

ADDENDUM III

Date of Addendum: April 15, 2020

Project Name: Pender County Courthouse - Interior Renovations

PROJECT INFORMATION

- A. Owner: Pender County.
- B. Architect: LS3P
- C. Architect Project Number: 7702-185550

NOTICE TO BIDDERS

- A. This Addendum is issued to plan holders pursuant to the Instructions to Bidders and Conditions of the Contract. This Addendum serves to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addendum affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.
- B. The Bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form.
- C. Attachments within this Addendum include, but may not be limited to, modifications as noted.
- D. The date, time, and location for receipt of bids are unchanged by this Addendum.

ATTACHMENTS

- A. This Addendum includes the following attached Documents and Specification Sections:
 - 1. Invitation to Bid, reissued.
 - 2. Bid Form, reissued.
 - 3. Section 012100, reissued.
 - 4. Section 012300, reissued.
 - 5. Section 042613, new.
 - 6. Section 072100, new.
 - 7. Section 087100, reissued.
 - 8. Section 092900, reissued.
 - 9. Section 220000, reissued.
 - 10. Section 230900, reissued.
 - 11. Section 323119, new
- B. This Addendum includes the following attached Sheets:
 - 1. Civil:
 - a. C-2, reissued.
 - 2. Architectural:
 - a. A-103, reissued.
 - b. A-124, reissued.
 - c. A-125, reissued.
 - d. A-126, reissued.
 - e. A-151, reissued.

- f. A-402, new.
 - g. A-601, reissued.
- 3. Plumbing:
 - a. P-001, reissued.
 - b. PD-101, reissued.
 - c. P-101, reissued.
 - d. P-102, reissued.
- 4. Mechanical:
 - a. M-701, reissued.
- 5. Electrical:
 - a. E-001, reissued.
 - b. E-101, reissued.
 - c. E-102, reissued.
 - d. E-112, reissued.
 - e. E-113, reissued.
 - f. E-114, reissued.
 - g. E-122, reissued.
 - h. E-123, reissued.
 - i. E-501, reissued.
 - j. E-502, reissued.
 - k. E-602, reissued.
 - l. E-701, reissued.

REVISIONS TO DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS

Item III-1. Invitation to Bid: Replace with revised Invitation to Bid, included. Added login instructions for virtual bid opening.

Item III-2. Bid Form: Replace with Revised Bid Form, included. Added Alternates No. 7 and No. 8.

REVISIONS TO DIVISION 01 GENERAL REQUIREMENTS

Item III-3. Section 012100: Replace with revised Section, included.

- 1. Article 3.2 F: Revised Allowance No. 6.
- 2. Article 3.2 K: Deleted Allowance No. 11 in its entirety.
- 3. Article 3.2 L: Revised Allowance No. 12.
- 4. Added Allowance No. 13.

Item III-4. Section 012300: Replace with revised Section, included.

- 1. Article 3.1 C: Revised luxury vinyl tile to luxury vinyl plank.
- 2. Added Alternates No. 7 and No. 8.

REVISIONS TO DIVISIONS 02 - 49 SPECIFICATION SECTIONS

Item III-5. Add Section 042613 "Masonry Veneer," included.

Item III-6. Add Section 072100 "Thermal Insulation," included.

Item III-7. Section 087100: Replace with revised Section, included. Updated section includes door hardware schedule for new doors.

Item III-8. Section 092900: Replace with revised Section, included.

1. Changed textured ceiling from aggregate ceiling to acoustical ceiling finish.
2. Added surface preparation requirements for acoustical ceiling finish.
3. Deleted Level 4 finish. Provide Level 5 finish for all areas to receive smooth paint finish.

Item III-9. Section 122113: Delete section in its entirety.

Item III-10. Section 220000: Replace with revised Section, included.

1. Revised Paragraph 220014 "Sump Pumps."
2. Revised Paragraph 220015 "Sump Pump Discharge Piping," Item D.
3. Revised Paragraph 220028 "Controls," Item A.2 and Item C.
4. Revised Paragraph 220031 "Fixtures," Water Closet WC-1 bowl and Lavatories L-1 and L-2 bowls: Added Sloan as acceptable manufacturer.

Item III-11. Section 230900: Replace Section in its entirety with new Section, included.

Item III-12. Add Section 323119 "Decorative Metal Gates," included.

REVISIONS TO DRAWING SHEETS

Item III-13. Sheet C-2: Replace with revised sheet, included. Added tree protection and construction entrance.

Item III-14. Architectural Clarification:

1. Refer to Section 072726 "Fluid Applied Membrane Air Barrier" and Architectural Detail A-351/A4 and B4: Install Fluid Applied Membrane Air Barrier in lieu of "New Moisture Barrier" indicated in these details. (Typical for all exterior walls where plaster is replaced by gypsum board.)
2. Refer to Section 071616 "Crystalline Waterproofing" for elevator pit, basement wall, and stair waterproofing indicated as "moisture barrier" on the Drawings.

Item III-15. Sheet D-103, Note 9: Revise note to read "Contractor to remove existing courtroom curtains and have them professionally dry cleaned, stored, and re-installed upon completion of the project."

Item III-16. Sheet A-103: Replace with revised sheet, included. Adjusted the number of seats in the Magistrate and Main Courtroom.

Item III-17. Sheets A-124, A-125, and A-126: Replace with revised sheets, included. Added areas for ceiling repair.

Item III-18. Sheet A-151: Replace with revised sheet, included. Added louver detail.

Item III-19. Add Sheet A-402, included. Added generator enclosure walls.

Item III-20. Sheet A-601: Replace with revised sheet, included. Revised fire rating of second floor hallway doors from 1 hour to 20 minutes.

Item III-21. Sheet A-701, Room Finish Schedule, Ceilings in Cell A214 and Cell B213: Repair existing plaster ceilings in these rooms and paint.

Item III-22. Sheet A-721 Finish Plan Level 1:

1. Storage Room 114 Floor: Remove existing flooring and replace with QTF-1 Quartz Tile and new quartz tile base.
2. Judge's Office 314: Existing flooring to remain.

Item III-23. Sheet P-001: Replace with revised sheet, included.

1. Revised Detail K to show the correct voltage and phase for the elevator sump pump control panel.
2. Revised mounting height of control panel.
3. Revised circulator pump schedule to indicate that the circulator pumps are to be controlled by the DDC, not time clocks.

Item III-24. Sheet PD-101: Replace with revised sheet, included. Added an existing floor drain, not previously shown, with a note to provide a camera scope of the waste line connected to a floor drain, and to project a water jet cleaning if any blockages are discovered.

Item III-25. Sheet P-101: Replace with revised sheet, included. Added an existing floor drain, not previously shown.

Item III-26. Sheet P-102: Replace with revised sheet, included. Noted mounting heights of sump pump control panels and oil holding tank high level alarm.

Item III-27. Sheets M-101, M-102, M-103, M-104, M-105 and B/M-106: Change all notes "1" Conduit with pull string for future controls" to "1" conduit for controls".

Item III-28. Sheet M-701: Replace with revised sheet, included. Added points, sequences of operation, and information for DDC controls.

Item III-29. Sheet E-001: Replace with revised sheet, included.

1. Added elevator telephone outlet symbol to Data & Telephone Outlet Legend.
2. Added base bid vs alternate bid notes to data/telephone outlet symbol on Data & Telephone Outlet Legend.
3. Added note to install Cat 6 data cable to card readers on PA & Security Legend.
4. Added base bid vs alternate bid notes to existing security camera symbol on PA & Security Legend.

Item III-30. Sheet E-101: Replace with revised sheet, included.

1. Added exit sign and egress light in basement.
2. Added dimensions for above grade pullbox.

Item III-31. Sheet E-102: Replace with revised sheet, included.

1. Added conduit from ATS to outside of building for portable generator hookup.
2. Revised circuitry for BSPCP and BSPCP.
3. Added generator pads.
4. Added notes to clarify base bid vs alternate requirements for building generator.
5. Added note to clarify that receptionist desk is alternate bid.
6. Revised genset-MTS to read genset-ATSP.

Item III-32. Sheet E-112: Replace with revised sheet, included. Added egress light at top of stairs from basement.

Item III-33. Sheet E-113: Replace with revised sheet, included.

1. Revised light fixture tag in Mech 203A.
2. Added light fixture tag to light fixture in RR 238.

Item III-34. Sheet E-114: Replace with revised sheet, included. Added light fixture tags to light fixtures in Record Storage 309.

Item III-35. Sheet E-122: Replace with revised sheet, included. Added note to clarify that receptionist desk is alternate bid.

Item III-36. Sheet E-123: Replace with revised sheet, included. Added elevator telephone outlet to new elevator.

Item III-37. Sheet E-501: Replace with revised sheet, included. Added generator pad detail.

Item III-38. Sheet E-502: Replace with revised sheet, included. Revised circulation pump control schematic.

Item III-39. Sheet E-602: Replace with revised sheet, included.

1. Revised circuit breaker for BSPCP on panel PE to 40A/1P.
2. Revised circuit breaker for ESPCP on panel M to 40A/1P.

Item III-40. Sheet E-701: Replace with revised sheet, included.

1. Revised genset-MTS to read genset-ATSP.
2. Added start/stop circuitry for genset-MDP and genset-ATSP.
3. Added notes to clarify base bid vs alternate requirements for building generator.

END OF ADDENDUM III

INVITATION TO BID

1.1 PROJECT INFORMATION

- A. Project Identification: Pender County Courthouse - Interior Renovations.
 - 1. Project Location: 100 S. Wright Street, Burgaw, North Carolina 28425.
- B. Owner: Pender County, 805 S. Walker Street, Burgaw, North Carolina 28425.
 - 1. Owner's Representative: Mr. Chad McEwan, Assistant Manager

1.2 BID SUBMITTAL AND OPENING

- A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:
 - 1. Bid Date: April 23, 2020
 - 2. Bid Time: 3:00 pm (local time).
 - 3. Location: Commissioner's Room, Pender County Administration Building, 805 S. Walker Street, Burgaw, North Carolina.

- B. Bids will be thereafter publicly opened and read aloud following guidelines posted by the NC Department of Administration.

- 1. In response to social distancing recommendations by state and local health authorities, bids will be opened publicly through video/audio conference.
- 2. Bids must be delivered via US Mail, UPS, or Federal Express. Hand delivery will be accepted. Deliver bids to:

PENDER COURTHOUSE BID
c/o Chad McEwen, County Manager
Pender County Administration Building
805 S. Walker Street
Burgaw, North Carolina 28425

- 3. ~~Virtual meeting access instructions will be posted in a later addendum.~~

- 3. **To gain access to the virtual meeting:**

- a. Visit: <https://zoom.us/join>
- b. Enter Meeting ID: 953 5426 2103
- c. Enter Password: 072373
- d. Click "Join" button.
- e. Complete required "Meeting Registration" page fields.
 - 1) It is suggested that you Pre-Register prior to the meeting. This can be completed at any time and may avoid delays when signing into the meeting.
- f. Click "Register" button when fields are complete.
- g. If all required fields are completed, you will be directed to a "Meeting Registration Approved" page that will provide a summary of the meeting Topic, Time, Meeting ID and URL to join the meeting.
- h. Click provided URL to join meeting.
- i. Note: Attendees must login to Zoom using a device equipped with a screen and microphone to view materials and/or presenters and communicate with others.

1.3 BID SECURITY

- A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.4 PREBID CONFERENCE

- A. A virtual prebid conference for all bidders will be held via Zoom video teleconferencing on April 8, 2020 at 3:00 p.m., local time. Attendance will be documented and considered during the award period.
1. To gain access to the virtual meeting:
 - a. Visit: <https://zoom.us/join>
 - b. Enter Meeting ID: 611 539 846
 - c. Enter Password: 911819
 - d. Click "Join" button.
 - e. Complete required "Meeting Registration" page fields.
 - 1) It is suggested that you Pre-Register prior to the meeting. This can be completed at any time and may avoid delays when signing into the meeting.
 - f. Click "Register" button when fields are complete.
 - g. If all required fields are completed, you will be directed to a "Meeting Registration Approved" page that will provide a summary of the meeting Topic, Time, Meeting ID and URL to join the meeting.
 - h. Click provided URL to join meeting.
 - i. Note: Attendees must login to Zoom using a device equipped with a screen and microphone to view materials and/or presenters and communicate with others.
 2. Building Preview: Contractors are invited to conduct a self-guided walk-through of the building between the hours of 10:00 am and 3:00 pm on Thursday 4/9, Tuesday 4/14, Wednesday 4/15, and Thursday 4/15. Please contact Allen Vann to schedule a time. (910-386-2605, or avann@pendercountync.gov) Bidders are reminded to observe social distancing and respect other safety regulations regarding the COVID pandemic. Masks are highly recommended.

1.5 BIDDING DOCUMENTS

- A. Bid Forms, Plans, Specifications, and Contract Documents Bidding documents may be examined at the office of Mr. Chad McEwan, Pender County, 805 S. Walker Street, Burgaw, North Carolina, between the hours of 8:00 a.m. and 5:00 p.m., and the following plan rooms' websites:
1. Dodge Data & Analytics – www.construction.com
 2. Carolinas Plan Room – www.carolinasplanroom.com
 3. iSqFt + bidclerk – www.iSqFt.com
- B. Bidders may obtain a complete set of bidding documents beginning on March 30, 2020 from: McGee Cadd Reprographics, 2527 S. 17th St., Wilmington, NC 28403, (910) 799-1212, e-mail: mcgee01@mcgee-cadd.com, upon the non-refundable payment of services charges.
- C. Electronic Documents: Complete plans, specifications, and contract documents can be obtained electronically on March 30, 2020. Go to <http://infoexchange.ls3p.com> and login using your e-mail address and "anonymous" as the password. Click on the Pender Courthouse Interior Bid Documents download link.

1.6 TIME OF COMPLETION AND LIQUIDATED DAMAGES

- A. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. Work is subject to liquidated damages as indicated in the Contract Documents.

1.7 BIDDER'S QUALIFICATIONS

- A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.
- B. Bidders and their subcontractors shall meet qualification requirements indicated in the Contract Documents.
- C. Submission of a bid shall serve as evidence that the Bidder has confirmed that the Bidder is properly qualified to perform the work and is capable of obtaining the required bonds and insurance. Bidders shall, if requested, submit evidence in affidavit form of applicable experience, licensure, approvals, and certifications, adequate financial resources, work in hand capacity, adequate organization, and acceptable past performance. Submittal will be in the form of AIA Document A305 *Contractor's Qualification Statement*. Bidder's qualification information shall be considered privileged and confidential.

END OF INVITATION TO BID

REVISED BID FORM

Project Name: Pender County Courthouse - Interior Renovations
Project Location: Burgaw, North Carolina

1.1 BID INFORMATION

- A. Date: _____
- B. Bidder: _____
- C. Bidder's Contractor License Number: _____
- D. Owner: Pender County
- E. Architect: LS3P
- F. Architect Project Number: 7702-185550

1.2 CERTIFICATIONS AND BASE BID

- A. Base Bid, Single-Prime Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by LS3P, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled/indicated allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:
1. _____ Dollars (\$_____).

1.3 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 90 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:
1. _____ Dollars (\$_____).
- B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.4 SUBCONTRACTORS

- A. The following companies shall execute subcontracts for the portions of the Work indicated:

| | Name | License Number |
|------------------------|-------|----------------|
| 1. Plumbing Work: | _____ | _____ |
| 2. HVAC Work: | _____ | _____ |
| 3. Electrical Work: | _____ | _____ |
| 4. Asbestos Abatement: | _____ | _____ |

1.5 ALLOWANCES

The undersigned Bidder acknowledges that Allowances, as specified in Section 012100 and modifying addenda, are included in their General Construction Work Base Bid.

1.6 UNIT PRICES

- A. Unit prices quoted and accepted shall apply throughout the life of the contract, except as specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the scope of the work in accordance with the contract documents.

Plaster Repair \$_____ Two Square Feet

1.7 ALTERNATES

- A. The undersigned proposes to perform alternates for stated resulting additions to or deductions from the Base Bid. Additions and deductions shall include any modifications of work or additional work that undersigned may be required to perform by reason of the acceptance of any alternative. Bidder shall write in the amounts for the alternates listed below.

Alternate No. 1: New Auditorium Seating

Adjust Base Bid by Adding or Deducting _____
_____ Dollars (\$ _____)

Alternate No. 2: Refinish Balcony Auditorium Seating

Adjust Base Bid by Adding _____
_____ Dollars (\$ _____)

Alternate No. 3: LVP in lieu of Porcelain Tile

Adjust Base Bid by Adding or Deducting _____
_____ Dollars (\$ _____)

Alternate No. 4: Textile Composite Tile in lieu of Carpet Tile

Adjust Base Bid by Adding _____
_____ Dollars (\$ _____)

Alternate No. 5: Epoxy Flooring in lieu of Porcelain Tile

Adjust Base Bid by Adding or Deducting _____
_____ Dollars (\$ _____)

Alternate No. 6: Receptionist Desk

Adjust Base Bid by Adding _____
_____ Dollars (\$ _____)

Alternate No. 7: Generator, Pad, Enclosure and Circuitry

Adjust Base Bid by Adding _____
_____ Dollars (\$ _____)

Alternate No. 8: Data Wiring

Adjust Base Bid by Adding _____
_____ Dollars (\$ _____)

1.8 HUB-M/WBE PARTICIPATION REQUIREMENTS

(Historically Underutilized Businesses - Minority/Women-Owned Business Enterprise)

Provide on the bid - Under GS 143-128 the undersigned bidder shall identify on its bid the minority businesses that it will use on the project and the total dollar value of the bid that will be performed by the minority businesses and list the good faith efforts made to solicit participation.

Note: Bidders must submit with their bid the *Identification of Minority Business Participation* list and *Affidavit A or Affidavit B*. Bidders must submit, after being notified of being the apparent low bidder, *Affidavit C or Affidavit D* as applicable within 72 hours. Failure to submit the required affidavits and documentation, with the bid or after being notified of being the apparent low bidder, may be grounds for rejection of the bid.

1.9 TIME OF COMPLETION

- A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect, and shall fully complete the Work within and not exceed the time limits set forth in the Contract Document.
- B. The undersigned Bidder acknowledges that 'Liquidated Damages' provisions shall be in effect for this project as stated in the Contract Document.

1.10 ACKNOWLEDGEMENT OF ADDENDA

- A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:
 - 1. Addendum No. I, Dated _____.
 - 2. Addendum No. II, Dated _____.
 - 3. Addendum No. III, Dated _____.
 - 4. Addendum No. IV, Dated _____.
 - 5. Addendum No. V, Dated _____.

1.11 CONTRACTOR'S LICENSE

- A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in the State of North Carolina, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full.

1.12 SUBMISSION OF BID

- A. Respectfully submitted this _____ day of _____, 20____.
- B. Submitted By: _____
(Name of Bidding Firm or Corporation)
- C. Authorized Signature: _____
(Handwritten Signature)
- D. Signed By: _____
(Type or Print Name)
- E. Title: _____
(Owner/Partner/President/Vice President)
- F. Witness/Attest: _____
(Handwritten Signature)
- G. Signed By: _____
(Type or Print Name)
- H. Title: _____
(Corporate Secretary or Assistant Secretary)
- I. Street Address: _____
- J. City, State, Zip: _____
- K. Phone: _____
- L. E-Mail: _____
- M. License No.: _____
- N. Federal ID No.: _____ (Affix Corporate Seal Here)

END OF BID FORM

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
 - 2. Include defined costs associated with allowances in base bid.

1.2 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Owner of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Owner's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Owner from the designated supplier.

1.3 INFORMATIONAL SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 LUMP-SUM AND UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials selected by Owner under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.5 UNFORESEEN WORK ALLOWANCE

- A. Unforeseen Work Allowance is limited to those items and Work hidden, undetectable, or unforeseen and not visible from pre-bid, on-site observation, or not shown, called for, or reasonably implied in the Contract Documents.

- B. Use the Unforeseen Work Allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- C. Change Orders authorizing use of funds from the Unforeseen Work Allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the Unforeseen Work Allowance to Owner by Change Order.

1.6 UNUSED MATERIALS

- A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Owner, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Owner, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

1.7 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.
- C. Unused amounts of moneys that define the value of the allowances, included integrally in the work and materials allowances, shall be credited to the Owner by deduct change order prior to approval of Final Application for Payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.
- B. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.2 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Include the sum of **\$100,000.00** for unforeseen work.
- B. Allowance No. 2: Include the sum of **\$25,000.00** for miscellaneous plaster repairs not indicated on Drawings.
- C. Allowance No. 3: Include the sum of **\$25,000.00** to repair or replace woodwork not indicated on Drawings.
- D. Allowance No. 4: Include the sum of **\$7,500.00** for residential appliances.
- E. Allowance No. 5: Include the sum of **\$50,000.00** for hazardous materials abatement not indicated on Drawings.
- F. Allowance No. 6: Include the sum of ~~\$75,000.00~~ **\$25,000.00** for miscellaneous door hardware/lock upgrades. **Allowance will cover hardware upgrades for existing doors. Refer to Section 087100 for door hardware for new doors.**
- G. Allowance No. 7: Include the sum of **\$50,000.00** for landscape improvements, including but not limited to, replacement of plant materials, seed and sod.
- H. Allowance No. 8: Include the sum of **\$25,000.00** for crawl space encapsulation.
 - 1. Basis of Design, including soil preparation, anti-microbial barrier, perimeter insulation board, and dehumidifiers is by Crawl Space Concepts. (Scott Gales, (910) 383-9910; scott@crawlspacconcepts.com)
 - 2. Conduct condensate drains from crawl space dehumidifiers to new sump pump in basement.
- I. Allowance No. 9: Include the sum of **\$25.00 per yard** for upholstery fabric for auditorium seating.
- J. Allowance No. 10: Include the sum of **\$75,000.00** for construction of an ADA accessible ramp.
- ~~K. Allowance No. 11: Include the sum of \$75,000.00 for a generator enclosure.~~
- L. Allowance No. 12: Include the sum of **\$25,000.00 for unforeseen data requirements** ~~\$105,000.00 for data wiring.~~
- M. **Allowance No. 13: Include the sum of \$50,000.00 for window treatments.**

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. General: The Drawings generally indicate the work which will be included if the alternate bids are accepted. The portions of the work described in the alternates will not be included in the base bid.
- B. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: In lieu of reupholstering and refinishing auditorium seating in the Courtroom and Magistrate's Room on the Second Floor, state the amount (cost difference) to be added to (or deducted from) the base bid to remove existing seating and replace with new. This alternate does not include seating on the Third Floor.
- B. Alternate No. 2: State the amount to be added to the base bid to refinish the wood seats and arm rests and repaint end standards on existing balcony auditorium seating.
- C. Alternate No. 3: In lieu of porcelain tile flooring, state the amount (cost difference) to be added to (or deducted from) the base bid to provide luxury vinyl ~~tile~~ plank flooring in the first-floor corridors.

