.
-(7) Use an Event Details Viewer with additional quick action buttons to process the Event.
- e....Each event shall provide the ability to show the entire Event Assessment with a single mouse click via an icon.
- f.....The event assessment layout shall only be available for viewing by operators with appropriate privilege.

NN. Dual Phase Event Acknowledgement

- 1. The SMS shall have the capability of configuring user defined events (alarms) to require Dual Phase Acknowledgement. Dual Phase Acknowledgement shall provide a Pending Acknowledgment window and a Pending Clear event monitoring window in addition to the System Activity window. Each event in the SMS shall be configurable individually to use Dual Phase Acknowledgement. Once the event is acknowledged, it shall be removed from the Pending Acknowledgment window and shall appear in the Pending Clear event monitoring window. A monitoring station operator with the appropriate privilege to clear events can select the event from the pending clear event monitor window and click the clear event button to clear the event. Events that require clearing and are waiting to be cleared shall be configurable to require acknowledgement upon re-activation of the event.
- 2. Events configured for Dual Phase Acknowledgement shall have the following features:
 - a....The event shall be configurable to require a log message for alarm acknowledgement and or alarm clearing.
 - b....Predefined log messages shall be assignable to alarm acknowledgement and or alarm clearing.

- c....The SMS shall support the configuration of an Operator's monitoring station permissions to determine if the operator can only acknowledge events, only clear events, or can acknowledge and clear events.
- d....Operators with acknowledge and clear privileges shall be able to acknowledge and clear events in a single action.
- e....A Dual Phase Acknowledgement event shall be configurable so the acknowledging operator can't clear the event. (In this configuration, clearing the event shall be required by a different operator.)
- f.....Events that are acknowledged or silenced shall be configurable to remain silent until cleared.
- g....A user-defined timer can be configured to activate a second event if acknowledgement of an event, or clearing of an event, does not take place within the specified time frame. The timer shall start when the event is activated.

OO. Sounds

- 1. The SMS shall include a Sound editor that allows an operator to create Sound objects to associate with 'Play Sound' Actions for Events. A single Sound object may be associated with multiple Events, rather than having to save an individual sound file multiple times—each associated with a single Event.
- 2. Sounds shall be saved in a Sound table in the SMS database.
- 3. Sounds shall replicate, on an enterprise system, but they will be Local Only.
- 4. The SMS shall support the ability to import and export Sounds in .WAV file format. The size of the .WAV files that are imported shall be enforced to be less than 1460000 bytes (1.39 MB).
- 5. Sounds shall be Privilege based.

PP. Journal Triggers

- The SMS shall support a Journal Triggers editor that allows an operator to define Triggers to activate an Event when a specified Journal Message occurs. The Journal Trigger shall be a Query-like object that evaluates Journal Messages and pulses an Event when the criteria specified in the configured trigger is logged in the Journal.
- 2. The SMS shall support an Event Action that sends email notification with a description of the activation cause each time a Journal trigger is activated.
- 3. The SMS Monitoring Event Status screen shall display the reason a particular Event was pulsed by a Journal trigger.
- 4. The SMS shall support up to a maximum of 500 Journal Triggers.

QQ. Audit Triggers

- The SMS shall support an Audit Triggers editor that allows an operator to define Triggers to activate an Event when a specified Audit Log Entry occurs. The Audit Trigger shall be a Querylike object that evaluates Audit Log Entries and pulses an Event when the criteria specified in the configured trigger is logged in the Audit Log.
- 2. The SMS shall support up to a maximum of 500 Audit Triggers.

RR. Manual Action Challenge

- 1. The SMS shall support Manual Action Challenges. The Manual Action Challenge shall require a SMS operator to enter their login credentials (User name and password) when executing a manual action from within the SMS.
- 2. The Manual Action Challenge shall be available from both the Administration and Monitoring Applications.
- 3. The Manual Action Challenge shall be assigned to a Privilege and the Privilege shall be assigned to the SMS operator.

SS. Document Editor

1. The SMS shall support the ability to import multiple types of document objects to include:

PDF, TXT, XML, DOC, XLS, JPG, GIF, PNG, TIF

- 2. The SMS shall have the ability to attach these object types to the following areas:
 - a....Personnel records to provide additional information.
 - b....Events as part of the Events Assessment Feature.
 - c....A Guard Tour

TT. Integrated Email

- 1. The SMS email system shall have the ability to interface directly to an SMTP-compliant email system supplied and configured by the user.
- 2. The email configuration shall support user authentication via a password and SSL encrypted communication to the email server.
- The email system shall support the ability to send emails to Personnel Groups.

UU. Import / Export

- 1. The SMS shall provide a means for manually importing and exporting selected data in XML format. This mechanism shall support the import and export of any and all classes or types of data in the system. Specific data validation and logging requirements shall be met.
- 2. The system shall also support importing from CSV files.
- The SMS shall provide an automated import mechanism (preferably XML-based). This mechanism shall support the import of most classes or types of data into the system. Specific data validation and logging requirements shall be met.
- 4. The SMS shall have the capability to perform automated imports from an Open Database Connectivity (ODBC) data source allowing the import of personnel data directly into the system database.
- 5. The system shall have the ability to connect to a directory service source via the Lightweight Directory Application Protocol (LDAP). The connection to the LDAP source shall be user-configurable directly from the SMS and shall not require custom code. The LDAP interface shall also support the automatic assignment of SMS clearances based on data contained in the LDAP record. The LDAP feature shall support the following features:
 - a....LDAP server name and user-defined port number.
 - b....A base distinguished name for the root of searches.
 - c....A user-definable LDAP search filter to refine object search.
 - d....User-defined mapping of attributes to SMS personnel fields.
 - e....The use of a Distinguished Name (DN) entry for the SMS to authenticate to LDAP.

- f.....Option to search all sub-levels of the directory from the base DN.
- g....Preview sample-data based on SMS LDAP import settings.
- h....Automatic roles-based SMS clearance(s) based on two fields of source data.
- i.....Automatic import of directory entries from the LDAP source.
- j.....Authentication via a user-definable LDAP user account and SSL.
- k....Automatic SMS clearance assignment.
- 6. The SMS shall provide a Data Mapping feature that provides field mapping information using the XSLT file based on the input data or an external XSLT file.
- 7. The SMS shall support Import and management of Operators with their respective Privilege Groups using XML and LDAP role-based templates.

VV. Objects

- 1. Each object within the SMS shall be addressed by a unique operator-defined name. Object names shall be unique within object types.
- 2. The SMS shall provide the ability to add description text to each object definition.

WW. Reports

- 1. The SMS shall support a Report Service that runs as a Windows Service. The Report Service shall operate in either 64 or 32 bit mode. The Report Service shall execute Reports that are either run on the Server by an Operator or configured to run automatically as an Event Action.
- The SMS shall provide configurable data reports for database configuration, historical activity (Journal) and audit tracking. Pre-defined reports shall be available for download and import into the system.
- 3. The SMS report function shall perform the following:
 - a....Create reports about any object.
 - b....Create report templates to simplify report design.
 - c....Run reports on demand.
 - d....Save report results for sharing between different users of the application.
 - e....Export reports into formats such as PDF, RTF, TXT, TIFF, Excel (XLS), and MHTML.
 - f.....Specify a guery to select and filter the records on which to report.
 - g....Specify the data fields to be included in a report.
 - h....Specify a design for the report layout.
 - i.....Design a report form to be used as a layout for headers / footers for multiple reports.
 - j. Access and use system pre-defined report forms.
 - k....Select tabular, multi-line, or free form report layouts.
 - I.....Report on objects linked together with parent / child relations.
 - m...Schedule reports to run automatically on a customized schedule.
 - n....Send exported report files to the printer or to external recipients via e-mail.
- 4. The SMS shall support integration to The Business Intelligence Reporting Suite (BIRS). The suite shall offer web-based reporting as well as data warehousing of SMS historical and system data. The suite shall include multiple pre-written reports such as 24 Hour Journal Messages, 24 Hour Trouble Messages, Graphical Usage and Count of Door Group. The open system procedures shall allow the reports to be written and saved for repeat use.
- 5. The reporting suite shall provide an interactive user experience via any standard web browser, allowing the user to scrutinize the information without needing to print or review hard copies.
- 6. The reporting suite shall support connecting to one or more SMS systems. This shall provide data and reports across an enterprise solution to allow segregated reports that reflect both satellite application server data as well as master application server data.

THE NEW WHITEHALL ELEMENTARY SCHOOL - APPOQUINIMINK SCHOOL DISTRICT - #1621

- 7. The reporting suite shall allow an enterprise to share and blend data from other sources such as ERP and Time and Attendance systems to yield critical business information and reporting.
- 8. The reporting suite shall provide information delivery options such as email, CSV export, PDF export, XML data transfer, or database pool offerings. The suite shall also be a critical resource in system review and audit procedures such as system maintenance and performance.
- 9. The Reporting Suite shall:
 - a....Provide Intuitive user interface and web-based reporting for SMS customers
 - b....Share and blend data from other sources to yield critical business information
 - c....Leverage Microsoft® Business Intelligence (BI) tools
 - d....Include Reporting Service for report delivery and presentation
 - e....Perform Reporting and processing from the SMS host
 - f.....Include Subscription options for automated delivery of reports
 - g....Include Dashboard, graphical, and statistical reports, and reports customized by user
 - h....Generate Reports on any PC with compatible Web browser without SMS Client software
 - i.....Offer and secure Data via Active Directory and SQL permissions
 - j.....Include Optional front end or other application integration including SharePoint

XX. Dynamic Views

- 1. The system shall support a grid format displayable report that will be usable to display homogeneous lists of objects within the system. This display shall be configurable both at configuration time and also at run time.
- 2. The Dynamic views shall have the following features:
 - a....Real-time updating and display of property values.
 - b....The display shall be sortable.
 - c....Groupable by any number of columns.
 - d....Filterable based on user selectable criteria.
 - e....Printable.
 - f.....Can be saved as a MS Excel file from the current view.
 - g....Exportable in either XML or CSV file formats.
 - h....The export file shall be viewable in Excel (Excel must be installed separately).
 - i. The export file shall be able to be emailed.
 - j.....The user shall be able to add and remove columns from the grid at runtime to enhance the user experience even if displaying a preconfigured view.
 - k....The view shall be capable of pre-configuration so that repeatable displays of objects are possible.
 - I.....The view shall support in-place editing of properties of the object.
 - m...Bulk operations shall be performed via multi-selection. The operations shall consist of (but are not limited to) setting a property to a value and deletion.

YY. Query

- 1. The SMS shall provide a Query engine to be useful for users without any knowledge of SQL or any other specific query language. It shall allow users to make requests against data sets with preconfigured relations between tables. The relations shall reflect the actual relations between database objects and the user shall be able to put conditions on any available field in the selected object type and its subordinate objects.
- 2. The users shall be able to construct a proper query expression selecting all available operations, column names, and table names from prompted lists. It shall eliminate the necessity to memorize any particular expression syntax. References to existing configuration objects shall also be prompted through a list of existing objects where applicable, eliminating the necessity of memorizing names. The Query feature also shall support complex logic, such as AND/OR.

- Negative logic Queries using the new NOT IN operators
 The SMS shall support Query filters that perform AND/OR operations to narrow Query results.
 The SMS shall also support building complex query operations by use of block filters that perform AND/OR/AND NOT IN/OR NOT IN operations to further narrow Query results.
- 4. The SMS shall provide a Journal Query Assistant as a special method of the Query engine to query on XML fields within Journal Messages. This method shall allow the user to build queries on Journal messages. The Journal Query Assistant shall support Card Admitted, Card Rejected, Operator Login and Operator Activity message types, Area Activity, Object Changed State and Manual Action message types.

ZZ. Guard Tour

- 1. The SMS shall support Guard Tours.
- 2. A Guard Tour shall consist of a series of predetermined Stops requiring a Guard to check-in at each Stop to complete the Tour within the specified time. The Guard Tour shall consist of any combination of Doors, Elevators, and Inputs.
- 3. The SMS shall support a maximum of two hundred Guard Tours.
- 4. The maximum number of Stops per Guard Tour shall be one hundred.
- 5. The SMS shall support up to a maximum of fifty simultaneous running Guard Tours.
- 6. The SMS shall support two types of Guard Tours: Sequential and Random requiring the Guard to check all Stops in sequence or in a random order.
- 7. A sequential tour shall be configured with a minimum and maximum time that a guard shall have between stops.
- 8. Each Tour shall be configured with a specific group of guards that shall be allowed to execute the Tour.
- 9. The following Tour states shall be available to activate preconfigured events in the SMS:
 - a....Activated
 - b....Started On Time
 - c....Started Early
 - d....Started Late
 - e....Suspended
 - f.....Suspended too Long
 - g....Resumed
 - h....Cancelled
 - i.....Completed
 - j.....Completed Early
 - k....Completed Late
 - I.....Inactive
 - m...Not completed On Time
 - n....Failed To Start
 - o....Error Occurred
- 10. A guard Tour shall have the ability to be initiated from:
 - a....The reader configured as the first Stop of the Tour
 - b....An Event (Manually activated or on a Schedule)
 - c....A manual Action from an Operator at the SMS Monitoring Workstation
- 11. The SMS shall support sending an email notification to a Guard of the impending start of the scheduled Tour.

- 12. A Guard shall be required to complete check-ins at all Guard Tour Stops before the maximum completion time expires and shall be required to spend at least the minimum amount of time on the Tour.
- 13. A Tour shall be canceled by either an error, event action or a manual action from an Operator at the SMS Monitoring Application.
- 14. Each Tour shall be able to be configured with a minimum and maximum time of completion.
- 15. The system shall indicate that a Tour Stop was reached early and started early if a guard checks in at the first stop before the minimum stop time expires.
- 16. The system shall indicate that a Tour Stop was reached late when a guard checks in at the first Stop after the maximum time expires.
- 17. The System shall indicate that a Tour Stop was not reached on time when a guard has not checked in after the maximum Stop time expires.
- 18. In the SMS Monitoring Station Application, it shall be possible to display the details of all the Guard Tour Stops and the current status of the Tour.
- 19. Each Guard Tour shall have the ability to attach up to a maximum of ten documents explaining the details of the configured Guard Tour.
- 20. Each Guard Tour shall support Predefined Log Messages or Message Groups.
- 21. Tour status shall be available from the SMS Monitoring Station Application and shall provide the following information:
 - a....Tour Type
 - b....Last Tour Status
 - c....Current Tour Status (Running/Not Running)
 - d....Guard Name (if active)
 - e....Last Completed Stop
 - f.....Percentage Completed.
- 22. The SMS shall provide the ability to configure an icon on an SMS MAP representing a Guard Tour. An Operator shall have the ability to start the Tour and manually assign a specific Guard responsible for completing the Tour from the MAP.
- 23. The icon representing the Tour shall change appearance based upon the current state of the tour.
- 24. The SMS shall provide the ability to run a Journal Report providing the details of any completed or active Tour including:
 - a....Time scheduled
 - b....Guard assigned
 - c....Activation time
 - d....Stop status

AAA. Hand Held Reader

- 1. The SMS shall support a portable hand-held reader that shall provide identity verification. The portable hand-held reader shall support the following:
 - a....The portable hand-held reader shall work on an Android device

THE NEW WHITEHALL ELEMENTARY SCHOOL - APPOQUINIMINK SCHOOL DISTRICT - #1621

b....This android device shall support Bluetooth communication to three types of Multi

technology readers. c....The readers shall be capable of reading:(1) HID Proximity and iCLASS SE PACS data(2) HID Proximity and custom MIFARE sector with key(3) HID Proximity and (Mifare, Desfire) csn d....Act as a single door controller much like a conventional door in online or offline modes. Offline modes shall support the following functions:(1) Offline mode shall support 100,000 cardholders(2) All card transactions shall be stored locally and uploaded to the SMS when the unit is placed online.(3) Offline mode shall support storing 10,000 transactions e....Online mode shall support all cardholders in the SMS f.....Shall securely communicate to the SMS using web services (encrypted using TLS) supporting (3G/4G or Wi-Fi) g....Allow Operators with appropriate permissions to log into the device using single sign on authentication h....Specific cardholders shall be downloaded to the device based on clearance assignment i.....Shall have the ability to display(1) access grant(2) denial of access(3) cardholders portrait(4) card number j.....It shall be possible to set the amount of time that the display shows the last card transaction

2. Roll Call

a....The portable hand-held reader shall be able to perform a Roll Call feature.

k....Shall be available to download from the Google Play app store

I. Shall support phones and tablets running Android OS 5.0 and higher

- b....As cardholders present their cards at this mobile device, the SMS shall have the ability to remove the cardholder from their current area and place them in a muster area.
- c....During a Roll Call, it shall be possible for an operator, from the SMS, to display a list of cardholders including their names and portraits in their respective areas.

BBB. Random Screening

- 1. The SMS shall support a Random Screening feature.
- 2. The Random Screening feature shall allow SMS doors to be configured to randomly reject cardholders for the purpose of identity verification or baggage searches etc.
- 3. The SMS shall allow each door to be configured with a percentage value to define the frequency of the random screening action.

THE NEW WHITEHALL ELEMENTARY SCHOOL - APPOQUINIMINK SCHOOL DISTRICT - #1621

- 4. The SMS shall provide a Random Screening event for each door that shall be activated when a cardholder is rejected for Screening. The event shall be used for notifying the proper Personnel of the Screening activity.
- 5. The SMS shall log all Screening activity for reporting or auditing purposes.

CCC. CCTV Integration / Digital Video

- 1. The SMS shall provide extensive integration with American Dynamics DVR/NVR solutions.
- 2. The SMS server shall be connected to the DVR/NVR during the configuration process enabling the SMS to guery the DVR/NVR for setup information.
- 3. The SMS shall use tree controls to drag and drop video servers or cameras directly into the interface for intuitive and instantly active video integration.
- 4. The SMS shall provide live camera display during configuration.
- 5. The SMS shall provide the ability to drag cameras into tours.
- 6. The SMS shall provide the ability to identify and automatically configure all cameras on a controller.

