Addendum #1

Directorate of Facilities Engineering 26 April 2021

This Addendum modifies, amends, and supplements designated parts of the Contract Documents, Specifications and Drawings for:

Westbrook Armory Renovation, 120 Stroudwater Avenue, 04092 Westbrook, Maine, Project Number 23SR19-427-D, BGS Project Number 3034, Bid Number 21-022.

It shall be the responsibility of the Contractor to notify all Subcontractors and Suppliers for various portions of the work of any changes or modifications contained in this Addendum.

Clarification Items:

1. **Question:** Additional Access to the Site and Building. May the Contractor return to the building and site for another visit?
   Answer: Normally there are no extra site visits allowed to the site or building. Access to the building and site will be allowed. Because the Pre-bid was a mandatory Pre-Bid, the General Contractor must accompany any of their subcontractors to the site and building. Please limit your site visits. You must coordinate through CPT Andrew Kavanagh (andrew.s.kavanagh.mil@mail.mil) for a time and date that he is available. He will not answers any questions, only allow you access to the site and the building. All questions must go through Win Stratton at Colby Co - winfields@colbycoengineering.com.

2. **Question:** In reviewing the window specifications, they have 2 spec sections issued for the same thing. Which is correct? Also note they are calling for an aluminum window to be mulled to a steel/hollow metal door. That can't happen. These are all blast rated materials and as such are tested only as complete units, you can't simply take a blast aluminum window and fasten it to another product/manufacturer. Any type of transom will need to be part of the door/frame supplier's scope?
   Answer: The transom window above the entrance doors are to be mulled as part of the door assembly from the same door manufacturer. The material callout in the schedule is an error. Material must be the same as door and part of the door assembly.

3. **Question:** Note 1 on A201 states blast resistant as indicated. Only two exterior doors and transoms are shown with the Note 1 designation. Are all exterior Aluminum windows also included in the blast resistant requirement?
   Answer: Yes, all exterior aluminum windows must have blast resistance.

4. **Question:** What is the warranty period of the generator – it's not listed?
   Answer: 2-year Warranty Period.

5. **Question:** Is tier 4 diesel really required? This is not a prime power application, its listed as stationary emergency in the spec, this will add significant cost for no reason?
   Answer: Tier 4 requirements are not required?

6. **Question:** What is the minimum R-value required for the EPDM roofing system?
   Answer: Per detail 2/A-506 6" min insulation (R-30) at the roof drains must be provided.

7. **Question:** The spec calls for Type III Pattern CD with an NRC not less than 0.80. The closest
comparable the acoustical contractor can find is the Sereno Fine Fissured by CertainTeed but that only gets us to a 0.75 NRC?
Answer: The contractor must make every effort to meet the specification and we will review the products when submitted.

8. **Question:** There are no interior elevations drawings for the Assembly Hall. Will they be distributed shortly?
Answer: There are no interior elevation drawings.

9. **Question:** How and where we are attaching the new basket-ball backstop?
Answer: See A102B for court layout and S102 note 9 for mounting detail.

10. **Question:** The interior finish schedule calls for the Assembly Hall to be painted the same color, red and blue band and mural/logo, there are no interior elevations for this space. Can this information be supplied for those that are not able to make a site visit?
Answer: Mural/Logo is vinyl applied decal located at center of Assembly Hall floor. Wall pattern consists of (from floor to ceiling) (4) rows of CMU painted white, (2) rows of CMU painted blue, (2) rows of CMU painted white, (2) rows of CMU painted red and the remainder of CMU to ceiling painted white. All paint colors are to match existing.

11. **Question:** Door 101A is called out as a Ballistic / Blast boor, should 101B also be a Ballistic / Blast door?
Answer: No, only door 101A.

12. **Question:** The mechanical specifications state that the cost of the gas utility company work is to be carried by the mechanical subcontractors or the GC. This is typically an owner-contracted item and the utility will not provide us with a price proposal for the work. We respectfully request the Owner set an allowance for all bidders to carry?
Answer: Please contact the utility for pricing. The Contractor is responsible for utility company work. Utility contact information and account, Unitil Natural Gas Company - #5090636500.

13. **Question:** The electrical plans and specifications state that the cost of the CMP work is to be carried by the electrical subcontractors or the GC. This is typically an owner-contracted item and CMP will not provide us with a price proposal for the work. We respectfully request the Owner set an allowance for all bidders to carry?
Answer: The contractor shall hire all the Utility Companies as specified in Bid Documents. Please see attachment #1 – CMP quote dated 1/16/20. Quote is not up to date. The contractor is responsible to contact CMP with the information required to obtain an updated price proposal. The Contractor is responsible for utility company work. Utility contact information and account numbers. CMP - #3501-2486-235, Portland Water and Sewer District - #168098-01, Unitil Natural Gas Company - #5090636500.

14. **Question:** Flooring/Floor covering - Is there specific products called out for this or is it just the manufacturers that can be used. Is there any more specific than this?
Answer: Flooring must comply with standards as indicated within the specifications, color and patterns to be chosen by the owner. Basis of design are provided within spec and other products meeting performance criteria within specifications will be considered.

15. **Question:** What is the peak reflective pressure (PSI) for the blast doors? Vendor needs to know?
    Answer: Use requirements listed in project specification 08 39 53, 3-second equivalent design load is 200psf per ASTM F2248, 4 psi peak overpressure with 28 psi-msec impulse.

16. **Question:** Several ATFP doors call for keyed removable mullions. In order to meet blast requirements they must have a specialty mullion that cannot be keyed. Is this acceptable?
    Answer: Doors that require ATFP rating must meet requirements regardless of mullion type.

17. **Question:** Hollow metal door spec section 08100.2.2.A lists exteriors doors to be cold rolled steel. Is this correct or should they be galvannealed? If galvannealed is required, is A60 galvannealed acceptable?
    Answer: Doors are cold rolled with galvanized coating. Receive either A90 or G90 galvanized steel. Galvannealing is not required.

18. **Question:** Hollow metal frame spec section 08100.2.3.A lists all frames to receive either A90 or G90 galvanized steel. Is A60 acceptable exterior and do interior frames need to be galvanized/galvannealed or can they be cold rolled steel?
    Answer: Frames are cold roll with galvanized coating. Receive either A90 or G90 galvanized steel. Galvannealing is not required.

19. **Question:** Should all exterior doors be ATFP or just the doors listed in the door schedule with that designation?
    Answer: Only the doors listed with ATFP designation.

20. All final questions must be emailed to Win Stratton at Colby Co - winfields@colbycoengineering.com. by 9:00 am on 3 May 2021, so if necessary the last addendum can be issued by 2:00 pm on 3 May 2021.

21. City of Westbrook's Road Moratorium. The MEARNG is working on an answer to this question and will have an answer by the last addendum.

Specification Items:

1. Replace Existing Table Of Content pages 1 through 8 with enclosed revised Table Of Content pages 1 through 8.

2. Replace Section 00 41 13 Contractor Bid Form, page 3 of 4 with enclosed revised Section 00 41 13 Contractor Bid Form, page 3 of 4. Addendum #1 is noted on page 3 of 4.

3. Replace Section 00 52 13 Construction Contract, page 3 of 4 with enclosed revised Section 00 52 13 Construction Contract page 3 of 4. Addendum #1 is noted on page 3 of 4.

4. Add Specification 061600 Sheathing.

5. Add Specification 071113 Bituminous Damp Proofing.

6. Add Specification 072100 Thermal Insulation.

7. Add Specification 078413 Penetration Fire Stopping.

8. Add Specification 078443 Joint Fire Stopping.

9. Add Specification 083323 Overhead Coiling Doors.

10. Add Specification 096513 Resilient Base And Accessories.

11. Add Specification 096566 Resilient Athletic Flooring.

12. Add Specification 101100 Visual Display Units.

13. Add Specification 104416 Fire Extinguishers.

14. Replace Section 230902 Niagara N4 Platform Requirements For HVAC, pages 1 through 46 with enclosed revised 230902 Niagara N4 Platform Requirements For HVAC pages 1 through 46.

Drawing Items:

1. Remove Drawings Sheet LS-102 Life Safety Occupancy Load Plans replace with revised Drawings Sheet LS-102 Life Safety Occupancy Load Plans.

2. Remove Drawings Sheet A-101 Basement Floor Plan, replace with revised Drawings Sheet A-101 Basement Floor Plan.

3. Remove Drawings Sheet M-101 Basement Mechanical Plan, replace with revised Drawings Sheet M-101 Basement Mechanical Plan.

4. Remove Drawings Sheet M-601 Mechanical Schedule, replace with revised Drawings Sheet M-601 Mechanical Schedule.

5. Remove Drawings Sheet P-101 Basement Plumbing Plan, replace with revised Drawings Sheet P-101 Basement Plumbing Plan.

6. Remove Drawings Sheet E-001 Electrical Legend and General Notes, replace with revised Drawings Sheet E-001 Electrical Legend and General Notes.

7. Remove Drawings Sheet ED-101 Electrical Demolition Plans, replace with revised Drawings Sheet ED-101 Electrical Demolition Plans.