- D. Alternate No. 4: In lieu of carpet tile (CPT-1), state the amount (cost difference) to be added to the base bid to provide textile composite tile (TCT-1).
- E. Alternate No. 5: In lieu of porcelain tile (PTF-3), state the amount (cost difference) to be added to (or deducted from) the base bid to provide epoxy flooring (EPX-1).
- F. Alternate No. 6: State the amount to be added to the base bid to provide new security/receptionist desk in first-floor corridor.
- G. **Alternate No. 7: In lieu of raceways for block heater, battery charger and ATS, state the amount (cost difference) to be added to base bid to provide full building generator, generator equipment pad, generator enclosure and circuitry as indicated on Drawings.**
- H. **Alternate No. 8: State the amount to be added to the base bid to replace all cabling as shown on Drawings, including 10 security lock proximity pads (to be located with owner's security personnel) and security cameras shown on Drawings. Include \$500/camera allowance for 10 new cameras (to be selected by owner).**
 - 1. **Base bid shall include leaving existing cable in place, add new data outlets where noted, and extend conduit and Cat 6 cable back to Data Room 116.**

END OF SECTION 012300

SECTION 042613 - MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Clay face brick.
 - 2. Mortar.
 - 3. Reinforcement and anchors.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
- C. Samples: For each type and color of the following:
 - 1. Clay face brick.
 - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 3. Accessories embedded in masonry.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C67.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 5. Anchors and reinforcement.
- B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
- C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
 - 3. Protect accepted mockups from the elements with weather-resistant membrane.
 - 4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down face of veneer, and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C216.
 - 1. Grade: MW or SW.
 - 2. Type: FBS.
 - 3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C7.

4. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
5. Size: Match existing.
6. Application: Use where brick is exposed unless otherwise indicated.
7. Color and Texture: Match existing.

2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: Not permitted.
- E. Mortar Cement: ASTM C1329/C1329M.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 1. Colored Portland Cement-Lime Mix:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Essroc, Italcementi Group; Riverton Portland Cement Lime Custom Color.
 - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 4) Lehigh Cement Company.; Lehigh Custom Color Portland/Lime Cement.
 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 3. Pigments shall not exceed 10 percent of portland cement by weight.
 4. Pigments shall not exceed 5 percent of mortar cement by weight.
- H. Aggregate for Mortar: ASTM C144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Addiment Incorporated; Mortar Kick
- b. BASF Construction Chemicals - Building Systems; Trimix-NCA.
- c. Euclid Chemical Company (The); Accelguard 80.
- d. GCP Applied Technologies; Morset.
- e. Sonneborn, Div. of ChemRex; Trimix-NCA

J. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

2.6 ANCHORS

- A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.7 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar.
 2. Use portland cement-lime or mortar cement unless otherwise indicated.
 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification.
1. For masonry below grade or in contact with earth, use Type S.
 2. For veneer masonry, use Type N.
- D. Pigmented Mortar: Use colored cement product.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of mortar cement by weight.
3. Color: Match existing.
4. Application: Use pigmented mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 REINFORCED UNIT MASONRY

- A. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

3.7 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

3.8 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20 or low-pressure spray method, using a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.9 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042613

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Extruded polystyrene foam-plastic board insulation.
 2. Loose-fill insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
1. Extruded polystyrene foam-plastic board insulation.
 2. Loose-fill insulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
1. For blown-in or sprayed cellulosic-fiber loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.
 2. Sign, date, and post the certification in a conspicuous location on Project site.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type IV: ASTM C578, Type IV, 25-psi minimum compressive strength; unfaced.

1. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
 - a. DiversiFoam Products
 - b. Dow Building Solutions
 - c. Owens Corning
 - d. Pactiv Building Products
2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 LOOSE-FILL INSULATION

- A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C739, chemically treated for flame-resistance, processing, and handling characteristics.
 1. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
 - a. Applegate
 - b. Greenfiber
 - c. Insulmax
 - d. Nu-Wool

2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.
- D. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.
- E. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.
 - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- B. Loose-Fill Insulation: Apply according to ASTM C1015 and manufacturer's written instructions.
 - 1. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
 - 2. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:
 - a. Swinging doors.
2. Electronic access control system components, including:
 - a. Electronic access control devices.
3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
4. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories

C. Related Sections:

1. Section 079200 "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
2. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
3. Division 26 sections for connections to electrical power system and for low-voltage wiring.
4. Division 28 sections for coordination with other components of electronic access control system.

1.2 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.3 SUBMITTALS

A. General:

1. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
2. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "Examination" article, herein.

B. Action Submittals:

1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated, and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
 - a. Door Index; include door number, heading number, and Architects hardware set number.
 - b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
 - c. Quantity, type, style, function, size, and finish of each hardware item.
 - d. Name and manufacturer of each item.
 - e. Fastenings and other pertinent information.
 - f. Location of each hardware set cross-referenced to indications on Drawings.
 - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for hardware.
 - i. Door and frame sizes and materials.
 - j. Name and phone number for local manufacturer's representative for each product.
 - k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
 - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
5. Key Schedule:
 - a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.

- b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
 - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
 - 6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.
- C. Informational Submittals:
- 1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
 - 2. Product data for electrified door hardware:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - 3. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
- 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Factory order acknowledgement numbers (for warranty and service)
 - d. Name, address, and phone number of local representative for each manufacturer.
 - e. Parts list for each product.
 - f. Final approved hardware schedule, edited to reflect conditions as-installed.
 - g. Final keying schedule
 - h. Copies of floor plans with keying nomenclature
 - i. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - j. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.4 QUALITY ASSURANCE

- A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
- 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- B. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC).
 2. Can provide installation and technical data to Architect and other related subcontractors.
 3. Can inspect and verify components are in working order upon completion of installation.
 4. Capable of producing wiring diagrams.
 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- C. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- D. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
- G. Keying Conference
 1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
- H. Pre-installation Conference
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.

I. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 2. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
 1. Promptly replace products damaged during shipping.
 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.6 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.7 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - 1) Mechanical: 30 years.
 - b. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - c. Locksets:
 - 1) Mechanical: 3 years.
 - d. Key Blanks: Lifetime
 - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.8 MAINTENANCE

- A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with "Quality Assurance" article, herein.
- B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

- A. Fasteners
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are

- required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.
- B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
 2. Use materials which match materials of adjacent modified areas.
 3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:
1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable.
 2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.
 3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
 4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.3 HINGES

- A. Manufacturers and Products:
1. Scheduled Manufacturer and Product: Ives 5BB series.
 2. Acceptable Manufacturers and Products: Hager BB series, Stanley FBB Series.
- B. Requirements:
1. Provide hinges conforming to ANSI/BHMA A156.1.
 2. 1-3/4 inch thick doors, up to and including 36 inches wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches high
 - b. Interior: Standard weight, steel, 4-1/2 inches high
 3. 1-3/4 inch thick doors over 36 inches wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 4-1/2 inches high
 - b. Interior: Heavy weight, steel, 4-1/2 inches high
 4. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches high
 - b. Interior: Heavy weight, steel, 5 inches high
 5. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.

6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
8. Width of hinges: 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified.

2.4 ELECTRIC POWER TRANSFER

- A. Manufacturers:
 1. Scheduled Manufacturer: Von Duprin EPT-10.
 2. Acceptable Manufacturers: ABH PT1000, Securitron CEPT-10.
- B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
- C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.5 FLUSH BOLTS

- A. Manufacturers:
 1. Scheduled Manufacturer: Ives.
 2. Acceptable Manufacturers: Burns, ABH.
- B. Requirements:
 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. For doors over 90 inches in height increase top rods by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

2.6 MORTISE LOCKS

- A. Manufacturers and Products:
 1. Scheduled Manufacturer and Product: Schlage L9000 series.
 2. Acceptable Manufacturers and Products: Best 45H series, Corbin-Russwin ML2000 series.
- B. Requirements:
 1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.

2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches backset with full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
6. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: Schlage M55N.

2.7 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 98 series.
2. Acceptable Manufacturers and Products: Detex Advantex series, Sargent 19-43-GL-80 series.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "Keying" article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer's approved strikes.
8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
11. Removable Mullions: 2 inches x 3 inches steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
12. Provide electrified options as scheduled.
13. Provide delayed egress devices, where scheduled, that are UL 294 listed, meet National Fire Protection Association (NFPA) and International Building Code (IBC) governing delayed egress, and/or other local and national fire codes acceptable to authority having jurisdiction as required.
 - a. Provide non-handed and field sizable device with 3/4 (19mm) throw deadlocking latch bolt. Device incorporates an internal RX switch that detects attempt to exit from applying less than 15lbs to the push pad, which causes this switch to start an irreversible alarm cycle. Key switch in device is capable of arming, disarming, or resetting the device; and indicator lamp determines status of the device
 - b. Provide devices capable of standard 15 second release delay and indefinite release delay as required by code, when tied into fire alarm system will release immediately when an alarm condition exists.
 - c. Provide devices with all control inputs – door position input, external inhibit input, fire alarm input; auxiliary locking; nuisance alarm and internal horn; and, remote signaling output self-contained in the device assembly.

14. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
15. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.8 EXIT DEVICES – BAR TYPE

A. Manufacturer and Product:

1. Scheduled Manufacturer: Von Duprin 88 series.
2. Acceptable Manufacturers and Products: Corbin-Russwin ED3000 series, Sargent 90 series.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "Keying" article, herein.
3. Provide bar type exit devices, cast or forged of brass, bronze, or stainless steel, plated to standard architectural finishes to match balance of the door hardware.
4. Latch Bolt Throw: 3/4 inch for rim and mortise devices, 5/8 inch for surface and concealed vertical rod devices.
5. Mechanism Case: One piece without cover plate. Mount flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
6. Provide UL labeled fire exit devices for fire rated openings.
7. Provide manufacturer's standard strikes.
8. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Removable Mullions: 2 inches x 3 inches steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Provide electrified options as scheduled in the hardware sets.
11. Furnish all necessary wood door kits and cover plates, for proper installation of exit device.
12. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.9 ACCESS CONTROL READER

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Scheduled Manufacturer and Product: Schlage MT11/ MT15.

B. Requirements: Read Only Multi-technology Contactless reader

1. Provide access control card readers manufactured by a global company who is a recognized leader in the production of access control devices. Card reader manufactured for non-access control applications are not acceptable
2. Provide multi-technology contactless readers which can read access control data from both 125 kHz and 13.56 MHz contactless smart cards and NFC-compatible. Provide multi-technology contactless reader optimally designed for use in access control applications that require reading both 125 kHz Proximity and 13.56 MHz contactless smart cards by providing:
 - a. Configuration allows reader to be enabled to read smart, proximity or both technologies at the same time.
 - b. A migration platform to upgrade from the most popular 125 kHz proximity technologies to MIFARE or MIFARE DESFire EV1 by reading both 125 kHz proximity technology and 13.56 MHz contactless smart card technology.

- c. Guaranteed compatibility to read all standard data formats ensuring card-to-reader interoperability in multi-location installations and multi-card/reader populations.
 - d. Secure access control data exchange between the smart card and the reader utilizing diversified keys and mutual authentication sequences.
 - e. Universal compatibility with most access control systems.
 - f. Ease of installation through industry standard wiring methods.
 - g. Compatibility with legacy 125 KHz proximity access control formats (all standard formats up to 37 bits, including HID Corporate 1000 formats).
 - h. Optimal read range and read speed for increased access control throughput.
 - i. Global availability.
 - j. Product construction suitable for both indoor and outdoor applications.
 - k. Customizable behavior for indicator lights and beeper.
3. Provide multi-technology contactless readers complying with the following 13.56MHz-related standards to ensure product compatibility and predictability of performance:
 - a. ISO 14443
 4. Provide multi-technology contactless readers configurable to read 13.56 MHz data simultaneously from the following cards (multiple credential support based on reader configuration):
 - a. Secure support - Mifare DESFire EV1 with PACSA, Mifare Classic, FIPS 201 PIV Credential.
 - b. UID/CSN Support – DESFire Classic V0.06, HID iClass, ISOX (my-d).
 - c. Proximity – Schlage Proximity, XID Proximity, HID Prox, AWID, GE/CASI, Lenel Prox, Inside Pictotag, TI Tagit, ST Micro.
 5. Provide multi-technology contactless readers configurable to read data from any compatible 125 kHz technology simultaneously with 13.56 MHz data. Compatible 125 kHz technologies include:
 - a. XCEEDID/Schlage/HID Prox (format in the card – formats up to 37-bits supported).
 - b. AWID PROX (SAME AS LENEL PROX - format in the card – formats up to 42-bits).
 - c. GE PROX - two possible format options.
 6. Provide multi-technology contactless readers with the ability to read card access data stored in the secure access control sector/application area of the ISO 14443 XceedID MIFARE or MIFARE DESFire EV1 card.
 7. Provide multi-technology contactless readers configurable to provide multiple hierarchical degrees of key compatibility for accessing the smart card access control data. Provide compatibility for the following key structure options:
 - a. Compatibility with the default manufacture's key structure to ensure convenient off the shelf compatibility with manufacture's cards and readers.
 - b. Compatibility with custom keys managed by manufacturer which provide a site-specific, unique, protected key structure.
 - c. Compatibility with high security customer managed custom keys.
 8. Provide multi-technology contactless readers configurable to provide compatibility with all standard Prox formats up to 37 bits (including Corporate 1000®).
 9. Provide multi-technology contactless readers which allow the reader firmware to be upgraded in the field without the need to remove the reader from the wall through the use of factory-provided device.
 10. Provide multi-technology contactless readers suitable for global deployment by meeting worldwide radio and safety regulatory compliance including:
 - a. FCC Certification (US)
 - b. CE (EU)
 - c. C-tick (Australia, New Zealand)
 - d. R&TTE Directive (15EU)
 - e. UL294 (US)
 - f. ULC-S319

- g. IC (Canada)
 - h. FIPS201 / PIV I
 - i. IP65
11. Provide multi-technology contactless readers fully compliant with Restriction of Hazardous Substances directive (RoHS) restricting the use of specific hazardous materials found in electrical and electronic products.
 12. Provide multi-technology contactless readers with universal compatibility with most access control systems by outputting card data in compliance with the SIA AC-01 Wiegand standard.
 13. Provide multi-technology contactless readers with tamper resistant screws.
 14. Provide multi-technology contactless readers with the ability to transmit an alarm signal via and integrated optical tamper switch if an attempt is made to remove the reader from the wall. Provide tamper switch programmable to provide a selectable action to provide a selectable action compatible with various tamper communication schemes provided by access control panel manufacturers. The selectable action must include one of the following:
 - a. The reader open collector line changes from a high state (5V) to a low state (Ground).
 - b. If utilizing OSDP, provide protocol reader reporting a tamper condition via RS485.
 15. Provide multi-technology contactless readers with the ability to mount to standard electrical boxes using universal international mounting holes.
 16. Provide multi-technology contactless readers with a full potted assembly.
 17. Provide multi-technology contactless readers with a quick connect wire harness.
 18. Provide multi-technology contactless readers with customizable reader behavior options either from the factory, or defined in the field using pre-configured command cards. Reader behavior programming options must include:
 - a. LED and Audio configurations.
 - b. Ability to disable reading of specific card technologies or frequencies.
 - c. ISO 14443/15693 CSN output configuration.
 - d. Wiegand output spacing and timing.
 19. Provide multi-technology contactless readers with the following programmable audio/visual indication:
 - a. Provide an audio beeper tone sequence to signify: access granted, access denied, power up, and diagnostics.
 - b. Provide a light bar with clear visual status (red/green/amber).
 20. Provide multi-technology contactless readers designed for low current operation to enable migration from most legacy proximity applications without the need to replace existing access control panels and/or power supplies. Provide contactless smart cards with the following power requirements:
 - a. Operating voltage: 5 – 16 VDC, reverse voltage protected. Linear power supply recommended.
 - b. Current requirements: 125 mA DC, 140 mA PEAK @ 12 VDC
 21. Provide multi-technology contactless readers meeting the following physical specifications:
 - a. Dimensions: 5.91" x 1.72" x 0.84"
 - b. Weight: 9.6 oz. (272.15 g)
 - c. Material: UL94 Polycarbonate
 - d. Plastics: Consist of three-piece design with mounting plate, potted case and aesthetic cover.
 - e. Color: Black.
 22. Provide multi-technology contactless readers meeting the following environmental specifications:
 - a. Operating temperature: -31 to 151 degrees F (-35 to 67 degrees C)
 - b. Operating humidity: 5% to 95% relative humidity non-condensing
 - c. Weatherized design suitable to withstand harsh environments
 - 1) Certified rating of IP65

23. Multi-technology contactless reader cabling requirements:

- a. Cable distance: (Wiegand): 500 feet (150m)
- b. Cable type: 5-conductor #22 AWG
- c. Standard reader termination: 18" wire harness

2.10 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Von Duprin 6000 Series.
2. Acceptable Manufacturers and Products: Folger Adam 300 Series, HES 1006 Series.

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.11 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage/Von Duprin PS900 series.
2. Acceptable Manufacturers and Products: Precision ELR series, Security Door Controls 600 series.

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
 - a. 12/24 VDC Output, field selectable.
 - b. Class 2 Rated power limited output.
 - c. Universal 120-240 VAC input.
 - d. Low voltage DC, regulated and filtered.
 - e. Polarized connector for distribution boards.
 - f. Fused primary input.
 - g. AC input and DC output monitoring circuit w/LED indicators.
 - h. Cover mounted AC Input indication.
 - i. Tested and certified to meet UL294.
 - j. NEMA 1 enclosure.
 - k. Hinged cover w/lock down screws.
 - l. High voltage protective cover.

2.12 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage Everest 29 Primus XP.
2. Acceptable Manufacturers and Products: ASSA V10, Medeco 3.

B. Requirements:

1. Provide cylinders/cores from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "Keying" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
 - a. High Security (Exterior locations and Records Rooms): Everest T Primus, dual-locking cylinder with large-format interchangeable core requiring restricted, patented keyway. Dual-locking mechanism with interlocking finger pin(s) to check for patented features on keys.
 - b. Restricted: Everest T 29 – other locations.
3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent-protected until the year, 2029.
4. Nickel silver bottom pins.

C. Construction Keying:

1. Replaceable Construction Cores.
 - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - 1) 3 construction control keys
 - 2) 12 construction change (day) keys.
 - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.13 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- C. Requirements:
 1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - a. Master Keying system as directed by the Owner.
 2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
 3. Provide keys with the following features:
 - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - b. Patent Protection: Keys and blanks protected by one or more utility patent(s) until the year, 2029.
 4. Identification:
 - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
 - b. Identification stamping provisions must be approved by the Architect and Owner.

- c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
5. Quantity: Furnish in the following quantities.
- a. Change (Day) Keys: 3 per cylinder/core.
 - b. Permanent Control Keys: 3.
 - c. Master Keys: 6.

2.14 KEY CONTROL SYSTEM

A. Manufacturers:

- 1. Scheduled Manufacturer: Telkee.
- 2. Acceptable Manufacturers: HPC, Lund.

B. Requirements:

- 1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.15 KEY MANAGEMENT SOFTWARE

A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product: Schlage SITEMASTER 200.
- 2. Acceptable Manufacturers and Products: Best Keystone 600N, Corbin-Russwin KeyWizard.

B. Requirements:

- 1. Software: Provide tracking, issuing, collecting and transferring information regarding keys. Provide customized query, reporting, searching capability, comprehensive location hardware listings, display key holder photos and signature for verification, and provide automatic reminders for maintenance, back-ups and overdue keys.
- 2. Provide training for Owner's personnel on proper operation and application of key management software.

2.16 DOOR CLOSERS

A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product: LCN 4040XP series.
- 2. Acceptable Manufacturers and Products: Corbin-Russwin DC8000 series, Sargent 281 series.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch diameter with 5/8 inch diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.17 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Hiawatha.

B. Requirements:

1. Provide push plates 4 inches wide by 16 inches high by 0.050 inch thick and beveled 4 edges. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide pull plates 4 inches wide by 16 inches high by 0.050 inch thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.

2.18 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Hiawatha.

B. Requirements:

1. Provide kick plates minimum of 0.050 inch thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
 - a. Kick Plates: 10 inches high by 2 inches less width of door on single doors, 1 inch less width of door on pairs

2.19 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS**A. Manufacturers:**

1. Scheduled Manufacturers: Glynn-Johnson.
2. Acceptable Manufacturers: Rixson, ABH.

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.20 DOOR STOPS AND HOLDERS**A. Manufacturers:**

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, ABH.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.21 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING**A. Manufacturers:**

1. Scheduled Manufacturer: Zero International.
2. Acceptable Manufacturers: National Guard, Reese.

B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Size of thresholds:
 - a. Saddle Thresholds: 1/2 inch high by jamb width by door width
4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.22 SILENCERS**A. Manufacturers:**

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Steelcraft, Republic.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.23 DOOR POSITION SWITCHES**A. Manufacturers:**

1. Scheduled Manufacturer: Schlage.
2. Acceptable Manufacturers: GE-Interlogix, Sentrol.

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches between switch and magnetic locking device.

2.24 COAT HOOKS**A. Manufacturers:**

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Trimco.