DDD. General Purpose Interface

- 1. The SMS shall support a licensable General Purpose Bi-directional Serial Interface.
- 2. The General Purpose Interface shall be a programmable bi-directional communication protocol that shall provide a general mode of communication between the SMS General Purpose Interface driver and a third-party device.
- 3. The third-party device shall send pure ASCII messages via a serial port (RS-232) or remotely via a TCP/IP port (via a Terminal Server) into the General Purpose Interface driver.
- 4. The SMS shall interpret messages in two ways:
 - a....As journal messages recorded into the SMS historical journal.
 - b....As any of five Monitoring Point status changes configured to trigger an SMS event.
- 5. The General Purpose Interface supports the following functionality:
 - a....Input: where the input strings are sent from the device through the Serial/Network port to the SMS Server. The General Purpose Message Protocol object is used to define and parse the information.
 - b....Output: where the output is an Action and requests a response from the device.
 - c....Poll: where the poll is an action that requires a response from the device.

EEE. ID Badging Subsystem

- 1. The SMS shall include an embedded ID Badging Subsystem. The ID Badging subsystem shall utilize a common database with and be an integral part of the SMS. The ID Badging Subsystem shall provide the ability to capture cardholder images and design and print user-defined badge layouts. The Badging Subsystem shall support the following capabilities:
 - a....Unlimited number of badge design layouts.
 - b....WYSIWYG badge designer.
 - c....Background color detection in the portrait image.
 - d....Threshold level selection to apply to background detection.
 - e....User-defined selection of background color.
 - f.....User-defined selection of replacement color or transparency setting.

- g....Edge-detection setting, to aid in replacing only the selected background and not any matching color within the portrait image.
- h....Capture, import, and display portraits.
- i. Capture, import, and display signatures.
- j.....Capture and display fingerprints.
- k....Insert, import, and display foreground and background images.
- I.....Print two-sided badges.
- m...Encode magnetic data onto personnel badges.
- n....Insert 1D or 2D bar codes.
- o....Insert or replace color and transparent effects for image and background display.
- p....Support a variety of image formats including .bmp, .jpg, .tif, and .wmf.
- q....Custom functions using the Expression builder.
- r.....Multiple images per cardholder.
- s....Diagonal and Square borders. Each type of border shall support a user-defined width and height setting, and individual color settings for each border side.
- t.....Proper Case (first letter in string is set to uppercase, all other characters set to lowercase).
- u....Year display (four- or two-digit).
- v....Month display (full or abbreviated name, or numeric).
- w. .. Day display (full or abbreviated name, or week/month numeric).
- x....Hour display (12 or 24 hour format).
- y....Minute display.
- z....Second display.

FFF. Visitor Management

- 1. The SMS shall support an optional, embedded Visitor Management feature. The SMS shall support the creation and management of visitor appointments. The Visitor Management feature shall serve as a replacement for paper-based visitor log books and shall support the organization and tracking of visitors. The Visitor Management feature shall support the following features:
 - a....Keep track of visits (and Visitors) in progress
 - b....Single-/multi-visitor group appointment scheduling
 - c....Temporary credential issuance
 - d....Visitor check-in/check-out
 - e....Visit Templates
 - f.....Visit Sites
 - g...e-mail notification of visitor arrivals
 - h....Manage unplanned visits and anonymous visitors
 - i.....Manage the return of credentials and the end of a visit
 - j.....Configure Instructions for the visit
 - k....Configure personnel as visit hosts
 - I.The capability to check-in and check-out visitors by presenting a valid card at a designated reader
 - m...The ability to scan a license or a passport when adding a new visitor. Each field associated with a license or passport can be individually selected for import.
 - n....Run reports and queries on both scheduled or completed visits
- 2. The SMS shall provide the ability to schedule a nightly event that shall perform an automatic checkout of all visitors per partition.
- 3. The SMS shall support an optional Visitor Management Web portal that shall allow a host to create and manage visits and visitors via a standard web browser. The initial browser logon shall allow customization to display a unique name.
- 4. The SMS Visitor Management Web portal shall support the following Web Browsers:

Internet Explorer Chrome

FireFox Safari on IOS

- 5. An SMS Operator shall be able to perform the following Visit Site functions:
 - a....Create and Configure Visit sites
 - b....Customize the Portal for each visit site
 - c....Assign a custom image that represents the visit site
 - d....Assign the visit site to a partition
 - e....Create and configure visitor templates for a site (which can include Clearances for the Visit)
 - f.....Create and configure a Visit Template for a site
 - g....Specify what fields are to be used when creating a new visitor in a site
 - h....Individually select which fields are mandatory
 - i. Add additional details to a visit site including user definable fields
 - j.....Designate which hosts can access a site to create a visit
 - k....Assign a document to a visit site
 - I.....Configure the details for the welcome Email to hosts
 - m...Configure a Visitor Management Door Action for card swipe check-in and checkout
- 6. A Host using the Visitor Management Web portal shall be able to do the following:
 - a....Create, edit and delete Visits
 - b....Utilize Visit Templates to create Visits
 - c....Search for existing Visits
 - d....Add instructions for the visit and attach pertinent documents to the visit
 - e....Add additional Hosts to a Visit
 - f.....Create New Visitor records and add Visitors to Visits
 - g....Email all visitors and hosts associated with the created visit
- 7. The SMS shall support a Kiosk for self-visitor check-in
 - a....The SMS system shall support an unlimited number of Check-in sites. Each Check-in site shall be configured with a Kiosk application that operates on an iPad. This Kiosk application shall be used to allow a visitor to self-check-in as a new or pre-enrolled visitor. Each site shall have the ability to customize how the Kiosk Check-in application works. The Kiosk shall provide the following features:
 - b....Each Kiosk shall support the creation of custom messages for each check-in site:
 -(1) Welcome message
 (2) Visitor not found message
 (3) Check in complete message
 -(3) Check-in complete message
 -(4) Registration complete message
 - c....The Kiosk shall have the ability to accept unregistered visitors (Optional) via the following steps:
 -(1) Enter a new visit (First, Last, Email)
 -(2) Take a picture
 -(3) Enter and assign Host via context sensitive lookup that shall show the host name and image as you type
 -(4) Require acknowledgement of an NDA or other document (Optional)
 -(5) Automatically email host when check-in is complete
 -(6) Automatically check-in visitor (optional)
 - d....The Kiosk shall have the ability to add a Pre-enrolled visitor via the following steps:
 -(1) Find visitor by either Email Address or First/ Last Name via context sensitive lookup
 -(2) Take a picture
 -(3) Require acknowledgment of an NDA or other document (Optional)

THE NEW WHITEHALL ELEMENTARY SCHOOL - APPOQUINIMINK SCHOOL DISTRICT - #1621

-(4) Automatically email host when check-in is complete(5) Automatically check-in visitor (optional

GGG.

The SM workflow clearan	nagement Workflow IS shall support an Access Management Workflow feature including a Web Portal. This w shall allow different types of requests and approvals to automate the assignment o ces. The following features shall be supported by the Access Management Workflow
workflow clearan	w shall allow different types of requests and approvals to automate the assignment o
aThe	e creation of an unlimited number of Access Request Sites
bEad	ch access request site shall be uniquely configurable with the following:
(2) (3) (4) (5) (6)	Show selected personnel fields from requesters Display General site information Show additional user definable fields Select authorized requesters Select available clearances Select Personnel for access request assignment
	Access web portal shall support the following:
(1)	Customized portal name display
(2)	Single Sign on authentication
(3)	Creation of Access requests, which shall provide the following:
	 (a) Name of the request (b) Available site clearance selection (c) Justification statement (d) Request Status (e) Personnel associated with the request (f) Attach a document relative to the request (g) Ability to save the request without submittal (h) Ability to submit the request
(4)	Access approval with the following capabilities:
 	 (a) List the assigned submitted pending requests (b) Show all details pertaining to the request (c) Ability to approve or deny the request (d) Provide comments on the reason for the approval/denial (e) Review the history (audit) of previously submitted requests (f) Provide the ability to revoke a previously approved request
	e SMS shall provide the following Internal Request features:
(1)	Clearances shall be configurable with the following approval rules:
	(a) Auto approve(b) Any approver from a partition(c) Any selected approvers(d) Only allow assignment via approved request
	feature: aThe bEac(1)(2)(3)(6) cThe(1)(2)(3) dThe(4) dThe

.....(2) Door activity shall also provide the ability to automatically generate an approval request

which shall be:

(a) Subject to a schedule

- (b) Subject to direction of the swipe (in/out)
- 2. All generated requests shall viewable within the SMS showing current status and details.

HHH. Smart Card / Proximity Card Enrollment

- 1. The SMS shall provide a smart card enrollment feature as part of the ID Badging Subsystem. The smart card enrollment feature shall allow a user to enroll MIFARE, iCLASS or DESFire cards utilizing a USB wedge reader or a Manufacturer-approved badge printer.
- 2. The SMS shall provide a proximity card enrollment feature as part of the ID Badging Subsystem. The proximity enrollment feature shall allow a user to enroll the card number of proximity cards on a Fargo HDP 5000 printer that is equipped with an OMINKEY CardMan 5x25 encoder.
- 3. The ID Badging Subsystem shall support the creation of Smart Card Templates to define the smart card configuration. Templates shall be used to define the data transfer between the physical card and the Personnel Record. Templates shall define the card type as MIFARE, iCLASS or DESFire. When programming a card, the system shall be able to read and write to all relevant data such as personnel fields, card fields or card formats. The Badging Subsystem shall provide the ability to Enroll MIFARE, iCLASS or DESFire. The Badging Subsystem shall provide the ability to Program and Enroll MIFARE.
- 4. Templates shall also be utilized to define the Security Keys needed to access the data on the smart card. Templates shall be assignable to the enrollment device (wedge reader or printer).
- 5. The ID Badging Subsystem shall support both the enrollment (reading of data from the card) and programming (writing of data to the card) for MIFARE cards. The ID Badging Subsystem shall support the enrollment of DESFire cards and shall support Card Serial Number data only. The ID Badging Subsystem shall support the enrollment of iCLASS cards and shall support Card Serial Number data only.
- 6. The ID Badging Subsystem shall support the creation of Custom read/write Keys. Custom Keys are private keys supplied by a third party. Custom Keys shall be assigned to Software House Readers via Program Cards supplied by the Manufacturer.
- III. System Parameters (Based on a single credential per cardholder)
 - 1. The SMS shall have a maximum capacity of:
 - a....5.000 online readers
 - b....20,000 online inputs
 - c....20,000 online outputs
 - d....500.000 enabled Personnel Records
 - e....256 Simultaneous Clients (256 is a design capability while the tested limit is 100)
 - 2. The SMS shall support a Master Application Server (Enterprise Architecture) with maximum capacity of:
 - a....40 Satellite Application Servers (tested limit)
 - b....500,000 Global enabled Personnel Records
 - c....100 Simultaneous Clients
 - 3. The SMS shall support an Enterprise Architecture (based on 40 SAS) with a maximum capacity of:
 - a....200,000 online readers
 - b....800,000 online inputs
 - c....800,000 online outputs
 - d....20,000,000 local enabled Personnel Records

- e....500,000 Global enabled Personnel Records
- f.....20,500,000 Total enabled Personnel Records

2.4 OPERATION

- A. The SMS shall provide the following operational functionality:
 - 1. The system shall control access to a designated area.
 - The system shall validate cardholder credentials by use of downloaded personnel records, card formats, PINs, biometric enrollment and multiple active cards. The system shall compare the time, location, and unique credential number of an attempted entry with information stored in memory.
 - Access to a designated area will be validated only when a user's credential has a valid number for its facility and the number is valid for the current time and for the reader where it is used.
 - 4. The system shall access the hardware that validates the person and monitor the security of a building by use of controllers, doors, readers, elevators, inputs and outputs. When access has been validated, a signal to the door locking device shall be activated to enable alarm-free access at that location.
 - 5. The system shall configure itself as required by use of an Administrative application, and shall provide Configuration templates.
 - 6. The system shall monitor access control activities by use of Monitor Station, Alarm configuration, NetVue, CCTV, and dynamic Graphical Maps display of alarm, door, and event activity (Maps based on CAD data).
 - 7. The system shall restrict administrative and Monitoring Station activity by use of Privileges and Authentication (User Password) using Microsoft Windows OS Password Function.
 - 8. The system shall report on various aspects of the system by use of Reports (canned and configurable). Reports shall be able to export to a printer.
 - 9. The system shall have the capability to report off-normal security device conditions both audibly and visually.
 - 10. The system shall control hardware from the monitoring station by use of Manual actions, Events, and cause lists.
 - 11. The system shall provide Record and Data Management by use of Historical Journal (archive and replay), Full Audit Trail and automated and manual import and export (data and images).
 - 12. The system shall allow for data to be imported from other products by use of database Migration tools (Card Holder data and configuration data) from, C·CURE 800/8000 and 3rd party applications via XML formatted data exchange.

2.5 EQUIPMENT

- A. Server Requirements
 - 1. The SMS Server shall meet or exceed the SMS Manufacturers requirements for the current version and series of the SMS software.
- B. Client Workstation Requirements
 - 1. The SMS client workstation shall meet or exceed the SMS Manufacturers requirements for the current version of the SMS software.

C. Badging Station Requirements

 The SMS badging workstation shall meet or exceed the SMS Manufacturers requirements for the current version of the SMS software.

D. Controllers

1. The SMS shall support the following controller hardware:

Note: For additional information, please refer to individual A&E specifications for the controllers listed below:

- a....Software House iSTAR Classic
- b....Software House iSTAR Pro
- c....Software House iSTAR eX
- d....Software House iSTAR EDGE
- e....Software House iSTAR Ultra/Ultra SE
- f.....Software House apC, apC/8X, apC/L

E. Clustering

- 1. The SMS shall support a user-defined grouping of iSTAR controllers defined as a cluster. iSTAR controllers within a cluster shall be able to communicate in a peer-to-peer scheme should the SMS server lose communication with the cluster.
- 2. Clustering shall support the following features:
 - a....Assignment of Master controllers for cluster communication to the SMS server
 - b....Primary and backup communication paths to the SMS server
 - c....Up to 16 controllers per cluster
 - d....Logical event linking between controllers in a cluster independent of SMS server communication
 - e....Antipassback control within a cluster shall be independent of SMS server communication
 - f.....Asynchronous communication via TCP/IP (Polled devices shall not be acceptable)
 - g....Dialup Communications. Dialup shall only be supported on iSTAR Pro and iStar Ultra SE (in Pro Mode)
 - h....Encrypted communications
- 3. The SMS shall support iSTAR clusters in two types: Encrypted and Non-Encrypted. Encrypted clusters shall support iSTAR Edge/eX/Ultra controllers. Unencrypted clusters shall support iSTAR Classic/ iSTAR Pro/unencrypted Ultra controllers.
- 4. Network communications between a cluster master and the host, and between a cluster master and cluster members, shall be done using AES 256 bit symmetric encryption, tested and verified by an independent lab and listed for FIPS 197.
- 5. Encrypted iSTAR controllers shall be listed for FIPS 140-2, which meets the necessary physical, operational, and cryptographic requirements for a cryptographic module for the National Institute of Standards (NIST).

PART 3 - EXECUTION

3.1 TESTING

A. The software shall be entered into the SMS computer systems and debugged. The Contractor shall be responsible for documenting and entering the initial database into the system. The Contractor shall provide the necessary blank forms with instructions to fill in all the required data information that will make up the database. The database shall then be reviewed by the Contractor and entered into the system. Prior to full operation, a complete demonstration of the computer real-time functions shall be performed. A printed validation log shall be provided as proof of operation for

THE NEW WHITEHALL ELEMENTARY SCHOOL - APPOQUINIMINK SCHOOL DISTRICT - #1621

each software application package. In addition, a point utilization report shall be furnished listing each point, the associated programs utilizing that point as an input or output and the programs which that point initiates.

- B. Upon satisfactory on-line operation of the system software, the entire installation including all subsystems shall be inspected. The Contractor shall perform all tests, furnish all test equipment and consumable supplies necessary and perform any work as required to establish performance levels for the system in accordance with the specifications. Each device shall be tested as a working component of the completed system. All system controls shall be inspected for proper operation and response.
- C. Tests shall demonstrate the response time and display format of each different type of input sensor and output control device. Response time shall be measured with the system functioning at full capacity. Computer operation shall be tested with the complete data file.
- D. The Contractor shall maintain a complete log of all inspections and tests. Upon final completion of system tests, a copy of the log records shall be submitted as part of the as-built documentation.

3.2 TRAINING

A. The Contractor shall provide a competent trainer who has extensive experience on the installed systems and in delivering training to provide the instruction. As an alternative, the Contractor may propose the use of factory training personnel and coordinate the number of personnel to be trained.

3.3 MAINTENANCE

- A. The Contractor shall offer a Software House Software Support Agreement (SSA) in order for Software House Technical Support Specialists to reactively troubleshoot system problems.
- B. As part of the agreement, 5x9 telephone support (Standard and Enhanced SSA) will be provided to the Contractor by Certified Technicians. An option of 7x24 Standby telephone support (Enhanced SSA) shall be offered.
- As part of the agreement, Flashable and Non-Flashable (Chips) firmware and documentation shall be provided.
- D. As part of the agreement, access to SMS patches and software release updates shall be provided.
- E. The SSA shall cover the current SMS release one full version back, and associated controller hardware.

END OF SPECIFICATIONS 280727

TechVENT® (all versions) – Installation Instructions

1. PRODUCT

TechVENT® is a nailable composite roof insulation panel made with Iso or XPS foam with a built-in space for roof ventilation. Panel size is a nominal 4' x 8' (actual coverage approx. 47-1/4" x 95-1/4"). Edges of wood sheathing are rabbetted or cut back to allow for expansion with foam edges machined into a tongue and groove profile. CHECK LOCAL BUILDING CODES for any applicable requirements.