8. Remove Drawings Sheet E-101 Electrical Floor Plan, replace with revised Drawings Sheet E-101 Electrical Floor Plan.

9. Remove Drawings Sheet E-102 Electrical Roof Plan, replace with revised Drawings Sheet E-102 Electrical Roof Plan.

10. Remove Drawings Sheet E-103 Electrical Lighting Plan, replace with revised Drawings Sheet E-103 Electrical Lighting Plan.

11. Remove Drawings Sheet E-401 Electrical Enlarged Plan, replace with revised Drawings Sheet E-401 Electrical Enlarged Plan.

12. Remove Drawings Sheet E-501 Electrical Diagrams, replace with revised Drawings Sheet E-501 Electrical Diagrams.

13. Remove Drawings Sheet E-502 Electrical Details, replace with revised Drawings Sheet E-502 Electrical Details.

14. Remove Drawings Sheet E-601 Panel Schedule, replace with revised Drawings Sheet E-601 Panel Schedule.

15. Remove Drawings Sheet E-602 Panel Schedule, replace with revised Drawings Sheet E-602 Panel Schedule.

16. Remove Drawings Sheet E-603 Panel Schedule, replace with revised Drawings Sheet E-603 Panel Schedule.

17. Remove Drawings Sheet E-604 Panel Schedule and Light Fixture Schedule, replace with revised Drawings Sheet E-604 Panel Schedule and Light Fixture Schedule.

18. Remove Drawings Sheet T-101 Telecommunications Plan, replace with revised Drawings Sheet T-101 Telecommunications Plan.

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Contractor Bid Form

1. The Bidder, having carefully examined the form of contract, general conditions, specifications and drawings dated *9 April 2021*, prepared by *Colby Co. LLC.* for *Westbrook Armory Renovation, Westbrook, Maine*, as well as the premises and conditions relating to the work, proposes to furnish all labor, equipment and materials necessary for and reasonably incidental to the construction and completion of this project for the **Base Bid** amount of:

$ _____ .00

2. Allowances *are included* on this project.
<Bid Administrator to select...>
1. Allowance #1 - Potential Contaminated Soil. See Administrative Provisions 01 00 00 Schedule of Allowances, Paragraph 1.01,G.1. - $10,0000.00

2. Allowance #2: Weatherproof Conex Storage Containers. See Administrative Provisions 01 00 00 Schedule of Allowances, Paragraph 1.01,G.2. - $20,000.00

3.Allowance #3: Replacement of furniture. See Administrative Provisions 01 00 00 Schedule of Allowances, Paragraph 1.01,G.3. - $15,000.00

$ *Total of 45,000*.00

3. Alternate Bids *are included* on this project.
Alternate Bids are as shown below
Any dollar amount line below that is left blank by the Bidder shall be read as a bid of **$0.00**.

1 Alt.#1 Generator - See 01 00 00 Add. Paragraph 1.01,H.1 $ _____ .00

2 None $ _____ .00

3 None $ _____ .00

4 None $ _____ .00

4. The Bidder acknowledges receipt of the following addenda to the specifications and drawings:

Addendum No. 1	Dated: 26 April 2021	Addendum No. ____	Dated: _____
Addendum No. ____	Dated: _____	Addendum No. ____	Dated: _____
Addendum No. ____	Dated: _____	Addendum No. ____	Dated: _____
Addendum No. ____	Dated: _____	Addendum No. ____	Dated: _____

4.6 The Contractor shall be responsible for any design cost, construction cost, or other cost incurred on the Project to the extent caused by the negligent acts, errors or omissions of the Contractor or their Subcontractors in the performance of Work under this Contract.

ARTICLE 5 OWNER'S RESPONSIBILITIES

5.1 The Owner shall provide full information about the objectives, schedule, constraints and existing conditions of the project. The Owner has established a budget with reasonable contingencies that meets the project requirements.

5.2 By signing this contract, the Owner attests that all State of Maine procurement requirements for this contract have been met, including the solicitation of competitive bids.

ARTICLE 6 INSTRUMENTS OF SERVICE

6.1 The Contractor's use of the drawings, specifications and other documents known as the Consultant's Instruments of Service is limited to the execution of the Contractor's scope of work of this project unless the Contractor receives the written consent of the Owner and Consultant for use elsewhere.

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 This Contract shall be governed by the laws of the State of Maine.

7.2 The Owner and Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to this Contract. Neither party to this Contract shall assign the Contract as a whole without written consent of the other party, which consent the Owner may withhold without cause.

7.3 Notwithstanding any other provision of this Agreement, if the Owner does not receive sufficient funds to fund this Agreement or funds are de-appropriated, or if the Owner does not receive legal authority from the Maine State Legislature or Maine Courts to expend funds intended for this Agreement, then the Owner is not obligated to make payment under this Agreement; provided, however, the Owner shall be obligated to pay for services satisfactorily performed prior to any such non-appropriation in accordance with the termination provisions of this agreement. The Owner shall timely notify the Consultant of any non-appropriation and the effective date of the non-appropriation.

ARTICLE 8 CONTRACT DOCUMENTS

8.1 The General Conditions of the contract, instructions to bidders, bid form, Special Provisions, the written specifications and the drawings, and any Addenda, together with this agreement, form the contract. Each element is as fully a part of the Contract as if hereto attached or herein repeated.

8.2 Specifications: ***9 April 2021***

8.3 Drawings: ***9 April 2021***

8.4 Addenda: ***26 April 2021***

Company Data

Attachment #1

Quote

CENTRAL MAINE POWER COMPANY
83 EDISON DRIVE
AUGUSTA , ME 04336-0001
USA

CENTRAL MAINE POWER

0250037518

Customer Data

STATE OF MAINE 100% STATE
CAMP KEYES CAMP KEYES SHS
AUGUSTA, ME 04333-0001
USA

Service Location:

STATE OF MAINE 100% STATE
120 STROUDWATER STREET
WESTBROOK, ME 04092
USA

Quote

Quote Number: 0882931020000101
Quote Date: 01/16/2020
Customer Number: 0001333823-0001333823
Description: 3 PHASE UPGRADE

Work Order: 801000264896
PO Number: 10300610369

Description	Amount	Tax Amount
Contractors	847.53	0.00
Coordination Charges/Credits	209.96	0.00
Labor	5,061.18	0.00
Mat Transformer, Regulator, Capacitor	5,447.55	0.00
Material	962.66	0.00
Vehicle	557.04	0.00

Quote Charge	13,085.92	Tax Charge	0.00
Amount Due	$13,085.92		

Payment Method

Work will not be scheduled until payment is received. The estimate is valid for 90 days from the quote date. Request for additional design changes may require a new estimate. If you have any questions regarding this quote, please call 1-800-750-4000 .

For check please detach and return this stub with payment in enclose envelope.

CENTRAL MAINE POWER

STATE OF MAINE 100% STATE
CAMP KEYES CAMP KEYES SHS
AUGUSTA, ME 04333-0001
USA

CENTRAL MAINE POWER COMPANY
PO BOX 847811
BOSTON, MA 02284-7811

Quote Number
0882931020000101
Customer Number
0001333823-0001333823
Amount Due
$13,085.92
Amount Paid
$

Do not write below this line

93100882931020000101000001308592

Quote

CENTRAL MAINE POWER

0250037518

ONLY PAYMENTS ARE TO GO TO THE ADDRESS BELOW. **DO NOT OVERNIGHT PAYMENT** SENDING OVERNIGHT OR INCLUDING ADDITIONAL DOCUMENTS WILL CAUSE DELAYS.

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry"

2. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

B. Sustainable Design Submittals:

1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
2. Product Data: For installation adhesives, indicating VOC content.
3. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings

2.5 WALL SHEATHING

A. Plywood Sheathing: **Either DOC PS 1 or DOC PS 2**, **Exposure 1, Structural I** sheathing.

1. Span Rating: Not less than **16/0**.
2. Nominal Thickness: Not less than **1/2 inch**.

B. Oriented-Strand-Board Sheathing: DOC PS 2, **Exposure 1, Structural I** sheathing.

1. Span Rating: Not less than **16/0**.
2. Nominal Thickness: Not less than **1/2 inch**.

C. Paper-Surfaced Gypsum Sheathing: ASTM C1396/C1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. American Gypsum.
   b. CertainTeed LLC; Saint-Gobain North America.
   c. Georgia-Pacific Gypsum LLC.

2. Type and Thickness: Type X, 5/8 inch thick.
3. Edge and End Configuration: tongue-and-groove long edges; square ends.
4. Size: 48 by 96 inches for vertical installation.

D. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CertainTeed LLC; Saint-Gobain North America.
   b. Georgia-Pacific Gypsum LLC.
   c. USG Corporation.

2. Type and Thickness: Regular, 1/2 inch thick, or Type X, 5/8 inch where indicated in drawings.

3. Size: 48 by 96 inches for vertical installation.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners of Type 304 stainless steel.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with [**nails**] [**or**] [**screws**].
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

END OF SECTION 061600

SECTION 071113 - BITUMINOUS DAMP PROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cold-applied, emulsified-asphalt dampproofing.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for bituminous vapor retarders under slabs-on-grade.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. APOC, Inc; a division of Gardner Industries.
2. Henry Company.
3. Karnak Corporation.

B. Brush and Spray Coats: ASTM D1227, Type III, Class 1.

2.4 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Cut-Back-Asphalt Primer: ASTM D41/D41M.