B. Provide coat hooks as specified.**2.25 FINISHES****A. Finish: BHMA 606 (US4); except:**

1. Door Closers: Powder Coat to Match
2. Weatherstripping: Gold Anodized Aluminum
3. Thresholds: Gold Finish Aluminum
4. Where specified different in hardware groups.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

- B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where on-site modification of doors and frames is required:
 - 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
 - 2. Field modify and prepare existing door and frame for new hardware being installed.
 - 3. When modifications are exposed to view, use concealed fasteners, when possible.
 - 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
 - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.
 - I. Wiring: Coordinate with Division 26, Electrical sections for:
 1. Conduit, junction boxes and wire pulls.
 2. Connections to and from power supplies to electrified hardware.
 3. Connections to fire/smoke alarm system and smoke evacuation system.
 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 5. Testing and labeling wires with Architect's opening number.
 - J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 - K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
 - L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
 - M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
 - N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
 - O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- 3.4 FIELD QUALITY CONTROL
- A. Engage qualified manufacturer trained representative to perform inspections and to prepare inspection reports.
 1. Representative will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed 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.
 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DOOR HARDWARE SCHEDULE

- A. Hardware items are referenced in the following hardware. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- B. Hardware Sets:

HARDWARE GROUP NO. 01 - DOORS 213 AND 214

Provide each SGL door(s) with the following:

| QTY | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|---------------|------------------------------|--------|-----|
| 1 | EXISTING DOOR | EXISTING HARDWARE TO REMAIN. | | |

HARDWARE GROUP NO. 02 - DOOR 221

Provide each SGL door(s) with the following:

| QTY | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----------------|-----------------------------|----------|-----|
| 3 | EA HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA PRIVACY LOCK | L9040 M55N 09-544 L283-722 | 606 | SCH |
| 1 | EA WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA DOOR BOTTOM | 369AA | AA | ZER |
| 1 | EA THRESHOLD | 63G-223 | G | ZER |
| 1 | EA GASKETING | 188SBK PSA (AS REQUIRED) | BK | ZER |
| 1 | EA SINGLE HOOK | 507B | 643E/716 | IVE |

HARDWARE GROUP NO. 03 - DOORS 205B AND 206B

Provide each SGL door(s) with the following:

| QTY | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----------------------|--------------------|----------|-----|
| 3 | EA HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA OFFICE/ENTRY LOCK | L9050T M55N 09-544 | 606 | SCH |
| 1 | EA WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA COAT AND HAT HOOK | 507 | 643E/716 | IVE |

HARDWARE GROUP NO. 04 - DOORS 117C AND 303

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | CLASSROOM LOCK | L9070T M55N | 606 | SCH |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |

HARDWARE GROUP NO. 05 - DOORS 119A, 121B, 122 AND 126

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | CLASSROOM LOCK | L9070T M55N | 606 | SCH |
| 1 | EA | OH STOP | 450S | US4 | GLY |

HARDWARE GROUP NO. 06 - DOOR 121A

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|--------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | CLASSROOM LOCK | L9070T M55N | 606 | SCH |
| 1 | EA | OH STOP | 450S | US4 | GLY |

HARDWARE GROUP NO. 07 - DOORS 209 AND 301F

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |

HARDWARE GROUP NO. 08 - DOOR 206A

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|-----------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | DOOR BOTTOM | 369AA | AA | ZER |
| 1 | EA | THRESHOLD | 63G-223 | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA (AS REQUIRED) | BK | ZER |

HARDWARE GROUP NO. 09 - DOOR 114

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|--------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | OH STOP | 450S | US4 | GLY |

HARDWARE GROUP NO. 10 - DOOR 203A

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | DOOR BOTTOM | 369AA | AA | ZER |
| 1 | EA | THRESHOLD | 63G-223 | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| | | | (AS REQUIRED) | | |

HARDWARE GROUP NO. 11 - DOORS 125A, 127 AND 128

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|-------------------|-----------------|--------|-----|
| 6 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 2 | EA | MANUAL FLUSH BOLT | FB457 12" | 606 | IVE |
| 1 | EA | DUST PROOF STRIKE | DP1 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | OH STOP | 450S | US4 | GLY |
| 1 | EA | SURFACE CLOSER | 4040XP STD CUSH | 696 | LCN |
| 1 | EA | GASKETING | 139G-S | G | ZER |
| 2 | EA | DOOR BOTTOM | 367G | G | ZER |
| 1 | EA | THRESHOLD | 63G-223 | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| | | | (AS REQUIRED) | | |

HARDWARE GROUP NO. 12 - DOORS 104, 105, 205A, AND 306C

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | PASSAGE SET | L9010 M55N | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD EDA | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| | | | (AS REQUIRED) | | |

HARDWARE GROUP NO. 13 - DOORS 303A AND 303B

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|----------------------------|----------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | PRIVACY LOCK | L9040 M55N 09-544 L283-722 | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD CUSH | 696 | LCN |
| 1 | EA | DOOR BOTTOM | 369AA | AA | ZER |
| 1 | EA | THRESHOLD | 63G-223 | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| | | | (AS REQUIRED) | | |
| 1 | EA | SINGLE HOOK | 507B | 643E/716 | IVE |

HARDWARE GROUP NO. 14 - DOORS 225, 238, AND 311

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|-----------------------------|----------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | PRIVACY LOCK | L9040 M55N 09-544 L283-722 | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD REG OR PA AS REQ | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | DOOR BOTTOM | 369AA | AA | ZER |
| 1 | EA | THRESHOLD | 63G-223 | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA (AS REQUIRED) | BK | ZER |
| 1 | EA | SINGLE HOOK | 507B | 643E/716 | IVE |

HARDWARE GROUP NO. 15 - DOORS 117A, 120A, AND 203

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|-----------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | CLASSROOM LOCK | L9070T M55N | 606 | SCH |
| 1 | EA | OH STOP | 450S | US4 | GLY |
| 1 | EA | SURFACE CLOSER | 4040XP STD | 696 | LCN |
| 1 | EA | GASKETING | 188SBK PSA (AS REQUIRED) | BK | ZER |

HARDWARE GROUP NO. 16 - DOOR 112

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|--------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | CLASSROOM LOCK | L9070T M55N | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD CUSH | 696 | LCN |

HARDWARE GROUP NO. 17 - DOOR 001

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|-----------------------------|--------|-----|
| 4 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD REG OR PA AS REQ | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS BY KEY FROM OUTSIDE. INSIDE LEVER ALWAYS FREE FOR EGRESS.

HARDWARE GROUP NO. 18 - DOORS 123 AND 124

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|-----------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD CUSH | 696 | LCN |
| 1 | EA | GASKETING | 188SBK PSA (AS REQUIRED) | BK | ZER |

HARDWARE GROUP NO. 19 - DOOR 002

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|---------------|----|--------------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | INTERLOCKING ANGLE | 25 | GLD | ZER |
| 1 | EA | DOOR BOTTOM | 361G | G | ZER |
| 1 | EA | THRESHOLD | 175G-224 | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| (AS REQUIRED) | | | | | |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS BY KEY FROM OUTSIDE. INSIDE LEVER ALWAYS FREE FOR EGRESS.

HARDWARE GROUP NO. 20 - DOORS 108 AND 109

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|---------------|----|-------------------|-------------------------------|----------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | FAC RESTRM W/IND | L9486T M55C L583-363 L583-375 | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | DOOR BOTTOM | 369AA | AA | ZER |
| 1 | EA | THRESHOLD | 63G-223 | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| (AS REQUIRED) | | | | | |
| 1 | EA | COAT AND HAT HOOK | 507 | 643E/716 | IVE |

HARDWARE GROUP NO. 21 - DOOR 121

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|---------------|----|---------------------|--------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | PANIC HARDWARE | LD-98-NL | US4 | VON |
| 1 | EA | PRIMUS RIM CYLINDER | 20-757-XP | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD EDA | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| (AS REQUIRED) | | | | | |

HARDWARE GROUP NO. 22 - DOORS 102D AND 111

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---------------------|--------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | FIRE EXIT HARDWARE | 98-L-F-06 | US4 | VON |
| 1 | EA | PRIMUS RIM CYLINDER | 20-757-XP | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD SCUSH | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |

HARDWARE GROUP NO. 23 - DOORS 240A AND 240B

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---------------------|--------------------|--------|-----|
| 6 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 2 | EA | FIRE EXIT HARDWARE | 8827-L-F-06 | US4 | VON |
| 2 | EA | PRIMUS RIM CYLINDER | 20-757-XP | 606 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP STD SCUSH | 696 | LCN |
| 2 | EA | MEETING STILE | 8879G | G | ZER |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| | | (AS REQUIRED) | | | |

HARDWARE GROUP NO. 24 - DOORS 101B AND 103B

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|----------------|-------------------|--------|-----|
| 6 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 2 | EA | PUSH PLATE | 8200 6" X 16" | US4 | IVE |
| 2 | EA | PULL PLATE | 8303 10" 4" X 16" | US4 | IVE |
| 2 | EA | SURFACE CLOSER | 4040XP STD SCUSH | 696 | LCN |

HARDWARE GROUP NO. 25 - DOOR 102C

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|----------------------------|--|--------|-----|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | DELAYED PANIC HARDWARE | CX98-EO-CON 24 VDC | US4 | VON |
| 1 | EA | DELAYED FIRE EXIT HARDWARE | CX98-L-F-E996-M55-FS-CON 24 VDC | US4 | VON |
| 1 | EA | PRIMUS RIM CYLINDER | 20-757-XP | 606 | SCH |
| 3 | EA | PRIMUS MORT. CYL. | 20-763 EV D 36-083 | 606 | SCH |
| 1 | EA | 90 DEG OFFSET PULL | 8190HD 12" O | US4 | IVE |
| 2 | EA | SURFACE CLOSER | 4040XP STD SCUSH | 696 | LCN |
| 1 | EA | GASKETING | 429G-S | G | ZER |
| 2 | EA | DOOR SWEEP | 39G | G | ZER |
| 1 | EA | THRESHOLD | 655G-223 | G | ZER |
| 1 | EA | MULLION SEAL | 8780NBK PSA | BK | ZER |
| 2 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |
| 2 | EA | DOOR CONTACT | 679-05HM | BLK | SCE |
| 1 | EA | POWER SUPPLY | PS914 900-2RS 900-BBK 120/240 VAC | | VON |
| 1 | SET | WIRING DIAGRAMS | DOOR ELEVATION AND POINT-TO-POINT SEALS BY DOOR SUPPLIER | | SCE |

REUSE EXISTING REMOVABLE MULLION AND ARMORED DOOR LOOPS.

OPERATIONAL DESCRIPTION: DOORS NORMALLY CLOSED AND LOCKED. AUTHORIZED ACCESS BY CARD READER, WHICH SHUNTS EXIT ALARM AND MOMENTARILY UNLOCKS OUTSIDE LEVER TRIM. AUTHORIZED EGRESS BY CARD READER, WHICH SHUNTS ALARM AND RELEASES PUSH RAILS FOR IMMEDIATE EGRESS. UNAUTHORIZED EGRESS WILL BEGIN AN IRREVERSIBLE 15 SECOND ALARM, DURING WHICH DOORS WILL REMAIN LOCKED. AFTER 15 SECOND ALARM, PUSH RAILS WILL RELEASE ALLOWING EGRESS. FIRE ALARM ALLOWS IMMEDIATE EGRESS.

HARDWARE GROUP NO. 26 - DOORS 101A AND 103A

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|------------------|------------------|--------|-----|
| 2 | EA | SURFACE CLOSER | 4040XP STD SCUSH | 695 | LCN |
| 1 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |

REUSE BALANCE OF EXISTING DOOR HARDWARE.

HARDWARE GROUP NO. 27 - DOOR 102A

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|----|---------------------|------------------------|--------|-----|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | PANIC HARDWARE | CD-9827-DT-264 | US4 | VON |
| 1 | EA | PANIC HARDWARE | CD-9827-NL-264 | US4 | VON |
| 1 | EA | PRIMUS RIM CYLINDER | 20-757-XP | 606 | SCH |
| 2 | EA | PRIMUS MORT. CYL. | 20-763 EV29 T 36-083 | 606 | SCH |
| 2 | EA | SURFACE CLOSER | 4040XP STD SCUSH | 696 | LCN |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | US4 | IVE |
| 1 | EA | GASKETING | 429G-S | G | ZER |
| 1 | EA | MEETING STILE | 8879G | G | ZER |
| 2 | EA | DOOR SWEEP | 39G | G | ZER |
| 1 | EA | THRESHOLD | 655G-223 | G | ZER |
| 2 | EA | DOOR CONTACT | 679-05HM | BLK | SCE |

DOORS MONITORED FOR SECURITY.

HARDWARE GROUP NO. 28 - DOORS 102E, 116, 117B, 120B, 125B, 211, 301B, 305, 306A, 306B, 309, 310, AND 312

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|------------------|-----------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | ELECTRIC STRIKE | 6211 FSE CON 12/16/24/28 VAC/VDC | 613 | VON |
| 1 | EA | SURFACE CLOSER | 4040XP STD REG OR PA AS REQ | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| | | (AS REQUIRED) | | | |
| 1 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |
| 1 | EA | DOOR CONTACT | 679-05HM | BLK | SCE |
| 1 | EA | POWER SUPPLY | PS902 BBK KL900 120/240 VAC | LGR | SCE |
| 1 | SET | WIRING DIAGRAMS | DOOR ELEVATION AND POINT-TO-POINT | | SCE |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS BY KEY, OR VALID CREDENTIAL READ, WHICH SHUNTS DOOR POSITION SWITCH AND MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING DOOR TO BE OPENED. INSIDE LEVER ALWAYS FREE FOR EGRESS.

HARDWARE GROUP NO. 29 - DOORS 111B, 119B, 210C, 315B, AND 315C

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|------------------|-----------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | ELECTRIC STRIKE | 6211 FSE CON 12/16/24/28 VAC/VDC | 613 | VON |
| 1 | EA | SURFACE CLOSER | 4040XP STD REG OR PA AS REQ | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | GASKETING | 188SBK PSA | BK | ZER |
| | | | (AS REQUIRED) | | |
| 1 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |
| 1 | EA | DOOR CONTACT | 679-05HM | BLK | SCE |
| 1 | EA | POWER SUPPLY | PS902 BBK KL900 120/240 VAC | LGR | SCE |
| 1 | SET | WIRING DIAGRAMS | DOOR ELEVATION AND POINT-TO-POINT | | SCE |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS BY KEY, OR VALID CREDENTIAL READ, WHICH SHUNTS DOOR POSITION SWITCH AND MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING DOOR TO BE OPENED. INSIDE LEVER ALWAYS FREE FOR EGRESS.

HARDWARE GROUP NO. 30 - DOORS 107, 115, AND 205

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|------------------|-----------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | ELECTRIC STRIKE | 6211 FSE CON 12/16/24/28 VAC/VDC | 613 | VON |
| 1 | EA | OH STOP | 450S | US4 | GLY |
| 1 | EA | SURFACE CLOSER | 4040XP STD | 696 | LCN |
| 1 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |
| 1 | EA | DOOR CONTACT | 679-05HM | BLK | SCE |
| 1 | EA | POWER SUPPLY | PS902 BBK KL900 120/240 VAC | LGR | SCE |
| 1 | SET | WIRING DIAGRAMS | DOOR ELEVATION AND POINT-TO-POINT | | SCE |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS BY KEY, OR VALID CREDENTIAL READ, WHICH SHUNTS DOOR POSITION SWITCH AND MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING DOOR TO BE OPENED. INSIDE LEVER ALWAYS FREE FOR EGRESS.

HARDWARE GROUP NO. 31 - DOORS 229, 232, 237, AND 314

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|------------------|-----------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 606 | IVE |
| 1 | EA | STOREROOM LOCK | L9080T M55N | 606 | SCH |
| 1 | EA | ELECTRIC STRIKE | 6211 FSE CON 12/16/24/28 VAC/VDC | 613 | VON |
| 1 | EA | SURFACE CLOSER | 4040XP STD REG OR PA AS REQ | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | GASKETING | 870G-S | G | ZER |
| 1 | EA | DOOR BOTTOM | 369AA | AA | ZER |
| 1 | EA | THRESHOLD | 63G-223 | G | ZER |
| 1 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |
| 1 | EA | DOOR CONTACT | 679-05HM | BLK | SCE |
| 1 | EA | POWER SUPPLY | PS902 BBK KL900 120/240 VAC | LGR | SCE |
| 1 | SET | WIRING DIAGRAMS | DOOR ELEVATION AND POINT-TO-POINT | | SCE |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. ACCESS BY KEY, OR VALID CREDENTIAL READ, WHICH SHUNTS DOOR POSITION SWITCH AND MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING DOOR TO BE OPENED. INSIDE LEVER ALWAYS FREE FOR EGRESS.

HARDWARE GROUP NO. 32 - DOORS 210B, 210D, AND 226

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|----------------------------|------------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | POWER TRANSFER | EPT10 CON | 695 | VON |
| 1 | EA | ELEC FIRE EXIT HARDWARE | RX-LC-98-L-F-E996-06-FS-CON 24 VDC | US4 | VON |
| 1 | EA | PRIMUS RIM CYLINDER | 20-757-XP | 606 | SCH |
| 1 | EA | SURFACE CLOSER | 4040XP STD REG OR PA AS REQ | 696 | LCN |
| 1 | EA | WALL STOP | WS406/407CVX | US4 | IVE |
| 1 | EA | GASKETING | 188SBK PSA (AS REQUIRED) | BK | ZER |
| 1 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |
| 1 | EA | POWER SUPPLY | PS902 BBK FA900 KL900 | LGR | SCE |
| 1 | SET | WIRING DIAGRAMS | DOOR ELEVATION AND POINT-TO-POINT | | SCE |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. AUTHORIZED ACCESS BY KEY OR VALID CREDENTIAL, WHICH MOMENTARILY UNLOCKS OUTSIDE LEVER. IMMEDIATE EGRESS ALWAYS ALLOWED. FIRE ALARM UNLOCKS OUTSIDE LEVER.

HARDWARE GROUP NO. 33 - DOORS 202A AND 202B

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|-----|-----|------------------|-----------------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 606 | IVE |
| 1 | EA | INSTITUTION LOCK | L9082T M55N | 606 | SCH |
| 1 | EA | ELECTRIC STRIKE | 6211 FSE CON 12/16/24/28 VAC/VDC | 613 | VON |
| 1 | EA | SURFACE CLOSER | 4040XP STD SCUSH | 696 | LCN |
| 2 | EA | MULTITECH READER | MT15 12 VDC | BLK | SCE |
| 1 | EA | DOOR CONTACT | 679-05HM | BLK | SCE |
| 1 | EA | POWER SUPPLY | PS902 BBK KL900 120/240 VAC | LGR | SCE |
| 1 | SET | WIRING DIAGRAMS | DOOR ELEVATION AND POINT-TO-POINT | | SCE |

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED FROM BOTH SIDES. ACCESS BY KEY, OR VALID CREDENTIAL READ, WHICH SHUNTS DOOR POSITION SWITCH AND MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING DOOR TO BE OPENED. ELECTRIC STRIKE WILL NOT RELEASE WHILE OTHER DOOR INTO SECURITY DOCK IS OPEN (INTERLOCK).

END OF SECTION 087100

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Texture finishes.

1.2 ACTION SUBMITTALS

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

B. Samples:

1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide gypsum products manufactured within the United States from materials free of sulfur, formaldehyde or other deleterious chemicals. Natural gypsum ore shall be mined in North America. Synthetic (by-product) gypsum shall be pure calcium sulfate from domestic sources.

B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory".

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

D. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for each level of gypsum board finish indicated for use in exposed locations.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

- B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
 - 1. Installation of gypsum panels before areas are enclosed and conditioned is done at Contractor's own risk. Damaged panels shall be removed and new panels installed at Contractor's expense and will not be deemed cause for additional time.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Gypsum
 - 2. Certaineed Corporation
 - 3. Georgia-Pacific Gypsum LLC
 - 4. Lafarge North America Inc.
 - 5. National Gypsum Company
 - 6. Temple-Inland Inc.
 - 7. USG Corporation

2.3 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 1396.
- B. Type X:
 - 1. Thickness: 5/8 inch, or as indicated on Drawings.
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
 - 3. Location: Vertical surfaces, unless otherwise indicated.
- C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 - 1. Thickness: 5/8 inch, or as indicated on Drawings.
 - 2. Long Edges: Tapered.
 - 3. Provide moisture- and mold-resistant where indicated on Drawings.

D. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: Type X, 5/8 inch, or as indicated on Drawings.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. C-Cure; C-Cure Board 990
 - b. CertainTeed Corp.; FiberCement BackerBoard
 - c. Custom Building Products; Wonderboard
 - d. FinPan, Inc.; Util-A-Crete Concrete Backer Board
 - e. James Hardie Building Products, Inc.; Hardiebacker
 - f. National Gypsum Company, PermaBase Cement Board
 - g. USG Corporation; DUROCK Cement Board
2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead: Use at outside corners, unless otherwise indicated.
 - b. Bullnose Bead: Use where indicated.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long leg receives joint compound; use at exposed terminations of gypsum board panels.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (Control) Joint: Galvanized or aluminum-coated steel sheet or rolled zinc control joint with 1/2 inch to 3/4 inch grounds for drywall finishes. Staple or screw grounds to panel face.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. MM Systems Corporation.
 - d. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use joint setting compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use joint setting compound.
 - 3. Fill Coat: For second coat, use joint setting compound.
 - 4. Finish Coat: For third coat, use drying-type compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use sandable topping compound.
- D. Joint Compound for Tile Backing Panels: As recommended by backing panel manufacturer.
- E. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 - 2. Provide sound attenuation blankets free of formaldehyde.
- E. Acoustical Sealant: As specified in Section 079200 "Joint Sealants."

2.8 TEXTURE FINISHES (AC-S)

- A. Primer: As recommended by textured finish manufacturer.
- B. Acoustical Finish: Water-based, chemical-setting or drying-type, job-mixed texture finish for spray application.**
 - 1. Basis of Design: Subject to compliance with requirements, provide basis of design indicated or comparable products by one of the following:**
 - a. International Cellulose Corporation; SonaSpray "fc" (Basis of Design)**
 - b. Monoglass Incorporated**
 - c. USG Corporation**
 - 2. Application Thickness: 1/2 inch.**

3. **Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.**
 - a. **Flame-Spread Index: 25 or less.**
 - b. **Smoke-Developed Index: 450 or less.**
4. **NRC: Not less than 0.55 according to ASTM C423.**
5. **Texture: As selected by Architect.**
6. **Color: As selected by Architect.**
7. **Location: Ceiling in Courtroom 240 and ceiling below mezzanine.**

~~B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested according to ASTM E84.~~

- ~~1. Texture: Match existing.~~

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine weathertight building enclosure, with Installer present, and verify that delivery, storage, and installation of gypsum panel products will not be affected by exposure to moisture beyond limits recommended by manufacturer.
- C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Form control and expansion joints with space between edges of adjoining gypsum panels.