2. STORAGE

TechVENT® products are shipped in units covered with a plastic bag which is intended to temporarily protect the material while in transit only. On the jobsite the units should be covered with a breathable waterproof tarpaulin. The plastic bag should be removed if moisture accumulates inside it.

3. PRODUCT APPLICATION

TechVENT® is designed to allow air flow through the air space below the top sheathing. To do this it must have the following:

- a. Adequate air entry flow at the eave. Use eave edge vents or eave soffit vents which allow approximately 9 square inches of air entry per foot run of eave. Where edges blocking is used at the eave, do not cover the entrance to the air space.
- b. The TechVENT® air spaces must not be closed off. If you need a smaller panel it is usually best to cut off the side or end with the tongue on it. Support the cut edge with spacer blocks running up the slope. Extra spacers are supplied with every shipment.
- c. A ridge vent with approximately 18 square inches of open area per foot run the ridge should be used. Warm moist air leaking from the inside of the building can cause condensation at the ridge, at the end walls or at any other opening. Seal off these openings by cutting the foam insulation at a suitable angle and filling any gaps with spray foam or caulking. Do not use combustible spray foam around chimneys.

4. INSTALLATION

- a. If specified, install a vapor retarder on the supporting roof deck. We recommend one over high humidity areas such as swimming pools. In this case particular care should be taken to seal all openings on the deck around lighting fixtures, skylights, end walls, and at the ridge, etc. On any building where conduit is installed above the structural deck, a separate layer of 1-1/2" thick foam insulation is recommended.
- b. Fire safety precautions should be observed when TechVENT® is installed. Protect foam from flame cutting and welding operations, etc. Around chimneys provide suitable fire protection.
- c. Install wood nailers at the eave and rake edge of the roof. Before installing the first row of insulation at the eave check how the eave vent or the sheathing over the roof overhang will be supported. Check the supporting roof deck is smooth and even without bumps or depressions.
- d. Lay panels with the wood side up and the long side parallel to the ridge. If the foam edges are tongue and grooved, then the tongue should face up the slope. Sheathing has rabbetted edges to maintain the proper expansion clearance between adjacent panels. Field cut panels should be kerf cut to maintain a 1/8" minimum gap between the sheathing on adjacent panels. Stagger end joints in succeeding panel rows. NO CLIPS REQUIRED TO GAP PANELS.
- e. Place screws directly through the panel into the structural deck, use insulation fasteners as shown on the next page. Do not over-torque the screws and compress the insulation too much.
- f. Check the insulation top surface for uneven edges BEFORE covering. Grind off any uneven edges with an electric sander or grinder.
- g. Roofing should be applied over dry insulation as soon as possible. Apply roofing felt and shingles to TechVENT® using shingle nails placed according to shingle manufacturers' recommendations. For best results use barbed or ring shank shingle nails and premium or laminated shingles.
- h. Install eave and ridge vents as described under Product Application. 18 in/ln ft open area minimum.

TechVENT Inst 0717 Page 1

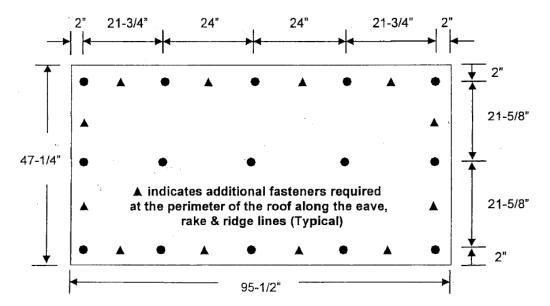
TechVENT® (all versions) - Installation Instructions Page 2

5. INSULATION FASTENERS—Use Tech SIP Fasteners

- a. Number Minimum of 15 Tech SIP Fasteners per 4' x 8' panel to meet standard load requirements. Apply fasteners at the approximate position of the internal spacers as shown in drawing below. There are lines on the sheathing (OSB only) at 24" and 48" from the panel ends which will assist in locating the fasteners. Ignore the lines at 16" and 32. Use additional screws at the rakes, eaves ridge as shown. If high wind load requirements exist, contact fastener manufacturer.
- b. Wood deck -Use Tech SIP Fasteners 1-1/4" to 1-1/2" longer than the overall depth of the TechVENT® insulation panel. If the wood deck is less than 2" actual thickness, use fasteners with a minimum of 1" penetration and install 4 extra fasteners on the horizontal center line of the panel. On plywood use fasteners that protrude through the deck at lease 1/4". If exposed fastener tips are not acceptable, contact Kurt Building Materials for suggestions.
- c. <u>Steel Deck</u> Use Tech SIP Fasteners with a minimum of 1" penetration into the steel deck; 1" longer than TechVENT® panel thickness
- d. Concrete Deck use Tapcon screws or equal. Advance testing is recommended.
- e. <u>Special Applications</u> Contact us for special applications not shown here.

6. FASTENER PATTERN

a. Use 15 screws per panel (5 across-parallel to the ridge & 3 up the slope) as the standard fastening pattern (1-90 uplift requirements), add additional fasteners as shown below. If high wind load requirements exist, contact fastener manufacturer or Kurt Building Materials for recommendations.



- b. When installing heavy material such as natural slate or tile on a pitch greater than 4/12 but less than 8/12, install 4 additional fasteners on each panel along the center of the panel (aligned along the 8' length) parallel with the ridge line. For roof pitch 8/12 or greater contact Kurt Building Materials for recommended fastener patterns.
- c. NOTE: For panels of overall thickness 6" or more, add 4 additional fasteners per panel; SEE 19 COUNT PATTERN.

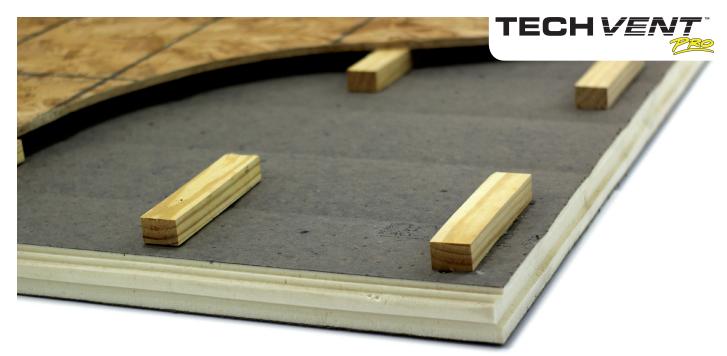
Visit our website/contact Kurt Building Materials for additional details or consult your architect.

KURT MANUFACTURING CO. Building Materials Division

5280 Main St NE, Minneapolis MN 55421 Tele: (715)572-1500 Fax: (763)572-9878 www.kurtbuildingmaterials.com

TechVENT® is a trademark of Blue Hills Tech LLC and used under license

TechVENT inst 0717 page 2



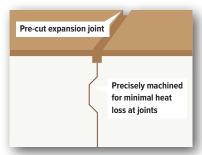
A highly efficient non-structural composite, vented nailbase external insulation panel from the originators of the nailbase roof and wall insulation industry.

TechVENT® Pro is our flagship product, providing roof insulation under shingles or other roofing and a standard 1" airspace made with wood spacers that ventilates in all directions to cool roof in summer, retards ice dams in winter. TechVENT® Pro is made with polyiso foam (XPS optional), solid wood spacers and APA/TECO rated OSB or Plywood. Fully machined panel features tongue and groove foam edges for minimal heat loss.

TechVENT®Pro is made to order for specific architectural/commercial applications with Polyiso foam (thickness to 8"/R-values to 39) with minimum 7/16" OSB and optional OSB and Plywood single/double layer sheathings. TechVENT®PRO is a non-structural insulation panel that attaches to your structural roof deck—metal, wood or concrete. 1.0" airspace standard, 1.5" and 2" optional

APPLICATIONS

- + Vaulted And Cathedral Ceilings
- + Sealed Attic Space Designs
- + New Construction And Reroofing
- + Historical Restorations
- + Post And Beam, Glue Lam Designs



- Fully machined panel guarantees squareness
- Saves time on the jobsite with easy fit panels
- High R-values in a single layer—less labor than two layer systems
- Largest vent space available— 10 sq. in/ft at 1.0" intake
- Most net free area in the panel—greater than 92%
- Solid wood spacer blocks— 27 per panel
- Spacer blocks no more than 12" apart in any direction
- Rabbetted wood edges create expansion gap perfectly
- No need for h-clips or spacers to give proper sheathing spacing for expansion
- Air flows in all directions over 86% upslope and over 50% cross ventilation



Kurt Building Materials



TechVENT® PRO Thermal Values and Product Weights

		The second second				
Product Thickness*		Polyiso Foam Thickness		Approx Product Weights		R-value**
inches	millimeters	inches	millimeters	lb/square foot	kg/square meter	LTTR
3.0"	75	1.5"	38	1.9	9.29	8.60
3.5"	89	2.0"	51	2.0	9.76	11.40
4.0"	102	2.5"	64	2.1	10.25	14.40
4.5"	114	3.0"	76	2.2	10.74	17.40
5.0"	127	3.5"	89	2.3	11.23	20.50
5.5"	140	4.0"	102	2.4	11.72	23.60
6.0"	152	4.5"	114	2.5	12.21	26.80
6.5"	165	5.0"	127	2.6	12.69	29.85
7.0"	178	5.5"	140	2.7	13.18	32.90
7.5"	190	6.0"	152	2.8	13.67	35.95
8.0"	203	6.5"	165	2.9	14.16	39.00

*Approx. overall panel thickness based foam thickness, single layer 7/16" (11.1 mm) OSB, and standard 1" (25.4 mm) spacer height. **Product LTTR R-value consists of polyiso insulation portion only for single layer vented systems. LTTR R-value calculations are based on ASTM C1289-11A, effective January 1, 2014

NOTE: Always refer to local building codes. Use of synthetic underlayments is strongly suggested for superior water resistance. Use of a vapor retarder is highly recommended in moisture prone applications. It is always recommended to have the roof assembly dew point calculated by a qualified architect or engineer to ensure proper usage in the chosen environment.

CODES AND COMPLIANCES

Polyiso insulation complies with ASTM C1289, Type II, Class I, Grade 2

ANSI/UL 790 Classification

Complies with classification under ANSI/UL 790 as a Shingle Decking Accessory for use with Class A, B, or C shingles, metal, tile, or slate roof coverings

ANSI/UL 1256 Classification

Complies with classification for Insulated Metal Deck Assemblies, Constructions No.120 and No.123 (polyiso foam) Complies with classification for Insulated Metal Deck Assemblies, Construction No.632 (XPS foam)

Physical Properties

 Sheathing – OSB conforms to APA Standard PRP 109, Exposure 1, and HUD/FHA-918

Polyiso insulation:

- ASTM E84 Flame Spread Index of < 75
- ASTM E84 Smoke Developed Index of 105-450
- Moisture Vapor Permeance per ASTM E96 of less than 1.5 perms

Kurt Building Materials Division

Kurt Building Materials, established with the experience from the former Cornell Corporation, originators of the nailbase roof and wall panel industry, is a Division of Kurt Manufacturing

Since 1946 Kurt Manufacturing has served the machining, casting and industrial industries with precision made products and services, including the industry standard Kurt AngLock machinist vise.

The same legacy of design and attention to detail are applied to Kurt Building Materials nailbase insulation panel products featuring tongue and groove machined mating surfaces for ease of installation and minimal heat loss.

Please visit **www.kurtbuildingmaterials.com** for insulation products or **www.kurt.com** for Kurt Manufacturing's extensive selection of products and manufacturing services.



TechVENT®, TechBASE® and TechWALL® are registered trademarks of Blue Hills Tech LLC and are used under license.

Kurt Building Materials

KURT Kurt Building Materials

KURT MANUFACTURING CO. Building Materials Division

5280 Main St NE, Minneapolis MN 55421 Tele: (763)572-1500 Fax: (763)572-9878

DRAFT SPECIFICATION TechVENT®Pro VENTILATED ROOF INSULATION

TechVENT®Pro (with one or two layers of sheathing OSB or Plywood). See company literature or website www.kurtbuildingmaterials.com. This spec is usually placed in Section 07 22 00 under the heading Ventilated Roof Insulation.

1. General

1.01. WORK INCLUDES

A. The work shall consist of covering all areas shown on the drawings with ventilated roof insulation

1.02. RELATED WORK

A. Specified elsewhere:

Section 07 --- Asphalt shingles, metal roofing or other roofing system over the ventilated insulation. Ridge vents and eave vents.

1.03 SYSTEM DESCRIPTION

- A. Description of system:
 - 1. The ventilated roof insulation shall be a preassembled panel consisting of one layer of 7/16" oriented strand board (FSC or standard), built-in ventilation space maintained by 1" wood spacers blocks, and isocyanurate insulation on the bottom.
 - ~ Architect's option for foam: XPS or EPS: for top surface: 5/8" or 3/4" OSB or Plywood. FRT, FSC or Standard
 - ~ Architect's option for spacer blocks 1-1/2" or 2"
 - 2. The Long Term Thermal Resistance (LTTR) R-Value of the ventilated roof insulation shall be no less than _____ for foam only.
 - 3. Wood panel edges shall be rabbetted to allow the foam edges to fit together while providing clearance between the wood sheathing on adjoining panels.
 - 4. Foam sides and ends shall have a machined tongue and groove profile to reduce heat loss at the joints.
- B. Performance Requirements:
 - 1. The wood spacer blocks shall not exceed 8% of the panel area and shall leave 50% open for lateral (across the slope) ventilation. Spacer blocks shall not be over 12" apart in either direction.\
 - 2. The vent space shall provide a minimum of 10 sq. in. of Net Free Area per lineal foot of insulation along the 8' edge after deducting for the spacer blocks.
 - 3. The foam insulation shall have a Flame Spread Rating of 40-60.

Page 1 of 2 Ref # KTV-DS-0717

1.04. QUALITY ASSURANCE

A. The ventilated insulation shall be classified by Underwriters Laboratories Inc. as a shingle decking accessory for use with any Class A, B or C asphalt glass mat or asphalt organic shingle. Each bundle of ventilated panels shall bear an Underwriter Laboratory's label. If applicable FSC Chain-of-Custody procedure will apply.

1.05. SUBMITTALS

A. The following will be submitted to the architect for approval:

Copies of the manufacturer's product information and installation instructions.

A manufacturer's dimensioned drawing showing how the 50% lateral ventilation is achieved. Calculations of spacer block percentage of panel area and the Net Free Area per Lin. Ft. of insulation after deducting for spacers.

1.06. DELIVERY AND STORAGE

A. The ventilated insulation shall be protected in the transit by plastic covers and by truck tarps. When material is stored at the jobsite, a reasonably level, drained storage area shall be provided. The insulation shall rest on firm blocking and shall be covered with tarps.

1.07. SEQUENCING/SCHEDULING

A. Erection of the ventilated insulation shall be coordinated with the roofing subcontractor so the roofing is applied as soon as possible after insulation is in place.

2. PRODUCT

- 2.01. Products shown below are acceptable provided they meet the requirements of this specification:
 - A. **TechVENT®Pro** by Kurt Building Materials, Minneapolis MN Tele: (763) 572-1500 Fax: (763) 572-9878 www.kurtbuildingmaterials.com
 - B. **Tech SIP Fasteners** as required per the appropriate fastener pattern.

3. <u>EXECUTION</u>

3.01.

A. The structural roof deck shown in the plans shall be smooth and level and free of water or debris before the ventilated insulation is installed. Apply vapor retarder if required.

NOTE: Kurt recommends that the designer carefully considers the need for a vapor/air retarder.

3.02.

- A. Installation shall follow the manufacturer's written installation instructions.
- B. Fasten with Tech SIP Fasteners to the supporting roof deck shown in the plans.
- C. Protect ventilated insulation work from exposure to moisture damage and deterioration, primarily by prompt installation of the roofing, sheet metal and waterproofing work. Page 2 of 2 Ref # KTV-DS-0717

For: File Resubmit Date: PO No.: Approval Other. GC: Architect: Mech: Engr: Rep: (Company) (Project Manager)



Tag #:



LS120HSV4

Job Name/Location:

High Efficiency Single Zone Inverter

Outdoor Unit (ODU) - LSU120HSV4 Indoor Unit (IDU) - LSN120HSV4

Performance:

Cooling:

Cooling Capacity (Min~Rated~Max) (Btu/h)	1,023~11,200~13,785
SEER	21.5
EER	12.5

Heating:

Heating Capacity (Min~Rated~Max) (Btu/h)	1,023~13,300~22,178
HSPF	11.0

HSPF - Heating Seasonal Performance Factor

Cooling Nominal Test Conditions: Heating Nominal Test Conditions: Indoor: 80°F DB/67°F WB Indoor: 70°F DB/60°F WB Outdoor: 95°F DB/75°F WB Outdoor: 47°F DB/43°F WB

Electrical:

Power Supply (V¹/Hz/Ø)	208-230/60/1

Outdoor Unit:

MOP (A)	15
MCA (A)	10
Cooling Rated Amps (A)	8.7
Heating Rated Amps (A)	8.7
Compressor (A)	8.3
Fan Motor (A)	0.40

MOP - Maximum Overcurrent Protection MCA - Minimum Circuit Ampacity

Total Power Input:

Cooling Power Input (kW)	0.90
Heating Power Input (kW)	1.0

Piping:

Liquid Line (in, OD)	1/4
Vapor Line (in, OD)	3/8
Additional Refrigerant (oz/ft)	0.22
Min/Max Pipe Length (ft) ²	6.6/65.6
Piping Length (no add'l refrigerant, ft)	41.0
Max Elevation (ft)	32.8

Controls Features:

- •24-Hour on/off timer Chaos wind
- •Condensate Sensor •4-Way auto swing
- Auto changeover Auto restart
- Connection Energy saving
- Built-in low ambient •Inverter (variable speed compressor)

standard, down to 14°F (cooling mode)

•IDU compatible with Multi F

- Jet cool/Jet heat
- •3M Micro Protection Filter
- •Self-cleaning indoor coil
- •Sleep mode
- •Cooling only function
- •Smart AC module



Operating Range:

Outdoor Unit:

Cooling (°F DB)	14-118
Heating (°F WB)	-4-65

Indoor Unit:

Cooling (°F WB)	53-75
Heating (°F DB)	60-86

Unit Data:

Refrigerant Type	R410A
Refrigerant Control	EEV
Refrigerant Charge (lbs)	2.21
ODU Sound Pressure (±3 dB(A)) ³	45
IDU Sound Pressure (H/M/L/Sleep) (±3 dB(A)) ³	39/33/23/19
ODU Net Unit Weight (lbs)	75
ODU Shipping Weight (lbs)	79
IDU Net Unit Weight (lbs)	20
IDU Shipping Weight (lbs)	26
Heat Exchanger Coating	GoldFin™

Fan:

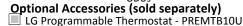
ODU Type	Propeller
IDU Type	Cross Flow
Fan Speeds (Fan/Cooling/Heating	g) 6/6/6
Quantity (ODU + IDU)	1+1
Motor/Drive	Brushless Digitally Controlled/Direct
ODU Max Air Flow Rate (CFM)	1,165
IDU Air Flow H/M/L (CFM)	353/272/191
Dehumidification (pts/hr)	2.3

Notes:

- 1.Acceptable operating voltage: 187V-253V.
- 2. Piping lengths are equivalent.
- 3.Sound Pressure levels are tested in an anechoic chamber under ISO Standard 1996.
- 4.All communication/power cable to be minimum 18 AWG, 4-conductor, stranded,
- shielded and must comply with applicable local and national code
- 5.See Engineering Manual for sensible and latent capacities 6. Power wiring cable size must comply with the applicable local and national code.
- 7.The indoor unit comes with a dry helium charge.
- 8.This data is rated 0 ft above sea level, with 24.6 ft of refrigerant line and a 0 ft level difference between outdoor and indoor units.
- 9. Must follow installation instructions in the applicable LG installation manual.