C. Emulsified-Asphalt Primer: ASTM D1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

D. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.

B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.

D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.

1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.

3.5 PROTECTION

A. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION 071113

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Polyisocyanurate foam-plastic board insulation.
3. Mineral-wool blanket insulation.
4. Spray-applied cellulosic insulation.

B. Related Requirements:

1. Section 072419 “Water-Drainage Exterior Insulation and Finish System (EIFS) for exterior wall insulation.
2. Section 075323 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing for roofing insulation.
3. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: for each type of product:

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

1.4 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 fiberglass and cellulosic-fiber loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.

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.

1.5 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, also called "XPS boards.": ASTM C578, Type X, 15-psi minimum compressive strength; unfaced.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Dow Chemical Company (The).
b. DuPont de Nemours, Inc.
c. Owens Corning.

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.

B. Extruded Polystyrene Board Insulation, Type VI: ASTM C578, Type VI, 40-psi minimum compressive strength.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Dow Chemical Company (The).
b. DuPont de Nemours, Inc.

c. Owens Corning.

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. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

A. Polyisocyanurate Board Insulation, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Atlas Roofing Corporation - Polyiso.
b. Dow Chemical Company (The).
c. DuPont de Nemours, Inc.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

B. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Atlas Roofing Corporation - Polyiso.
b. Carlisle Coatings & Waterproofing Inc.
c. Hunter Panels.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 MINERAL-WOOL BLANKET INSULATION

A. Verify insulation complies with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. Owens Corning.
    c. ROCKWOOL.

2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.4 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450 respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Corporation.
    b. CertainTeed Corporation.
    c. Dow Chemical Company (The).

2. Minimum density of 2.0 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

3. Provide Manufacturer’s kit packaged system for spray foam filler insulation.

2.5 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.

1. Verify adhesives have a VOC content of 70 g/L or less.

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 SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 48 inches in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.6 INSTALLATION OF MISCELLANEOUS INSULATION

A. Comply with insulation manufacturer’s written instructions applicable to products and applications.

B. Spray insulation to envelope entire area to be insulated and fill voids

C. Apply in multiple passes not to exceed maximum thickness recommended by manufacturer.

D. 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.

3.7 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 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:

a. Penetrations in fire-resistance-rated walls.
b. Penetrations in horizontal assemblies.
c. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Minimally, the Contractor, the Contractor’s testing agency and the firestopping installer shall attend this meeting. .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency (such as UL Design W-L-1029).

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration

firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

2. Provide firestopping system designations to be used in a single submittal.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

B. Tests and inspections by qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Obtain penetration firestopping systems, for each type of penetration and construction condition, from a single manufacturer.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

C. Coordinate material, diameter and length of sleeves, if used, with other trades and with firestopping assemblies selected.

D. Coordinate selected firestopping systems with requirements for continuation or termination of pipe insulation through wall and floor openings. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Approval in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Specified Technologies, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479 where water exposure may occur.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

1. Verify sealant has a VOC content of 250 g/L or less.

F. Manufactured Piping Penetration Firestopping System: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A48/A48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet. Do not locate in finished areas normally exposed to view.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

2. Provide all firestopping system designations to be used in a single submittal.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Documentation of training and experience for Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Specified Technologies, Inc.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed. Where joints are between assemblies of two different fire resistance ratings, the joint shall have an hourly rating meeting or exceeding the highest fire resistance rating of the two assemblies.

C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Specified Technologies, Inc.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

1. Verify sealant has a VOC content of 250 g/L or less.

E. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required.

Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

F. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, ponding water, or other forms of moisture characteristics during and after construction.

G. Firestopping systems for floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Contractor will engage a qualified testing agency to perform tests and inspections according to ASTM E2393 and prepare report(s) of findings. Architect will approve testing agency selected.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

END OF SECTION 078443

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, and corner guards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing and inspecting agency.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design”, the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.0.

2.3 DOOR ASSEMBLY

A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Alpine Overhead Doors, Inc.
b. McKeon Rolling Steel Door Company, Inc.
c. Overhead Door Corporation.

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Door Curtain Material: Galvanized steel.

D. Door Curtain Slats: Flat profile slats of 1-7/8-inch center-to-center height.

E. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.

F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

G. Hood: Match curtain material and finish.

1. Shape: Round.
2. Mounting: Face of wall.

H. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Single-jamb side locking bars, operable from outside with cylinder.

I. Manual Door Operator: Push-up operation.

1. Provide operator with through-wall shaft operation.

J. Curtain Accessories: Equip door with smoke seals, automatic-closing device, and push/pull handles.

K. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Owner from manufacturer's full range.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch-thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.

2.7 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: As specified in Section 087100 "Door Hardware.

2.8 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, [**seamless**] [**or**] [**welded**] carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Push-up Door Operation: Lift handles and pull rope for raising and lowering doors, with counterbalance mechanism designed so that required lift or pull for door operation does not exceed 25 lbf

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.
2. Vinyl molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Product Data: For sealants, indicating VOC content.

C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

D. Product Schedule: For resilient base and accessory products.

1.4 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. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE (RB)

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Flexco; Roppe Holding Company.
2. Johnsonite; a Tarkett company.
3. Roppe Corporation; Roppe Holding Company.

B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Cove: Provide in areas with resilient floor coverings

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As selected by Owner from full range of industry colors.

2.2 VINYL MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Armstrong World Industries, Inc.
2. Flexco; Roppe Holding Company.
3. Johnsonite; a Tarkett company.

B. Profile and Dimensions: As indicated.

C. Locations: Where dissimilar flooring materials abutt.

D. Colors and Patterns: As selected by Owner from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Verify adhesives have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096566 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Athletic Rubber Tiles.
2. Connection System
3. Adhesive

1.3 REFRENCES

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation

B. American Society for Testing and Materials (ASTM):
1. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension
2. ASTM F137 Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus
3. ASTM F970 Standard Test Method for Static Load Limit
4. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as measured by the James Machine
5. ASTM F925 Standard Test Method for Resistance to Chemicals of Resilient Flooring
6. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
7. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
8. ASTM E492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
9. ASTM E413 Classification for Rating Sound Insulation
10. ASTM E2129 Standard Practice for Data Collection for Sustainability Assessment of Building Products
11. ASTM D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
12. ASTM D297 Standard Practice for Rubber Products – Chemical Analysis

13. ASTM D3676 Standard Specification for Rubber Cellular Cushion used for Carpet or Rug Underlay
14. ASTM D395 Standard Test Methods for Rubber Property – Compression Set
15. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
16. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
17. ASTM F1292 Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment

C. Federal Test Method Standard 101B Test Methods for Packaging Materials
   1. Method 4046 Electrostatic Properties of Materials

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. South Coast Air Quality Management District (SCAQMD) Rule #1168 1.

      a. VOC levels for adhesive and sealant applications

C. Samples for Initial Selection: For each type of floor tile indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance

B. Cleaning: Furnish flooring manufacture’s neutral cleaner for initial cleaning and maintenance of the finished floor surface.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

   1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

B. Mockups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain owner's acceptance of finish color, texture and pattern, and workmanship standard.

a. Size: Minimum 10 sq. ft. for each type, color, and pattern in locations indicated.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact

B. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.9 FIELD CONDITIONS

A. Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 INTERLOCKING RUBBER TILE FLOORING SYSTEM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Basis of design products:
   a. Ecore Athletic Everlast Interlocking Rubber Tiles
   b. Quad Blok 4.74" x 4.74" Connection System
   c. E-Grip III, a one-component polyurethane adhesive
2. Amorim
3. ROPPE

2.2 FLOOR TILE

A. Product basis of design: Ecore Athletic Everlast 1" UltraTile Recycled Rubber Molded Tiles

B. Dimensions: Square 20" x 20" min. and an overall thickness of 1".

C. Material: Rubber and wear surfaces with a wear-resistant polyurethane.

D. Standard Tolerances: Width: ± 1/8" Thickness: ± 1/8"

E. Colors: Specify color from manufacturer's standard colors, custom colors, or special logo/graphic inlays

F. Tensile Strength (ASTM D412): 200lb/in² min

G. Static Load Limit (ASTM F970): Pass ¼" mandrel

H. Flexibility (ASTM F137): 400 lb/in² < 0.005 in

I. Coefficient of Friction (ASTM D2047): > 0.9

J. Impact Insulation Class (ASTM E492): 49

2.3 CONNECTION SYSTEM

A. Product Basis of Design: Quad Blok 4.74" x 4.74"

B. Material: High quality post-consumer recycled rubber granules encapsulated in a wear and water resistant elastomeric network.

C. Tensile Strength (ASTM D412, Die C): 116 psi. minimum

D. Elongation (ASTM D412, Die C): 74% minimum

E. Compression: @50 psi – 15% ; @100 psi – 28%; @200 psi – 45%

F. Shore A Hardness (ASTM D2240): 50 + /- 5 points

G. Tear Strength (ASTM D624, DIE C): 30 PPI

H. Flexibility (ASTM F147): 0 -1 Factor

2.4 ADHESIVE

A. Product Basis of Design: E-Grip III one-component polyurethane adhesive

B. Material: one-component urethane moisture cured, non-sag permanently elastic adhesive that has excellent adhesion to elastomers, concrete, and wood and is engineered for indoor and outdoor applications.