- G. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.
- H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- I. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- M. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings, or, if not shown, according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
 4. U-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 1. Level 0: This level of finish shall be used in temporary construction only. No taping, finishing, or accessories required unless indicated or specified as in dust proof partitions.
 2. Level 1: This level shall be used in ceiling plenum areas and concealed areas unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies. Embed tape at joints.
 3. Level 2: This level of finish shall be used where water resistant gypsum backing board is used as a substrate for tile. Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where indicated.

4. Level 3: This level of finish shall be used in areas to receive heavy textured, thick (1/8 inch or greater) wall coverings and where indicated. Embed tape and apply separate first and finish coats of joint compound to tape, fasteners, and trim flanges.
5. ~~Level 4: This level of finish shall be used for areas to receive smooth paint finish. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces.~~
 - a. ~~Tape joints require joint compound and feathering of joint to a minimum of 12 inches each side of joint.~~
 - b. ~~Tape joints that are visible through finished walls are not acceptable.~~
6. Level 5: This level of finish shall be used **for areas to receive smooth paint finish, where skim coat is indicated on Drawings.** Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.

E. Cementitious Backing Panels: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer **or manufacturer's recommended pretreatment coating** to gypsum panels and other surfaces receiving texture finishes. Apply primer/**pretreatment coating** to surfaces that are clean, dry, and smooth. **Prepare a smooth substrate prior to application of primer/pretreatment coating.**
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching existing texture, free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.
 - g. Installation of through-penetration firestopping and fire-resistant joint sealants, with identification labels.

3.9 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 220000 - PLUMBING

220001 GENERAL

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
- B. Plumbing work shall be performed as outlined in "Information for Bidders".
- C. These specifications and the accompanying plumbing drawings are intended to provide for all labor, materials and equipment necessary for the installation complete of all
 - 1. Plumbing Fixtures
 - 2. Equipment
 - 3. Rough-Ins
 - 4. Waste and Vent System
 - 5. Waste Oil Holding Tank
 - 6. Condensate Drainage System
 - 7. Sump Pump Discharge Systems
 - 8. Cold Water System
 - 9. Hot Water System
 - 10. Fuel Gas Systemand accessories including necessary apparatus, valves and fittings hereinafter described or called for on the plumbing drawings accompanying these specifications.
- D. All plumbing work shall be installed in accordance with the following Codes and all Local Ordinances. Materials, equipment and workmanship shall be as hereinafter specified.
 - 1. North Carolina State Plumbing Code
 - 2. North Carolina State Fire Prevention Code
 - 3. National Electrical Code
 - 4. North Carolina State Fuel Gas Code
 - 5. ICC A117.1
 - 6. NSF Standard # 61
- E. This contractor shall secure all required permits and inspection fees necessary for this work. Permits may be secured from the Building Inspections Department.
- F. The accompanying drawings are schematic only and are not intended to show all fittings, bolts, connections, offsets, etc., unless specifically dimensioned. Follow drawings as closely as possible, provide all adjustments as necessary to conform to the structural conditions, machinery, equipment, work of other contractors and the intent of the drawings, without additional cost to the Owner. Plumbing drawings should not be scaled. Secure dimensions from Architectural drawings. Refer to drawings of other trades and coordinate with other contractors. All items of equipment shall be installed in accordance with the manufacturer's published installation instructions and diagrams.
- G. The Contractor shall coordinate water and sewer taps and pay all fees in conjunction to provide services as required, for this project.

220002 SCOPE OF WORK

- A. The Contractor shall be required to perform all the following work, in general and provide a complete plumbing system as shown on the plans. The items in general are to be as follows:

1. Furnish and install complete waste and vent system with connections to services as shown on the plumbing drawings and here-in specified.
2. Furnish and install waste oil system from the elevator pit sump pumps as shown on the plumbing drawings and here-in specified.
3. Furnish and install cold water system complete with connections to point as shown on the plumbing drawings and here-in specified.
4. Furnish and install hot water system complete with connections to equipment as shown on the plumbing drawings and here-in specified.
5. Furnish and install fuel gas piping system with connections to equipment as noted and/or as shown on the plumbing drawings and here-in specified.
6. Furnish and install condensate drainage system as shown on the plumbing drawings and here-in specified.
7. Provide connections to equipment furnished and installed by General Contractor or Owner as shown on the plumbing drawings and here-in specified.

220003 LIST OF MATERIALS, FIXTURES AND EQUIPMENT

- A. The Plumbing Contractor shall obtain written approval from the Engineer/Architect for the use of substitute materials claimed as equal to those specified. Such approvals must be obtained as soon after contract awards as possible and before any materials are ordered. Applications for approvals shall be made by the Plumbing Contractor and not by subcontractors or manufacturer's representative. The Plumbing Contractor shall submit within ten days following award of contract and written notice to begin the work a complete list of materials proposed for the job. All like items shall be by the same manufacturer. When this list is approved, no further substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted, the Contractor shall supply materials specified. *Contractor should note that all items specified in section 220000 shall be submitted independently of other 220000 series sections.* The Plumbing Contractor shall review and stamp the submittals as being in accordance with his bid and these specifications. **Private labeled materials are not acceptable.**
- B. The Plumbing Contractor shall submit shop drawings to the Architect after award of the contract, and before any materials, fixtures, and equipment to be incorporated in the work has been ordered. Shop drawings shall include the name and address of the manufacturer and their catalog numbers and trade names clearly marked. All items shall be referenced to the plans and specifications by **fixture designation or specification paragraph number on an index tab**. One complete set of submittal data shall be manufacturer's original published material. **FAXED COPIES WILL NOT BE ACCEPTABLE.** Approval of materials will be based upon the manufacturer's published ratings. Submit shop drawings and/or catalog data for the following material and equipment:
 1. Waste Piping, Fittings and Couplings
 2. Condensate Piping, Fittings and Couplings
 3. Water Piping, Fittings and Equipment
 4. Fuel Gas Piping, Fittings and Equipment
 5. Circulator Pumps
 6. Sump Pumps
 7. Waste Oil Holding Tank
 8. Cleanouts and Access Doors
 9. Valves
 10. Insulation
 11. Hangers
 12. U. L. penetration systems
 13. Pipe Markers
 14. Fixtures
- C. Approval of shop drawings and/or submittal data shall not relieve the Plumbing Contractor of the responsibility to comply with the requirements and intent of the plans and specifications with regard to

dimensions, capacities, quality, quantity, performance characteristics, etc. If data submitted deviates from the contract documents, the Plumbing Contractor shall point out such deviations in writing and also state reasons for same. All similar items shall insofar as possible be one make and manufacturer.

- D. Where any special make, fixture or materials are specified by plate number, trademark or name, deliver to the building with original labels or other identification marks placed thereon by the manufacturer and do not remove until inspected and approved by the Architect. Similar and equal materials and equipment by other manufacturers will be acceptable, subject to approval.
- E. Failure to submit materials, equipment, fixtures, etc., in the time period specified above, the Architect shall assume that all items shall be installed as specified.

220004 DEMOLITION

- A. General Requirements: The work includes the demolition or removal of all construction indicated, specified or necessary to accomplish the work under this contract. The drawings define the scope of work but it is not intended that all items of demolition work be specifically indicated. After carefully reviewing the drawings and specifications to determine intent, the Contractor shall visit the site and determine the extent of demolition work required to properly complete the work under his contract.
- B. Protection of Materials and Work: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of work required. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner and any damage to such work shall be repaired or replaced at no additional cost to the Owner.

220005 WORKMANSHIP

- A. Layout:
 - 1. Drawings indicate general locations of fixtures. Secure exact location from Architectural plans before proceeding with work.
 - 2. Furnish and install all necessary sleeves, inserts, bolts, etc., for concrete floor slabs, roof, walls, and partitions. Failure to install such items in time to avoid delaying the general contractor shall result in the Contractor doing all cutting and repairing at his own expense.
 - 3. Sleeves as here-in-after specified shall be installed on all through the floor piping above slab on grade except water closet rough-ins. Water closet rough-ins shall be cast in place. Core drilling of slabs shall be sealed with approved fire retardant caulking and sealed watertight.
 - 4. All equipment shall be installed in accordance with manufacturer's written installation instructions.
- B. Drainage, Waste and Vent Piping:
 - 1. Grade all sanitary waste lines 2" and smaller 1/4" per foot.
 - 2. Grade all sanitary waste lines 3" and larger 1/4" per foot, where possible, 1/8" per foot minimum.
 - 3. Grade all condensate drain lines 1/8" per foot.
 - 4. All underground piping shall be graded by the use of a laser beam alignment system.
 - 5. All floor drains shall be set 1/2 inch below the room finished floor perimeter and the entire floor sloped to the floor drain.
 - 6. Run all piping as directly as possible, avoiding unnecessary bends and turns so as not to interfere with proper installation of work of other contractors.
 - 7. All PVC-DWV piping shall be protected by a cast iron sleeve under the following condition with a sleeve as follows:

- a. Piping passing thru foundation walls: Sleeve shall extend 6 inches beyond wall footing on both sides.
- b. Piping passing below a footing: Per Contract Drawings.
8. Provide removable caps for cleanouts with at least six threads engaged. Provide cleanouts at foot of waste and drainage stacks, all changes in direction of horizontal lines more than 135 degrees, in straight lines at intervals not exceeding 100-feet and anywhere additionally noted on the drawings.
9. Run all horizontal and vertical piping true and plumb to building structure and connect all piping with 'Y' branches and 1/8 or 1/16 bends.
10. Tapped tees and crosses will not be permitted. Tapped sanitary tees and crosses shall be used.
11. No soil, waste, or vent piping shall be covered or concealed, until tested and approved by the Architect.
12. Conceal all soil and vent piping. Vents shall be tied together as shown with minimum number of vents extending through roof. All vents extended through the roof shall be a minimum of 12" above roof level.
13. All PVC-DWV and PVC drainage lines shall be bedded per the manufacturer's recommendations and shall be maintained under a continuous head of 10-feet until after all concrete slabs are poured and/or all heavy equipment has been removed from the site. Contractor shall be responsible for the protection of the piping system at all times including freezing weather.

C. Water System:

1. Conceal water supply piping in walls, crawl space or above ceiling except where exposed for connections to fixtures. Install and secure all piping as walls are built. Wedging of piping will not be permitted. All piping shall be isolated from mortar.
2. All water piping shall be routed with a minimum clearance of ten (10) feet from any electrical switchboards, panel boards or telephone backboards.
3. Arrange all pipes to freely drain through a ball valve when water is cut off. All branch valves shall be installed adjacent to the water piping main.
4. All supplies to fixtures shall have individual stop valves.
5. Provide water hammer shock arrestors as required to prevent water hammer. Arresters shall be A.S.S.E. Standards Number 1010 certified. Arresters shall be installed in accordance with manufacturer's published recommendations. Air chambers are not acceptable. Water hammer shock arrestors shall be as manufactured by Precision Plumbing Products, Inc. or approved equal by Zurn, Josam, J.R. Smith, or Sioux Chief.
6. All exposed piping to fixtures shall be chrome plated installed true and plumb.
7. Insulate all water piping inside the building as hereinafter specified.
8. All tees shall be installed such that the flow shall be straight thru the tee and/or out the side. Tees **shall not** be installed where the flow is into the side and out of both ends of the tee (bullhead tee). Bullhead tees installations are not acceptable and shall not be used.
9. Extend water lines to water mains where shown on the plans.

D. Fuel Gas System:

1. Gas piping shall be concealed in crawl space, walls, or above ceiling unless noted otherwise.
2. Gas piping shall be graded 1/4" per 15-feet towards drip legs. Drip legs shall be full size of the main and shall be 6 inches in length.
3. Gas piping shall be installed in accordance with North Carolina State Gas Code.

E. Insulation:

1. All pipe insulation joints shall be sealed to maintain integrity of the vapor jacket and shall pass thru all sleeves unbroken except for fire stops.
2. Pipe insulation at all fire separations shall be butted tightly to the firewall or to the floor after fire stop material has been installed.

220006 CUTTING, PATCHING AND CHASING

- A. All cutting and patching shall be in accordance with the "General Conditions" of these specifications.

220007 EXCAVATION, TRENCHING AND BACKFILLING

- A. All excavation, trenching and backfilling shall be in accordance with Division 31 of these specifications.

220008 SEISMIC RESTRAINTS

- A. The Contractor shall be responsible for providing restraints to resist the earthquake effects on the plumbing system. The requirements for these restraints are found in Section 1613 of the North Carolina Building Code. All tables and references shall conform to the building's location. Restraints shall be per Seismic Design Category C.
- B. The Contractor shall refer to the latest edition of the "Seismic Restraints Manual Guidelines for Mechanical Systems" published by SMACNA for guidelines to determine the correct restraints for piping and conduit, etc. This manual refers to Seismic Hazard Level (SHL).
- C. The anchorage of the equipment and machinery for this project shall be an integral part of the design and specification of such equipment and machinery. Manufacturers of all equipment including pumps, hot water heaters, tanks, etc. shall provide anchorage details, isolators, seismic mounts and restraints, etc. necessary to comply with Section 1613 to the Contractor for installation. It shall be the Contractor's responsibility to provide and install the equipment, machinery, systems, and assemblies, etc. For this project that satisfies these requirements.
- D. Where seismic restraints are required, the Contractor shall provide restraints per details and instructions included in SMACNA's Seismic Restraints Manual. Contractor shall include shop drawings of the specific methods of seismic restraint to be used for this project before installation of piping and equipment.
- E. The Contractor shall retain the services of a Professional Engineer registered in the State of North Carolina to design seismic restraint elements required for this project. The engineer's computations, bearing his professional seal, shall accompany shop drawings that show Code compliance. Computations and shop drawings shall be submitted for review prior to the purchasing of materials, equipment, systems and assemblies.
- F. Internal seismic restraint elements of manufactured equipment shall be certified by a Professional Engineer retained by the manufacturer. Such certificate applies only to internal elements of the equipment. All equipment anchorage requirements shall be coordinated with the building structure and shall be compatible thereto. All such anchorage shall be reviewed by the project's structural engineer.
- G. The Professional Engineer retained by the Contractor for seismic restraint calculations, shall visit the job site upon completion of the seismic restraint installation. This engineer shall provide in writing verification of compliance with the approved seismic submittal. This verification shall bear the Engineer's professional seal. Job site inspections by other than this engineer are not acceptable.
- H. Review of the seismic design and shop drawings by the Engineer/Architect or his agent shall not relieve the Contractor of his responsibility to comply with the seismic or any other requirements of the North Carolina State Building Code.

220009 WASTE & VENT SYSTEMS

A. Piping:

1. Waste and vent piping shall be schedule 40 PVC-DWV solid wall conforming to ASTM D-2665 and C.S. 272 with NSF seal.

B. Fittings:

1. Fittings for PVC-DWV piping shall be PVC-DWV fittings conforming to piping specifications.

C. Joints:

1. Joints for PVC-DWV piping shall be made using the piping manufacturer's approved solvent cement.
2. Flashing of plumbing vents will be provided by the General Contractor.

220010 CONDENSATE DRAINAGE

A. Piping:

1. Condensate piping shall be Schedule 40 PVC-DWV solid wall, conforming to ASTM D-2665 and C.S. 272.

B. Fittings:

1. Fittings for PVC-DWV piping shall be PVC-DWV fittings conforming to piping specifications.

C. Joints:

1. Joints for PVC-DWV piping shall be made using manufacturer's approved solvent cement.

220011 HOT AND COLD WATER SYSTEMS

A. Water Piping:

1. Water piping 2-1/2" and smaller, below grade, shall be type 'K' soft copper conforming to ASTM B-88.
2. Water piping 3" and larger, below grade, shall be type 'K' hard copper conforming to ASTM B-88.
3. Water piping 4" and smaller above grade inside the building shall be Type 'L' hard copper conforming to ASTM B-88.

B. Fittings:

1. Fittings for copper piping shall be wrought copper, solder joint fittings conforming to ANSI B 16.22.
2. Fittings for copper piping 2" and smaller may be press fittings conforming to ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.

C. Joints:

1. All copper piping joints, 1-1/4" and smaller shall be made using lead free solder with a minimum melting point of 410 degrees Fahrenheit.
2. All copper piping joints, 1-1/2" and larger shall be made using Phos-copper silver alloy material with a minimum melting point of 1000 degrees Fahrenheit.
3. Press fitting joints shall be made using the press fitting manufacturer's tools and per manufacturer's instructions. Upon completion of the project, the press fitting manufacturer's tools used for installation shall be turned over to the Owner.

D. Backflow Preventer:

1. Double Check: Backflow preventer shall be lead-free double check valve design, high hazard, with strainer, test valves, gate valve on inlet and discharge, inlet and outlet pressure gauges, designed to meet AWWA C-510, ASSE 1015. Unit shall be size as shown on the drawings and be manufactured by Watts LF007S or approved equal by Wilkins, Febco, or Conbraco.
2. RPZ: Backflow preventer shall be lead-free reduced pressure design with test valves, strainer, gate valve on inlet and discharge, inlet and outlet pressure gauges, discharge drain funnel, designed to meet AWWA C-511, ASSE 1013, and IAMPO performance specifications. Unit shall be size as shown on the drawings and be manufactured by Watts LF909S or approved equal by Wilkins, Febco, or Conbraco. Funnel drain shall be piped to over floor drain or thru wall.

E. Expansion Tank:

1. Expansion tank shall be diaphragm design constructed of welded steel and shall bear the ASME and National Board Stamp for 150 pounds working pressure and 200° F. operating temperature. Fittings shall include test cocks, hose bibb drain and air control fitting. Tank and fittings shall be as manufactured by Amtrol, Bell and Gossett, Thrush or Taco.

F. Thermometers and Gauges:

1. Thermometers shall be metallic element type with 3" dial, Type 304 stainless steel case, accuracy range of 1%, black markings on white face, and designed for variable angle mounting. Thermometers range shall be such that the operating temperature shall be in the middle range for the dial. Thermometers shall be installed in a thermometer well and shall be Weiss Model 3VBM Series or approved equal by Omega or Tel-Tru Mfg. Co.
2. Pressure gauges shall be non-filled with 4" face, 1/4" NPT lower connection with operating range in middle portion of the dial, accuracy range of 1%, and black markings on white face. Pressure gauges shall be installed with lever handle gauge cocks. Pressure gauges shall be Weiss Model 4PG-1 or approved equal by Omega or Tel-Tru Mfg. Co.

220012 FUEL GAS SYSTEM

A. Gas Piping:

1. Gas piping above grade and inside the building shall be standard weight schedule 40 black steel conforming to ASTM A-53.

B. Fittings:

1. Fittings for piping 2" and smaller above grade and inside building shall be malleable iron threaded fittings conforming to ASME B16.3 with threads conforming to ASME B1.20.1.
2. Fittings for piping 2-1/2" and larger above grade and inside the building shall be steel.

C. Joints:

1. Joints for threaded piping shall be made using pipe dope applied sparingly to the male thread of pipe. Pipe dope shall be resistant to actions of gas.
2. Joints for steel piping 2-1/2" and larger shall be welded.

D. Pressure Regulators:

1. Regulators shall have the minimum capacities as shown on the drawings with single stage pressure reduction. Regulators installed inside the building shall be of the limited venting design.
2. Regulators shall be listed as complying with ANSI Z21.80, and shall be equal to those as manufactured by Maxitrol, American Meter Company, or Invensys.

E. Gas Valves:

1. Gas valves shall be U.L. or AGA approved bronze construction, full port ball with threaded ends designed for 600-PSI gas working pressure conforming to ASME B16.44. Valves located on 2 psi gas lines shall be labeled "2G".
2. Gas valves controlling each piece of equipment shall be full ported, bronze body, threaded ends, ball valve with gauge tapping.
3. Each valve shall be lubricated and turned during the installation to assure good working order. Plug valves shall be greased again after turning to aid the shut off. All valve boxes shall be encased in 18" square x 6" thick concrete pad at grade level.

F. Connections:

1. The Plumbing Contractor shall coordinate the rough-in connection for the boiler gas train with the Mechanical Contractor. The Plumbing Contractor shall make the final connection to the boiler gas train.

220013 HOT WATER CIRCULATOR

- A. Circulator shall have capacity as shown on drawings and shall be specifically designed for domestic hot water service.
- B. Circulator shall have lead-free bronze body and flanges with lead-free impeller; circulator motor shall be rubber mounted and shall be equipped with overload protection. Circulator shall be direct connected to motor. Circulator shall be Taco, B&G, or Grundfos with capacity as noted on the drawings.
- C. Circulator shall be supported by appropriate hangers to avoid piping strain. Circulators shall be mounted horizontally.