ODUs

PI-485 - PMNFP14A0

Low Ambient Wind Baffle (Cooling operation to 0°F) - ZLABGP01A

For a complete list of available accessories, contact your LG representative For continual product development, LG reserves the right to change specifications without notice.

Outdoor Unit (ODU) - LSU120HSV4

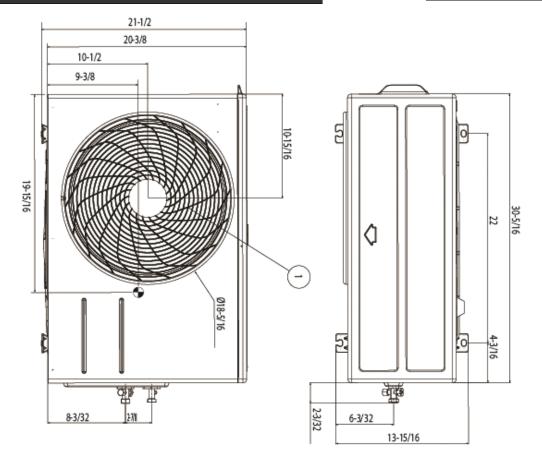
High Efficiency Single Zone Inverter



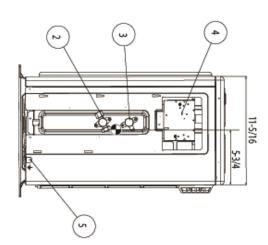
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Date:

PO No.:







om No	Part Name
1	Discharge Air Grille
2	Gas Pipe Connection Port
3	Liquid Pipe Connection Port
4	Control Box
51	Earth Screw

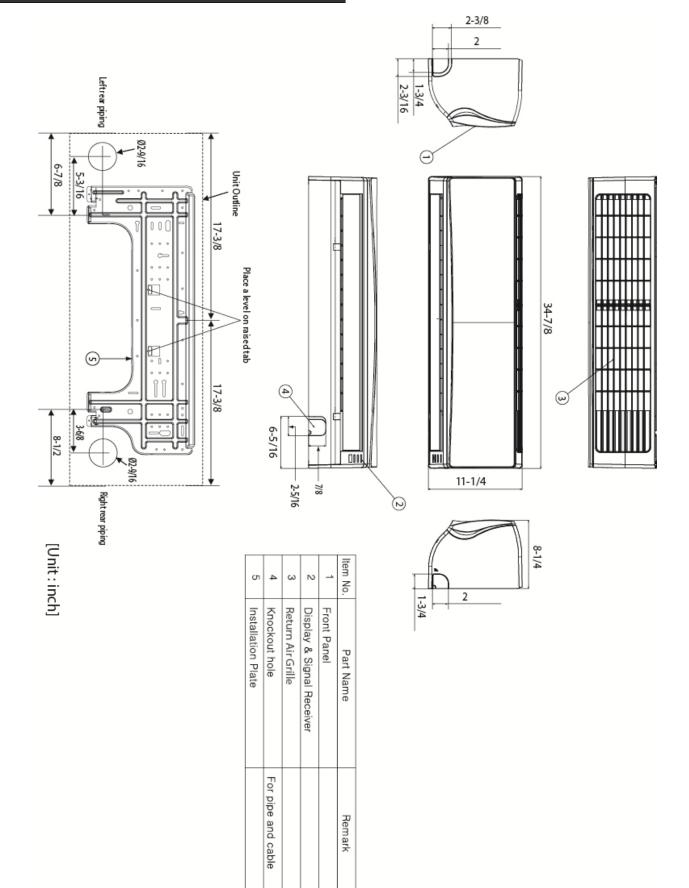
Indoor Unit (IDU) - LSN120HSV4 High Efficiency Single Zone Inverter



Tag #:

Date:

PO No.:



For: File Resubmit Date: PO No.: Approval Other GC: Architect:

Mech: Engr:

Rep:

(Company) (Project Manager)



Job Name/Location:

Single Zone Wall Mounted Extended Piping Outdoor Unit (ODU) - LSU363HLV Indoor Unit (IDU) - LSN363HLV









Performance:

Cooling:

Capacity (Min-Rated-Max, Btu/h)	3,070-33,000-34,000
SEER	17.5
EER	8.18

SEER - Seasonal Energy Efficiency Ratio EER - Energy Efficiency Ratio

Heating:

Capacity (Min-Rated-Max, Btu/h) 3,070-35,200-38,898

HSPF - Heating Seasonal Performance Factor

Cooling Nominal Test Conditions: Heating Nominal Test Conditions: Indoor: 80°F DB/67°F WB Indoor: 70°F DB/60°F WB Outdoor: 95°F DB/75°F WB Outdoor: 47°F DB/43°F WB

Electrical:

Power Supply (V¹/Hz/Ø)	208-230/60/1
	200 200,00,1

Outdoor Unit:

MOP (A)	30
MCA (A)	19
Recommended Fuse Size (A)	25
Cooling Rated Amps (A)	14.85
Heating Rated Amps (A)	14.85
Compressor (A)	14.6
Fan Motor (A)	0.25

MOP - Maximum Overcurrent Protection MCA - Minimum Circuit Ampacity

Total Power Input:

Cooling Power II	nput (kW)	4.04
Heating Power I	nput (kW)	3.84

Piping:

Liquid Line (in, OD)	3/8
Vapor Line (in, OD)	5/8
Additional Refrigerant (oz/ft)	0.38
Max Pipe Length (ft) ²	164
Piping Length (no add'l refrigerant, ft)	24.6
Max Elevation (ft)	98.4

Controls Features:

•24-Hour on/off timer	Chaos wind
4-Way auto swing	Jet cool/Jet heat
 Auto changeover 	•3M HAF Filter
 Auto restart 	 Sleep mode
 Built-in low ambient standard, 	 Cooling only function

- •Inverter (variable speed compressor)
- Condensate sensor connection
- •Temp display on indoor unit
- •Remote control via Wi-Fi and smartphone app

Optional Accessories (sold separately):

- LG Programmable Thermostat PREMTB10U
- Low Ambient Wind Baffle (Cooling operation to 0°F) ZLABGP02A

Defrost control

PI-485 - PMNFP14A1

down to 14°F (cooling mode)

Dry contact for 3rd party thermostat - PDRYCB300

Operating Range:

Tag #:

Outdoor Unit:

Cooling (°F DB)	14-118
Heating (°F WB)	-4-65
Indoor Unit:	

Indoor Unit:

Cooling (°F WB)	53-75
Heating (°F DB)	60-86

Unit Data:

Refrigerant Type	R410A
Refrigerant Control	EEV
Refrigerant Charge (lbs)	4.85
ODU Sound Pressure (±3 dB(A)) ³	55
IDU Sound Pressure (H/M/L/Sleep) (±3 dB(A))	49/44/40/37
ODU Net Unit Weight (lbs)	125
ODU Shipping Weight (lbs)	133
IDU Net Unit Weight (lbs)	40
IDU Shipping Weight (lbs)	46
Heat Exchanger Coating	GoldFin™

Fan:

ODU Type	Propeller
IDU Type	Cross Flow
Fan Speeds (Fan/Cooling/Heating)	6/6/6
Quantity (ODU + IDU)	1 + 1
Motor/Drive Brushless Digita	lly Controlled/Direct
ODU Max Air Flow Rate (CFM)	2,119
IDU Air Flow Max/H/M/L (CFM)	953/848/706/530
Dehumidification (pts/hr)	6.6

Notes:

- 1.Acceptable operating voltage: 187V-253V.
- 2. Piping lengths are equivalent.
- 3. Sound Pressure levels are tested in an anechoic chamber under ISO Standard 1996.
- 4.All communication/power cable to be minimum 18 AWG, 4-conductor, stranded,
- shielded and must comply with applicable local and national code. 5.See Engineering Manual for sensible and latent capacities.
- 6. Power wiring cable size must comply with the applicable local and national code. 7.The indoor unit comes with a dry helium charge.
- 8. This data is rated 0 ft above sea level, with 24.6 ft of refrigerant line and a 0 ft level difference between outdoor and indoor units.
- 9. Must follow installation instructions in the applicable LG installation manual.





Outdoor Unit (ODU) - LSU363HLV

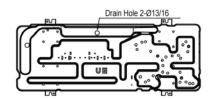
Single Zone Wall Mounted Extended Piping

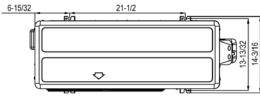


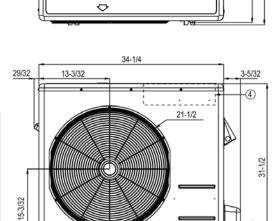
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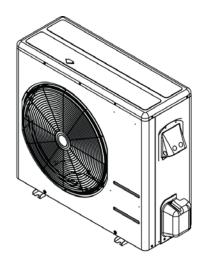
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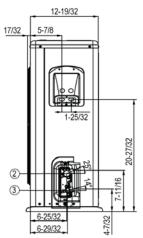
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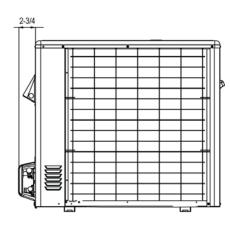












No	Part Name	Remark
1	Air Discharge Grille	
2	Gas Pipe Connection Port	
3	Liquid Pipe Connection Port	
4	Control Box	

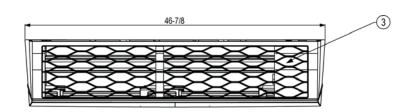
Unit : inch (mm)

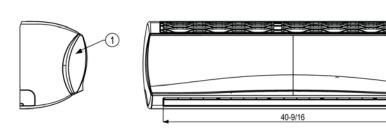
Indoor Unit (IDU) - LSN363HLV Single Zone Wall Mounted Extended Piping

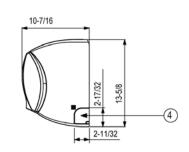


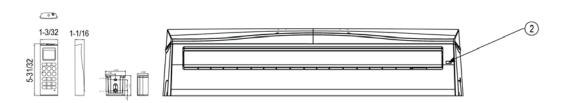
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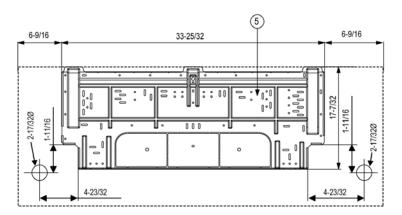
PO No.:











No	Part Name	Remark
1	Front Panel	
2	Display & Signal Receiver	
3	Air Suction Grille	
4	Knockout Hole	For pipe and cable
5	Installation Plate	

Unit: inch

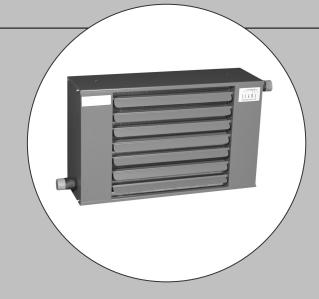






Catalog





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Sigma horizontal and vertical propeller unit heaters feature a wide performance range for both hot water and steam applications. The performance range is consolidated to reduce the number of different models, simplifying the selection, ordering and installation activities.

All single-phase models may be ordered with a low-cost speed-reducer permitting units to be field tuned. Side entry coil connections on model H units permit installation in clearance-critical low ceiling environments. Special coils, constructed with 0.032" wall Cu-Ni tubes or 0.049" wall copper, are available for more demanding applications. Furthermore, special explosion-proof motors may be ordered for any unit size.

PERFORMANCE

All units are designed for maximum airflow and for optimum air distribution. As a result, outlet temperatures are reduced, avoiding unwanted "hot spots".

Standard units in both horizontal (model H) and vertical configurations (model V) have 12 fpi fin series for enhanced performance.

All model H units are equipped with horizontal louvres for simple vertical air distribution adjustment. Optional Louvre Fin Diffusers on model H units permit enhanced air distribution adjustment with either a wide spread of warmth or focussed warm air for greater unit throw. Optional Louvre Cone Diffusers are available on model V units to permit tailored airflow distribution.







ROBUST CONSTRUCTION FEATURES

Cabinets are constructed from heavy-duty, cold-rolled, corrosion-resistant steel finished in grey baked enamel.

Model H back panels and Model V discharge panels, both have integral inlet collars for additional stiffness.

All coils are pressure-tested at 350 psig.

Unit fans are statically and dynamically balanced and all motors are resilient-mounted resulting in quiet operation. Model H motors are mounted onto sturdy mounts, which also act as fan guards.

Inherently stable blades on the model V Louvre Cone Diffuser permit louvre blades to be set at any position without flutter.

All louvre blades have rugged retaining springs keeping blades at their set position. These springs permit unlimited blade adjustment over the unit's life without decreasing the blade holding force.

SIMPLE INSTALLATION AND MAINTENANCE

Model H units are designed with all coil connections to the side(s) of the unit, facilitating access to the rear of the unit. Thus, model H motors and motor/fan assemblies are readily accessible.

All model V units are designed with generous spacing between the fan blades, facilitating access to the motor mounting fasteners. This enables easy removal of motor/fan assemblies through the discharge opening on model V units, thus permitting installation close to the ceiling.

All H and V units come equipped with an electrical junction box for simple electrical hook-up.





Horizontal Unit Specifications



CABINETS

Cabinets are constructed from heavy duty cold-rolled corrosion-resistant steel finished in grey baked enamel. Fronts have integral double-folded discharge frame for additional cabinet rigidity. Back panels have integral inlet collars for superior stiffness. Suspension tappings securely fastened to top panel.

FANS

Fans are designed and selected for high efficiency. Fans are statically and dynamically balanced for quiet, low vibration operation.



Motors

Standard motors are 115/60/1, totally enclosed, with automatic thermal overload protection. Standard motors shall be resilient mounted onto fan guards for quiet, low-vibration operation.

DIFFUSERS

Model H units are equipped with horizontal louvres with individually adjustable blades. The optional louvre fin diffuser consists of vertically arranged, individually adjustable blades for maximum air distribution adaptibility.

COILS

Standard coils are constructed from heavy wall 5/8" outside diameter copper tube with mechanically bonded aluminum fins. Coils are pressure tested at 350 psig. Coils with 0.035" copper tubes are suitable for steam applications up to 100 psig.



Horizontal Unit Dimensions



FIGURE 1

DIMENSION DIAGRAM FOR HORIZONTAL UNIT HEATER WITH SERPENTINE COIL (30H & 40H)

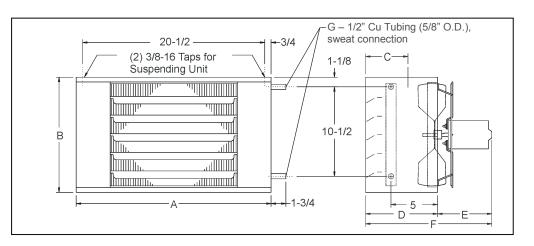


FIGURE 2

DIMENSION DIAGRAM FOR HORIZONTAL UNIT HEATER WITH MULTI-CIRCUITED COIL (47H TO 245H)

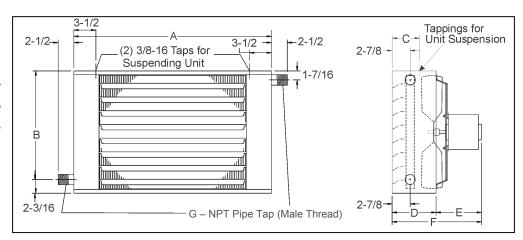


TABLE 1 HORIZONTAL UNIT HEATER SPECIFICATIONS

	FIGURE			Din	IENSIONS	(IN)			Wτ	Max.	Мах Тн	ROW (FT)
MODEL	REF.	Α	В	С	D	E	F	G	(LB)	Мт G. Нт (FT)	w/ Horiz. Louvers	w/ Vert. Louvers
015H	1	20	13.5	5	8	7.5	15.5	FIG. 1	27	9	16	19
025H	1	22	13.5	4.75	8	7.50	15.5	FIG. 1	36	9	19	24
030H	1	22	13.5	4.75	8	7.50	15.5	FIG. 1	40	9	18	23
040H	1	22	13.5	4.75	8	7.50	15.5	FIG. 1	40	10	23	29
047H	2	27	16.5	5.00	8.5	7.75	16.25	1.25	48	10	23	29
058H	2	27	16.5	5.00	8.5	9.50	18.0	1.25	48	10	28	35
062H	2	31.5	19.5	5.625	10	9.50	19.5	1.25	71	10	25	30
084H	2	31.5	19.5	5.625	10	7.50	17.5	1.25	76	12	32	40
105H	2	31.5	24	5.625	10	7.50	17.5	1.25	96	12	38	48
133H	2	37.0	24.0	5.875	10	7.75	17.75	1.50	108	13	40	50
200H	2	42.5	28.5	5.50	10	9.50	19.5	1.50	148	15	50	64
245H	2	46.5	31.5	5.50	10	9.50	19.5	1.50	172	16	54	68
260H	2	46.5	31.5	5.50	10	9.50	19.5	1.50	190	16	56	70
325H	2	46.5	31.5	5.50	10	9.50	19.5	1.50	230	16	60	75

Note: Model 325H motor mount differs from detail shown above in Fig.2.