C. Adhesive Cure System: Moisture cured

D. Color: Medium grey

E. VOC Content: 0 lb/gal calculated

F. Relative Humidity (RH) Test (ASTM F2170): Maximum 85%

G. Flashpoint: > 500° F

H. Shelf Life: 12 months

2.5 SOURCE QUALITY

A. Source Quality: Obtain recycled rubber resilient flooring materials from a single manufacturer

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including any technical bulletins, product installation instructions, and product packaging instructions for installation.

3.2 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.3 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions or manual to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer.

4. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.4 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing flooring.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.5 CLEANING AND PROTECTION

A. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

B. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

C. Cover floor tile until Substantial Completion.

END OF SECTION 096566

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Visual display board assemblies.

B. Related Requirements:

1. Section 101200 "Display Cases".

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Sustainable Design Submittals:

1. Product Data: For installation adhesives, indicating VOC content.
2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For visual display units.

1. Include plans, elevations, sections, details, and attachment to other work.
2. Include sections of typical trim members.

D. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:

1. Samples of facings for each visual display panel type, indicating color and texture.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the work.

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

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

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25or less.
2. Smoke-Developed Index: 50 or less.

2.3 VISUAL DISPLAY BOARD ASSEMBLY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AJW Architectural Products.
2. EverWhite.
3. Peter Pepper Products, Inc.

B. Visual Display Board Assembly: factory fabricated.

1. Assembly: markerboard.
2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.
5. Mounting Method: Direct to wall.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.

1. Color: White.

D. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; standard size and shape.

1. Aluminum Finish: Clear anodic finish.

E. Chalktray: Manufacturer's standard; continuous.

1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.

F. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, designed to hold accessories.

1. Size: 1 inch high by full length of visual display unit.
2. Map Hooks: Two map hooks for every 48 inches of display rail or fraction thereof.
3. Flag Holder: One for each room.
4. Aluminum Color: Match finish of visual display assembly trim.

2.4 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.

1. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
2. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.5 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

B. Plastic-Impregnated-Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout.

C. Composite Wood Products: Verify products are made without added urea formaldehyde.

D. Hardboard: ANSI A135.4, tempered.

E. Particleboard: ANSI A208.1, Grade M-1.

F. MDF: ANSI A208.2, Grade 130.

G. Fiberboard: ASTM C208 cellulosic fiber insulating board.

H. Extruded Aluminum: ASTM B221, Alloy 6063.

I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

1. Verify adhesives have a VOC content of 50 g/L or less.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine walls and partitions for proper preparation and backing for visual display units.

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

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches o.c., horizontally and vertically.

C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.

D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.

1. Mounting Height: 36 inches above finished floor to top of markertray.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 104416 – FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Portable, hand-carried fire extinguishers.

B. Related Requirements:

1. Section 104413 “Fire Protection Cabinets”.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

2. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

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

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: 6 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each indicated
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Badger Fire Protection
b. Guardian Fire Equipment, Inc.
c. Larsens Manufacturing Company.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marketing system complying with NFPA 10, Appendix B, and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective or unchargeable fire extinguishers.

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

3.2 INSTALLATION

A. General: Installation fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 101100

SECTION 230902 - NIAGARA N4 PLATFORM REQUIREMENTS 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.
B. MEMORANDUM OF USE POLICY FOR MEARNG Components, dated 10 August 2016 (Attached at the end of this section).

1.2 RELATED SECTIONS

A. Section 230800 – Commissioning of HVAC
B. Section 260533 – Raceways and Boxes
C. Section 263353 – Static Uninterruptible Power Supply.
D. Section 264313 – Surge Protective Devices.
E. Section 271100 – Communication Equipment Room Fittings.

1.3 SUMMARY

A. The intent of this specification is to provide an open source Building Automation Control System (BACS) based on the NiagaraN4 (must use latest approved NGB version) and a network of freely programmable interoperable open protocol BACnet digital controllers. The Interoperable BACnet controllers shall be fully programmable via the embedded Niagara Workbench tool requiring only a web browser to complete the programming process. Controllers that are not programmable or configurable directly within Niagara N4 are unacceptable. Contractor shall be the subContractor to the General Contractor, not the Mechanical Contractor or any other sub-Contractor.

B. Products requiring a licensed, non-embedded, off site programming site programming tool are not acceptable with the exception of variable refrigerant volume system controls. Open source as referred to herein shall mean that the Niagara N4 Network Area Controller and the Interoperable Digital BACnet Controller (IDC) products are available from multiple Contractor and vendor sources, affording the Owner freedom of choice and competitive bidding for the initial installation of the BACS and future system expansions and modifications not limited by Contractor, vendor or networking protocol. No territorially restricted OEM brands, single vendor or “branch only” products are acceptable. All products must be available for purchase by any qualified Contractor that the Owner chooses to do the installation and any further expansion or modifications. No non-Niagara programming is acceptable.

C. All JACE’s and Controllers shall be fully programmable or configurable from within any vendor’s version of the Niagara N4 Platform. Controllers that require a separate programming tool are not acceptable.

D. Contractor must be an authorized and approved representative of the product which they propose to install.

E. The successful bidder shall demonstrate to the Owner via a product website dealer/Contractor locator, that there are multiple Contractors and vendors in the project geographic area to choose from. Nom. No exceptions to this to this requirement will be allowed.

F. Furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation Control System (BACS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.

G. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

H. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).

1.4 SYSTEM DESCRIPTION

A. The entire Building Automation Control System shall be comprised of a network of interoperable, stand-alone digital controllers communicating via BACnet™ communication protocols to a Network Area Controller (NAC) through a Network Router. Temperature Control System products shall be by approved manufacturers. Equivalent BACnet™ products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days after receipt of Letter of Intent.

B. The Building Automation Control Systems (BACS) consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and perform functions specified.

C. The Building Automation Control System shall be comprised of Network Area Controller or Controllers
(JACE) within each facility. From herein, NAC must refer to a JACE. The NAC shall connect to the Owner's local or wide area network, depending on configuration. The controllers must be located adjacent to the equipment they monitor or control and must be sized for the task assigned to them. The system must utilize distributed processing architecture and one controller must be provided for each major piece of equipment or system controlled or monitored. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the local area network. Each NAC shall communicate to Open Protocol controllers and other open protocol systems/devices provided under "Related Sections".

D. The BACS Installation shall be integrated into the existing Niagara N4 Supervisor located at Camp Chamberlain in Augusta, Maine. The Niagara Supervisor provides the communication between the NAC and web browsers.

E. The BACS as provided in this Division shall be based on a hierarchical architecture incorporating the Niagara N4 Framework™. Systems not developed on the Niagara N4 Framework™ platform are unacceptable.

F. JACE controllers shall be provided with a Network Router, a static Uninterruptable Power Supply (UPS) and surge protection devices. UPS shall meet the requirements of Section 263353 "Static

Uninterruptible Power Supply". Further, all control panels shall be provided with a UPS with capacity to operate at full load for a minimum of 2 hours.

G. The BACS must monitor and control equipment as called for by the "Sequences of Operation" as indicated on M-700 series drawings and points list.

H. The BACS shall provide full graphic software capable of complete system operation for up to 34 simultaneous Thin-Client workstations.

I. The BACS shall provide full graphic operator interface to include the following graphics as a minimum:

1. Home page to include a minimum of six critical points, i.e. Outside Air Temperature, Outside Air Relative Humidity, Enthalpy, KWH, KW, BTU, etc.
2. Graphic floor plans accurately depicting rooms, walls, hallways, and showing accurate locations of space sensors and major mechanical equipment.
3. Detail graphics for each mechanical system to include, but not be limited to; RTUs (rooftop units), ERUs (energy recovery units), VRV's (variable refrigerant volume), AHUs (air handling units), Exhaust Fans, Heat Pumps, Domestic Water Heating Systems, Energy Monitoring, etc. and associated controls.
4. Provide access to corresponding system drawings, technical literature, and sequences of operations directly from each system graphic.
5. The BACS shall provide the following data links to electronically formatted information for operator access and use:
   a. Project control as-built documentation; to include all BACS drawings and diagrams converted to Adobe Acrobat.pdf filers.
   b. Temperature Control System (TCS) Bill of Material for each system, i.e. AHU, RTU, FCU, Boiler etc.
   c. Technical literature specification data sheets for all components listed in the BACS Bill of Material.
6. The BACS shall provide automated alarming software capable of sending messages to email compatible cellular telephones and pagers via the Owner's e-mail service. The email alarm paging system shall be able to segregate users, time schedules, and equipment, and be capable of being programmed by the Owner. Currently, these features may not be currently active due to communications restrictions, but must be provided for possible future use.

7. The Contractor must provide the appropriate quantity of legal copies of all software and utilities used during system commissioning and installation. The Owner must be named the license holder for all software associated with any and all incremental work in the project.

8. System Performance:
   a. Software requirements are Niagara 4.6/N4 as previously specified in this document.
   b. Peripheral device performance requirements are specified/detailed in the sequence of operations, and/or drawings for this project; per each individual piece of equipment of system.