220014 SUMP PUMPS

- A. **The Contractor shall furnish and install submersible sump pumps with non-clog vortex impeller, cast iron base, float switches with length of cable as required, rust resistant steel shaft, and power/control cords to plug into standard duplex receptacle.**

B. **Dewatering Sump Pumps:**

1. **Sump pumps in basement, not located in elevator pits (dewatering sump pumps) shall have capacity of 50-GPM at a 20-foot total dynamic head 1/2 HP, 115-volt single phase motor with internal overload and thermal protection. Pump shall be complete with NEMA 4X weather tight corrosion resistant fiberglass enclosure. Pumps shall be pre-wired to controller and be Stancor #SE-50/120/1, or approved equal by Liberty Pumps, with power cable length as needed to be specified by Contractor when ordering.**
2. **A single control panel shall control both basement dewatering sump pumps. Manufacturer shall include pre-wired junction box and disconnect switch between pumps and controls.**
3. **Dewatering sump pump controller shall be NEMA 4X control panel capable of providing instruction to two pumps that operate independently, and shall be UL approved. Enclosure shall be polycarbonate and include IEC motor contactor, MCCB for short circuit, Hand/Off/Auto switches, green pump run indicator lights, audio alarm with silencing switch, red light alarm, high level alarm, manual reset, remote monitoring capability for connection to a building automation system, and light to indicate which pump is in alarm. Control panel shall have 120V Single Phase input. Controller shall be completely assembled at manufacturer, and pre-wired to pumps by manufacturer. Stancor #CB-1000/120/1/15/2, with #741-009-2-XXX float switches, or approved equal by SJ Rhombus. Length of float switch cable to be specified as needed by the Contractor when ordering.**

C. **Elevator Sump Pumps:**

1. Sump pumps for elevator sump pits shall have capacity of 50-GPM at a 20-foot total dynamic head 1/2 HP, 120-volt single phase motor with internal overload and thermal protection. Two pumps shall be located in each elevator sump pit. Pumps shall be connected to the waste systems indicated on the plans. Pumps shall be complete with NEMA 4X weather tight corrosion resistant fiberglass enclosure. Stancor #SE-50/120/1, or approved equal by Liberty Pumps, with power cable length as needed to be specified by Contractor when ordering.
 2. A single control panel shall control all four elevator sump pumps. Manufacturer shall include pre-wired junction box and disconnect switch between pumps and controls.
 3. Elevator sump pump controller shall be NEMA 4X control panel capable of providing instruction to all four pumps that operate independently based on a signal from the conductivity probe, and shall meet both ASME 17.1.2.2.2.5 and the NC Building Code. Control panel shall power on sump pumps connected to the oil holding tank and power off sump pumps not connected to the oil holding tank if oil is sensed via stainless steel oil probe. Control panel shall have 120V Single Phase input. Panels shall be complete with audio alarm with silencing switch, red light alarm, high level alarm, manual reset, remote monitoring capability for connection to a building automation system, and light to indicate which pump is in alarm.
 4. Elevator sump pumps, solenoid valves, and controller shall be a single package and shall be a full U.L. Assembly. Controller shall be completely assembled at manufacturer, and pre-wired to pumps by manufacturer. Stancor OM50JB/ELV/VALVE/Liquidator2/115, or approved equal by SJ Rhombus. Length of cables to be specified as needed by the Contractor when ordering.
- D. Sumps for pumps that are not existing will be furnished and installed by the General Contractor.
- E. Pumps shall be started by the manufacturer's factory representative.
- A. ~~The Contractor shall furnish and install submersible sump pumps with non-clog vortex impeller, cast iron base, float switches with length of conduit as required, rust resistant steel shaft, and power/control cords to plug into standard duplex receptacle.~~
- B. ~~Dewatering Sump Pumps:~~
1. ~~Sump pumps in basement, not located in elevator pits (dewatering sump pumps) shall have capacity of 50 GPM at a 20 foot total dynamic head 1/2 HP, 120 volt single phase motor with internal overload and thermal protection. Pump shall be complete with NEMA 4X weather tight corrosion resistant fiberglass enclosure. Pumps shall be pre-wired to controller and be manufactured by Stancor.~~
 2. ~~Control system shall be by the same manufacturer as the sump pumps. A single control panel shall control both basement dewatering sump pumps. Manufacturer shall include pre-wired junction box and disconnect switch between pumps and controls~~
 3. ~~Dewatering sump pump controller shall be NEMA 4X control panel capable of providing instruction to two pumps that operate independently, and shall be UL approved. Enclosure shall be polycarbonate and include IEC motor contactor, MCCB for short circuit, Hand/Off/Auto switches, green pump run indicator lights, audio alarm with silencing switch, red light alarm, high level alarm, manual reset, remote monitoring capability for connection to a building automation system, and light to indicate which pump is in alarm. Control panel shall have 208V 3-Phase input. Controller shall be completely assembled at manufacturer, and pre-wired to pumps by manufacturer. Stancor CB2000/208/3.~~
- C. ~~Elevator Sump Pumps:~~
1. ~~Sump pumps for elevator sump pits shall have capacity of 50 GPM at a 20 foot total dynamic head 1/2 HP, 120 volt single phase motor with internal overload and thermal protection. Two pumps shall be located in each elevator sump pit. Pumps shall be~~

~~connected to the waste systems indicated on the plans. Pumps shall be complete with NEMA 4X weather tight corrosion resistant fiberglass enclosure.~~

- ~~2. Control system shall be by the same manufacturer as the sump pumps. A single control panel shall control all four elevator sump pumps. Manufacturer shall include pre-wired junction box and disconnect switch between pumps and controls.~~
- ~~3. Elevator sump pump controller shall be NEMA 4X control panel capable of providing instruction to all four pumps that operate independently based on a signal from the conductivity probe, and shall meet both ASME 17.1.2.2.2.5 and the NC Building Code. Control panel shall power on sump pumps connected to the oil holding tank and power off sump pumps not connected to the oil holding tank if oil is sensed. Control panel shall have 208V 3-Phase input. Panels shall be complete with audio alarm with silencing switch, red light alarm, high level alarm, manual reset, remote monitoring capability for connection to a building automation system, and light to indicate which pump is in alarm.~~
- ~~4. Elevator sump pumps, solenoid valves, and controller shall be a single package and shall be a full U.L. Assembly. Controller shall be completely assembled at manufacturer, and pre-wired to pumps by manufacturer. Stancor OM50JB/ELV/VALVE/Liquidator2/115.~~

~~D. Sumps for pumps that are not existing will be furnished and installed by the General Contractor.~~

~~E. Pumps shall be started by the manufacturer's factory representative.~~

220015 SUMP PUMP DISCHARGE PIPING

A. Piping:

1. Piping shall be Schedule 40 PVC-DWV solid wall, conforming to ASTM D-2665.

B. Fittings:

1. Fittings for shall be of the sanitary drainage pattern and conforming to piping specification.

C. Joints:

1. Joints for PVC-DWV piping shall be made using manufacturer's approved solvent cement.

D. Waste Oil Holding Tank:

1. Waste oil holding tank shall be constructed of seamless high density polyethylene (HDPE) confirming to ASTM D-1248 or fiberglass and be designed for direct buried, with side inlet, vent, and heavy-duty reinforced cover for light pedestrian traffic. Tank shall have 12" threaded access for oil pump out. Tank shall have capacity as shown on the drawings. Tank shall be Town and Country Plastics #TCB-250M/HDPE-TCA12 or approved equal by Orion or Zurn.
2. High level oil sensor and alarm shall be provided. Float shall be located 3/4 of the total vertical distance inside the tank from the bottom of the tank. Manufacturer shall provide length of conduit from float as required, Contractor to specify when ordering. Alarm panel shall be light duty indoor rated, and include horn and strobe with battery backup and shall have 120V single-phase input, with remote monitoring capability for connection to a building automation system. Complete U.L. Rated assembly shall be Stancor #1000-1BB with #741-009-2-XXX float switch, or approved equal by Orion or Zurn. Length of float switch cable to be specified as needed by the Contractor when ordering.

~~D. Waste Oil Holding Tank:~~

- ~~1. Waste oil holding tank shall be plastic or fiberglass and be designed for direct buried installation and shall be constructed of seamless high density polyethylene (HDPE) confirming to ASTM D-1248, with side inlet, vent, and heavy-duty reinforced cover for light~~

~~pedestrian traffic. Tank shall have 12" threaded access for oil pump out. Tank shall have capacity as shown on the drawings. Tank shall be Town and Country Plastics #1000-1-BB or approved equal by Orion or Zurn.~~

2. ~~High level oil sensor and alarm shall be provided. Float shall be located 3/4 of the total vertical distance inside the tank from the bottom of the tank. Manufacturer shall provide length of conduit from float as required. Alarm panel shall be light duty indoor rated, and include horn and strobe with battery backup and shall have 120V single phase input, with remote monitoring capability for connection to a building automation system. Complete U.L. Rated assembly shall be Stancor #741-009-5-XXX.~~

220016 CLEANOUTS AND ACCESS DOORS

- A. Cleanouts shall be the same diameter as the pipe they are connected to. If the pipe is greater than 4" in diameter, the cleanout shall be 4".
- B. Cleanouts installed in walls or pipe chases shall be installed using PVC-DWV cleanout tee with slotted plug, stainless steel cover with vandalproof securing screw. Cleanouts shall be Zurn ZS-1468, Josam 58600-PLG, or J. R. Smith 4472.
- C. Cleanouts installed in floors and walks shall have adjustable cast iron body with cast brass plug, lead seal and round nickel bronze top with watertight gasketed cover. Cleanouts shall be Zurn ZN-1400, or approved equal by Josam or J. R. Smith.
- D. Cleanouts installed in crawl space or above ceiling, where permitted by authority having jurisdiction, shall be a pipe cap installed using a no-hub band and clamp.
- E. Cleanouts installed outside the building and flush with grade shall be installed flush with 24" x 24" x 6" thick concrete pad. Cleanouts plugs shall be ABS with recessed head. Cleanouts shall be Josam 57000-X-LT, Zurn Z-1403-BP-NL, or J. R. Smith 4293 Series.
- F. The Contractor shall provide access doors in accordance with Division 08. Access doors shall be provided for all valves and shock arrestors located behind hard ceilings and in walls to provide access. Ceiling access doors shall be a minimum of 24" x 24".

220017 VALVES

- A. Valves shall be installed at all points noted on the plans by standard symbols or as required by best general practice for proper control and operation of the system. All valves shall be identified with 1" diameter, 19 gauge, polished brass identification tags with a number and valve service indicated. Provide a valve chart listing all valves with size and service framed and mounted under glass in the main mechanical room. Provide a self-sticking 1/2" diameter dot on lay-in ceiling grid at all valve locations. Red dot for domestic hot water supply and return, Blue for cold water.
- B. Valves installed in piping systems with press fittings may have press connections.
- C. Check valves 2 inch and small shall be Class 125, lead free design cast bronze body with threaded ends.
- D. Check valves 2-1/2 inch and larger shall be Class 125, cast iron body with flanged ends.
- E. Domestic cold and hot water system valves 1-1/4 inch and smaller shall be lead free design cast bronze body, full ported, soldered end ball valves rated for Class 150, 200 WOG service.

- F. Domestic cold and hot water system valves 1-1/2 inch and 2 inch shall be lead free design cast bronze body, full ported, threaded end ball valves rated for Class 150, 200 WOG service. Valves shall be provided with stem extensions for insulation thickness specified.
- G. Domestic cold and hot water system valves 2-1/2 inch and larger shall be flanged end, iron body ball valves rated for Class 150, 200 WOG service. Valves shall be provided with stem extensions for insulation thickness specified.

220018 PIPE INSULATION

- A. All plumbing pipe insulation systems shall be installed as a subcontract to the Plumbing contract. All plumbing pipe insulation systems, including jacketing, coverings, adhesives when used, shall have a flame spread rating not exceeding twenty-five (25) and a smoke development rating not exceeding fifty (50) when the insulation assembly is tested as a composite. Fibrous glass pipe insulation shall be pre-molded with a thermal conductivity of 0.24BTU/in/hr/ft² at 100°F.
 - 1. **Insulate all existing uninsulated domestic water piping located in crawlspace.**
 - 2. Insulate all cold water piping above grade with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant vapor barrier jacket.
 - 3. Insulate all hot water piping, 1-1/2" and smaller, above grade with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant jacket.
 - 4. Insulate all hot water piping, 2" and larger, above grade with 1-1/2" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant jacket.
 - 5. Insulate all copper water piping below grade or slab on grade with 1/2" thick pre-molded closed cellular plastic foam pipe insulation.
 - 6. Insulate all hot water return piping with 1" thick fibrous pre-molded glass pipe insulation with self-sealing fire retardant jacket.
 - 7. Rigid pipe insulation inserts shall be provided for all insulated piping 2" and larger.
 - 8. All condensate drainage piping, horizontal and vertical, above slab on grade serving air conditioning condensate shall be insulated with 1" thick pre-molded fibrous glass pipe insulation with self-sealing fire retardant vapor barrier. Condensate P-traps shall be insulated with 1" thick insulating cement insulation.
- B. Exposed pre-molded pipe insulation in finished areas and mechanical rooms shall be finished with factory jacket neatly pasted in place and left ready for painting as specified hereinafter.
- C. All pipe insulation for pipe fittings shall be pre-molded to fit fittings and shall be enclosed under pre-molded PVC fitting jacket.
- D. Plumbing piping located in CMU walls shall be insulated with closed cellular foam insulation with thicknesses as specified above. Foam insulation thermal properties shall match or exceed the specified thermal insulation properties for the intended usage. Insulation shall be secured with insulation manufacturer's approved tape. All copper piping penetrating CMU walls, shall have continuous insulation through penetration. Copper piping shall not come into direct contact with CMU or mortar.

220019 HANGERS

- A. Hangers for vertical piping shall be the Riser Clamp design and shall conform to MSS SP-58, Types 1 through 58.
- B. Hangers for horizontal piping shall be the Clevis type and shall conform to MSS SP-58, Types 1 through 58.

- C. **Hangers for insulated piping shall extend around the insulation.** Provide 16 gage galvanized steel insulation protection saddles 12" long at each hanger on all insulated lines. At the contractor's option, hangers for insulated piping may be Michigan Hangers Model 4031 or 4041. Insulation Shields shall cover lower 180 degrees of pipe in the case of clevis hangers, and entire circumference of pipe in the case of trapeze hangers or clamps.
- D. Hangers shall be spaced per the NC State Plumbing Code in accordance with the piping material.
- E. A hanger shall be provided within one (1) foot of each bend in horizontal piping. Vertical piping shall be supported at each floor or at intervals not exceeding ten (10) feet.
- F. For piping 4" in diameter and larger, rigid support sway bracing shall be provided at changes in direction greater than 45 degrees.
- G. Hangers shall be fastened by means of threaded rods to steel beam clamps, center of bar joist, center of trusses, or with wood Sammy screws, etc. All hangers shall permit adequate adjustment after erection while still supporting the load. All hanger rods attached to bar joist and trusses shall be install between bottom or top cords of the structural member. Structural members to span from building structure to structure shall be provided by the Contractor.
- H. Hangers SHALL NOT be fastened to joist bridging or roof deck.
- I. Piping supported on a trapeze hanger shall be secured to the trapeze hanger by means of a pipe clamp around the pipe insulation and insulation saddle. Bare piping shall be secured by a pipe clamp and isolated by an isolation cushion.
- J. Piping supported from the floor shall be supported using a base plate securely anchored to the floor and be equipped with a pipe riser. Riser shall be a minimum size of one inch. Horizontal piping above the floor shall be anchored and rest on a manufactured saddle. Piping shall be secured to each saddle as approved by the Engineer.

220020 PIPE SLEEVES, PLATES, ESCUTCHEONS, ETC.

- A. Pipe sleeves shall be standard weight schedule 40 black steel above slab on grade or cast iron below slab on grade. All sleeves shall be equal to construction thickness except that pipe sleeves passing through floors, other than slab on grade, shall extend 3/4" above the finished floor. Pipe sleeve sizes shall be sized two pipe sizes larger than piping passing thru the sleeve.
- B. Piping thru non-fire rated walls, floors above slab on grade or ceilings, piping passing through foundation walls, and piping installed below structural footings shall have sleeves installed concentric and centered on pipe. Ream all sleeves to prevent cutting of piping. The Contractor shall furnish shop drawings to the general contractor and the Architect showing location, dimensions, and sizes of holes required. Sleeves on piping passing through foundation walls shall extend 6" beyond wall footing on both sides. Sleeves on piping installed below structural footings shall extend beyond footing as indicated on contract drawings.
- C. Install escutcheons snug against room finish on all exposed pipe passing through walls, floors above slab on grade or ceilings. Use cup type escutcheons at floors where sleeves extend above finished floors. Escutcheons shall be chrome plated steel with spring clip.
- D. Sleeves for insulated piping shall be large enough to allow the insulation to pass thru sleeve unbroken.

- E. Core drill openings for all floor openings may be utilized in lieu of sleeved openings. All openings shall be sized two pipe sizes larger than pipe passing thru the opening. All cored openings shall be fireproofed as required and shall be made water tight.
- F. All penetrations in rated floors, firewalls and any other rated separations shall be protected using a through-penetration firestopping method with an "F" rating equivalent to the rating of the membrane being penetrated for particular piping materials used and membrane construction type. Floor penetrations shall additionally have a "T" rating equivalent to the rating of the floor being penetrated. Through-penetration firestop systems shall be installed and tested in accordance with ASTM E814 or UL 1479 with a minimum positive pressure differential 0.01 inch w.g. All openings through horizontal fire separations shall be protected by Metacaulk U.L. Systems or approved U.L. listed system by other manufacturers.
- G. All openings through floors and vertical fire separations shall be protected by combination water seal and fire stops as manufactured by HoldRite, or approved equal by Proset, Metacaulk, or 3M.

220021 PLUMBING SYSTEM IDENTIFICATION

- A. All piping in the building shall be identified by snap-on pipe markers or secured with two zip ties. Markers shall have ANSI colored letters at ANSI height on ANSI colored background with flow arrows and shall be located at 10' on center along pipeline, at each tee branch and at each floor/wall penetration, both sides. A pipe marker shall be located adjacent to each valve. Pipe identification markers shall comply with ANSI A13.1 and be Custom MS-790 as manufactured by Marketing Service Incorporated or approved equal Steton, Emed or DuraLabel. Stenciling of piping and/or insulation is not acceptable. Wording on markers shall be as follows where more stringent than ANSI Standards:
 - 1. Cold Water
 - 2. Hot Water
 - 3. Hot Water Return
 - 4. Waste
 - 5. Vent
 - 6. Fuel Gas (with pressure noted)
 - 7. Condensate
- B. Engraved plastic laminate signs for listed plumbing equipment shall be 1/16 inch thick and be secured with self-tapping stainless steel screws. Plastic laminate face color shall be red for all emergency applications and black for all other uses. Background color shall be white. Signage for all equipment, etc., shall show equipment or service identification, capacity, final date of acceptance for equipment item and warranty information. Signage shall be provided for the following items:
 - 1. Water Heaters
 - 2. Sump pumps
 - 3. Circulator pumps

220022 PROTECTION OF WORK AND EQUIPMENT

- A. It is imperative that waste and vent lines not be filled with concrete, concrete grindings, sand, gravel, or other foreign matter. Under no circumstances shall any line be left open while the Contractor's workers are not on the job site.
- B. Plug each opening of waste and vent lines the same day it is installed with test plug securely held in place.
- C. All floor drains and hub drains shall be covered immediately after installation.

- D. The Contractor shall be responsible for all work damaged by him/her. Any plumbing work damaged by any other contractor shall be replaced by the Contractor and placed in perfect working condition without extra cost to the Owner. All fixtures and fittings shall be adequately protected before, during and after installation.
- E. The Contractor shall be responsible for all plumbing fixtures at time of final inspection. Any broken fixtures will be replaced by the Contractor at no cost to the owner regardless of by whom the fixture was broken.

220023 TESTING

- A. The Contractor shall notify the Engineer forty-eight (48) hours in advance of all tests. The Contractor shall make all necessary preliminary tests to insure a tight system. Any joint found to leak under test shall be broken, cleaned and remade.
- B. All tests shall be applied before any work is concealed or covered in any manner.
- C. All sanitary waste, vent, and condensate drainage piping shall be tested in the following manner: Plug all openings and fill entire waste and vent system to overflow with water and sustain a constant level for a minimum period of three hours. All portions of the floor system shall be tested under a minimum of a 10-foot head including roof vent terminal.
- D. All water piping, hot and cold shall be made tight under a hydrostatic test pressure of 150-lbs. per square inch and maintained without pressure loss for a minimum of four (4) hours. No caulking of joints will be permitted. Any joint found to leak under this test shall be broken, remade and a new test applied.
- E. All backflow preventers shall be tested and certified by an approved and licensed backflow prevention company.
- F. All fuel gas piping shall be tested by applying an air pressure of 100-lbs. per square inch and shall be maintained for minimum of eight (8) hours. Air receivers shall be charged with peppermint for odor test and any indication of leakage will be checked by applying a soap and water solution at each joint to determine leaking joint. Test shall be conducted using an eight inch pressure-temperature recorder with a pressure range of 0-150-psi with a 24 hour recording time. Pressure measuring elements shall be heat treated to prevent hysteresis-related inaccuracies. The original chart with copies shall be included in the "Owners and Operating Manuals.
- G. The Contractor shall furnish all necessary equipment, materials and labor to perform the above-specified tests.

220024 STERILIZATION

- A. All new water piping shall be charged with a chlorine solution containing not less than 50-ppm available chlorine. The solution shall remain in the piping for a minimum period of 6 hours, during which time valves shall be opened and closed to permit a small flow of the solution. At the end of the six (6) hours, the solution shall be tested and must contain a residual of at least 5 to 10 ppm chlorine. The system shall then be drained and flushed to provide satisfactory potable water before final connection is made to the existing distribution system.
- B. The Contractor shall contract with an independent Testing Laboratory for a certification letter that the system sterilization meets or exceed standards for potable water.

220025 PLACING IN SERVICE

- A. Upon completion of the entire system installation, the entire system and all equipment shall be tested by actual operation to provide that it will function as intended.
- B. The Contractor shall flush all waste piping prior to final connection to existing system, to ensure that no foreign materials are in these lines, and that a continuous flow of water and waste can be affected.
- C. The Contractor shall flush all water piping prior to the connection of flush valves, mixing valves, and faucet aerators to provide a clean and operational water system.
- D. The Contractor shall place the entire system in a satisfactory operating condition and shall furnish all assistance and instructions required by the Owner's representative during initial operating period. The Contractor shall acquaint the Owner's representative with the special parts required for the operation of the flush valves furnished and installed on the project.
- E. It is the Contractor's responsibility to turn over to the owner all fixtures and floor drains in a clean condition.

220026 PAINTING

- A. The Contractor should note that plumbing piping may be exposed in various areas. The contractor should specifically note that all exposed cast iron piping be uncoated.
- B. All exposed plumbing pipe and plumbing pipe insulation in areas other than mechanical rooms shall be left clean and free from oil ready for painting by the General Contractor. All finished painting will be by the General Contractor with colors to match the surrounding areas.
- C. All exposed gas piping exposed to the exterior and exposed in mechanical rooms shall be cleaned of all rust and painted with one (1) coat of rust inhibitor primer and two (2) coats of oil base Yellow paint.