Horizontal Unit - Performance Data



TABLE 2 STANDARD HORIZONTAL UNIT HEATERS PERFORMANCE DATA

		160 °F EWT					180 °F	EWT			200 °F	EWT		2 PSIG	STEAM
	WATER	CAP	FLOW	LAT	WPD	CAP	FLOW	LAT	WPD	CAP	FLOW	LAT	WPD	CAP	FLOW
030H	TD (°F)	(MBH) 20.3	(GPM)	(°F)	(FT)	(MBH) 25.0	(GPM) 5.1	(°F)	(FT)	(MBH)	(GPM)	(°F)	(F T)	(MBH)	(#/HR)
CFM 420	20	17.6	4.1 1.8	104.6 98.7	3.1 0.7	22.4	2.3	115.0 109.2	4.4 1.1	29.7	6.1 2.8	119.6	1.5	36.6	37.9
RPM 850	30	15.0	1.0	92.8	0.7	19.8	1.4	103.5	0.4	24.6	1.7	114.1	0.6	30.0	37.9
1/20HP, 1.1A	40	12.4	0.6	87.2	0.3	17.2	0.9	97.8	0.4	22.1	1.1	108.5	0.3	-	
030H	10	23.1	4.7	101.0	3.9	28.5	5.9	110.6	5.5	33.9	7.0	120.1	7.4		
CFM 520	20	20.0	2.0	95.5	0.9	25.5	2.6	105.2	1.3	30.9	3.2	114.8	1.8	40.3	41.7
RPM 1050	30	17.0	1.2	90.2	0.3	22.5	1.5	100.0	0.5	28.0	1.9	109.7	0.8	+0.5	71.7
1/20HP, 1.1A	40	14.1	0.7	85.0	0.1	19.6	1.0	94.8	0.3	25.2	1.3	104.6	0.4	-	
040H	10	25.6	5.2	98.0	4.7	31.5	6.5	106.9	6.7	37.5	7.7	115.7	8.9		
CFM 620	20	22.1	2.3	92.9	1.1	28.2	2.9	100.9	1.6	34.2	3.5	110.8	2.2	43.8	45.4
RPM 1150	30	18.8	1.3	88.0	0.4	24.9	1.7	97.0	0.6	31.0	2.1	106.1	0.9	45.0	75.4
1/8HP, 1.8A	40	15.6	0.8	83.2	0.2	21.7	1.1	92.3	0.3	27.8	1.4	101.4	0.5	-	
040H	10	27.9	5.7	95.3	5.5	34.4	7.1	103.5	7.8	40.9	8.4	111.7	10.5		
CFM 730	20	24.2	2.5	90.5	1.3	30.8	3.2	98.9	1.9	37.4	3.8	107.2	2.6	47.1	48.8
RPM 1350	30	20.6	1.4	86.0	0.5	27.2	1.9	94.4	0.7	33.9	2.3	102.8	1.1	77.1	10.0
1/8HP, 1.8A	40	17.0	0.9	81.5	0.2	23.7	1.2	90.0	0.4	30.4	1.6	98.4	0.5	-	
040H	10	30.0	6.1	93.0	6.3	37.0	7.6	100.7	8.9	44.0	9.1	108.3	11.9		
CFM 840	20	26.0	2.7	88.5	1.4	33.1	3.4	96.3	2.1	40.2	4.1	100.3	3.0	50.1	51.9
RPM 1550	30	22.1	1.5	84.3	0.5	29.2	2.0	92.1	0.8	36.4	2.5	100.0	1.2	30.1	01.5
1/8HP, 1.8A	40	18.3	0.9	80.1	0.2	25.5	1.3	88.0	0.4	32.7	1.7	95.9	0.6	-	
047H	10	31.1	6.3	102.7	1.4	38.4	7.9	112.9	2.1	45.8	9.4	123.1	2.8		
CFM 670	20	26.4	2.7	96.3	0.3	33.9	3.5	106.6	0.5	41.3	4.3	116.9	0.7	56.3	58.4
RPM 850	30	21.8	1.5	90.0	0.1	29.4	2.0	100.5	0.2	37.0	2.5	110.9	0.3	- 00.0	00.1
1/20HP, 1.1A	40	17.0	0.9	83.4	0.05	25.0	1.3	94.4	0.1	32.7	1.7	105.0	0.1	-	
047H	10	35.2	7.2	99.2	1.8	43.7	9.0	108.5	2.6	52.0	10.7	117.8	3.5		
CFM 830	20	29.9	3.0	93.2	0.4	38.4	3.9	102.7	0.6	46.9	4.8	112.1	0.9	62.0	64.3
RPM 1050	30	24.7	1.7	87.4	0.1	33.3	2.3	97.0	0.2	42.0	2.9	106.6	0.3	- 52.5	0
1/20HP, 1.1A	40	19.4	1.0	81.6	0.1	28.4	1.5	91.5	0.1	37.0	1.9	101.1	0.2	-	
058H	10	37.1	7.6	97.6	2.0	46.0	9.4	106.6	2.8	54.8	11.3	115.6	3.8		
CFM 910	20	31.5	3.2	91.9	0.4	40.5	4.1	101.0	0.7	49.4	5.1	110.1	0.9	64.7	67.1
RPM 1150	30	26.0	1.8	86.3	0.2	35.1	2.4	95.6	0.3	44.2	3.0	104.8	0.4		
1/8HP, 1.8A	40	20.5	1.0	80.8	0.1	29.9	1.5	90.3	0.1	39.0	2.0	99.5	0.2	1	
058H	10	40.5	8.3	94.9	2.3	50.2	10.3	103.3	3.3	59.9	12.3	111.6	4.5		
CFM 1070	20	34.3	3.5	89.6	0.5	44.2	4.5	98.1	0.8	54.0	5.6	106.5	1.1	69.6	72.2
RPM 1350	30	28.4	1.9	84.4	0.2	38.3	2.6	93	0.3	48.2	3.3	101.6	0.4		
1/8HP, 1.8A	40	22.4	1.1	79.3	0.1	32.6	1.7	88.1	0.1	42.6	2.2	96.7	0.2		
058H	10	43.4	8.9	92.8	2.6	53.8	11.0	100.6	3.8	64.1	13.2	108.5	5.1		
CFM 1220	20	36.7	3.7	87.8	0.6	47.3	4.8	95.7	0.9	57.8	5.9	103.7	1.2	74.1	76.8
RPM 1550	30	30.3	2.1	82.9	0.2	41.0	2.8	91.0	0.3	51.6	3.5	99.0	0.5		
1/8HP, 1.8A	40	24.0	1.2	78.2	0.1	34.9	1.8	86.4	0.2	45.6	2.3	94.4	0.2		



Horizontal Unit - Performance Data



Table 2 Standard Horizontal Unit Heaters Performance Data (Continued)

		160 °F EWT 180 °F EWT 200 °F EWT						2 PSIG	STEAM						
	WATER	Сар	FLOW	LAT	WPD	Сар	FLOW	LAT	WPD	Сар	FLOW	LAT	WPD	Сар	FLOW
	TD (°F)	(MBH)	(GPM)	(°F)	(FT)	(MBH)	(GPM)	(°F)	(FT)	(MBH)	(GPM)	(°F)	(FT)	(MBH)	(#/ H R)
062H	10	41.0	8.4	108.4	3.7	49.9	10.2	119.0	4.9	59.3	12.2	130.1	6.5		
CFM 780	20	36.1	3.7	102.6	0.8	44.9	4.6	113.1	1.2	54.3	5.6	124.2	1.6	76.6	78.3
RPM 850	30	31.2	2.1	96.9	0.3	39.9	2.7	107.2	0.5	49.5	3.4	118.5	0.7		
1/20HP, 1.1A	40					35.0	1.8	101.4	0.2	44.6	2.3	112.8	0.3		
062H	10	47.2	9.7	104.8	4.6	57.5	11.8	114.7	6.3	68.3	14.1	124.9	8.5		
CFM 970	20	41.6	4.3	99.5	1.1	51.7	5.3	109.2	1.5	62.6	6.4	119.5	2.1	83.2	86.2
RPM 1050	30	36.0	2.5	94.2	0.4	46.0	3.1	103.7	0.6	57.0	3.9	114.2	0.9		
1/20HP, 1.1A	40					40.3	2.1	98.3	0.3	51.4	2.6	108.9	0.4		
084H	10	52.1	10.7	102.1	5.6	63.5	13.0	111.4	7.6	75.4	15.5	121.0	10.1		
CFM 1140	20	45.9	4.7	97.1	1.3	57.1	5.8	106.2	1.8	69.1	7.1	115.9	2.5	89.5	92.7
RPM 1150	30	39.7	2.7	92.1	0.5	50.8	3.5	101.1	0.7	62.9	4.3	110.9	1.1		
1/6HP, 2.0A	40	33.7	1.7	87.2	0.2	44.5	2.3	96.0	0.4	56.7	2.9	105.9	0.5		
084H	10	57.0	11.7	99.5	6.6	69.4	14.2	108.1	8.9	82.4	17.0	117.1	11.9		
CFM 1330	20	50.1	5.2	94.8	1.4	62.4	6.4	103.3	2.2	75.5	7.8	112.4	3.0	96.2	99.7
RPM 1350	30	43.4	3.0	90.1	0.6	55.5	3.8	98.5	0.9	68.8	4.7	107.7	1.2		
1/6HP, 2.0A	40	36.7	1.9	85.4	0.3	48.7	2.5	93.8	0.4	62.0	2.3	98.5	0.4		
084H	10	63.3	13.0	96.2	8	77.1	15.8	104.1	10.7	91.5	18.9	112.4	14.4		
CFM 1610	20	55.7	5.7	91.9	1.8	69.3	7.1	99.7	2.6	83.9	8.6	108.0	3.6	104.7	108.5
RPM 1625	30	48.2	3.3	87.6	0.7	61.6	4.2	95.3	1.0	76.4	5.2	103.7	1.5		
1/6HP, 2.0A	40	40.9	2.1	83.4	0.3	54.1	2.8	91.0	0.5	68.9	3.5	99.5	0.8		
133H	10	87.4	17.9	99.3	6.9	107.6	22.1	108.4	9.8	127.7	26.3	117.4	13.0		
CFM 2050	20	76.5	7.8	94.4	1.6	96.8	9.9	103.6	2.4	117.2	12.1	112.7	3.3	149.0	154.4
RPM 850	30	65.7	4.5	89.5	0.6	86.3	5.9	98.8	1.0	106.8	7.3	108.0	1.4		
1/4HP, 3.5A	40	55.2	2.8	84.8	0.3	75.9	3.9	94.1	0.5	96.5	5.0	103.4	0.7		
133H	10	99.5	20.3	95.3	8.7	122.5	25.1	103.4	12.3	145.4	30.0	111.6	16.5		
CFM 2600	20	87	8.9	90.9	2.0	110.3	11.3	99.1	3.0	133.4	13.7	107.3	4.1	165.8	171.8
RPM 1075	30	74.8	5.1	86.5	0.8	98.2	6.7	94.8	1.2	121.6	8.3	103.1	1.7		
1/4HP, 3.5A	40	62.9	3.2	82.3	0.3	86.5	4.4	90.7	0.6	109.9	5.6	99.0	0.9		
200H	10	133.1	27.2	96.3	3.0	164.6	33.8	104.9	4.4	196.0	40.4	113.5	5.8		
CFM 3380	20	113.8	11.6	91.0	0.7	145.7	14.9	99.8	1.0	177.5	18.3	108.4	1.4	227.7	236
RPM 850	30	95.1	6.5	86.0	0.3	127.3	8.7	94.7	0.4	159.6	10.9	103.5	0.6		
1/2HP, 5.6A	40	76.9	3.9	81.0	0.1	109.6	5.6	89.9	0.2	141.9	7.3	98.7	0.3		
200H	10	150.5	30.7	92.4	3.8	186.1	38.2	100.1	5.4	221.7	45.7	107.8	7.3		
CFM 4280	20	128.6	13.1	87.7	0.9	164.8	16.9	95.5	1.3	200.8	20.7	103.3	1.8	253.4	262.6
RPM 1075	30	107.5	7.3	83.2	0.3	143.9	9.8	91.0	0.5	180.4	12.4	98.9	0.7		
1/2HP, 5.6A	40	86.9	4.4	78.7	0.1	123.8	6.3	86.7	0.2	160.5	8.2	94.6	0.4		
245H	10	160.5	32.8	99.5	16.3	196.9	40.4	108.4	23.1						
CFM 3750	20	142.3	14.5	95.0	3.9	179.0	18.3	104.0	5.7	215.7	22.2	113.0	7.8	268.7	278.4
RPM 850	30	124.3	8.4	90.6	1.5	161.4	11.0	99.7	2.3	198.4	13.6	108.8	3.3		
1/2HP, 5.6A	40	106.7	5.4	86.2	0.7	143.9	7.4	95.4	1.2	181.1	9.3	104.5	1.7		
245H	10	182.3	37.2	95.5	20.5										
CFM 4740	20	161.7	16.5	91.4	4.9	203.4	20.8	99.6	7.1	245.0	25.2	107.7	9.8	298.8	309.7
RPM 1075	30	141.4	9.6	87.5	1.9	183.4	12.5	95.7	2.9	225.5	15.5	103.9	4.1]	
1/2HP, 5.6A	40	121.5	6.2	83.6	0.9	163.8	8.4	91.9	1.5	205.9	10.6	100.0	2.1		





CABINETS

Cabinets are constructed from heavy duty cold-rolled corrosion-resistant steel finished in grey baked enamel. Corners have multiple folds for enhanced cabinet rigidity. Discharge panels have integral discharge collars for superior stiffness. Suspension tappings securely fastened to top panel.

FANS

Fans are designed and selected for high efficiency. Fans are statically and dynamically balanced for quiet, low vibration operation.

Coils

Standard coils are constructed from heavy wall 5/8" outside diameter copper tube with mechanically bonded aluminum fins. Coils are pressure tested at 350 psig. Coils with 0.035" copper tubes are suitable for steam applications up to 100 psig.

Motors

Standard motors are 115/60/1, totally enclosed, with automatic thermal overload protection. Motors shall be removable through the air discharge opening.

DIFFUSERS

The optional louvre cone diffuser on the model V consists of radially positioned, individually adjustable blades for maximum air distribution adaptibility.