1.5 SUBMITTALS

A. One digital copy of shop drawings of the components and devices for the entire control system must be submitted and must consist of a complete list of equipment and materials, including

manufacturers catalog data sheets and installation instructions for all controllers, valves, dampers, sensors, routers, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package. Division 26 Contractors supplying products and systems, as part of their packages must provide catalog data sheets, wiring diagrams, and point lists to the Division 23 Contractor for proper coordination of work.

B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media, and protocol. This shall include coordination of electrical branch circuit quantity and location for HVAC control and operator workstations as well as coordination of required network communications for HVAC control and operator workstations. Though the Division 23 and 26 Contractors shall provide these diagrams for their portions of work, the Systems Integrator shall be responsible for integrating those diagrams into the overall trunk cable schematic diagrams for the entire Wide Area Network (WAN) and/or Local Area Network (LAN) utilized by the BACS. Submittal shall also include a complete point list of all points to be connected to the BACS. Division 23 and 26 Contractors shall provide necessary point lists, protocol documentation, and factory support information for systems provided in their respective divisions but integrated into the BACS.

1. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The number of nodes per channel shall be no more than 80% of the defined segment (logical or physical) limit in order to provide future system expansion with minimal infrastructure modifications.

C. Submittal shall also include a complete point list of all points to be connected/integrated to the BACS. Division 23 and 26 Contractors shall provide necessary point lists, protocol documentation, and factory support information for systems provided in their respective divisions but integrated into the BACS.

D. Submittal shall also include an example of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. An equipment list coordinated with available points per item of equipment shall be submitted and confirmed by both the AE and the Owner that the equipment complies with the design intent.

E. Provide certificate of compliance that materials and equipment comply with the provisions of the Buy
American Act. See 007300 "Special Conditions," Par. 14, for additional requirements.

F. Upon completion of the work, provide a complete set of ‘as-built’ drawings that will reside in the file structure of the Niagara 4.6/N4 Supervisor. Eight 11”x17” bound paper copies of the ‘as-built’ drawings must be provided. Division 23 and 26 Contractors shall provide as-builts for their portions of work. The Division 23 Contractor shall be responsible for as-builts pertaining to overall BACS architecture and network diagrams.

1.6 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

1. Direct Digital Control System (DDC)
2. Building Automation Control System (BACS)
3. Graphical User Interface (GUI)
4. Interoperable BACnet Controller (IBC)
5. Interoperable Digital Controller (IDC)
6. Local Area Network (LAN)
7. Network Area Controller (NAC)
8. Object Oriented Technology (OOT)
9. Product Interoperability Compliance Statement (PICS)
10. Power Measurement Interface (PMI)
11. Portable Operator's Terminal (POT)
12. Temperature Control System (TCS)
13. Wide Area Network (WAN)
14. Web Browser Interface (WBI)

1.7 DIVISION OF WORK

A. The Division 23 Contractors shall be responsible for all controllers (IDC and IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring.

B. The Division 23 Contractor shall be responsible for the Network Area Controller(s) (NAC), software and programming of the NAC, graphical user interface software (GUI), development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, network management and connection of the NAC to the local or wide area network and Niagara Supervisor.

1.8 RELATED WORK SPECIFIED ELSEWHERE

A. Division 26, Electrical:

1. Providing motor starters and disconnect switches (unless otherwise noted).
2. Power wiring and conduit (unless otherwise noted).
3. Provision, installation and wiring of smoke detectors (unless otherwise noted).
4. Other equipment and wiring as specified in Division 26.

1.9 AGENCY AND CODE APPROVALS

A. All products of the BACS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.

1. UL-916; Energy Management Systems
2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 “signal Equipment”
3. CE
4. FCC, Part 15, Subpart J, Class A Computing Devices

1.10 SOFTWARE LICENSE AGREEMENT

A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). Any and all required IDs and passwords for access to any component or software program shall be provided to the Owner.

C. The Owner, or his appointed agent, shall receive Ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara 4.6/N4 Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and all connected routers and devices.

1.11 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.12 QUALITY ASSURANCE

A. Proven Experience: Provide a list of no less than ten similar projects which utilize a Niagara AX/N4 Platform. These projects must be on-line and functional such that the Owner's Representative would observe a direct digital control system in full operation. The Contractor must be a direct, wholly owned branch of a national control's manufacturer, or a representative not a wholesale distributor.

B. Quality of Compliance: Control systems shall be installed by trained control mechanics regularly employed in installation and calibration of BACS equipment by the manufacturer of the proposed equipment to be installed.

C. Contractor Requirements
1. Longevity: The BACS Contractor shall have a minimum of ten years’ experience installing, and servicing computerized building systems utilizing a Niagara AX/N4 Platform. All subContractors utilized by the BACS Contractor shall have a minimum of five-year experience within their appropriate trades.
2. Past Projects: The BACS Contractor shall have completed a minimum of five projects which utilized the Niagara AX/N4 Platform within the last three years that are at least equal in dollar value and scope to this project. A list of similar projects, dollar volume, scope, contact name and contact number shall be provided by the BACS Contractor if asked for by the

Owner.
3. Personnel, Coverage and Response Capabilities: The BACS Contractor shall have a minimum of ten full time electronic service personnel and one factory trained DDC control technician within a 150 mile radius of the project location. One full time electronic service personnel and one DDC control technicians must work within a 150-mile radius of the project location.
4. The BACS Contractor shall have an established 24-hour emergency service organization. A dedicated telephone number shall be provided to the Owner for requesting emergency service. The BACS Contractor shall guarantee that within a maximum of four hours, the electronic service technicians shall be on site.
5. The Potential Low Bidder will submit with Bid Documents a qualification statement demonstrating how the above Contractor requirements shall be achieved. Any Potential Low Bidder that does not meet all of the criteria shall not be considered and shall be rejected for not complying with the specifications.
6. All Control Contractors must be pre-vetted by the Owner and the Consulting Engineer. This list will be provided as an amendment after the completion of the site visit. Any interested control Contractors wanted to be included on the pre-vetted list of acceptable control Contractors must be present at the site walkthrough, where they will receive instructions on how to be included on the pre-vetted control Contractors list for this project.
7. Contractor and subContractors performing work shall be required to fingerprinting and formal background checks sufficient to satisfy current Department of Defense security clearances for Contractor's or subContractors performing work in secure areas.

1.13 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

PART 2 – PRODUCTS

2.1 GENERAL

A. The Building Automation Control System (BACS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices, valves, dampers, sensors, and other devices as specified herein.
B. The installed system shall provide secure password access to all features, functions and data contained in the overall BACS.

2.2 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design: Honeywell / Tridium Niagara N4. Subject to compliance with requirements, provide the product named. System must operate on an open licensed JACE, no appliance may be used. All instances of Niagara N4 must operate with the Brand ID set to “none”, and compatibility modes set for “all”. All instances of Niagara N4 must be capable of being programmed within any vendor’s version of the Niagara N4 Workbench. All Unitary Controllers must be Programmable or Configurable directly within any vendor’s version of the

Niagara 4.6/N4 workbench, no additionally required software is acceptable.

1. Honeywell WEBS
2. Siemens Talon

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet™ technology, MODBUS™, OPC, and other open and non-proprietary communication protocols into one open, interoperable system.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI /ASHRAE™ Standard 135-2001 and BACnet to assure interoperability between all system components is required. For each BACnet device, the device supplier must provide a PICS document showing the installed device's BACnet compatibility. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of Open Protocol devices must be via Ethernet, and/or RS-485 and/or RS-232.

C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. Systems requiring proprietary database and user interface programs shall not be acceptable.

E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 30 seconds for local network connected user interfaces.

2.4.1 NETWORKS

A. The Local Area Network (LAN) shall be a 100 Megabit/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.

B. Local area network minimum physical and media access requirements:

1. Ethernet; IEEE standard 802.3
2. Cable; 100 Base-T, UTP-8 wire, category 5
3. Minimum throughput; 100 Mbps.

C. Open Protocol Networks must each be a properly biased network, and capable of being converted to Open Protocol IP, via a converter.

2.5 NETWORK ACCESS

A. Remote Access:

1. System must be capable of remote access that can be enabled at the Clients discretion.

2.6 NETWORK AREA CONTROLLER (NAC)

A. The Contractor shall supply one or more Network Area Controllers (NAC) as part of this contract. Number of area controllers required is dependent on the type and quantity of devices provided under Divisions 23 and 26. It is the responsibility of the Contractor to coordinate with the Division 23 and 26 Contractors to determine the quantity and type of devices.

B. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:

1. Calendar functions
2. Scheduling
3. Trending
4. Alarm monitoring and routing
5. Time synchronization
6. Integration of BACnet controller data
7. Network Management functions for BACnet based devices

C. The Network Area Controller shall provide the following hardware features as a minimum:

1. One Ethernet Port – 10/100 Mbps
2. One RS-232 port
3. One RS-485 port if BACnet controllers are used.
4. The NAC must contain a hard disk with at least 1 gigabyte storage capable of saving data for a minimum or 24 hours and trending data for 48 hours.
5. The NAC must be capable of operation over a temperature range of 32 to 122°F
6. The NAC must be capable of withstanding storage temperatures of between 0 and 158°F.
7. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.

D. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

E. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.