220027 ELECTRICAL WIRING

- A. The Electrical Contractor shall furnish and install all disconnects and motor starters and circuitry. Plumbing Contractor shall make all final electrical connections to equipment provided under Division 22. See Electrical Drawings.
 - 1. EXCEPTION: Plumbing Contractor shall provide Aquastat(s) as indicated on Contract Drawings and in "CONTROLS" section of Division 22 specifications. The Plumbing Contractor shall be responsible for Aquastat wiring connections.

220028 CONTROLS

- A. General:
 - 1. Furnish and install an electric control system to fulfill the intent of the drawings and specifications. The system shall include all necessary labor, materials, electrical wiring and devices for a complete installed control system.
 - 2. **The Controls Contractor will provide a DDC-controlled circuit in the Mechanical Room. The Contractor shall connect at this point and provide water heating system controls as here in after specified.**
 - 2. ~~The Plumbing Contractor shall provide a 120-volt, 24-hour, 7-day programmable time clock, and wire the time clock to the hot water circulation pump. Time clock shall be located in the same room as the circulation pump.~~

3. All electric wiring in connection with the temperature controls and all interlock wiring shall be furnished under this section of the specifications. The wiring shall be installed by licensed electricians employed by Contractor in strict accordance with all local, State, and National Codes. All control and interlock wiring whether line or low voltage shall be run in EMT conduit or as specified under the electrical section of these specifications. Installation of all concealed conduit shall be coordinated with contractor for general construction so it may be installed before slabs are poured or walls are erected.
 4. The control diagrams indicated on the drawings and specified herein show the intended sequences of operation of the various control systems and shall be followed as closely as practicable.
- B. Temperature Sensing Devices:
1. Strap-on Aquastat shall have an adjustable range and be mounted directly on the building hot water recirculating line. Aquastat shall be set to 105°F.
 2. Each water heater shall be equipped with an integral adjustable thermostat.
- C. Sequence of Operation:
1. **The DDC-controlled circuit shall energize the power to the circulator pump wiring circuit.**
~~The programmable time clock shall energize the power to the circulator pump wiring circuit.~~
- D. Instructions and Diagrams:
1. The Contractor shall provide to the owner a complete instruction manual covering the function and operation of all control components. The manual shall also contain a schematic drawing of each control system properly marked and keyed with the equipment list to identify each item of control equipment.
 2. The Contractor shall also provide a complete schematic control diagram framed under glass and mounted on the wall in the equipment room.

220029 OPERATING AND MAINTENANCE MANUAL

- A. All operation and maintenance manuals **shall** be delivered by the Contractor to the Owner thru the Architect. The manuals **shall** be installed in 3-ring hard cover heavy duty notebooks with the name of the project and the words "**Operation and Maintenance Manual**" permanently affixed to the cover and spine. All items for the project shall be separated by identification tabs correlated to the index. The manuals **shall** contain the following items as a minimum:
1. Index and page number.
 2. Certificate of substantial completion.
 3. A summary sheet of warranties with dates noted and a copy of all warranties.
 4. List of subcontractors and suppliers with names, addresses, and phone numbers.
 5. Water Line test data for sterilization.
 6. Backflow preventer certificate of operation.
 7. Complete start-up, operation, and shutdown procedures for each system including sequence of events, locations of switches, emergency procedures, and any other critical items
 8. Lubrication schedules and types of lubricants.
 9. Complete set of current shop drawings and equipment description showing all capacities and other operation conditions.
 10. Equipment summary showing all capacities and ratings (HP, KW, etc.).
 11. Operation manuals, installation manuals, and parts list for all installed equipment.
 12. All submittal data indexed with tabs and shop drawings.
- B. One copy shall be manufacturer's original published literature with manufacturer's name on all items.
FAXED COPIES WILL NOT BE ACCEPTABLE.

220030 AS BUILT DRAWINGS

- A. The General Contractor and Plumbing Contractor shall maintain, during construction, a set of drawings from the original construction set marked up to show the work as installed, including dimensions to and elevations of buried work. Coordination drawings shall not be considered to be As Built drawings. Both Contractors shall initial and date all changes to the contract drawings. The Architectural Observer may check this set of documents monthly for compliance. Upon completion of the work, return this set of drawings to the Architect.

220031 FIXTURES

- A. All exposed piping and metal parts shall be chrome plated. Slip joints will not be permitted except on fixture side of trap. Rigid supplies are specified for fixtures and it is intended that they be installed true and plumb from fixture to wall rough in. Connections for water closets shall be made by use of flanges compatible to waste piping materials and verminproofed wax gaskets.
- B. **MANUFACTURER'S MODEL NUMBERS ARE PROVIDED FOR GENERAL INFORMATION ONLY.** Description of product shall take precedence over model numbers.
- C. All water closets shall flush properly when flushing with 25 PSIG at the flush valve.
- D. All floor drains and mop receptors shall have deep seal cast iron P-trap installed below floor as a separate item.
- E. All floor-mounted water closets shall be set and grouted with white grout between floor and closet base.
- F. All wall-hung fixtures shall be sealed between wall and fixture with white "G.E. Silicone Seal" caulking.
- G. All counter mounted fixture rims shall be sealed with clear "G.E. Silicone Seal" caulking.

WC-1 **WATER CLOSET:** (Adult ADA) 16-1/2" high, floor mounted, vitreous china, elongated siphon jet water saver 1.28 GPF bowl with 1-1/2" top spud, china caps, American Standard No. 3461.001, or approved equal by Kohler, **Sloan** or Zurn. Flush valve with 1" screwdriver angle check stop, vandal resistant stop cap, ADA flush handle, vacuum breaker, 1" chrome plated wall supply cover pipe, chrome plated cast brass escutcheon with set screw, 1-1/2" chrome plated flush pipe, Sloan No. 111-1.28YK or approved equal by Zurn or American Standard. White moltex open front seat with concealed stainless steel check hinge, less cover, American Standard 5901.100, Church No. 9500CT, Centoco 1500CCSS Bemis 1955SSCT, or Benekee 527. Contractor should note flush valve rough-in height as shown on the drawings. Flush valve handle shall be roughed in and mounted to the wide side of the toilet stall.

L-1 **LAVATORY:** (Adult ADA) 20" by 18" acid resistant enameled cast iron with 4" center set punching, back ledge, wall hanger, front overflow shall be Commercial Enameling 553 or approved equal by Zurn, **Sloan** or Kohler. Chrome plated, lead free, metering faucet with dual push buttons and 0.5 GPM vandal resistant aerator shall be Zurn Z86500-XL-3M, or approved equal by Delta, or Moen. Thermostatic lead free mixing valve with locking set point, 3/8" inlet check stops, 3/8" outlet, shall be installed under the lavatory to supply 110 F tempered water to the faucet. Mixing valve shall conform to ASSE 1070 or CSA B125.3 and shall be Watts Model LFUSG-B or approved equal by Combraco or Heatguard. A bronze lead free body strainer with stainless steel strainer shall be installed between the stop and the mixing valve. Chrome plated lead free angle stops with loose key handle and 1/2" chrome plated nipple to wall and escutcheon with set screw shall be McGuire or approved equal by Zurn or Brasscraft. Stainless steel braided flexible supplies shall be as manufactured by McGuire or approved equal by Brass Craft, Watts. Chrome plated cast brass strainer with open grid, overflow openings, cast brass

locknut and 1-1/4" 17 gauge tailpiece shall be McGuire, Zurn, or Engineered Brass Company. 1-1/4" by 1-1/2" chrome plated adjustable cast brass P-trap with 1-1/4" slip in inlet, cleanout, ground joint, 1-1/2" I.P.S. outlet, shall be McGuire, Zurn, or Engineered Brass Company. 1-1/2" chrome plated nipple to wall with escutcheon and setscrew shall be McGuire, Zurn, or Engineered Brass Company. Chair carrier with floor anchor plate, upright supports, and bearing plate shall be Zurn Model Z-1224, J. R. Smith Model 0800, or approved equal by Watts. Lavatory shall be mounted at height as shown on the drawings. Lavatory supplies and trap shall be protected by A.D.A. approved premolded insulation assembly as manufactured by Truebro, McGuire or Mainline.

- L-2 LAVATORY: (Adult ADA) 20" by 18" acid resistant enameled cast iron with 4" center set punching, back ledge, wall hanger, front overflow shall be Commercial Enameling 553 or approved equal by Zurn, **Sloan** or Kohler. Single lever, chrome plated, lead free supply faucet with 0.5 GPM vandal resistant aerator shall be Zurn Z7440-XL-FC, or approved equal by Chicago Faucets, Delta, or Moen. Thermostatic lead free mixing valve with locking set point, 3/8" inlet check stops, 3/8" outlet, shall be installed under the lavatory to supply 110 F tempered water to the faucet. Mixing valve shall conform to ASSE 1070 or CSA B125.3 and shall be Watts Model LFUSG-B or approved equal by Combraco or Heatguard. Chrome plated lead free angle stops with loose key handle and 1/2" chrome plated nipple to wall and escutcheon with set screw shall be McGuire or approved equal by Zurn or Brasscraft. Stainless steel braided flexible supplies shall be as manufactured by McGuire or approved equal by Brass Craft, Watts. Chrome plated cast brass strainer with open grid, overflow openings, cast brass locknut and 1-1/4" 17 gauge tailpiece shall be McGuire, Zurn, or Engineered Brass Company. 1-1/4" by 1-1/2" chrome plated adjustable cast brass P-trap with 1-1/4" slip in inlet, cleanout, ground joint, 1-1/2" I.P.S. outlet, shall be McGuire, Zurn, or Engineered Brass Company. 1-1/2" chrome plated nipple to wall with escutcheon and setscrew shall be McGuire, Zurn, or Engineered Brass Company. Chair carrier with floor anchor plate, upright supports, and bearing plate shall be Zurn Model Z-1224, J. R. Smith Model 0800 or approved equal by Watts. Lavatory shall be mounted at height as shown on the drawings. Lavatory supplies and trap shall be protected by A.D.A. approved premolded insulation assembly as manufactured by Truebro, McGuire or Mainline.

- SK-1 COUNTER SINK: (ADA) 14" x 14" x 4-3/8" deep bowl single compartment (16-1/2" x 16-1/2" overall), 18-gauge, type 304 (18-8) nickel bearing stainless steel undermount sink with sound deadening applied to under side shall be Elkay ELUHAD141445 customized with front overflow or approved equal by Just or Advance Tabco. Stainless steel crumbcup strainer with 1-1/2" offset tailpiece shall be Elkay LKAD35 or Just J-ADA-35 GR or approved equal by Advance Tabco. Hot and cold water supply faucet with replaceable ceramic disk cartridge, 9-1/2" restricted swing L type spout, 1.5 GPM vandal resistant laminar flow aerator, 4" vandal resistant wristblade handles, lead content equal to 0.25% by weighted average, Chicago No. 786-LR9E35V317XKAB, or approved equal by Delta or Zurn. Thermostatic lead free mixing valve with locking set point, 1/2" inlet check stops, 1/2" outlet, shall be installed under the sink to supply 120 F tempered water to the faucet. Mixing valve shall be ASSE 1017 approved and shall be Watts Model LF1170-US-M2 or approved equal by Combraco or Heatguard. 1/2" sweat x 1/2" compression sink supply stops shall be equipped with 5" extension, wheel handle ball valve angle stops shall be McGuire, Zurn, or Brasscraft. 1-1/2" x 1-1/2" chrome plated adjustable cast brass P-trap with 1-1/2" slip joint inlet, cleanout, and 1-1/2" 17-gauge tube outlet shall be McGuire, Zurn, or Kohler. Install cast brass escutcheons with setscrew on all piping entering base cabinet.

- EWC-1 ELECTRIC WATER COOLER: (Dual Height) Wall mounted, dual height, filtered, vandal resistant, air cooled type cooler with stainless steel anti-splash receptor, stainless steel cabinet, in line 'Y' strainer, anti-squirt dual stream bubbler, automatic stream regulator, push controls on front, hands free bottle water filler, wall hanger, sealed hermetic compressor with capacity of 8-GPH of 50°F drinking water at 90°F room temperature and 80° F inlet water temperature, Elkay

LVRGRNTL8WSK or approved equal by Halsey Taylor or Oasis, factory wired for 115 volt, single phase electrical service. Chair carrier with steel upright support legs, backing plates shall be Zurn Z-1225-BL, or approved equal by J.R. Smith or Watts. The Plumbing Contractor shall furnish the electrical receptacle rough-in dimensions to the Electrical Contractor to provide for a concealed electrical service to the unit. Plumbing Contractor shall provide PVC P-trap the same size as the electric water cooler drain. Wheel handle lead free stop valve shall be McGuire LF175 or approved equal. Plumbing Contractor should note that spout should be set at height as shown on the drawings.

EWC-2 ELECTRIC WATER COOLER: (Dual Height) Wall mounted, dual height, filtered, vandal resistant, air cooled type cooler with stainless steel anti-splash receptor, stainless steel cabinet, in line 'Y' strainer, anti-squirt dual stream bubbler, automatic stream regulator, push controls on front, wall hanger, sealed hermetic compressor with capacity of 8-GPH of 50°F drinking water at 90°F room temperature and 80° F inlet water temperature, Elkay LVRGRNTL8C or approved equal by Halsey Taylor or Oasis, factory wired for 115 volt, single phase electrical service. Chair carrier with steel upright support legs, backing plates shall be Zurn Z-1225-BL, or approved equal by J.R. Smith or Watts. The Plumbing Contractor shall furnish the electrical receptacle rough-in dimensions to the Electrical Contractor to provide for a concealed electrical service to the unit. Plumbing Contractor shall provide PVC P-trap the same size as the electric water cooler drain. Wheel handle lead free stop valve shall be McGuire LF175 or approved equal. Plumbing Contractor should note that spout should be set at height as shown on the drawings.

EWC-3 ELECTRIC WATER COOLER: (Single, Standing Height per ADA) Wall mounted, single height, filtered, vandal resistant, air cooled type cooler with stainless steel anti-splash receptor, stainless steel cabinet, in line 'Y' strainer, anti-squirt dual stream bubbler, automatic stream regulator, push controls on front, hands free bottle water filler, wall hanger, sealed hermetic compressor with capacity of 8-GPH of 50°F drinking water at 90°F room temperature and 80° F inlet water temperature, Elkay VRCGRN8WSK or approved equal by Halsey Taylor or Oasis, factory wired for 115 volt, single phase electrical service. Chair carrier with steel upright support legs, backing plates shall be Zurn Z-1225, or approved equal by J.R. Smith or Watts. The Plumbing Contractor shall furnish the electrical receptacle rough-in dimensions to the Electrical Contractor to provide for a concealed electrical service to the unit. Plumbing Contractor shall provide PVC P-trap the same size as the electric water cooler drain. Wheel handle lead free stop valve shall be McGuire LF175 or approved equal. Plumbing Contractor should note that spout should be set at height as shown on the drawings.

EWC-4 ELECTRIC WATER COOLER: (Single, Wheelchair Height per ADA) Wall mounted, single height, filtered, vandal resistant, air cooled type cooler with stainless steel anti-splash receptor, stainless steel cabinet, in line 'Y' strainer, anti-squirt dual stream bubbler, automatic stream regulator, push controls on front, hands free bottle water filler, wall hanger, sealed hermetic compressor with capacity of 8-GPH of 50°F drinking water at 90°F room temperature and 80° F inlet water temperature, Elkay VRCGRN8WSK or approved equal by Halsey Taylor or Oasis, factory wired for 115 volt, single phase electrical service. Chair carrier with steel upright support legs, backing plates shall be Zurn Z-1225, or approved equal by J.R. Smith or Watts. The Plumbing Contractor shall furnish the electrical receptacle rough-in dimensions to the Electrical Contractor to provide for a concealed electrical service to the unit. Plumbing Contractor shall provide PVC P-trap the same size as the electric water cooler drain. Wheel handle lead free stop valve shall be McGuire LF175 or approved equal. Plumbing Contractor should note that spout should be set at height as shown on the drawings.

MR-1 MOP RECEPTOR: 24" x 24" x 12" deep terrazzo receptor with three corners, dropped threshold with stainless steel cap, 3" inside caulked drain, stainless steel strainer, Fiat Model TSBC1610, or approved equal by Williams or Mustee. Wall mounted, polished chrome plated supply faucet with top brace, vacuum breaker, integral screwdriver shank check stops, 3/4" hose

end, T&S B-0665-BSTP or approved equal by Chicago Faucets or Moen. Heavy duty, cloth reinforced rubber hose and hose hook, Fiat Model 832-AA, Williams Model T-35, or Mustee Model 65.700. Wall mounted, 24" long, 3 mop spring clip hanger, Fiat Model 889-CC, Williams Model T-40, or Mustee Model 65.600. Stainless steel wall guards with corner bracket shall be Fiat Model MSG 2424 or approved equal Williams, or Mustee 67.2424. Supply faucet outlet shall be mounted 24" above receptor floor. Contractor should note that joint between receptor, wall and floor should be sealed with clear silicone sealant.

- FD-1 FLOOR DRAIN: Cast iron body drain with 3" outlet to match piping system, 6" square nickel bronze heelproof top, vandal resistant securing screws with flashing device, Zurn ZN415S-VP, or approved equal by Josam, J. R. Smith, Wade, or Watts. Install 3" in-line floor drain trap seal, ABS plastic housing with EPDM rubber diaphragm and soft rubber sealing gasket, conforming to ASSE 1072, as a separate item.
- HB-1 HOSE BIBB: Wall mounted, polished chrome plated brass with 3/4" vacuum breaker hose end, locking shield, tee handle, 1/2" inlet wall flange, Woodford Model 26P-1/2, Mifab MHY-9240, T & S Brass B-0702/B-972 or Preir C-257CP.50.
- CB-1 ICE MAKER CONNECTION BOX: Fully recessed unit with lead free cold water shut-off valve, compression nut and ferrule as shall be LSP Products Group model OB-801, IPS Corporation model AB9700 or approved equal Oatey Company.
- WH-1 WATER HEATER (SOUTH): Factory assembled electric 20-gallon storage type heater shall be equipped with glass lined steel tank, ASME pressure temperature relief valve, magnesium anode rod, tank drain with hose connection, ASHRAE/IESNA 90.1 insulated factory applied baked enamel finish jacket, single bolt-in, 2,500-watt immersion element and control box. Heater shall be controlled by immersed bulb thermostat and be equipped with high limit temperature control, control box, transformer, contactors and junction box. Control circuits shall be a maximum of 120-volts. Heaters shall be U.L. approved and shall carry 3-year factory warranty. Heater shall be factory wired for 208-volt, single-phase electrical service as shown on the plans and shall be A.O. Smith DEL-20, or approved equal by State, Bradford White, or Rheem. Water heater shall be started by the manufacturer's factory representative.
- WH-2 WATER HEATER (NORTH): Factory assembled electric 30-gallon storage type heater shall be equipped with glass lined steel tank, ASME pressure temperature relief valve, magnesium anode rod, tank drain with hose connection, ASHRAE/IESNA 90.1 insulated factory applied baked enamel finish jacket, two bolt-in, 6,000-watt immersion elements set to run non-simultaneously (6 kw total) and control box. Heater shall be controlled by immersed bulb thermostat and be equipped with high limit temperature control, control box, transformer, contactors and junction box. Control circuits shall be a maximum of 120-volts. Heaters shall be U.L. approved and shall carry 3-year factory warranty. Heater shall be factory wired for 208-volt, three-phase electrical service as shown on the plans and shall be A.O. Smith DEL-30, or approved equal by State, Bradford White, or Rheem. Water heater shall be started by the manufacturer's factory representative. Water heater shall be supported on shelf, see detail on Contract Drawings.

220032 GUARANTEE

- A. Guarantee: The Contractor shall guarantee the entire plumbing system subject to the General Conditions of these specifications.

220033 BIDDING PROCEDURE

- A. The Contractor shall provide bidding for Alternate Bids in accordance with Division 1. Contractor shall refer to Division 1 for any required unit prices and allowances.

END OF SECTION 220000

SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. Furnish and install an electric control system to fulfill the intent of the drawings and specifications. The systems shall include all necessary controllers, software, graphics, labor, electrical wiring, BAS communication buss wiring, DDC controllers, building controllers, sensors, devices, and materials for a complete installed DDC BAS control system.
- B. Controls shall be BACnet protocol controllers and devices connecting to and communicating with Niagara N4 JACE(s) with no proprietary software or licenses including graphics and user interfaces. Software and equipment to be latest version.
- C. System architecture shall be fully modular permitting expansion of application software, system peripherals, and field hardware.
- D. System architecture shall provide secure Web access using MS Internet Explorer or as necessary from any computer connected to the building's network.
- E. BAS graphics shall reside on the building controller. Graphics shall be appropriate for the systems installed and as customary for BAS systems. Graphics shall be Web based viewable and manipulatable through graphical user interface through network connection via the appropriate level of password access control.
- F. If any system or product specific software or licenses are required to access the controllers/programming and requires an annual fee for the software/licenses, the controls contractor shall supply five (5) licenses to the Owner. These five (5) licenses shall be upgraded every year by the vendor as not to expire, all licenses shall be upgraded when new versions or firmware are released. The vendor shall maintain all product and software support for each copy. This term will last for as long as the software is supported by the manufacturer.
- G. The control system shall be erected, assembled, and installed by factory-trained mechanics regularly employed by the control provider or manufacturer's authorized distributor as a subcontractor to the Heating and Air Conditioning Contractor. All equipment, unless specified to the contrary, shall be fully proportional and shall be the product of the control manufacturer.
- H. As referred to in this specification, Contractor, Controls Contractor, and BAS Contractor are the same Contractor.
- I. The control diagrams indicated on the drawings or specified herein show the intended sequences of operation of the various control systems and shall be followed as closely as practicable. All required devices and control schemes may not be shown on the drawings. It is the Contractor's responsibility to provide all devices and control schemes whether shown or not.
- J. Additional General Requirements for Controls:
 - 1. All material and equipment used shall be standard components and software, regularly manufactured and available, and not custom designed especially for this project.