Vertical Unit Dimensions



FIGURE 3

DIMENSION DIAGRAM
FOR VERTICAL UNIT
HEATER

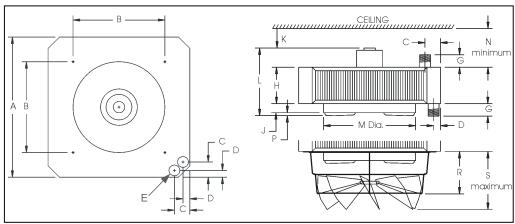


TABLE 3 VERTICAL UNIT HEATER SPECIFICATIONS

Model					DIMENSIO	NS (IN)			
MIODEL	Α	В	С	D	E (NPT)	F	G	Н	J
039V	18.5	10	2.625	1.25	1.5	3/8-16 UNC	2.75	6.125	1.25
050V	18.5	10	2.625	1.25	1.5	3/8-16 UNC	2.75	6.125	1.25
054V	22	13	2.625	1.25	1.5	3/8-16 UNC	2.75	6.125	1.5
067V	22	13	2.625	1.25	1.5	3/8-16 UNC	2.75	6.125	1.5
078V	26.5	16	2.625	1.25	1.5	3/8-16 UNC	2.75	7.625	1.625
100V	26.5	16	2.625	1.25	1.5	3/8-16 UNC	2.75	7.625	1.625
145V	30.875	20	3.375	1.5	2	3/8-16 UNC	2.75	7.625	2
210V	36.875	25	3.375	1.5	2	3/8-16 UNC	2.75	7.625	2.375
300V	44.125	30	4.125	2	2.5	1/2-13 UNC	3	9.125	3
370V	44.125	30	4.125	2	2.5	1/2-13 UNC	3	13.625	3
375V	44.125	30	4.125	2	2.5	1/2-13 UNC	3	9.125	3
480V	44.125	30	4.125	2	2.5	1/2-13 UNC	3	13.625	3

			Dı	MENSIONS (IN)				Max. Mtd	6. Н т. (FT)
MODEL	K	L	M	N	Р	R	S	WT (LB)	WITHOUT LOUVER	WITH LOUVER
039V	3	11.5	12.25	6	1.125	6.25	8.875	49	12	16
050V	3	11.5	12.25	6	1.125	6.25	8.875	50	17	22
054V	3	11.875	14.375	6	1.25	7	10	62	13	16
067V	3	11.875	14.375	6	1.25	7	10	63	19	23
078V	2	12.25	16.375	7	1	7.25	10.625	85	14	17
100V	2	12.25	16.375	7	1	7.25	10.625	90	21	25
145V	2.375	13.5	20.375	7	1.5	9	13.25	118	23	28
210V	4	15.25	24.5	7	1.25	8.5	11.875	146	26	32
300V	3	15.875	30.5	7	0.75	9.5	13.75	200	26	32
370V	1.875	19.25	30.5	7	0.75	9.5	13.75	265	28	34
375V	4.5	17.375	30.5	8	0.75	9.5	13.75	205	40	48
480V	2.5	19.875	30.5	8	0.75	9.5	13.75	270	42	52



Vertical Unit - Performance Data



TABLE 4 STANDARD VERTICAL UNIT HEATERS PERFORMANCE DATA

		160 °F EWT					180 °F	EWT			200 °F	EWT		2 PSIG	STEAM
	WATER TD (°F)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW
039V	10	26.6	5.4	103.1	0.2	33.5	6.9	114.2	0.2	40.3	8.3	125.2	0.3	(101211)	(minty
CFM 570	20	20.7	2.1	93.5	0.1	27.9	2.9	105.1	0.1	34.9	3.6	116.5	0.1	51.3	53.1
RPM 850	30				***	21.8	1.5	95.3	0.1	29.6	2.0	108.0	0.1		
1/20HP, 1.1A	40									23.2	1.2	97.5	0.1		
040V	10	30.5	6.2	99.7	0.2	38.4	7.9	109.9	0.3	46.3	9.5	120.1	0.4		
CFM 710	20	23.8	2.4	90.9	0.05	32.0	3.3	101.5	0.1	40.0	4.1	112.0	0.1	56.4	58.5
RPM 1050	30					25.3	1.7	92.9	0.1	33.9	2.3	104.1	0.1		
1/20HP, 1.1A	40									27.2	1.4	95.3	0.1		
050V	10	32.3	6.6	98.2	0.2	40.7	8.3	108.1	0.4	49.0	10.1	117.9	0.5		
CFM 780	20	25.2	2.6	89.7	0.05	33.8	3.5	99.9	0.1	42.3	4.4	110.0	0.1	58.8	60.9
RPM 1150	30					26.8	1.8	91.7	0.1	35.8	2.5	102.4	0.1		
1/8HP, 1.8A	40									28.9	1.5	94.1	0.1		
050V	10	35.2	7.2	95.7	0.3	44.4	9.1	105.0	0.4	53.5	11.0	114.2	0.6		
CFM 910	20	27.4	2.8	87.8	0.1	36.8	3.8	97.3	0.1	46.1	4.8	106.8	0.1	63.2	65.5
RPM 1350	30					29.4	2.0	89.7	0.1	39.0	2.7	99.6	0.1		
1/8HP, 1.8A	40									31.7	1.6	92.2	0.1		
050V	10	37.9	7.7	93.6	0.3	47.7	9.8	102.3	0.5	57.6	11.9	111.0	0.6		
CFM 1040	20	29.4	3.0	86.1	0.1	39.5	4.1	95.1	0.1	49.6	5.1	104.0	0.1	67.3	69.8
RPM 1550	30	18.2	1.2	76.2	0.1	31.6	2.2	88.0	0.1	41.9	2.9	97.2	0.1		
1/8HP, 1.8A	40									34.2	1.8	90.4	0.1		
054V	10	35.7	7.3	104.5	0.4	44.5	9.1	115.5	0.5	53.3	11.0	126.5	0.7		
CFM 740	20	29.1	3.0	96.3	0.1	38.1	3.9	107.5	0.1	47.1	4.9	118.7	0.2	66.5	68.9
RPM 850	30	21.1	1.4	86.3	0.1	31.9	2.2	99.8	0.1	41.1	2.8	111.2	0.1		
1/20HP, 1.1A	40					23.5	1.2	89.3	0.1	35.0	1.8	103.6	0.1		
054V	10	40.9	8.4	101.0	0.5	51.1	10.5	111.2	0.7	61.2	12.6	121.4	0.9		
CFM 920	20	33.3	3.4	93.4	0.1	43.7	4.5	103.8	0.2	54.0	5.6	114.2	0.2	73.2	75.8
RPM 1050	30	24.9	1.7	84.9	0.1	36.5	2.5	96.6	0.1	47.1	3.2	107.2	0.1		
1/20HP, 1.1A	40					28.0	1.4	88.1	0.1	40.2	2.1	100.2	0.1		
067V	10	43.0	8.8	99.7	0.5	53.7	11.0	109.5	0.7	64.4	13.3	119.4	1.0		
CFM 1000	20	35.0	3.6	92.3	0.1	45.9	4.7	102.3	0.2	56.8	5.8	112.4	0.2	76.1	78.9
RPM 1150	30	26.4	1.8	84.3	0.1	38.4	2.6	95.4	0.1	49.4	3.4	105.6	0.1		
1/8HP, 1.8A	40					29.7	1.5	87.4	0.1	42.2	2.2	98.9	0.1		
067V	10	47.3	9.7	97	0.6	59.1	12.1	106.2	0.9	70.8	14.6	115.4	1.2		
CFM 1180	20	38.4	3.9	90	0.1	50.5	5.2	99.4	0.2	62.4	6.4	108.8	0.3	81.9	84.9
RPM 1350	30	29.3	2	82.9	0.05	42.1	2.9	92.9	0.1	54.3	3.7	102.4	0.1		
1/8HP, 1.8A	40					33.1	1.7	85.9	0.05	46.3	2.4	96.2	0.1		
067V	10	50.9	10.4	94.8	0.7	63.6	13.1	103.5	1.0	76.3	15.7	112.1	1.4		
CFM 1350	20	41.3	4.2	88.2	0.1	54.3	5.6	97.1	0.2	67.2	6.9	105.9	0.3	87.2	90.4
RPM 1550	30	31.7	2.2	81.7	0.1	45.2	3.1	90.9	0.1	58.4	4.0	99.9	0.1		
1/8HP, 1.8A	40					35.9	1.8	84.6	0.1	49.8	2.6	94.0	0.1		



Vertical Unit - Performance Data



Table 4 Standard Vertical Unit Heaters Performance Data (Continued)

		160 °F EWT 180 °F EWT								200 °F	EWT		2 PSIG	STEAM	
	WATER TD (°F)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW (#/HR)
078V	10	50.9	10.4	108.8	0.6	63.1	12.9	120.6	0.9	75.2	15.5	132.3	1.1		
CFM 960	20	42.8	4.4	101.1	0.1	55.2	5.7	113.0	0.2	67.6	7.0	124.9	0.3	97.2	100.7
RPM 850	30	34.2	2.3	92.8	0.05	47.5	3.2	105.7	0.1	60.1	4.1	117.7	0.1		
1/20HP, 1.1A	40					38.9	2.0	97.3	0.05	52.7	2.7	110.6	0.10		
078V	10	58.9	12.0	105.7	0.8	73.1	15.0	116.7	1.1	87.3	18.0	127.6	1.5		
CFM 1190	20	49.5	5.0	98.4	0.2	63.9	6.6	109.5	0.3	78.3	8.1	120.7	0.4	107.0	110.9
RPM 1050	30	40.0	2.7	91.0	0.10	55.0	3.8	102.6	0.1	69.6	4.8	113.9	0.1		
1/20HP, 1.1A	40					45.7	2.3	95.4	0.05	60.9	3.1	107.2	0.1		
100V	10	62.4	12.7	104.3	0.9	77.5	15.9	114.9	1.2	92.4	19.1	125.6	1.7		
CFM 1300	20	52.4	5.3	97.2	0.2	67.7	6.9	108.0	0.3	82.9	8.5	118.8	0.4	111.4	115.5
RPM 1150	30	42.4	2.9	90.1	0.1	58.2	4.0	101.3	0.1	73.6	5.0	112.2	0.2		
1/6HP, 2.0A	40					48.5	2.5	94.4	0.05	64.5	3.3	105.7	0.1		
100V	10	68.8	14.1	101.7	1.0	85.4	17.5	111.8	1.5	101.9	21.0	121.8	2.0		
CFM 1520	20	57.7	5.9	95.0	0.2	74.6	7.6	105.2	0.3	91.4	9.4	115.4	0.5	119.8	124.2
RPM 1350	30	46.8	3.2	88.4	0.1	64.1	4.4	98.9	0.1	81.1	5.6	109.2	0.2		
1/6HP, 2.0A	40	30.3	1.5	78.4	0.05	53.6	2.7	92.5	0.10	71.0	3.6	103.0	0.1		
100V	10	76.7	15.7	98.7	1.2	95.3	19.5	108.0	1.8	113.7	23.4	117.3	2.4		
CFM 1830	20	64.3	6.6	92.4	0.3	83.1	8.5	101.9	0.4	101.9	10.5	111.3	0.6	130.4	135.1
RPM 1625	30	52.2	3.5	86.3	0.1	71.3	4.9	95.9	0.2	90.4	6.2	105.5	0.2		
1/6HP, 2.0A	40	36.4	1.9	78.3	0.05	59.9	3.1	90.2	0.1	79.0	4.1	99.8	0.1		
145V	10	97	19.8	98.2	2.3	120.0	24.6	107.3	3.2	143.0	29.5	116.3	4.3		
CFM 2340	20	82.6	8.4	92.5	0.5	106.0	10.9	101.8	0.8	129.2	13.3	110.9	1.1	160.9	166.8
RPM 850	30	68.6	4.7	87.0	0.2	92.3	6.3	96.4	0.3	115.9	7.9	105.7	0.4		
1/4HP, 3.5A	40	54.3	2.8	81.4	0.1	79.0	4.0	91.1	0.1	102.6	5.3	100.4	0.2		
145V	10	110	22.5	94.3	2.9	136.3	28.0	102.5	4.1	162.4	33.5	110.6	5.5		
CFM 2960	20	93.7	9.6	89.2	0.6	120.3	12.3	97.5	1.0	146.8	15.1	105.7	1.3	179.0	185.5
RPM 1075	30	77.9	5.3	84.3	0.2	104.7	7.1	92.6	0.4	131.5	9.0	101.0	0.5		
1/4HP, 3.5A	40	62.2	3.2	79.4	0.1	89.6	4.6	87.9	0.2	116.6	6.0	96.3	0.3		
210V	10	139	28.3	95.2	5.4	170.9	35.1	103.4	7.6	203.2	41.9	111.6	10.2		
CFM 3630	20	120	12.2	90.5	1.2	152.7	15.7	98.8	1.8	185.4	19.1	107.1	2.5	222.2	230.2
RPM 850	30	102	6.9	85.9	0.5	134.9	9.2	94.3	0.7	167.9	11.5	102.7	1.0		
1/2HP, 5.6A	40	84.2	4.3	81.4	0.2	117.6	6.0	89.9	0.3	150.7	7.7	98.3	0.5		
210V	10	156	31.9	91.4	6.7	192.8	39.6	98.7	9.5	229.2	47.3	106.0	12.7		
CFM 4590	20	135	13.8	87.2	1.5	172.2	17.6	94.6	2.3	209.0	21.5	102.0	3.1	247.2	256.1
RPM 1075	30	115	7.8	83.1	0.6	152.1	10.4	90.5	0.9	189.4	13.0	98.0	1.3		
1/2HP, 5.6A	40	95	4.8	79.1	0.2	132.6	6.8	86.6	0.4	170.1	8.7	94.2	0.7		



Vertical Unit - Performance Data



Table 4 Standard Vertical Unit Heaters Performance Data (Continued)

			160 °F	EWT			180 °F	EWT			200 °F	EWT		2 PSIG	STEAM
	WATER TD (°F)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	C _{AP} (MBH)	FLOW (GPM)	LAT (°F)	WPD (FT)	CAP (MBH)	FLOW (#/HR)
300V	10	197	40.2	96.1	8.7	242.5	49.8	104.4	12.3	287.8	59.3	112.8	16.4		
CFM 5030	20	172	17.6	91.6	2.0	218.4	22.4	100.0	3.0	264.1	27.2	108.4	4.1	313.5	324.8
RPM 850	30	148	10.1	87.2	0.8	194.7	13.3	95.7	1.2	240.9	16.5	104.2	1.7		
1/2HP, 5.6A	40	125	6.4	82.9	0.3	171.5	8.8	91.4	0.6	217.8	11.2	99.9	0.9		
300V	10	223	45.4	92.3	10.8	273.8	56.2	99.7	15.3	325.0	67.0	107.1	20.5		
CFM 6360	20	195	19.9	88.2	2.5	246.6	25.3	95.7	3.7	298.3	30.7	103.2	5.1	348.8	361.4
RPM 1075	30	168	11.4	84.3	1.0	219.8	15.0	91.9	1.5	272.1	18.7	99.5	2.1		
1/2HP, 5.6A	40	141	7.2	80.4	0.4	193.9	9.9	88.1	0.7	246.3	12.7	95.7	1.1		
370V	10	243	49.6	102.1	6.1	298.7	61.3	111.8	8.6	354.5	73.1	121.4	11.5		
CFM 5320	20	213	21.7	96.8	1.4	269.0	27.6	106.6	2.1	325.3	33.5	116.4	2.9	401.4	416.0
RPM 850	30	183	12.4	91.7	0.5	239.8	16.4	101.6	0.8	296.7	20.3	111.4	1.2		
1/2HP, 5.6A	40	154	7.8	86.6	0.2	210.9	10.8	96.6	0.4	268.2	13.8	106.5	0.6		
370V	10	278	56.7	98.1	7.7	341.8	70.1	106.8	11.0	405.7	83.6	115.6	14.7		
CFM 6730	20	243	24.8	93.3	1.8	307.8	31.5	102.2	2.7	372.3	38.3	111.0	3.7	446.6	462.8
RPM 1075	30	209	14.2	88.6	0.7	274.4	18.7	97.6	1.1	339.6	23.3	106.5	1.5		
1/2HP, 5.6A	40	176	9.0	84.1	0.3	241.6	12.4	93.1	0.5	307.0	15.8	102.1	0.8		
375V	10	279	57.0	85.2	16.3										
CFM 10200	20	244	24.9	82.1	3.8	309.3	31.7	88.0	5.6	374.3	38.5	93.8	7.7	432.3	448.0
RPM 850	30	211	14.3	79.0	1.4	276.1	18.8	85.0	2.2	341.5	23.4	90.9	3.2		
2HP, 7.4A*	40	177	9.0	76.0	0.6	243.5	12.4	82.0	1.1	309.6	15.9	88.0	1.6		
480V	10	355	72.5	90.3	12.0	436.8	89.6	97.3	17.1						
CFM 10800	20	310	31.7	86.5	2.8	393.3	40.3	93.6	4.1	475.9	49.0	100.6	5.7	553.6	573.7
RPM 1075	30	268	18.2	82.8	1.1	350.7	23.9	89.9	1.7	434.1	29.8	97.1	2.4		
2HP, 7.4A*	40	225	11.4	79.2	0.5	309.4	15.8	86.4	0.8	393.2	20.2	93.6	1.2		

^{*} Denotes FLA at 230/60/3 electrical power



Selection Procedure – Steam Applications



DESIGN CONDITIONS

Heating Load = 210 MbH Entering Air Temperature = 50°F

Steam Pressure =15 psi Mounting Height = 12 feet

1. CAPACITY EVALUATION

From Table 5, the correction factor for 15 psig steam and 50°F entering air is 1.275. Equivalent capacity at standard conditions (2 psig steam and 60°F entering air) is:

Capequivalent =
$$\frac{210}{1.275}$$
 = 164.7 MBH

2. UNIT SELECTION

From Table 2, model 133-H delivers 165.8 MbH at stdandard conditions and at 1075 rpm and has a maximum mounting height of 13 feet (Table 1).

Thus, Model 133-H should be selected.