F. Event Alarm Notification and actions

1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network, or remote via dial-up telephone connection or wide-area network.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including, but not limited to:

a. In alarm

b. Return to normal
c. Fault condition

4. Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and/or classes of alarms, i.e.: security, HVAC, Fire, etc.
5. Provide timed (schedule) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

G. Controller and network failures shall be treated as alarms and annunciated.

H. Alarms shall be annunciated in any of the following manners as defined by the user:

1. Screen message text
2. Email of the complete alarm message to multiple recipients via the Owner's e-mail service. Provide the ability to route and email alarms based on:

a. Day of week
b. Time of day
c. Recipient

3. Pagers via paging services that initiate a page on receipt of email message via the Owner's e-mail service.
4. Graphic with flashing alarm object(s)
5. Printed message, routed directly to a dedicated alarm printer

I. The following shall be recorded by the NAC for each alarm (at a minimum):
1. Time and date
2. Location (building, floor, zone, office number, etc.)
3. Equipment (air handler #, access way, etc.)
4. Acknowledge time, date, and user who issued acknowledgement.
5. Number of occurrences since last acknowledgement.

J. Alarm actions may be initiated by user defined programmable objects created for that purpose.

K. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

L. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

M. Provide a "query" feature to allow review of specific alarms by user defined parameters.

N. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

O. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.7 DATA COLLECTION AND STORAGE

A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.

B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:

1. Designating the log as interval or deviation.
2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.

D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

E. All log data shall be available to the user in the following data formats:
1. HTML
2. XML
3. Plain Text
4. Comma or tab separated values
5. PDF

F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

G. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:

1. Archive on time of day.
2. Archive on user-defined number of data stores in the log (buffer size).
3. Archive when log has reached its user-defined capacity of data stores.
4. Provide ability to clear logs once archived.

2.8 AUDIT LOG

A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:

1. Time and date

2. User ID
3. Change or activity: i.e., Change set point, add or delete objects, commands, etc.

2.9 DATABASE BACKUP AND STORAGE

A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.

C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.10 ADVANCED UNITARY CONTROLLER

A. The controller platform shall be designed specifically to control HVAC – ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes but is not limited to: constant volume air handlers, VAV air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units, and radiant panels. The controller platform shall provide options and advanced system functions, and shall be fully programmable and configurable using any vendors version of the Niagara N4 Framework™, that allow standard and customizable control solutions.

B. Minimum Requirements:

1. The controller shall be capable of either integrating with other devices or stand-alone operation.
2. The controller shall have an FTT transformer-coupled communications port interface for common mode-noise rejection and DC isolation.
3. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.
    a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
    b. Accuracy: ±1 minute per month at 77° F (25° C).
    c. Power Failure Backup: 24 hours at 32° to 122° F (0° to 50° C).
4. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
5. The controller shall have an internal DC power supply to power external sensors.
6. Power Output: 24 VDC +/- 10% at 75mA.
7. The controller shall have a visual indication (LED) of the status of the device:
    a. Controller operating normally.
    b. Controller in process of download.
    c. Controller in manual mode under control of software tool.
    d. Controller lost its configuration.

e. No power to controller, low voltage, or controller damage.
f. Processor and/or controller are not operating.

8. The minimum controller Environmental ratings
a. Operating Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
b. Storage Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
c. Relative Humidity: 5% to 95% non-condensing.

9. The controller shall have the additional approval requirements, listings, and approvals:

a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
b. CSA (LR95329-3) Listed
c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
d. Meets Canadian standard C108.8 (radiated emissions).
Conforms to the following requirements per European Consortium standards:
1) EN 61000-6-1; 2001 (EU Immunity)
2) EN 61000-6-3; 2001 (EU Emissions)

10. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).

11. The controller shall have sufficient on-board inputs and outputs to support the application.

a. Analog outputs (AO) shall be capable of being configured to support 0-10 V, 2-10 V or 4-20 mA devices.
b. Triac outputs shall be capable of switching 30 Volts at 500 mA.
c. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring. Input and Output wiring terminals shall be designated with color coded labels.
d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).

12. The controller shall provide for “user defined” Network Variables (NV) for customized configurations and naming using Niagara N4 Framework™.

a. The controller shall support 62 Network Variables with a byte count of 31 per variable.
b. The controller shall support 1,922 separate data values.

13. The controller shall provide “continuous” automated loop tuning with an Adaptive Integral Algorithm Control Loop.
14. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized “sequence of operations” as outlined in the contract documents.
a. Discharge air control and low limit
b. Pressure-dependent dual duct without flow mixing.
c. Variable air volume with return flow tracking.
d. Economizer with differential enthalpy.
e. Minimum air flow coordinated with CO2.
f. Unit ventilator cycle (1, 2, 3) 2-pipe.

g. Unit ventilator cycle (1, 2,3) 2-pipe with face/bypass.
h. With EOC valve.

2.11 GRAPHICAL USER INTERFACE SOFTWARE

A. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

B. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. Systems requiring proprietary database and user interface programs shall not be acceptable.

C. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

11. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for local network connected user interfaces.
12. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.12 NETWORKS

A. The Local Area Network (LAN) shall be a 100 Megabit/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.

B. Local area network minimum physical and media access requirements:

11. Ethernet; IEEE standard 802.3
12. Cable; 100 Base-T, UTP-8 wire, category 5
13. Minimum throughput; 100 Mbps.

2.13 NETWORK ACCESS

A. Remote Access.

1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the Owner's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Owner agrees to pay monthly access charges for connection and ISP.

2.14 NETWORK AREA CONTROLLER (NAC)

A. The Contractor shall supply one or more Network Area Controllers (NAC) as part of this contract. Number of area controllers required is dependent on the type and quantity of devices provided under Divisions 23 and 26. It is the responsibility of the Contractor to coordinate with the Division 23 and 26 Contractors to determine the quantity and type of devices.

B. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:

1. Calendar functions
2. Scheduling
3. Trending
4. Alarm monitoring and routing
5. Time synchronization
6. Integration of BACnet controller data
7. Network Management functions for BACnet based devices
8. The Network Area Controller shall provide the following hardware features as a minimum:
   a. One Ethernet Port – 10/100 Mbps
   b. One RS-232 port
   c. One RS-485 port if BACnet controllers are used.
   d. Battery Backup
   e. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
   f. The NAC must be capable of operation over a temperature range of 32 to 122°F
   g. The NAC must be capable of withstanding storage temperatures of between 0 and 158°F
   h. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non- condensing
9. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
10. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 34 simultaneous users.
11. Event Alarm Notification and actions
    a. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
    b. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network, or remote via dial-up telephone connection or wide-area network.
    c. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including, but not limited to:
       1) In alarm
       2) Return to normal
       3) Fault condition
       4) Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and/or classes of alarms, i.e.: security, HVAC, Fire, etc.

5) Provide timed (schedule) routing of alarms by class, object, group, or node.
6) Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

12. Controller and network failures shall be treated as alarms and annunciated.
13. Alarms shall be annunciated in any of the following manners as defined by the user:
    a. Screen message text
    b. Email of the complete alarm message to multiple recipients via the Owner's e-mail service. Provide the ability to route and email alarms based on:
        1) Day of week
        2) Time of day
        3) Recipient
        4) Pagers via paging services that initiate a page on receipt of email message via the Owner's e-mail service
        5) Graphic with flashing alarm object(s)
        6) Printed message, routed directly to a dedicated alarm printer
14. The following shall be recorded by the NAC for each alarm (at a minimum):
    a. Time and date
    b. Location (building, floor, zone, office number, etc.)
    c. Equipment (air handler #, access way, etc.)
    d. Acknowledge time, date, and user who issued acknowledgement.
    e. Number of occurrences since last acknowledgement.
15. Alarm actions may be initiated by user defined programmable objects created for that purpose.
16. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
17. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.
18. Provide a "query" feature to allow review of specific alarms by user defined parameters.
19. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
20. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.15 DATA COLLECTION AND STORAGE

A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.

B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:

1. Designating the log as interval or deviation.
2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
5. Each log shall have the ability to have its data cleared on a time-based event or by a user-

defined event or action.

6. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.
7. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

8. All log data shall be available to the user in the following data formats:

   a. HTML
   b. XML
   c. Plain Text
   d. Comma or tab separated values
   e. PDF

9. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
10. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:

    a. Archive on time of day
    b. Archive on user-defined number of data stores in the log (buffer size)
    c. Archive when log has reached its user-defined capacity of data stores
    d. Provide ability to clear logs once archived

2.16 AUDIT LOG

A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:

   1. Time and date
   2. User ID
   3. Change or activity: i.e., Change set point, add or delete objects, commands, etc.

2.17 DATABASE BACKUP AND STORAGE

A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.

C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.18 ADVANCED UNITARY CONTROLLER

A. The controller platform shall be designed specifically to control HVAC – ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes but is not limited to: constant volume air handlers, VAV air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units, and radiant panels. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara N4 Framework™, that allow standard and customizable control solutions.

B. Minimum Requirements:

1. The controller shall be capable of either integrating with other devices or stand-alone operation.
2. The controller shall have an FTT transformer-coupled communications port interface for common mode-noise rejection and DC isolation.
3. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.
   a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
   b. Accuracy: ±1 minute per month at 77° F (25° C).
   c. Power Failure Backup: 24 hours at 32° to 122° F (0° to 50° C).