2. All wiring, conduit, and panels for all temperature controls.
3. Power required for controls shall be provided by the Controls Contractor from points coordinated with the Electrical Contractor.
4. Perform all wiring in accordance with all local and national codes and Division 26 of these specifications.
5. Surge transient protection shall be incorporated in the design of the system to protect electrical components in all system components as described below under "General Product Description."
6. System modifications necessary to fine-tune sequences during commissioning of systems at no additional cost to the Owner.
7. Mount control devices inside of a UL-listed steel enclosure panel, with hinged locking cover and key locking latch.

K. Wiring and Controls:

1. Control Contractor shall be responsible for the installation and wiring of temperature controls, control interlock wiring, electrical controls and devices in the temperature control system.

1.3 QUALITY ASSURANCE AND STANDARDS

- A. Materials and equipment shall be the cataloged products of manufacturers regularly engaged in production and installation of integrated control systems and shall be manufacturer's latest standard design that complies with the specification requirements.
- B. All products used in this project installation shall be new and currently being manufactured. This installation shall not be used as a test site for any new products. Spare parts shall be available for at least five years after completion of this contract.
- C. Install system using competent workmen who are fully trained in the installation of integrated control systems.
- D. Single source responsibility of Contractor shall be the complete installation and proper operation of the control system and shall include debugging and proper calibration of each component in the entire system.
- E. Contractor shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.
- F. The Contractor and manufacturer representative shall support the installed system for a minimum of 1 year. The support shall provide full material warranty of controllers and 8 hours of on-site training.
- G. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, governing Radio Frequency Electromagnetic Interference and be so labeled.
- H. Design and build all system components to be fault-tolerant.
 1. Satisfactory operation without damage at 110% and 85% of rated voltage and at plus 3-Hertz variation in line frequency.
 2. Static, transient and short-circuit protection on all inputs and outputs.
 3. Protect communication lines against incorrect wiring, static transients and induced magnetic interference.
 4. Network-connected devices to be A.C. coupled or equivalent or that any single device failure will not disrupt or halt network communication.
 5. All real time clocks and data file RAM to be battery-backed for a minimum 72 hours and include local and system low battery indication.
 6. All programs shall retain their memory for a minimum of 7 days upon loss of power.

- I. Comply with NFPA 90A, Standard for Installation of Air Conditioning and Ventilating Systems.
- J. Provide wiring in accordance with NEC requirements and Division 26 of these Specifications.
- K. The system shall enable an open architecture that utilizes ANSI / ASHRAE™ Standard 135-2004, BACnet functionality to assure interoperability between all system components. Native support for the ANSI / ASHRAE™ Standard 135-2004, BACnet protocol are required to assure that the project is fully supported by the HVAC open protocols to reduce future building maintenance, upgrade, and expansion costs.
- L. The contractor shall provide hardware and software components of the same manufacturer wherever possible.
- M. The contractor shall use standard off-the-shelf components and/or products whenever possible. Custom products shall not be used unless approved by Owner prior to the installation.
- N. Materials and equipment shall be catalogued products and shall be manufacturer's latest standard design that complies with the specification requirements. Where multiple units of the same type or function are required for this project, these units shall be products of a single manufacturer.
- O. All equipment shall be manufactured, installed and tested to comply with the acceptance testing requirements specified herein.
- P. Installer's Experience with Proposed Product Line: Firms shall have specialized in and be experienced with the installation of the proposed product line for not less than five years from date of final completion on at least ten (10) projects of similar size and complexity. Submittals shall document this experience with references.
- Q. Installer's Field Coordinator and Sequence Programmer Qualifications: Individual(s) shall specialize in and be experienced with BACnet and Niagara N4 control system installation for not less than five (5) years. Installer shall include a list of qualified employees on staff with specific experience that will be committed to the project. Proposed field coordinator shall have experience with the installation of the proposed product line for not less than five (5) projects of similar size and complexity. Installer shall submit the names of the proposed individual and at least one alternate for each duty. Submittals shall document this experience with references.
- R. Installer's Service Qualifications: The installer must be experienced in control system operation, maintenance and service. Installer must document a minimum five (5) year history of servicing installations of similar size and complexity. Installer must document at least a one year history of servicing the proposed product line. Installer must also provide references and examples of projects that have been completed.
- S. Coordinate with the Owner to ensure that the BAS will perform in the Owner's IT environment without disruption to any of the other activities taking place on that LAN or WAN. Coordinate device IDs with owner to prevent duplication within BAS environment.
- T. Uniformity: To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer.
- U. Installer's Response Time and Proximity:
 - 1. Installer shall have an office, which is staffed with BACnet and network infrastructure trained engineers and technicians fully capable of providing instruction and routine emergency maintenance service on all system components within 24 hours of notification.
 - 2. Installer shall have a service facility within a 150-mile radius of the job site, staffed with qualified service personnel as defined above, fully capable of providing instructions and routine or emergency maintenance service. The Installer must also have qualified staff able to respond to the job site to

insure a response time of one hour or less for all construction and warrantee related issues. Provide evidence of this as a condition of acceptance of bid. Local staff shall be qualified in all aspects related to the BAS control system repair and troubleshooting including, HVAC and mechanical equipment operation, network management, and DDC controller programming and configuration.

- V. Install control devices in accessible location with reasonable working access. Coordinate all control device locations with other trade contractors. Contractor to report to A/E conditions that prevent reasonable accessibility.
- W. Provide weather protection cover or weatherproof control devices where required for control devices located outdoors.
- X. All control devices located outdoors shall be rated for the anticipated environment.

1.4 GENERAL CONDITIONS

A. Correction of Work:

- 1. Contractor's Responsibility: The Contractor shall promptly correct all work the Owner finds defective or failing to conform to the Contract Documents. The Contractor shall bear all cost of correcting such work.
- 2. During Warranty: If, within the warranty period required by the Contract Documents, any of the work is found to be defective in material or workmanship or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of notice from Owner to do so. Owner shall give notice promptly after discovery of the condition. Contractor shall notify owner within 24 hours of proposed corrections and schedule.

B. Coordination of Work During Construction:

- 1. The Contractor shall protect the installed works by other trades.
- 2. The Contractor shall coordinate with other trades.
- 3. The Contractor shall repair any damage caused by his work to building(s) and equipment.
- 4. The contractor shall maintain functionality of all systems throughout the project.

C. Warranty and Service:

- 1. Standard Warranty:
 - a. The Contractor shall warrant the system to be free from defects in material and workmanship per Division 1 of these Specifications. Any defects shall be repaired or replaced, including materials and labor at no cost to Owner.
- 2. Owner reserves the right to make changes to the BAS during the Warranty Period. Such changes do not constitute a waiver of warranty. Contractor shall warrant parts and installation work regardless of any such changes made by Owner, unless the Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the BAS.
- 3. Service Response Requirements During the Warranty Period:
 - a. Emergency Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by the Owner to the Contractor. Emergency service shall be provided 24 hours per day, 7 days per week, and 365 days per year with no exceptions and at no cost to Owner.
 - b. Response by telephone to any request for service shall be provided within two (2) hours of Owner's initial telephone request for service.
 - c. In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to

- be serviced, shall be dispatched to the site within four (4) hours of the initial telephone request for such services, as specified.
- d. Normal Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would not result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by the Owner to the Contractor.
 - e. Response by telephone to any request for service shall be provided within eight (8) working hours (Contractor specified 40 hours per week normal working period) of the Owner initial telephone request for service.
 - f. In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to be serviced, shall be dispatched to the site within three (3) working days of the initial telephone request for such services, as specified.
 - g. At any time during the Warranty Period that Contractor is on Site for maintenance, emergency, or normal service, Contractor shall notify the local building operating personnel. Contractor shall notify said personnel of all work anticipated being involved for the service work. In addition, no work affecting system operation shall commence until express permission is granted. After the work is completed a work order ticket describing in detail all work performed (i.e. hardware replaced or serviced, software or firmware modifications made, etc.), hours worked, follow-up work required, etc., must be signed by an authorized building operator.
 - h. Telephonic Request for Service: Contractor shall specify a maximum of three telephone numbers for Owner to call in the event of a need for service. At least one of the lines shall be attended at any given time at all times. Alternatively, pagers can be used for technicians trained in system to be serviced. One of the three paged technicians shall respond to every call within 15 minutes.
 - i. Technical Support: Contractor shall provide technical support by telephone throughout the Warranty Period.
 - j. Preventive maintenance shall be provided throughout the Warranty Period in accordance with the hardware component manufacturer's requirements.
 - k. In the last month of the Warranty Period, all System software and controller firmware, software, drivers, etc. will be upgraded to the latest release (version) in effect at the end of the Warranty Period.

1.5 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's technical product data for each control device furnished. Indicate dimensions, capacities, performance, electrical characteristics, material finishes; also include installation and start-up instructions.
- B. Shop Drawings: Submit copies of shop drawings for each control system, containing at least the following information:
 - 1. Schematic flow diagram of system showing fans, pumps, coils, dampers, valves, control devices and all interconnections between devices.
 - 2. Indicate all required electrical wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
 - 3. Written description of sequence of operation.
 - 4. Control Drawings: Laminated control Drawings including system control schematics, Sequence of Operation and panel termination Drawings, shall be provided in panels for major pieces of equipment, such as air handling units, chillers, boilers, etc. Drawings should be of sufficient size to be easily read. Terminal unit Drawings shall be located in the central plant equipment panel or mechanical room panel.
 - 5. Control Logic Documentation:

- a. Submit control logic program listings (for graphical programming) and logic flow charts illustrating (for line type programs) to document the control software of all control units. Submit functional temperature control diagrams for each mechanical system served by the BAS. Indicate and tag each input/output served by each ASC or PCU and show locations and functions of BAS.
 - b. Submit logical control diagram indicating points on each controller.
 - c. Control logic shall be annotated to describe how it accomplishes the sequence of operation. Annotations shall be sufficient to allow an operator to relate each program component (block or line) to corresponding portions of the specified Sequence of Operation. Include all control parameters, system variables, and constants that will affect the system operation.
 - d. Include written description of each control sequence.
 - e. Include control response, settings, set points, throttling ranges, gains, reset schedules, adjustable parameters and limits.
 - f. Sheets shall be consecutively numbered.
 - g. Each sheet shall have a title indicating the controller designations and the HVAC system controlled.
 - h. Include Table of Contents listing sheet titles and sheet numbers.
 - i. Submit one complete set of programming and operating manuals for all digital controllers concurrently with control logic documentation. This set will count toward the required number of Operation and Maintenance materials specified below and in Division 01.
6. As Built Drawings. All drawings, documentation and manuals shall be reviewed after the final system checkout and updated or corrected to provide 'as-built' drawings to show exact installation and configuration and programming. The system will not be considered complete until the 'as-built' documentation has received final approval, by owner.
7. Shop Drawings. Shop drawings shall be submitted and shall consist of a complete list of equipment, software, materials, manufacturer's technical literature, cut-sheets, and installation instructions. Drawings shall contain proposed layout, complete wiring, list of I/O points, routing, schematic diagrams, ladder diagrams, communication architecture drawings, tag number of devices, software descriptions, graphical sequence calculations, installation details, control system components, control system schematics, test and verification plan and any other details required to demonstrate that the system will function properly. Shop drawings shall be approved by Engineer and Owner before any equipment is installed.
- C. Number of copies of Product Data and Shop Drawings shall be per Division 1 of these Specifications.
- D. Documentation: Operating and Maintenance (O&M) manuals for the system shall be made available electronically, accessible from the control system JACE, in hard copy and include the following categories: User's Manual, Project Engineering Handbook, and Software Documentation. Submit two (2) copies of system documentation directly after receipt of reviewed shop drawings.
 1. See Section 017823 for requirements for Operation and Maintenance Data, including submittal format, etc.
 2. BAS User's Manual shall contain as a minimum:
 - a. System overview.
 - b. Contractor's name, address, 24-hour telephone number, and job control number. As applicable, also include telephone numbers, and contact names for service during normal hours, service during off-hours, parts ordering, and technical support.
 - c. Name, signature and title of Contractor's representative responsible for preparation of technical manual. Include date of issuance and revision number.
 - d. Warranty information including start and end dates. Coverage's as they pertain to labor, service parts, replacements, etc. Warranty limitations if any exist.
 - e. Alphabetical list of all system components installed as part of this job, including control devices, relays, power supplies, sensors, and accessory items. List manufacturer name and manufacturer's part number, and include the name, address, and 24-hour phone number of the company responsible for servicing and supplying each item during the first year of

- operation or warranty period, whichever is greater. Identify where each replacement part can be purchased by the owner for future replacement.
- f. Include a wiring identification matrix which shows wire color codes and assignments, and labeling definitions.
 - g. Generate a maintenance procedure for all aspects of the system. The procedures shall indicate recommended durations and frequency for each task as well as the means and methods to accomplish each item. This procedure shall include the following minimum requirements:
 - 1) Procedure for updating operating software on the system controllers. This shall include a procedure for obtaining security patches, updates, and network software updates and patches. Coordinate this procedure with the Network Integrator.
 - 2) Calibration routines, frequency, and procedures for all sensors and actuators.
 - 3) Required maintenance for all other system components.
 - h. Include installation and service manuals for each device supplied by the controls contractor as part of this project.
 - i. Include a documented list of every user name and password required to access all aspects of the system. This shall include user names and passwords to gain access and modify the following components but shall not be limited to:
 - j. DDC Controllers.
 - k. Network Electronics.
 - l. Networking concepts.
 - m. Launching a web browser from a networked PC and login.
 - n. Web Browser Graphical User Interface (GUI) screen menus and their definitions.
 - o. Creating, modifying or deleting schedules.
 - p. Uploading and downloading software to the field hardware.
 - q. Creating historical trends, collecting trend data and generating trend graphs.
 - r. Enabling and assigning alarms and messages to reporting actions/groups.
 - s. Report generation and 'third party software'.
 - t. Backing up software and data files.
 - u. Creating, modifying or deleting control loop logic.
3. Project Engineering Manual shall contain as a minimum:
- a. System architecture overview and networking configuration.
 - b. Hardware cut-sheets and product descriptions.
 - c. The BAS Contractor shall deliver 'as-built' drawings and written sequences of operation in accordance with Division 1 that reflect final assigned device and room numbers. All drawings shall be reviewed after the final system checkout and updated to provide 'as-built' drawings. The system will not be considered complete until the 'as-built' drawings have received their final approval.
 - d. Include the following as-built drawings as a minimum. All drawings requested shall be updated to include field modifications and change orders. The drawings shall be printed on 11x17 sheets, folded to 8.5 x 11, and included in the binder.
 - 1) All submittal drawings updated to include field modifications and change orders, and all information requested below:
 - a) Functional temperature control diagrams for each mechanical system served by the BAS. Indicate and tag each input/output served by each ASC or PCU.
 - b) Floor plans indicating the exact installed location of the following equipment and/or devices:
 - i. All control panels and miscellaneous control devices.
 - ii. All network controllers, Web Server, and operator workstations.
 - iii. Indicate all communications / network wiring between control devices.
 - iv. Indicate all BAS FACLAN wiring.
 - v. All major BAS integrated equipment (i.e. Air Handlers, Boilers etc.)

- 2) Additional drawings to include:
 - a) Legend of all symbols, line types, and abbreviations used.
 - b) Wiring details for any device wiring or interconnection that varies from accepted industry practices or for which none exist.
 - c) Logical program flow diagram for every programmable controller. Flow diagrams shall be developed and designed in accordance with industry standards and shall indicate the natural flow of the control software. Flow charts shall clearly indicate each source line or program block of programming code.
- e. Installation, mounting and connection details for all field hardware and accessories.
- f. Commissioning, setup and backup procedures for all control modules/accessories, BAS server software, and database.
- g. Listing of basic terminology, alarms/messages, error messages and frequently used commands or shortcuts.
4. BAS Software Documentation shall contain as a minimum:
 - a. The Contractor shall provide all Graphical Programs, detailing their application to specific HVAC equipment and electrical/mechanical subsystems, together with a glossary or icon symbol library detailing the function of each graphical icon. Revisions made as a result of the submittal process, during the installation, start-up or acceptance portion of the project, shall be accurately reflected in the "as-builts".
 - b. Graphical representation of the mechanical equipment hierarchy for the project including all equipment controlled by the BAS. For example: a VAV terminal box may be the source for increased cooling demand and require the primary VAV AHU to operate which, in turn, requires the chillers to operate.
 - c. Detailed listing of all alarm and event messages programmed for designated mechanical/electrical equipment and required operator action.
- E. On Site Documentation:
 1. At each field controller provide a laminated diagram, showing all connected control points, point naming, and system name.
 2. At building main controller provide laminated diagram of entire controller network. Include device name, and room location.
 3. Provide manual for local users describing method to access, monitor and schedule systems operation.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Provide equipment and control devices in factory shipping carton. Maintain in cartons while shipping, storing and handling as required to prevent equipment damage and to keep dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Building controls, controllers, and communications between devices shall be provided as necessary to achieve specified sequences of operation.
- B. Controls Contractors shall be Tridium factory authorized agent or dealer of control hardware and controls system interface. The controls contractors' principal business shall be providing building automation

systems. Bids by contractors, franchised dealers, wholesalers, or any other firm whose principal business is not that of manufacturing, or installing building automation systems, shall not be acceptable.

2.2 BAS SYSTEM HARDWARE

2.2.1 BAS SERVER HARDWARE

- A. Computer Configuration (Hardware Independent):
 - 1. Central Server: Dedicated BAS server, if necessary, shall be furnished by the Control System Contractor.
- B. Standard Client: The thin-client Web Browser BAS GUI shall be Microsoft Internet Explorer (8.0 or later) running on Microsoft Windows 7. No special software shall be required to be installed on the PCs used to access the BAS via a web browser.

2.2.2 BUILDING LEVEL SUPERVISORY CONTROLLER (JACE):

- A. These controllers contain the Niagara N4 framework. These controllers are designed to manage communications between the General Purpose Multiple Application Controllers, General Purpose Single Application Controllers, and Unitary Controllers which are connected to its communications trunks, manage communications between itself and other JACE(s) and with any operator workstations (OWS) that are part of the BAS, and perform control and operating strategies for the system based on information from any controller connected to the BAS.
- B. The communication protocols utilized for peer-to-peer communications between Building Level Supervisory Controllers will be Niagara N4 and BACnet TCP/IP. Use of a proprietary communication protocol for peer-to-peer communications between Building Level Supervisory Controllers is not allowed.
- C. Building Level Supervisory Controller must provide the following hardware features as a minimum:
 - 1. One Ethernet Port-10/100 Mbs
 - 2. One RS-232/485 port
 - 3. One BACnet Interface Port.
 - 4. Battery Backup for JACE soft shutdown
 - 5. Flash memory for long term data backup
 - 6. 256 Megabyte Ram memory
 - 7. Firmware Updates: The Building level supervisory controllers shall allow firmware updates to be performed remotely
 - 8. Provide Uninterruptible Power Supply (UPS) capable of sustaining 30 minute utility power failure.

2.2.3 STANDALONE CONTROLLERS

The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing the BACnet protocol and products, technology communication protocol in one open, interoperable system.

- A. General Purpose Multiple Application Controllers:
 - 1. General Purpose Multiple Application controllers must use BACnet as the native communication protocol between controllers.
 - 2. General Specification. Each General Purpose Multiple Application Controller must be capable of standalone direct digital operation utilizing its own processor, non-volatile flash memory, input/output, and voltage transient and lightning protection devices. All non-volatile flash memory shall have a battery backup. Firmware revisions to the module shall be made from the BAS server

- or remotely over the Intranet or Internet. Controllers that require component changes to implement firmware revisions are NOT acceptable.
3. Point Programming. All point data, algorithms and application software within a controller shall be custom programmable. Program Execution. Each General Purpose Multiple Application Controller shall execute application programs, calculations, and commands via a microcomputer resident in the controller. All operating parameters for application programs residing in each controller shall be stored in read/writable nonvolatile flash memory within the controller and will be able to upload/download to/from the BAS.
 4. Self-Test Diagnostics. Each controller shall include self-test diagnostics, enabling the controller to report malfunctions to the BAS. Building level supervisory controller.
 5. PID Loops. Each General Purpose Multiple Application Controller shall contain both software and firmware to perform full DDC Proportional, Integral, Derivative (PID) control loops and programs.
 6. Digital Outputs shall be relays, or solid state switching 24 Volts AC or DC maximum, 3 amp maximum current. Each configured as normally open or normally closed
 7. Universal Inputs shall be industry standard thermistors, RTD, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, 0-5vdc, dry contact - 0.5mA maximum current.
 8. Analog Output shall be electronic, voltage mode 0-10VDC or current mode 4-20mA.

B. General Purpose Single Application Controllers:

1. The General Purpose Single Application Controllers must use BACnet as the native communication.
2. General Specification: General Purpose Single Application controllers must be capable of stand-alone DDC operation utilizing its own processor, nonvolatile flash memory, input/output, and voltage transient protection devices. Firmware revisions to the module shall be made from the Building level supervisory controller or remote locations over the Internet. Controllers that require component changes to implement Firmware revisions are NOT acceptable.
3. Point Programming: All point data, algorithms, and application software within the controllers shall be custom programmable.
4. Program Execution: Each General Purpose Single Application Controller shall execute application programs, calculations, and commands via a microcomputer resident in the controller. All operating parameters for the application program residing in each controller shall be stored in read/writable nonvolatile flash memory within the controller and will be able to upload/download to/from the Building level supervisory controller.
5. Self-Test Diagnostics: Each controller shall include self-test diagnostics, enabling the controller to report malfunctions the Building level supervisory controller.
6. PID Loops: Each General Purpose Single Application Controller shall contain both software and firmware to perform full DDC PID control loops.
7. Rooftop Mounting. The General Purpose Single Application Controllers shall be capable of being mounted directly in or on rooftop AHU equipment.
8. Operating Temperature. The General Purpose Single Application Controllers shall be capable of proper operation in an ambient temperature environment of -20°F to +150°F. (-28.9° to 65.6°C.).
9. Input-Output Processing:
 - a. Digital Outputs shall be relays, or solid state switching 24 Volts AC or DC maximum, 3 amp maximum current. Each configured as normally open or normally closed
 - b. Universal Inputs shall be industry standard thermistors, RTD, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, Dry Contact - 0.5mA maximum current.
 - c. Analog Electronic Outputs shall be voltage mode 0-10VDC or current mode 4-20mA.
 - d. Enhanced Zone Sensor Input shall provide a digital display of room temperature and setpoint, setpoint adjustment and push button override with status indicator. The sensor shall provide capability for connection to the controller network for controller programming. Selected locations will have this connection wired.