3. ACTUAL PERFORMANCE

Actual capacity:

Capactual =
$$165.8 \times 1.275 = 211.4$$
 MBH

Or expressed as Equivalent Direct Radiation (EDR):

Sq. ft of radiation =
$$\frac{\text{Cap (Btu)}}{240} = \frac{211,400}{240} = 880.8 \,\text{EDR}$$

The amount of condensate is:

Lbs of condensate =
$$\frac{\text{Sq. ft of radiation}}{4} = \frac{880.8}{4} = 220.2 \text{ lbs per hour.}$$

4. DETERMINING FINAL TEMPERATURE

The air temperature rise through the unit heater can be determined by:

$$\Delta T_{air} = \frac{Cap (Btu)}{scfm \times 1.085} = \frac{211,400}{2600 \times 1.085} = 74.9 \, ^{\circ}F$$

Leaving Air Temperature
$$=$$
 Inlet Air Temperature $+$ ΔT_{air} $=$ 70 + 74.9 °F = 144.9 °F



Selection Procedure – Steam Applications



TABLE 5 CORRECTION FACTORS FOR HORIZONTAL UNIT HEATERS AT VARIOUS STEAM CONDITIONS

STEAM					Enter	RING A IR TE	MPERATU	RE (°F)				
Pressure (PSIG)	-10	0	10	20	30	40	50	60	70	80	90	100
0	1.542	1.451	1.363	1.277	1.194	1.113	1.034	0.957	0.883	0.810	0.740	0.671
2	1.587	1.496	1.406	1.320	1.236	1.155	1.075	0.998	0.923	0.850	0.779	0.710
5	1.647	1.554	1.464	1.377	1.293	1.210	1.130	1.053	0.977	0.903	0.831	0.761
10	1.733	1.639	1.547	1.459	1.373	1.290	1.209	1.130	1.053	0.979	0.906	0.835
15	1.805	1.710	1.618	1.528	1.441	1.357	1.275	1.196	1.118	1.043	0.969	0.897
20	1.867	1.771	1.678	1.588	1.500	1.415	1.333	1.252	1.174	1.098	1.024	0.951
25	1.924	1.827	1.734	1.643	1.554	1.468	1.385	1.304	1.225	1.148	1.073	1.000
30	1.973	1.875	1.781	1.689	1.600	1.514	1.430	1.348	1.269	1.191	1.116	1.042
40	2.061	1.962	1.866	1.774	1.683	1.596	1.511	1.428	1.347	1.269	1.193	1.118
50	2.138	2.038	1.941	1.847	1.756	1.667	1.581	1.497	1.416	1.337	1.260	1.184
60	2.202	2.101	2.003	1.909	1.816	1.727	1.640	1.556	1.474	1.394	1.316	1.240
70	2.265	2.163	2.064	1.968	1.876	1.785	1.698	1.613	1.530	1.449	1.370	1.294
75	2.292	2.190	2.090	1.994	1.901	1.811	1.723	1.637	1.554	1.473	1.394	1.317
80	2.320	2.218	2.118	2.022	1.928	1.837	1.749	1.663	1.579	1.498	1.419	1.342
90	2.369	2.266	2.165	2.068	1.974	1.882	1.793	1.707	1.623	1.541	1.461	1.384
100	2.417	2.313	2.212	2.114	2.019	1.927	1.837	1.750	1.666	1.583	1.503	1.425
125	2.521	2.415	2.313	2.214	2.117	2.024	1.933	1.845	1.759	1.676	1.594	1.515
150	2.611	2.504	2.401	2.300	2.203	2.108	2.016	1.927	1.840	1.755	1.673	1.593

TABLE 6 CORRECTION FACTORS FOR VERTICAL UNIT HEATERS AT VARIOUS STEAM CONDITIONS

STEAM					Enter	RING A IR TE	EMPERATUI	RE (°F)				
Pressure (PSIG)	-10	0	10	20	30	40	50	60	70	80	90	100
0	1.488	1.408	1.329	1.251	1.176	1.101	1.029	0.957	0.887	0.819	0.751	0.684
2	1.526	1.445	1.366	1.288	1.213	1.139	1.066	0.994	0.924	0.856	0.788	0.721
5	1.575	1.494	1.415	1.337	1.262	1.187	1.115	1.043	0.973	0.904	0.836	0.770
10	1.645	1.564	1.484	1.407	1.331	1.257	1.184	1.112	1.042	0.973	0.905	0.839
15	1.704	1.622	1.543	1.465	1.389	1.315	1.242	1.170	1.100	1.031	0.963	0.896
20	1.754	1.673	1.593	1.516	1.439	1.365	1.292	1.220	1.150	1.081	1.013	0.946
25	1.800	1.719	1.639	1.561	1.485	1.410	1.337	1.265	1.195	1.126	1.058	0.991
30	1.839	1.758	1.678	1.600	1.524	1.449	1.376	1.304	1.233	1.164	1.096	1.029
40	1.910	1.828	1.748	1.670	1.593	1.518	1.445	1.373	1.302	1.233	1.165	1.098
50	1.971	1.889	1.808	1.730	1.653	1.578	1.505	1.433	1.362	1.292	1.224	1.157
60	2.022	1.939	1.859	1.781	1.704	1.629	1.555	1.483	1.412	1.342	1.274	1.207
70	2.071	1.989	1.908	1.829	1.753	1.677	1.603	1.531	1.460	1.390	1.322	1.254
75	2.092	2.010	1.929	1.851	1.774	1.698	1.624	1.552	1.481	1.411	1.342	1.275
80	2.115	2.032	1.952	1.873	1.796	1.720	1.646	1.574	1.503	1.433	1.364	1.297
90	2.153	2.070	1.989	1.910	1.833	1.758	1.684	1.611	1.540	1.470	1.401	1.334
100	2.190	2.107	2.026	1.947	1.870	1.794	1.720	1.648	1.576	1.506	1.437	1.370
125	2.271	2.188	2.107	2.028	1.950	1.874	1.800	1.727	1.655	1.585	1.516	1.448
150	2.341	2.258	2.176	2.097	2.019	1.943	1.868	1.795	1.723	1.653	1.584	1.516

Note: To determine steam heat output of a horizontal/vertical unit heater at other than standard conditions (2 psig steam and 60°F entering air temperature), multiply unit capacity by the correction factor for the desired conditions from the above tables.

13

Selection Procedure – Hot Water Applications



DESIGN CONDITIONS

Heating Load = 240 MbH

Entering Air Temperature = 75°F

Entering Water Temperature = 195°F

Water Temperature Drop = 15°F

Mounting Height = 22 ft

Configuration = Standard Vertical

Projection Unit Heater (Model V)

1. CAPACITY EVALUATION

From Table 7, since there are no factors for 75°F entering air nor any for 215°F entering water, hence the correction factor must be interpolated across the pertinent downward diagonal as follows:

Factor at 70°F EAT & 190°F EWT= 0.845
Factor at 80°F EAT & 200°F EWT= 0.838
Factor at 75°F EAT & 195°F EWT(Average) = 0.8415

There is no need to utilize the factors along the upward diagonal (i.e., 70°EAT-200°EWT & 80°EAT-190°EWT). A first approximation of the equivalent capacity at standard conditions (200°F water and 60°F entering air) is:

$$Cap_{first approximation} = \frac{240}{0.8415} = 285.2 \text{ MBH}$$

2. ADJUST THE WATER TEMPETRATURE DROP

The adjusted water temperature is:

$$\Delta T_{\text{adjusted}} = \frac{15}{0.8415} = 17.8 \text{ }^{\circ}\text{F}$$

3. Unit Selection and Equivalent Capacity

From Table 4, Model V Hot Water Capacities, at 200°F EWT and 1075 rpm, model 300-V delivers 298.3 MbH at 20°F Δ T and 325.0 MbH at 10°F Δ T and thus meets the capacity requirements of our first approximation. From Table 3, model 300-V may be mounted up to 26 feet above floor level without the need for a louvre cone diffuser and thus complies with the mounting height requirements. Interpolating for 17.8°F Δ T, the equivalent performance at 200°F EWT is:

$$Cap_{equivalent} = \frac{325.0 - 298.3}{(20 - 10)} \times (17.8 - 15) + 298.3 = 305.7 \text{ MbH}$$

Continued →



Selection Procedure – Hot Water Applications



DESIGN CONDITIONS

Heating Load = 240 MbH

Entering Air Temperature = 75°F

Entering Water Temperature = 195°F

Water Temperature Drop = 15°F

Mounting Height = 22 ft

Configuration = Standard Vertical

Projection Unit Heater (Model V)

4. ACTUAL PERFORMANCE

To obtain the actual capacity, multiply the equivalent capacity by the correction factor as follows:

$$Cap_{actual} = Cap_{equivalent} \times 0.8415 = 305.7 \times 0.8415 = 257.2 \, MbH$$

5. DETERMINATION OF GPM AND WATER PRESSURE DROP

The required water flow can be found by:

$$Q_{actual} = \frac{Cap_{actual} \; (MbH)}{0.485 \; x \quad \Delta T_{actual}} = \frac{257.2}{0.485 \times 15.0} = 35.4 \; GPM$$

The water pressure drop may be interpolated at 200°F, resulting in:

6. DETERMINATION OF FINAL TEMPERATURE

Lastly, the final air temperature leaving the unit heater can be determined by:

$$\begin{aligned} \text{FAT}_{\text{actual}} &= \text{EAT} + \Delta T_{\text{air}} = \text{EAT} + \frac{\text{Cap}_{\text{actual}} \text{ (Btu/hr)}}{\text{CFM x 1.085}} \\ &= 75^{\circ} + \frac{257,200}{6360 \times 1.085} = 112.3^{\circ} \, \text{F} \end{aligned}$$



Selection Procedure – Hot Water Applications



Table 7 Hot Water Correction Factors for Horizontal and Vertical Unit Heaters

Entering Water			Er	NTERING AIR TE	MPERATURE (°	F)		
TEMP. (°F)	30	40	50	60	70	80	90	100
160	0.962	0.880	0.795	0.715	0.634	0.568	0.484	0.410
170	1.036	0.954	0.869	0.785	0.704	0.628	0.552	0.478
180	1.110	1.024	0.940	0.859	0.774	0.698	0.622	0.546
190	1.182	1.100	1.011	0.929	0.845	0.768	0.690	0.615
200	1.259	1.171	1.085	1.000	0.917	0.838	0.760	0.684
210	1.331	1.249	1.158	1.071	0.988	0.908	0.829	0.753
220	1.408	1.318	1.230	1.141	1.058	0.978	0.898	0.820
230	1.482	1.391	1.301	1.215	1.129	1.048	0.967	0.889
240	1.554	1.468	1.374	1.285	1.200	1.118	1.036	0.957
250	1.627	1.539	1.448	1.359	1.270	1.188	1.106	1.025
260	1.702	1.612	1.520	1.429	1.340	1.258	1.173	1.095
270	1.780	1.686	1.590	1.500	1.410	1.328	1.244	1.161
280	1.850	1.759	1.664	1.571	1.482	1.398	1.311	1.230
290	1.925	1.831	1.735	1.642	1.552	1.468	1.380	1.300
300	2.000	1.909	1.809	1.715	1.622	1.538	1.450	1.368
310	2.070	1.976	1.882	1.785	1.694	1.604	1.515	1.433
320	2.142	2.048	1.953	1.858	1.764	1.674	1.585	1.499
330	2.220	2.120	2.024	1.930	1.838	1.742	1.655	1.569
340	2.295	2.193	2.095	2.000	1.907	1.815	1.723	1.638
350	2.370	2.268	2.168	2.070	1.976	1.884	1.795	1.705
360	2.440	2.348	2.242	2.140	2.045	1.952	1.862	1.776
370	2.515	2.417	2.312	2.215	2.116	2.020	1.930	1.843
380	2.590	2.488	2.388	2.285	2.188	2.091	1.998	1.910
390	2.660	2.560	2.459	2.360	2.258	2.162	2.067	1.977
400	2.735	2.632	2.530	2.430	2.332	2.230	2.137	2.046



Plant Order Form



PO No.:	 	 	
JOB NAME:			

Ĩ	HORIZONTAL UNIT HEATERS									
MODEL	QTY.	TAG	Louver Fin Diffusers	SPEED CONTROLLER	MANUAL STARTER	THERMOSTAT IMPERIAL	THERMOSTAT METRIC			
030H			□ = LFD12	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM			
040H			□ = LFD12	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM			
047H			□ = LFD14	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM			
058H			□ = LFD14	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM			
062H			□ = LFD16	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM			
084H			□ = LFD16	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM			
133H			□ = LFD20	□ = SPD50	□ = MSTNO	□ = RTI	□ = RTM			
200H			□ = LFD24	□ = SPD10	□ = MSTNO	□ = RTI	□ = RTM			
245H			□ = LFD24	□ = SPD10	□ = MSTNO	□ = RTI	□ = RTM			

	VERTICAL UNIT HEATERS								
MODEL	QTY.	TAG	Louver Cone Diffusers	SPEED CONTROLLER	MANUAL STARTER	THERMOSTAT IMPERIAL	THERMOSTAT METRIC		
039V	_		□ = LCD12	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM		
050V			□ = LCD12	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM		
054V			□ = LCD14	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM		
067V			□ = LCD14	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM		
078V			□ = LCD16	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM		
100V			□ = LCD16	□ = SPD25	□ = MSTNO	□ = RTI	□ = RTM		
145V			□ = LCD20	□ = SPD50	□ = MSTNO	□ = RTI	□ = RTM		
210V			□ = LCD24	□ = SPD10	□ = MSTNO	□ = RTI	□ = RTM		
300V			□ = LCD30	□ = SPD10	□ = MSTNO	□ = RTI	□ = RTM		
370V			□ = LCD30	□ = SPD10	□ = MSTNO	□ = RTI	□ = RTM		
375V	_		□ = LCD30	NA [*]	NA [*]	□ = RTI**	□ = RTM**		
480V			□ = LCD30	NA [*]	NA [*]	□ = RTI**	□ = RTM**		

Notes

^{** 375}V and 480V are equipped with three phase motors; thermostats are for single phase 120/240 and should be applied to pilot circuit of unit heater starter.



^{* 375}V and 480V are equipped with three phase motors, for which speed controllers and manual starters are not available.

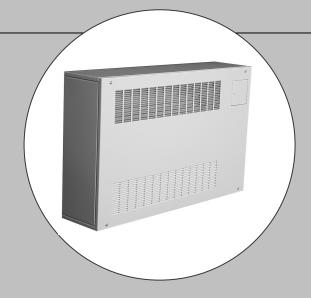






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Sigma force flow cabinet unit heaters are styled to fit into any room and provide efficient, individualized room temperature control.

Sigma force flow heaters have been designed so that as the unit size increases, the depth and height of the units remains constant. Only the length of the unit increases with capacity, resulting in uniform heights between models.

The standard cabinet is easily installed and may be ordered in any of several different airflow configurations. Installation collars shipped with recessed models provide further standardization and product simplification. These collars are field installed permitting units to be fully or partially recessed to suit field conditions and are adaptable to both floor mount or above-floor installations.

Force flow cabinet heaters are available in various standard finishes, from the economical primer finish to a choice of industry-standard baked enamel colours. Custom baked enamel colours are available upon request.

Force flow cabinet heaters are also available with various options including: 1) an infinitely variable motor speed controller, 2) unit or remote mounted temperature controls to cycle fan on demand, 3) an aquastat override which disables unit operation when the hot water supply temperature is below 85 DegF, 4) motor starter (with or without overloads) and 5) safety chains for ceiling hung units.





CABINETS

The outer cabinet is constructed from heavy duty corrosion resistant 16 Ga steel. The removable front panel provides uninhibited access to the internal structure for servicing the motor, fans, controls and coil. Cabinets are available in a left or right hand configurations. Cabinets have a standard factory finish in grey primer. Cabinets are also available with standard or custom color baked enamel finishes.

COILS

Heating coils are manufactured from 1/2" outside diameter seamless copper tubes which are expanded within corrugated aluminum fins. This forced expansion within a restrictive frame creates a durable mechanical bond between the fins and tube. This bond means there is no movement of the fin on the tube and no rattling noises as air is forced through the coil. The coils are designed for working pressures up to 150 psi.

BLOWERS

Twin centrifugal double-inlet double-width fans are mounted onto double-shafted motors for quiet operation and optimum airflow distribution across the coil and through the unit. The 1200 and 1500 cfm units employ a pair of twin fan & motor assemblies. All fan wheels and fan housings are corrosion resistant.

MOTORS

Permanent split capacitor type motors with self aligning sleeve bearings for durable motor life, low operating cost and reduced noise levels. A motor controller provides infinitely adjustable blower speed.

FILTERS

All units are supplied with wire framed polyester media filters as standard. These filters are designed for quick and cost effective replacement within all units.

CONTROLS

Force flow units are offered with the following control options:

- 1. Motor Speed Control with On/Off Switch
- 2. Built-In Thermostat (1 Stage)
- 3. Remote Thermostat (1 Stage)
- 4. Motor Starter with/without Overloads
- 5. Aquastat Override



Dimensions and Weights



FIGURE 1

FULLY EXPOSED ELEVATION & SIDE VIEW

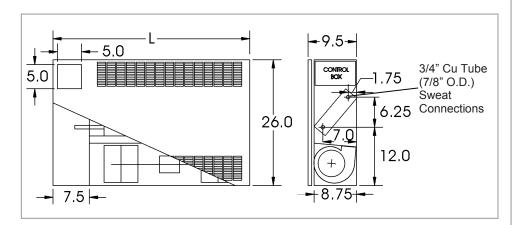


FIGURE 2
SEMI-RECESSED TO FULLY
RECESSED ELEVATION &
SIDE VIEW

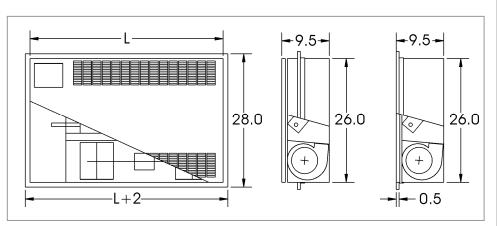


TABLE 1 MODEL DIMENSIONS

MODEL	NOMINAL AIR FLOW (CFM)	No. of Motors	Motor Power (HP)	MOTOR SPEED (RPM)	MOTOR CURRENT (AMPS)	No. of Fans	LENGTH "L" (IN)	DUCT COLLAR SIZE (IN)	FILTER SIZE (IN)	TOTAL WEIGHT (LB)
SFF-A-02	200					1	26.0	5 x 14	7.5 x 18	75
SFF-A-03	300								7.5 x 32	125
SFF-A-04	400	1	1/10	1075	1.9		40.5	5 x 28		
SFF-A-06	600	I	1/10			2				
SFF-A-08	800						50.5	5 x 38	7.5 x 42	150
SFF-A-10	1000						50.5	5 X 36	7.5 X 42	150
SFF-A-12	1200	2	2×1/10]	3.8	_	70.5	E v 50	7 E v 62	200
SFF-A-15	1500	2	2 2×1/6 1625 4.4		4	70.5	5 x 58	7.5 x 62	200	



Inverted Dimensions and Weights



FIGURE 1

FULLY EXPOSED ELEVATION & SIDE VIEW

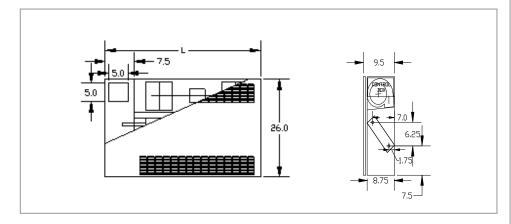


FIGURE 2

SEMI-RECESSED TO FULLY RECESSED ELEVATION & SIDE VIEW

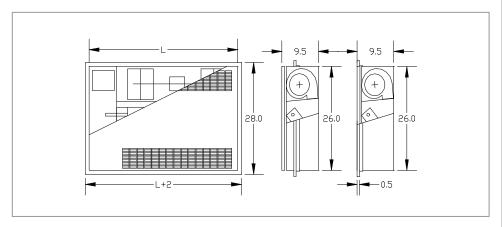


TABLE 1 MODEL DIMENSIONS

MODEL	NOMINAL AIR FLOW (CFM)	No. of Motors	Motor Power (HP)	MOTOR SPEED (RPM)	MOTOR CURRENT (AMPS)	No. of Fans	LENGTH "L" (IN)	DUCT COLLAR SIZE (IN)	FILTER SIZE (IN)	TOTAL WEIGHT (LB)
SFF-A-02	200					1	26.0	5 x 14	7.5 x 18	75
SFF-A-03	300									125
SFF-A-04	400	1	1/10		1.9		40.5	5 x 28	7.5 x 32	
SFF-A-06	600	'	1/10	1075		2				
SFF-A-08	800						50.5	5 x 38	7.5 x 42	150
SFF-A-10	1000						50.5	5 X 36	7.5 X 42	150
SFF-A-12	1200	2	2×1/10		3.8	4	70.5	E v 50	7 5 v 62	200
SFF-A-15	1500	2	2×1/6	1625	4.4	4	70.5	5 x 58	7.5 x 62	200



Selection Procedure Hot Water Applications



- **1.** If required selection is at tabulated conditions (200/180/160°F EWT, 60°F EAT & 20/30/40°F Δ T), then the resulting performance can be looked up directly from the Heating Performance Data (Table 2).
- **2.** If the conditions are as above but with a non-standard ΔT , then the performance can be interpolated from data in Table 2 between the adjacent ΔT values.
- 3. If required selection is not at tabulated conditions (200/180/160 °F EWT, 60°F EAT), one must first calculate the equivalent required performance at standard conditions (180°F EWT & 60°F) by applying a Correction Factor from Table 3, then lookup in the Heating Performance Data (Table 2) under 180°F EWT to find the unit which best matches the equivalent required capacity at the same gpm (See example on page 5).