      1) The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
      2) The controller shall have an internal DC power supply to power external sensors.
      3) The controller shall have a visual indication (LED) of the status of the devise:

         a) Controller operating normally.
         b) Controller in process of download.
         c) Controller in manual mode under control of software tool.
         d) Controller lost its configuration.
         e) No power to controller, low voltage, or controller damage.
         f) Processor and/or controller are not operating.

      4) The minimum controller Environmental ratings

         a) Operating Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
         b) Storage Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
         c) Relative Humidity: 5% to 95% non-condensing.

      5) The controller shall have the additional approval requirements, listings, and approvals:

         a) UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
         b) CSA (LR95329-3) Listed
         c) Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.

d) Meets Canadian standard C108.8 (radiated emissions).
e) Conforms to the following requirements per European Consortium standards:
f) EN 61000-6-1; 2001 (EU Immunity)
g) EN 61000-6-3; 2001 (EU Emissions)

6) The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
7) The controller shall have sufficient on-board inputs and outputs to support the application.

a) Analog outputs (AO) shall be capable of being configured to support 0-10 V, 2-10 V or 4-20 mA devices.
b) Triac outputs shall be capable of switching 30 Volts at 500 mA.
c) Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring. Input and Output wiring terminals shall be designated with color coded labels.
d) Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).

8) The controller shall provide for "user defined" Network Variables (NV) for customized configurations and naming using Niagara N4 Framework™.

   a) The controller shall support 62 Network Variables with a byte count of 31 per variable.
   b) The controller shall support 1,922 separate data values.

9) The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
10) The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in the contract documents.

   a) Discharge air control and low limit
   b) Pressure-dependent dual duct without flow mixing.
   c) Variable air volume with return flow tracking.
   d) Economizer with differential enthalpy.
   e) Minimum air flow coordinated with CO2.
   f) Unit ventilator cycle (1, 2, 3) 2-pipe.
   g) Unit ventilator cycle (1, 2, 3) 2-pipe with face/bypass.

2.19 GRAPHICAL USER INTERFACE SOFTWARE

A. Operating System:

1. The Workstation with GUI shall run on Microsoft Windows 7 or the current approved Maine Army National Guard Microsoft product.
2. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimal knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, hypertext buttons to drawings or files designated by the Owner, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.
3. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:

   a. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of, a graphic background the GUI shall support the use of scanned pictures.
   b. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
   c. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
   d. Modifying common application objects, such as schedules, calendars, and set

points shall be accomplished in a graphical manner.

1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

2) Holidays shall be set by using a graphical calendar without requiring any keyboard entry from the operator.

3) Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No text entry shall be required.

4) Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No text entry shall be required.

4. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:

a. Create, delete, or modify control strategies.
b. Add or delete objects to the system.
c. Tune control loops through the adjustment of control loop parameters.
d. Enable or disable control strategies.
e. Generate hard copy records or control strategies on a printer.
f. Select points to be alarmable and define the alarm state.
g. Select points to be trended over a period of time and initiate the recording of values automatically.

5. On-Line Help. Provide a context sensitive on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for the currently displayed screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
6. Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off the system if no keyboard or mouse activity is detected for a specified time. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.
7. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
8. Alarm Console

a. The system shall be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console may be enabled or disabled by the system administrator.
b. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new

alarms and unacknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

9. Hypertext links shall be provided to access as-built drawings or related building documents designated by the Owner for the buildings being controlled by the Niagara N4 platform. Installer shall coordinate with Owner to obtain server address locations and hypertext link protocols. Drawings and other documents not used for operation of the Niagara N4 platform will be accessed using a hypertext method.

WEB BROWSER CLIENTS

B. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™, Safari™, or Google Chrome™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

C. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BACS, shall not be acceptable.

D. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface (if used). Systems that require different graphic views, different means of graphic generation, or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

E. The Web browser client shall support at a minimum, the following functions:

1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
5. Real-time values displayed on a Web page shall update automatically without requiring a manual
"refresh" of the Web page.
6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

    a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.

1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
2) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

a) Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop- up menu. No text entry shall be required.

View logs and charts
View and acknowledge alarms
Setup and execute SQL queries on log and archive information

3) The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to set a specific homepage for each user. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
4) Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.20 SYSTEM CONFIGURATION TOOL

A. The Workstation Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.

B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and by linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. GUI screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real- time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

C. Programming Methods

1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
2. Configuration of each object will be done through the object's property sheet using fill-in

the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.

3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.21 LIBRARY

A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.

C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.

D. All control objects shall conform to the control objects specified in the BACnet specification.

E. The library shall include applications or objects for the following functions, at a minimum:

1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on- off events.
2. Calendar Object. The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.
3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals
4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un- occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start /

stop time object properties based on the previous day's performance.

6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.
7. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.

   a. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
   b. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
   c. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
   d. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
   e. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
   f. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
   g. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.

h. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.

i. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.

j. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an “On” state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.

k. Global Settings Object - Provide an object or objects whose purpose is to provide the capability of globally changing set points during seasonal changes such as summer, fall, winter and spring.

l. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the “contained” application that are represented on the graphical shell of this container.

8. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:

a. For BACnet devices, provide the following objects at a minimum:

1) Analog In
2) Analog Out
3) Analog Value
4) Binary
5) Binary In
6) Binary Out
7) Binary Value
8) Multi-State In
9) Multi-State Out
10) Multi-State Value
11) Schedule Export
12) Calendar Export
13) Trend Export
14) Device
15) For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
16) For BACnet devices, provide the following support at a minimum

a) Segmentation
b) Segmented Request
c) Segmented Response
d) Application Services
e) Read Property
f) Read Property Multiple
g) Write Property
h) Who-has
i) I-have
j) Who-is
k) I-am
l) Media Types
m) Ethernet
n) BACnet IP Annex J
o) MSTP
p) BACnet Broadcast Management Device (BBMD) function
q) Routing.

2.22 DDE DEVICE INTEGRATION

A. The Network Area Controller shall support the integration of device data via Dynamic Data Exchange (DDE), over the Ethernet Network. The Network Area Controller shall act as a DDE client to another software application that functions as a DDE server.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of these devices into the BACS. Objects provided shall include at a minimum:

1. DDE Generic AI Object
2. DDE Generic AO Object
3. DDE Generic BO Object
4. DDE Generic BI Object

2.23 MODBUS SYSTEM INTEGRATION

A. The Network Area Controller shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:

1. Read/Write Modbus AI Registers
2. Read/Write Modbus AO Registers
3. Read/Write Modbus BI Registers
4. Read/Write Modbus BO Registers
5. All scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices, shall be performed by the Network Area Controller.
6. The BACS supplier shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning

2.24 OPC SYSTEM INTEGRATION

A. The Network Area Controller shall act as an OPC client and shall support the integration of device data from OPC servers. The connection to the OPC server shall be Ethernet IP as required by the device. The OPC client shall support third party OPC servers compatible with the Data Access 1.0 and 2.0 specifications.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the OPC system data into the BAS. Objects provided shall include at a minimum:

1. Read/Write OPC AI Object
2. Read/Write OPC AO Object
3. Read/Write OPC BI Object
4. Read/Write OPC BO Object
5. Read/Write OPC Date/Time Input Object
6. Read/Write OPC Date/Time Output Object
7. Read/Write OPC String Input Object
8. Read/Write OPC String Output Object
9. All scheduling, alarming, logging and global supervisory control functions, of the OPC system devices, shall be performed by the Network Area Controller.
10. The BACS supplier shall provide an OPC client communications driver. The equipment system vendor that provided the equipment utilizing OPC shall provide documentation of the system's OPC server interface and shall provide factory support at no charge during system commissioning.

2.25 OTHER CONTROL SYSTEM HARDWARE

A. Alternate device manufacturers will be considered with the approval of the Owner.

B. All wall mounted devices shall have white finish, unless noted otherwise, to match electrical wiring devices and cover plates see Section 262726 “Wiring Devices”.

C. Space Thermostats: Temperature sensing modules mounted on the wall in occupied spaces. Optional set point, indication, and override switches must be provided as specified.

1. Sensor shall contain digital display and user function keys along with temperature sensor. Sensor shall function as occupant control unit. It shall allow occupant to raise and lower set point and activate terminal unit for unoccupied override use all within limits as programmed by building operator.
2. Provide means for occupant to view room set point, and room temperature at each controller. Override time may be set and viewed in 0.1 hour increments. Override time countdown shall be automatic, but may be reset to zero using function keys on unit. Display shall be blank in unoccupied mode unless a function button is pressed.
3. Space temperature sensors shall be accurate to plus or minus 0.5 deg. F at 77 deg. F.
4. Blank, wall mounted space temperature sensors with unoccupied override button, without set point adjustment or LCD readout shall be utilized as required when no occupant interaction is needed or desired and where indicated on the drawings.

D. Duct Mount, Pipe Mount, and Outside Air Temperature Sensors:

1. Outside air sensors shall include an integral sun shield.
2. Temperature sensors shall have an accuracy of plus or minus 1.0 deg. F. over operating range.
3. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 inches.
4. Multipoint averaging element sensors shall be provided where specified, and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).
5. Pipe mount sensors shall have copper, or stainless steel separable wells.
6. Outside Air Sensor (OAS) to be located on north side of building in a location that is not exposed to direct sunlight.