2.2.4 LAPTOP COMPUTER SERVICE TOOL

- A. Laptop computer service tool shall be new laptop device as necessary with all hardware and current software as necessary to connect to and fully communicate with the control system and devices.
- B. Provide to the Owner two laptop computer service tools for this project.

2.2.5 MOBILE DEVICE

- A. Mobile Device Interface:
 - 1. General Purpose. A graphical interface shall be made available to mobile devices as a way to observe and address alarms, view general graphics and make minor setpoint changes.
 - 2. Interface: The graphics shall be made available for use on Apple or Android technology, as specified by Owner. The display shall utilize English language descriptors rather than cryptic code and a menu penetration technique to access data.
 - 3. Points of Interest. Control interface points for the mobile devices shall include but not be limited to the following:
 - a. Alarms
 - b. Temperature setpoints
 - c. On/off status of equipment in graphical or line based form.

2.3 BUILDING SYSTEMS INTEGRATION

- A. The BAS System shall establish a seamless interconnection with other building, electrical and/or mechanical subsystems that employ the BACnet protocol (Chillers, Variable frequency drives, etc.). These systems shall be controlled, monitored and graphically programmed with the same Graphical Programming Language (GPL) used for all other control modules.
 - 1. OEM Cooperation: Full cooperation by the Original Equipment Manufacturer (OEM) in this open protocol effort shall be a requirement for bidding this project.

2.4 FIELD HARDWARE/INSTRUMENTATION

- A. Provide all remote sensing points and instrumentation as required for the systems.
- B. All sensors, actuators, etc. shall be electronic.
- C. Temperature Sensor:
 - 1. Stem or tip sensitive types.
 - 2. Sensing elements shall be hermetically sealed.
 - 3. Stem and tip construction shall be 304 stainless steel.
 - 4. All external trim material shall be corrosion resistant designed for the intended application.
 - 5. Thermometer wells shall be stainless steel. Heat transfer compounds shall be compatible with the sensors. All piping system sensors shall be installed in thermowells.
- D. Room sensors shall be the following, all in one device:
 - 1. Programmable and application specific room controller.
 - 2. Configurable scheduler.
 - 3. Color display with touchscreen interface.
 - 4. Non-volatile memory.
 - 5. Low voltage.

6. Heating and cooling temperature dual setpoint type, automatic changeover. Temperature accuracy to plus or minus 1 degree F.
 7. Relative humidity sensor with dehumidification control. Single point calibrated polymer type. Accuracy to plus or minus five percent (5%) at 20 to 80% RH.
 8. Night temperature and relative humidity setpoints.
 9. CO2 sensor inputs.
 10. Configurable economizer.
 11. BACnet communication.
 12. All capabilities to satisfy the sequences of operation as specified.
- E. Duct-Mounted Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of $\pm 0.2^{\circ}\text{C}$. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F. The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, duct-mounted sensors shall be bendable averaging duct sensors with a minimum 8 - foot long sensor element. These devices shall have accuracy of 0.5 degrees, F., over the entire range.
- F. Sensors used for mixed air applications shall be the averaging type and have an accuracy of $+1^{\circ}\text{F}$. (0.5°C). Sensors shall be of adequate length to accurately measure average temperature of coil or plenum area.
- G. Outside air temperature sensors accuracy shall be within $+1^{\circ}\text{F}$. (0.5°C). Minimum operating span shall - 50°F . to 150°F . Outside Air Temperature and Humidity Sensors (separate devices) shall be mounted in the outdoors where natural air flow occurs, away from any artificial affect from mechanical sources. The humidity sensor span shall be 0 – 100% RH. The sensors shall be independent devices, designed for exterior application; provide all required shielding.
- H. Liquid Immersion Temperature Sensors shall have a temperature range of -40 to 250°F .
- I. Heat Pump Loop and Condenser Water Sensors. Chilled water and condenser water sensors shall have an accuracy of $+1.0^{\circ}\text{F}$. in their range of application. Minimum operating span shall be 0°F . to 125°F . Sensors shall be installed in stainless steel sensor wells.
- J. Hot Water Temperature Sensors. Hot water temperature sensors shall have an accuracy of 1.0°F . Minimum operating span shall 0°F to 250°F . Sensors shall be installed in stainless steel sensor wells. Heat transfer compounds shall be compatible with the sensors.
- K. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degree F. Sensors shall be selected for wall, duct or outdoor type installation as indicated on the drawings. Space mounted sensors shall have blank display. Duct mounted sensors shall have LCD display.
- L. Occupancy/Vacancy Sensor: Sensor shall be passive infrared type with daylight sensor lockout and manual adjustments for time-on delay and sensitivity. Sensor shall have 180-degree field of view with vertical sensing adjustment. Sensor shall be designed for flush mounting. Sensor shall be user-adjustable for the following alternative modes of operation:
1. Occupancy Mode: Sensor shall automatically energize controlled elements when the space becomes occupied and de-energize them when the space becomes unoccupied.
 2. Vacancy Mode: Controlled elements shall be energized by manual occupant control when the space is occupied and de-energized by the sensor when the space becomes unoccupied.
- M. Carbon Dioxide (CO2) Sensors: Sensors shall be non-dispersive infrared (NDIR) type, ether single-lamp single-wavelength or single-lamp dual wavelength configuration, designed specifically for air diffusion

measurement of CO₂ in the range of 0 to 2000 ppm. Sensors shall provide output, 0-10 VDC or 4-20 mA, in direct proportion to CO₂ concentration.

1. Sensor accuracy shall be within +/- 60 ppm (10%) across the range of 400 to 1000 ppm at 25°C, 50%RH, and 14.7 psia air conditions.
2. Sensor shall have test gas inlet port and be provided with manufacturer's detailed, *written* calibration procedures for using CO₂ calibration gas samples.
3. Sensors shall be calibrated at the factory prior to shipment using a minimum of two calibration gas samples, one a 950-1050 ppm and one at either 0 ppm or 450-550 ppm, with the concentration of the calibration gas known to within +/- 2%. Provide factory sensor test/calibration reports for review by the A/E.
4. **Sensors shall *not* incorporate "automatic baseline adjustment" logic.**
5. Sensor sensitivity to atmospheric conditions shall not exceed the following:

| | |
|-------------|---------------------|
| Humidity | +/- 0.3 ppm/%RH |
| Temperature | +/- 0.1 ppm/°C |
| Pressure | +/- 5.0 ppm/ in. Hg |

- N. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. See Section 230500 for specification of motorized control dampers.
- O. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators.
- P. Condensate Level Sensor shall be plenum-rated water level detection device, conforming to UL 508, consisting of one or more moisture sensors and a NO dry contact to serve as a binary input point connected to the building control system to disable mechanical cooling and initiate an alarm in the event the condensate drain is blocked. Device shall include adjustable 1-3 minute time delay before opening to reduce short term nuisance shutdowns. Device shall be mounted on the unit, with remote sensor(s) installed in the equipment's factory-installed primary drain pan, located at a point higher than the pan's primary drain line connection and below the overflow rim of the pan. Sensor(s) shall be retained by clips and/or adhesive tape.
1. Exceptions:
 - a. Where the primary drain pan is too shallow or otherwise designed so that sensor(s) cannot be located as required, a drain pan overflow sensor, installed in the pan's secondary drain line connection, may be used.
 - b. Where an auxiliary drain pan is required, as indicated on the Drawings, provide water level detection device with sensor(s) installed at the lowest possible level in the auxiliary drain pan.
- Q. Emergency Stop Button: Shall be red maintained, turn to reset, mushroom pushbutton in wall-mounted box with yellow plate and no shield cover. Stop shall include one (1) NO and one (1) NC contacts. Label pushbutton "BOILER SHUTDOWN" or as applicable, in accordance with the drawings.
- R. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point. Manufacturer: Veris, or approved equivalent.
- S. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a

subbase and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.

- T. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120VAC/24VAC operation.
- U. Line voltage protection: All control system panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.
- V. Enclosures: May be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment. Enclosures shall have hinged, locking doors.
 - 1. Provide laminated plastic nameplates for all enclosures in any mechanical room or electrical room. Include location and unit served on nameplate. Laminated plastic shall be 0.125 inches thick and appropriately sized to make label easy to read.

2.5 DDC SOFTWARE

2.5.1 OVERVIEW

The system shall continuously perform Direct Digital Control (DDC) functions at the local control module in a stand-alone mode. Using Graphical Programming, the operator shall be able to design and modify control sequence of operation and all tuning parameters.

- A. Minimum Function: Each control module shall perform the following functions:
 - 1. Identify, time/date stamp.
 - 2. Execute all application programs specified.
 - 3. Execute DDC algorithms.
 - 4. Trend and store data.
- B. Control Failure Mode: In the event of a control module failure, all points under its control shall be commanded to the failure mode. All DDC software shall reside in the respective control module.
 - 1. Orderly Shutdown. Power failures shall cause the control module to go into an orderly shutdown with no loss of program memory.
 - 2. Automatic Restart. Upon resumption of power, the control module shall automatically restart and print out the time and date of the power failure and restoration at the respective Workstation system.
 - 3. Automatic Restart. The restart program shall automatically restart affected field equipment. The operator shall be able to define an automatic power up time delay for each piece of equipment under control.

2.6 APPLICATIONS SOFTWARE

2.6.1 GENERAL

All software application algorithms described below MUST reside at the local Building/Area level, Multi-Application, Single-Application, or Unitary Controller level. Systems that rely on a workstation PC, server or

router to perform these functions are NOT acceptable. The following applications software shall be provided for the purpose of optimizing energy consumption while maintaining occupant comfort:

- A. Time of Day Scheduling (TOD): The system shall be capable of the following scheduling features:
 - 1. Schedule by Type. Scheduling by building, area, zone, groups of zones, individually controlled equipment and groups of individually controlled equipment. Each schedule shall provide beginning and ending dates and times (hours: minutes). A weekly repeating schedule, i.e. between 8:00 a.m. and 5:00 p.m., Monday through Friday shall constitute one schedule.
 - 2. Schedule in Advance. Dated schedules shall be entered up to 9 (nine) years in advance.
 - 3. Self-Deleting. Schedules shall be self-deleting when effective dates have passed.
 - 4. Leap Year. Leap years shall be adjusted automatically without operator intervention.
- B. Optimum Start/Stop (OSS)/Optimum Enable/Disable (OED): This application provides software to start and stop equipment on a sliding schedule based on the individual zone temperature and the heating/cooling capacity in °F. /hour of the equipment serving that zone. The heating/cooling capacity value shall be operator adjustable. Temperature compensated peak demand limiting shall remain in effect during morning start up to avoid setting a demand peak.
 - 1. Optimum Stop: Optimum Stop shall not be enabled on equipment more than one (1) hour prior to previously scheduled stop.
- C. Demand Limiting (DL) - Temperature Compensated: The DL application shall be capable of four separate times of day KW demand billing rate periods. The system shall be capable of measuring electrical usage from multiple meters serving one building and each piece of equipment being controlled on the LAN shall be programmable to respond to the peak demand information from its respective meter.
 - 1. Sliding Window. The demand control function shall utilize a sliding window method. The sliding window interval and increment shall be operator selectable in increments of one minute, up to 60 minutes.
 - 2. Set-points for Defined Demand Level. The operator shall have the capability to set an initial set-point and a maximum set-point for each demand period. The initial set-point shall automatically increase by a user defined increment if the electrical demand is above set-point and all loads have been shed. The set-point shall only increase to the maximum set-point value.
 - 3. Information Archiving. The system shall archive demand and usage information for use at a later time. System shall permit the operator access to this information on a current day, month to date and a year to date basis.
- D. Unoccupied High/Low limit: The system shall allow the space temperature to drift down [up] within a preset [adjustable] unoccupied temperature range. The heating [cooling] shall be activated upon reaching either end of the High/low limit range and shall remain activated until the space temperature returns to the High/low limit range.
 - 1. Outside & Exhaust Air. The system shall close all outside air and exhaust air dampers and stop all exhaust fans during the unoccupied period
 - 2. Unoccupied Space Temperature. Unoccupied space temperature shall be monitored by the DDC temperature sensors located in the individual zones being controlled or within a representative room.
 - 3. Parameter Changes. Operator shall be able to define, modify or delete the following parameters.
 - a. Unoccupied High/Low limit set-point temperature(s).
 - b. Temperature band for Unoccupied operation.
- E. Timed Local Override (TLO): The system shall have TLO input points that permit the occupants to request an override of equipment that has been scheduled OFF. The system shall turn the equipment ON upon receiving a request from the local input device. Local input devices shall be push button (momentary contact). Equipment on Time: If a push button is used the system operator shall be able to define the duration of equipment ON time per input pulse. The system shall maintain a trend log of override usage. The log shall include, date, time and area of override.

- F. Space Temperature Control (STC): There shall be two space temperature set-points, one for cooling and one for heating, separated by a dead band. Only one of the two set-points shall be operative at any time. The cooling set-point is operative if the actual space temperature has more recently been equal to or greater than the cooling set-point. The heating set-point is operative if the actual space temperature has more recently been equal to or less than the heating set-point. There are three modes of operation for the set-points, one for the occupied mode (example: heating = 72°F. or 22°C., cooling = 74°F. or 23.3°C.), one for the unoccupied mode (example: heating = 55°F. or 12.7°C., cooling = 90°F. or 32°C.), and one for the standby mode (example: heating = 68°F. or 22°C., cooling = 76°F. or 24.4°C.). Where occupancy sensors are integrated with the space temperature sensor, the occupancy control shall override based on the occupancy sensor output.
- G. Schedule. The occupied/unoccupied modes may be scheduled by time, date, or day of week.
- H. Color Code. Colors shall be generated to represent the comfort conditions in the space, and shall be displayed graphically at the operator station.
 - 1. If the actual space temperature is in the dead band between the heating setpoint and the cooling set-point, the color displayed shall be white for the occupied mode, representing ideal comfort conditions.
 - 2. If the space temperature rises above the cooling set-point, the color shall change to light red. Upon further rise beyond the cooling set-point plus an offset, the color shall change to red. When space temperature falls below the heating setpoint, the color shall change to light blue. Upon further temperature decrease below the heating setpoint minus an offset, the color shall change to dark blue.
- I. Operator Definable. All set points and offsets shall be operator definable. When in the occupied mode, start-up mode, standby mode, or when heating or cooling during the unoccupied mode, a request shall be sent over the network to other equipment in the HVAC chain, such as to an AHU fan that serves the space, to run for ventilation. The operator shall be able to disable this request function if desired.
- J. Optimum Start. An optimum start-up program transitions from the unoccupied set points to the occupied set points. The optimum start-up algorithm considers the rate of space temperature rise for heating and the rate of space temperature fall for cooling under nominal outside temperature conditions; it also considers the outside temperature; and the heat loss and gain coefficients of the space envelope (AI: Space Temperature).

2.7 SURGE AND LIGHTNING PROTECTION

- A. Line voltage protection: The JACE panels and HVAC equipment shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. A grounding conductor, (minimum 12 awg), shall be brought to each control panel from either a system grounding point or the ground bus in a breaker panel. Conduit grounds will not be acceptable. The surge protection device should be mounted so the LEDs are readily visible.
 - 1. Surge protector requirements:
 - a. Diagnostic LED indicates ground presence, system power and SPD function
 - b. UL listed
 - c. IEEE Cat A and Cat B
 - d. Parallel configuration, external mount
 - e. 22,500 amp peak surge current
 - f. Operating Frequency: 0 Hz – 400 Hz
 - g. Protective Modes: L-G, L-N, N-G
 - h. Warranty: Ten Year Warranty
 - i. Housing NEMA 4 ABS

- B. Inter-unit Communications: All panel to panel data networks that are routed outside or between buildings shall be protected with proper surge protection. The protection device shall match the voltage levels of the inter-unit communications network.
 - 1. Communications trunk wiring shall be protected with a transient surge protection device providing the minimal protection specifications of the General semiconductor, Model #422E device.
 - 2. Power and Communication Wiring Transient Protection: The control manufacturers shall submit catalog data sheets providing evidence that all BAS products offered by the manufacturer are tested and comply with the standard for Transient Surge withstand capabilities for electrical devices ANSI C62.41, IEEE-587-1980, Categories A and B. Such testing shall have included power and communication trunk wiring. Compliance with IEEE-587 shall imply conformance with IEEE-472 transient standards based on the stated position of ANSI and IEEE regarding applicability of the rated standards.
 - 3. The communications circuitry, input/output circuitry, and CU's, shall provide protection against a 1,000 volt, 3 amp transient signal, directly applied to the communication or input/output terminations. The manufacturer's catalog data sheet shall provide evidence of conformance with this requirement. Systems not complying with this requirement shall provide equivalent protection external to the BAS controller. Protection shall be provided for the individual communications and input/output terminations for each BAS controller. Submittal documentation shall clearly define how this requirement will be met and how the external protection will not affect the performance of the controllers.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Install systems and materials in accordance with manufacturer's instructions in a neat workmanlike manner.
- B. Coordinate with other trades on the project as the work progresses so that each will be aware of the extent of all work. Carefully plan all work and check for interferences before installation. No extras will be allowed for changes caused by failure to check for interferences.
- C. Provide structural supports as required for panels and control devices.
- D. Supervise installation of all control dampers.
- E. Install metering devices away from bends and elbows with minimum upstream and downstream straight distances per manufacturer's recommendations and as shown on Drawings.
- F. Mylar labels shall be provided to identify all control components and points of connection.

3.2 CONTROL WIRING

- A. Install color-coded control wiring without splices between terminal points in accordance with National Electrical Code.
- B. Control wiring shall be yellow jacketed No. 22 TSP for inputs and outputs.
- C. Communication buss wiring shall be purple jacketed No. 22 TSP.
- D. All wiring and cable not in conduit shall be plenum rated.
- E. Wiring above lay-in ceilings may be installed as properly supported cable.

- F. Wiring above hard ceilings, in walls, or where exposed including in mechanical rooms shall be in 3/4" minimum EMT conduit with steel-plated hexagonal compression connectors. Wiring above lay-in ceilings may be installed as properly supported cable. Flexible metallic conduit shall be 1/2" minimum in size and not exceed 3'-0" in length.
- G. Conduit in crawl space shall be PVC Schedule 80.
- H. All wiring in floor slabs or on exterior shall run in rigid conduit.
- I. All conduits shall be blue in color.

3.3 COLOR GRAPHIC DISPLAYS

- A. Unless otherwise directed by the Owner, the Contractor shall provide color graphic displays as depicted in the mechanical drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for setpoint changes as required by the Owner.
- B. Central Plant Equipment Graphics: Graphics shall depict equipment in a two-dimensional diagram format for central plant equipment (i.e., chillers, steam to hot water equipment, boilers, pumps, etc.) Place sensors and controlled devices associated with each piece of equipment in their appropriate locations.
- C. Floor Plan Graphics: Provide a single graphic for each floor, unless the graphic shall contain more information than can reasonably be shown on a single graphic. Each heating or cooling zone within a floor plan shall have its current temperature displayed in the zone for which it applies. Owner to provide blueprints or CAD files for building floor plans where possible.
- D. AHU (WSHP/FCU/Split Systems/Heat Pumps/VAVs, etc.) Graphics: Provide a two-dimensional graphic to depict each piece of equipment. Do not use line drawings. Place sensors and controlled devices associated with the AHU in their appropriate locations. Provide visual warning of each point in alarm. Provide capability to change setpoints from the graphical interface.

3.4 TESTING

- A. When installation of the control system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line.
- B. Provide a cross check of each control point within the control system by making a comparison between the control command and the field-controlled device.
- C. Replace any work found defective. After replacement, repeat test.

3.5 START-UP AND DEMONSTRATION

- A. After completion and testing of the installation, regulate, adjust and service as necessary all control devices in the systems, placing each item in complete and proper operation.
- B. Demonstrate all systems to Owner, Architect and Engineer, and that all are operable from local controls in the specified failure mode upon electronic control system failure or loss of power.
- C. Complete all commissioning requirements as necessary to this scope of work.

3.6 INSTRUCTION

- A. Provide the services of manufacturer's technical personnel for 8 hours of instruction to Owner's personnel in the operation, maintenance and programming of the control system. Orient the training specifically to the system installed rather than a general training course.
- B. Provide training manuals, equipment and material required for classroom training.
- C. Training to include the following items:
 - 1. Operation of equipment
 - 2. Programming
 - 3. Diagnostics
 - 4. Failure recovery procedures
 - 5. Alarm formats (where applicable)
 - 6. Maintenance and calibration
 - 7. Trouble shooting, diagnostics, and repair instructions

PART 4 - POINTS LISTS AND SEQUENCES OF OPERATION

4.1 SUMMARY

- A. The drawings indicate the individual types of systems and the points required in each system.
- B. System sequences of operation shall be as indicated on the drawings and as specified herein.

END OF SECTION 230900

SECTION 323119 - DECORATIVE METAL GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Decorative aluminum swing gates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For gates.
 - 1. Include plans, elevations, sections, gate locations, and attachment details.
- C. Samples: For color.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

PART 2 - PRODUCTS

2.1 SWING GATES

- A. Gate Configuration: Double leaf.
- B. Gate Frame Height: As indicated on Drawings.
- C. Gate Opening Width: As indicated on Drawings.
- D. Aluminum Frames and Bracing: Fabricate members from square extruded-aluminum tubes 2 by 2 inches with 0.125-inch wall thickness.
- E. Frame Corner Construction: Welded.
- F. Picket Size, Configuration, and Spacing: As indicated on Drawings.
- G. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
- H. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 - completely sanded joint, some undercutting and pinholes okay.
- I. Aluminum Finish: Baked enamel or powder coating.

2.2 ALUMINUM

- A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
- B. Extrusions: ASTM B221, Alloy 6063-T5.
- C. Tubing: ASTM B429/B429M, Alloy 6063-T6.
- D. Plate and Sheet: ASTM B209, Alloy 6061-T6.
- E. Castings: ASTM B26/B26M, Alloy A356.0-T6.

2.3 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.

2.4 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 2 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for construction layout and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Adjust hardware for smooth operation and lubricate where necessary.

3.3 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION 323119