TABLE 2 FORCE FLOW HEATERS PERFORMANCE DATA AT 60°F ENTERING AIR TEMPERATURE

				200° F	EWT			180°	F EWT			160°	EWT	
MODEL	AIR FLOW (CFM)	WTD (°F)	Сар.	FLOW (GPM)	WPD (FT WG)	LAT (°F)	Сар. (мвн)	FLOW (GPM)	WPD (FT WG)	LAT (°F)	Сар. (мвн)	FLOW (GPM)	WPD (FT WG)	LAT (°F)
		20	19.4	1.95	8.0	142	16.2	1.62	0.6	128	13.0	1.30	0.4	115
SFF02	220	30	18.2	1.22	0.4	137	15.0	1.00	0.3	123	11.7	0.78	0.2	109
		40	17.0	0.85	0.2	132	13.6	0.68	0.1	117	10.3	0.52	0.1	103
		20	30.7	3.07	2.4	155	25.9	2.59	1.8	140	21.0	2.10	1.2	125
SFF03	300	30	29.4	1.96	1.1	151	24.5	1.63	0.8	136	19.6	1.31	0.5	120
		40	28.1	1.40	0.6	147	23.2	1.19	0.4	132	18.0	0.90	0.3	116
		20	38.0	3.80	3.5	148	32.0	3.20	2.6	134	25.9	2.59	1.8	120
SFF04	400	30	36.3	2.42	1.6	144	30.2	2.01	1.1	130	24.0	1.60	8.0	116
		40	34.5	1.73	0.9	140	28.3	1.42	0.6	126	22.0	1.10	0.4	111
		20	50.6	5.06	5.8	138	42.5	4.25	4.3	126	34.3	3.43	2.9	113
SFF06	600	30	48.1	3.21	2.6	134	39.9	2.66	1.9	122	31.7	2.11	1.2	109
		40	45.5	2.28	1.4	130	37.2	1.86	1.0	117	28.9	1.44	0.6	105
		20	66.9	6.69	1.6	137	56.0	5.60	1.1	125	45.0	4.50	0.8	112
SFF08	800	30	63.1	4.21	0.7	133	52.1	3.47	0.5	120	41.0	2.73	0.3	107
		40	59.3	2.97	0.4	129	48.1	2.41	0.3	116	36.8	1.84	0.2	103
		20	77.7	7.77	2.0	132	64.9	6.49	1.5	120	52.1	5.21	1.0	108
SFF10	1000	30	73.1	4.88	0.9	128	60.2	4.02	0.6	116	47.3	3.15	0.4	104
		40	68.6	3.43	0.5	123	55.5	2.77	0.3	111	42.4	2.12	0.2	99
		20	103.0	10.30	4.5	140	86.6	8.66	3.3	127	70.1	7.01	2.3	114
SFF12	1200	30	98.1	6.54	2.0	136	81.5	5.43	1.4	123	64.8	4.32	1.0	110
		40	93.0	4.65	1.1	132	76.2	3.81	0.8	119	59.2	2.96	0.5	106
		20	119.8	12.00	5.9	134	100.7	10.10	4.3	122	81.4	8.14	3.0	110
SFF15	1500	30	113.9	7.59	2.6	130	94.5	6.30	1.9	118	75.0	5.00	1.2	106
		40	107.8	5.39	1.4	127	88.2	4.41	1.0	114	68.4	3.42	0.6	102



Notes: EWT = Entering Water Temperature; LAT = Leaving Air Temperature

Selection Procedure - Example Hot Water Applications



DESIGN CONDITIONS

Heating Load = 52.0 MbH Entering Water Temp. = 215°F Water Temp. Drop = 40°F Entering Air Temp. = 55°F

REQUIRED EQUIVALENT CAPACITY (AT 180°F EWT / 60°F EAT)

From Table 3, since there are no factors for 55°F entering air, nor any for 215°F entering water, the correction factor must be Interpolated across the pertinent downward diagonal as follows:

Factor at 50°F EAT & 210°F EWT= 1.342 Factor at 60°F EAT & 220°F EWT= 1.347 Factor at 55°F EAT & 215°F EWT(Average) = 1.345

There is no need to utilize the factors along the upward diagonal (i.e., 50°F EAT-220°F EWT & 60°F EAT-210°F EWT).

The equivalent required capacity at standard conditions (180°F water and 60°F entering air) is:

$$Cap_{at_std_conditions} = \frac{52.0}{1.345} = 40.9 \text{ MbH}$$

CALCULATE GPM

$$Q = \frac{Cap_{design} \text{ (MbH)}}{0.5 \text{ x } \Delta T_{design}} = \frac{52.0}{0.5 \times 40.0} = 2.75 \text{ gpm}$$

UNIT SELECTION AND ACTUAL CAPACITY

From the standard hot water capacities (Table 2), at 180°F EWT, model SFF-06 which delivers 39.9 MbH at 2.66 gpm (and 30°F ΔT) meets the capacity requirements. Note, that to utilize this method, the gpm is to be matched as closely as possible (ΔT will vary). To obtain the actual capacity, multiply the capacity (at std conditions) by the correction factor as follows:

$$Cap_{actual} = Cap_{at_std_conditions} \times 1.345$$
$$= 39.9 \times 1.345 = 53.7 \text{ MbH}$$

DETERMINING GPM AND WATER PRESSURE DROP

The required water flow can be found by:

$$Q_{actual} = \frac{Cap_{actual} \text{ (MbH)}}{0.5 \text{ x } \Delta T_{actual}} = \frac{53.7}{0.5 \times 40.0} = 2.7 \text{ gpm}$$

The water pressure drop can be approximated using the following equation:

$$\begin{split} &\Delta P_{actual} = WPD_{at_std_conditions} \times (\frac{Q_{actual}}{Q_{at_std_conditions}})^{1.8} \\ &= 1.9 \times (\frac{2.7}{2.66})^{1.8} = 1.95 \; \; \text{ft. of water} \end{split}$$

DETERMINING FINAL AIR TEMPERATURE

$$\begin{aligned} & \text{FAT}_{\text{actual}} = \text{ EAT} + \Delta T_{\text{air}} = \text{ EAT} + \frac{\text{Cap}_{\text{actual}} \text{ (Btu/hr)}}{\text{CFM} \times 1.085} \\ & = 55^{\circ} + \frac{53,700}{600 \times 1.085} = 137.5^{\circ} \text{F} \end{aligned}$$

TABLE 3 HOT WATER CORRECTION FACTORS (APPLIED TO 180°F EWT / 60°F EAT CAPACITY DATA)

Entering Air		Entering Water Temperature (°F)											
Temp. (°F)	100	110	120	130	140	150	160	170	180	190	200	210	220
40	0.495	0.569	0.655	0.743	0.830	0.918	0.989	1.076	1.163	1.250	1.337	1.424	1.512
50	0.404	0.490	0.576	0.662	0.749	0.822	0.908	0.995	1.082	1.168	1.255	1.342	1.429
60	0.325	0.410	0.495	0.581	0.668	0.742	0.828	0.914	1.000	1.086	1.173	1.260	1.347
70	0.245	0.329	0.414	0.499	0.576	0.661	0.746	0.832	0.918	1.004	1.091	1.177	1.264
80	0.164	0.248	0.332	0.417	0.495	0.579	0.665	0.750	0.836	0.922	1.008	1.094	1.181



Force Flow Ordering & Model Numbers



FORCE FLOW ORDERING

- 1. Select the appropriate order form for Upright & Horizontal Units (pg. 8) or Inverted Units (pg. 9).
- 2. Fill in appropriate job specific information on the order form (PO No., Job Name, Qty., and Tags).
- **3.** Select **only one** option from each of the items grouped in Section A: Air Flow, Voltage, Inlet/Outlet, Configuration, Handing, Thermostat, and Finish.
- **4.** Select **only required** items from the options in Section B: speed controller, access door (for optional speed controller and unit mounted thermostat), cover safety chains (usually for horizontal ceiling units), recess collars (for semi or fully recessed units), aquastat, and manual starter.

TYPICAL MODEL NUMBERS

The Sigma force flow model number encapsulates options and accessories relevant to the unit. An example model number is depicted below showing the various options. A full list of options is provided in Table 4.

Position: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 Code: SFF-A-04-120-FIFO-OLV-ILV-TU-LH-UT-SPD-RC-NSC-AD-MST-AQS-GRY-TAG1

TABLE 4
DESCRIPTION
OF CODE
OPTIONS FOR
FORCE FLOW
HEATERS

Position	DEFINITION	CODE OPTIONS					
1	Unit designation	SFF = Sigma Force Flow					
2	Development series	A					
3	Nominal CFM/100	02, 03, 04, 06, 08, 10, 12, 15					
4	Voltage	120=120V/1/60Hz, 208=208-2	30V/1/60Hz				
5	Flow configuration		For Inverted (BI): FIFO = front in-front out FIBO = front in-bottom out, TIFO = top in-front out,				
6	Outlet type	OLV = louvers, OBG = bargrill					
7	Inlet type	ILV = louvers, IBG = bargrille,					
8	Arrangement	TU = upright, BI = inverted					
9	Pipe handing	LH = left hand, RH = right hand					
10	Temperature control	UT=unit mounted thermostat, RTI=remote mounted thermostat (imperial units), RTM=remote mounted thermostat (metric units)					
11	Speed control	SPD = variable speed controll					
12	Collar configuration	RC = recessed collar, EX = ex	posed collar				
13	Safety chain	SC = safety chain, NSC = no s	safety chain				
14	Access	AD = access door, NAD = no a	access door				
15	Starter	MST = manual starter (no overloads) MSO = manual starter with overloads NMS no manual starter					
16	Aquastat	AQS = aquastat, NAQ = no aquastat					
17	Finish type	NON=no paint, PRM=primer, SNO=snow white, TWHT=tinted white, CMW=cameo white, SFD=soft dove, BGE = beige, GRY=gray, BLK=satin black, CST = custom					
18	Tag	As per customer's direction					



Plant Order Form - TU Upright & Horizontal Units



PO No.:		QUANTITY	<u> </u>	
JOB NAME:		Tags:		
	SECTION A: SI	ELECT ONE OPTION FR	OM EACH GROUP	
AIR FLOW	□ = (02) 200 cfm	□ = (04) 400 cfm	□ = (08) 800 cfm	□ = (12) 1200 cfm
	□ = (03) 300 cfm	□ = (06) 600 cfm	□ = (10) 1000 cfm	□ = (15) 1500 cfm
VOLTAGE	\Box = (120) 120V/1Ph/60) Hz	□ = (208) 208-230V/1I	Ph/60 Hz
OUTLET	□ = (OLV) Louvers	□ = (OBG) Bargrille	□ =(ODT)Duct Collar	
INLET/OUTLET	□ = (FIFO)	□ = (FITO)	□ = (BIFO)	□ = (BITO)
CONFIGURATION	Front in/Front out	Front in/Top out	Bottom in/Front out	Bottom in/Top out
	CONTROL BOX	CONTROL BOX	CONTROL	CONTROL BOX
INLET	□ = (ILV) Louvers	□ = (IBG) Bargrille	□ = (IDT) Duct Collar	1
HANDING	☐ = (LH) Left Hand Co	nnections	☐ = (RH) Right Hand (Connections
	CONTROL			CONTROL
THERMOSTAT	☐ = (NT) No Thermost	at	□ = (UT) Unit Mounted	i
	□ = (RTM) Remote Mo	ounted (Metric)	□ = (RTI) Remote Mou	unted (Imperial)
MAN. STARTER	□ = (NMS) NO Starter	☐ = (MST) Manual Starter (No OverLoads)	☐ = (MSO) Manual Starter with OverLoads	
FINISH	☐ = (NON) No Paint	□ = (TWHT)Tinted White	□ = (BGE) Beige	□ = (CST) Custom
	□ = (PRM) Primer	□ = (CMW)Cameo	□ = (GRY) Grey	
	☐ = (SNO) Snow White	□ = (SFD)Soft Dove	■ = (BLK) Satin Black	
	Section B	SELECT ONLY REQU	IRED OPTIONS	
□ = (SPD) Speed Cor	,	SC) Cover Safety Chain	☐ = (AD) Acce	ss Door
□ = (AQS) Aquastat	□ = (RC) Recessed Collar		



Plant Order Form - BI Inverted Units



PO No.:		QUANTITY	:	
JOB NAME:		Tags:		
		ELECT ONE OPTION FR		
AIR FLOW	\Box = (02) 200 cfm	\Box = (04) 400 cfm	\Box = (08) 800 cfm	
	□ = (03) 300 cfm	□ = (06) 600 cfm	□ = (10) 1000 cfm	<u>`</u>
VOLTAGE	□ = (120) 120V/1Ph/6	0 Hz	□ = (208) 208-230V/1	Ph/60 Hz
INLET	□ = (ILV) Louvers	□ = (IBG) Bargrille	□ = (IDT) Duct Collar	
INLET/OUTLET	□ = (FIFO)	□ = (FIBO)	□ = (TIFO)	□ = (TIBO)
CONFIGURATION	Front in/Front out	Front in/Bottom out	Top in/Front out	Top in/Bottom out
	CONTROL	CONTROL BOX	CONTROL BOX	CONTROL BOX
OUTLET	☐ = (OLV) Louvers	□ = (OBG) Bargrille	□ =(ODT)Duct Collar	
HANDING	☐ = (LH) Left Hand Co	onnections	□ = (RH) Right Hand	Connections
	CONTROL			CONTROL BOX
THERMOSTAT	□ = (NT) No Thermost	tat	□ = (UT) Unit Mounte	d
	□ = (RTM) Remote Mo	ounted (Metric)	□ = (RTI) Remote Mo	unted (Imperial)
MAN. STARTER	□ = (NMS) NO Starter	□ = (MST) Manual Starter (No OverLoads)	☐ = (MSO) Manual Starter with OverLoads	
FINISH	□ = (NON) No Paint	☐ = (TWHT)Tinted White	□ = (BGE) Beige	□ = (CST) Custom
	□ = (PRM) Primer	■ = (CMW)Cameo	□ = (GRY) Grey	
	□ = (SNO) Snow White	□ = (SFD)Soft Dove	☐ = (BLK) Satin Black	
	SECTION B	: SELECT ONLY REQU	IRED OPTIONS	
□ = (SPD) Speed Cor	ntrol	(SC) Cover Safety Chain	□ = (AD) Acce	ss Door
☐ = (AQS) Aquastat	= ((RC) Recessed Collar		



Guide Specifications



- 1. Casing shall be constructed of corrosion resistant 16Ga steel. The removable front panel shall provide uninhibited access to the motor, fans, controls and coil of the unit. Front panels shall be available with an optional hinged access door. Recessed unit shall be supplied with a recessing collar.
- **2.** Heating coils shall be manufactured from ½" seamless copper tube with expanded corrugated aluminum fins. Heating coils shall be suitable for sweat connections and designed for working pressures of 150 psig.
- **3.** Blowers shall be double-inlet double-width forward curved centrifugal type manufactured of corrosion resistant steel. All blowers shall be balanced for quiet, vibration free operation.

- **4.** Motors shall be permanent split capacitor (PSC) type with self aligning sleeve bearings and internal overload protection.
- **5.** Filter shall be supplied with a wire framed polyester media.
- 6. Factory options:
 - · speed controller
 - aquastat
 - manual starter
 - architectual bargrille inlet and/or outlet
 - safety chains
 - unit mounted thermostat/remote thermostat

Unit shall be Sigma, model numbers and sizes as indicated in schedule and/or drawings.

SIGMA FORCE FLOW SCHEDULE (BASIS OF DESIGN: SIGMA)

TAG	MODEL	ARRANGEMENT	Сарасіту	Motor HP	REMARKS