E. Current Switches: Solid state, split core, current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point shall be provided where specified. Current switches shall include an integral LED for indication of trip condition.

1. Sensing range 0.5 – 250 Amps.
2. Output 0.3 A @ 200 VAC/VDC / 0.15 A @ 300 VAC/VDC
3. Operating frequency 40 Hz -1 kHz.
4. Operating Temperature 5-104 deg. F -15 – 40 deg. C), Operating Humidity 0-95% non- condensing
5. Approvals CE, UL.

F. Current Sensors: Solid state, split core linear current sensors shall be provided where specified.

1. Linear output of 0-5 VDC, 0-10 VDC, or 4-20 mA.
2. Scale sensors so that average operating current is between 20-80% full scale.
3. Accuracy plus or minus 1.0% (5-100% full scale)
4. Operating frequency 50-600 Hz.
5. Operating Temperature 5-104 deg. F (-15 – 40 deg. C), Operating Humidity 0-95% non- condensing
6. Approvals CE, UL.

G. Water Flow Meters: Water flow meters shall be axial turbine style flow meters which translate liquid motion into electronic output signals proportional to the flow sensed.

1. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag.
2. Flow meters shall be 'insertion' type complete with 'hot-tap' isolation valves to enable sensor
removal without water supply system shutdown.
3. Accuracy shall be + 2% of actual reading from 0.4 to 20 feet per second flow velocities.

H. Thermal Mass Flow Meters:

1. Sensor shall utilize hybrid analog/digital sensing circuitry to measure thermal mass flow rate of natural gas.
2. Sensor shall be constructed of 316 Stainless Steel.
3. Accuracy: +/- 2% of reading. Able to be field calibrated.
4. Sensor shall be factory installed in 1/2" thru 4" pipe with flow straighteners factory installed.
5. 24v input power.
6. Operating range of -40 to 200 deg F and up to 500 psi.
7. Outputs available:

    a. Analog 4-20 mA 24 VDC pulse output.
    b. Optional flow display module displays instantaneous rate and totalized flow.
    c. Network Interface: MODBUS with RS-485 connection for BACnet/IP.

I. Low Temperature Limit Switches. Safety low limit shall be manual reset twenty foot limited fill type responsive to the coolest section of its length.

1. Low limit set point shall be adjustable between 20 and 60 deg. F. (-5 and 15 deg. C.)
2. Switch enclosure shall be dustproof and moisture-proof.
3. Switch shall break control circuit on temperature fall. Contact ratings shall be 10.2 FLA at 120 VAC, and 6.5 FLA at 240 VAC.
4. Ambient Temperature range -20 to 125 deg. F. (-11 to 52 deg. C.)
5. Operating Temperature Range 20 to 60 deg. F. (-5 to 15 deg. C.

J. High Temperature Limit Switches. Safety high limit (fire stats) shall be manual reset type.

1. High limit set point shall be adjustable between 100 and 240 deg. F. (38 and 116 deg. C.)
2. Switch enclosure shall be dustproof and moisture-proof.
3. Switch shall break control circuit on temperature fall. Contact ratings shall be 10 FLA at 120 VAC, and 5 FLA at 240 VAC.
4. Ambient Temperature range -20 to 190 deg. F. (-28 to 88 deg. C.) at case, and 350

deg. F (177 deg. C.) at the sensor.

5. Operating Temperature Range 100 to 240 deg. F. (38 to 116 deg. C.

K. Carbon Dioxide Sensors (General Occupancy Areas)

1. Carbon Dioxide sensors shall be 0-10 Vdc, 2-10 Vdc, or 4-20 mA linear analog output type, with corrosion free gold-plated non-dispersive infrared sensing, designed for duct or wall mounting.
2. Sensor shall incorporate internal diagnostics for power, sensor, analog output checking, and automatic background calibration algorithm for reduced maintenance. Sensor range shall be 0- 2000 PPM with +/- 75 PPM accuracy at full scale.
3. Sensor shall have an LCD display that displays the sensor reading and status.

L. Nitrogen Monoxide and Nitrogen Dioxide Sensors (Garage/Work Bay)

1. Nitrogen sensors shall be 0-10 Vdc, 2-10 Vdc, or 4-20 mA linear analog output type, with solid- state infrared sensing, designed for wall mounting.
2. Sensor shall incorporate internal diagnostics for power, sensor, analog output checking, and automatic background calibration algorithm for reduced maintenance. Sensor range shall be 0-10 PPM with +/- 10% accuracy at full scale.
3. Where specified, sensor shall have an LCD display that displays the sensor reading and status.

M. Refrigerant Sensors (General Occupancy)

1. Basis of Design: Bacharach MGS-250 Series
2. Refrigerant sensors shall have 0-10 Vdc, 2-10 Vdc, or 4-20 mA linear analog output, with non- dispersive infrared sensing, audible alarm, and alphanumeric LED display of sensor reading and status designed wall mounting.
3. 24 VAC/VDC input power supply.
4. Sensor shall be factory calibrated for detection of R-410A and incorporate internal diagnostics for power, sensor, analog output checking, and automatic background calibration algorithm for reduced maintenance. Sensor range shall be 0-3500 PPM with +/- 75 PPM accuracy at full scale. Adjustable high limit alarm from 500-900 ppm.
5. Sensor shall be capable of output to BMS control system.

N. Differential Pressure Sensors

1. Sensor shall have four field selectable ranges: 0.1, 0.24, 0.5, 1.0 in w.c. for low pressure models, and 1.0, 2.5, 5, 10 for high pressure models.
2. Sensor shall provide zero calibration via pushbutton or digital input.
3. Sensor shall have field selectable outputs of 0-5 VDC, 0-10 VDC, and 4-20 mA
4. Where specified, sensor shall have and LCD display that displays measured value.
5. Sensor overpressure rating shall be 3 PSID proof, and 5 PSID burst.
6. Sensor accuracy shall be plus or minus 1% FS selected range.

O. Humidity Sensors.

1. Humidity transducer shall be accurate to +/- (2%, 3%, 5% choose desired accuracy) between 20- 95% RH NIST traceable calibration.
2. Sensors shall have a field selectable output of 0-10 Vdc, 0-5 Vdc, or 4-20 mA.

3. Sensors shall provide field calibration option using non-interacting zero and span potentiometers, and/or toggle switches that increment or decrement the RH value in steps of 0.5% RH.
4. Accuracy of the sensor shall not be adversely affected by condensation.

P. Enthalpy Sensors.

1. (Option 1 – Changeover type – Select one) Duct mounted enthalpy sensor shall include a temperature sensor and a humidity sensor constructed to close an electrical contact upon a drop in enthalpy (total heat) to enable economizer modes of operation where specified.

2. (Option 2 – Proportional analog signal– Select one) Provide duct mounted sensor including solid state temperature and humidity sensors with electronics which shall output a 4-20 ma signal input to the controller upon a varying enthalpy (total heat) to enable economizer modes of operation when outside air enthalpy is suitable for free cooling.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

        1) Honeywell
        2) Siemens Building Technologies

Q. Annular Pitot Tube Flow Meter. Annular pitot tube shall be averaging type differential pressure sensors with four total head pressure ports and one static port made of austenitic stainless steel.

1. Sensor shall have an accuracy of ±.25% of full flow and a repeatability of ±.05% of measured value.
2. Transmitter shall be electronic and shall produce a linear output of 0-10 Vdc, 0-5 Vdc, or 4 to 20 mA dc corresponding to the required flow span.
3. The transmitter shall include non-interacting zero and span adjustments.

R. Emergency Shutdown Stations

1. Wall-mounted, ADA compliant, UL listed, emergency button station with 120v or 24v SPST contacts. Stainless steel back plate with molded polycarbonate housing. Basis of design: Safety Technology International, Inc. Series 2000 Stopper Station.
2. Activation: Push button to activate, turn to reset.
3. Text: Stations shall be provided with the following custom label, “HVAC SYSTEM SHUTDOWN”
4. Finish: Yellow.
5. Cover: Top hinged, clear polycarbonate cover mounts over station to prevent accidental activation equal to STI Mini Stopper 2.
6. Indicator light located above station shall illuminate on all emergency shutdown stations when one station has been activated to alert occupants.

S. Window Sash Sensors

1. Window switches shall consist of a fixed earth magnet in operable window sash with magnetic activating contact housed in window frame equal to GE Security 1075.
2. Switching voltage of 120v or 24 VDC.

T. Standard Automatic Control Dampers. Provide all automatic control dampers not specified to be integral with other equipment.

1. Frames shall be 5 inches wide and of no less than 16-gauge galvanized steel. Inter-blade linkage shall be within the frame and out of the air stream.
2. Blades shall not be over 8 inches wide or less than 16-gauge galvanized steel triple V type for rigidity.
3. Bearings shall be acetyl, oilite, nylon or ball-bearing with ½ inch diameter plated steel shafts.
4. Dampers shall be suitable for temperature ranges of -40 to 180F.
5. All proportional control dampers shall be opposed or parallel blade type as hereinafter specified and all two-position dampers shall be parallel blade types.
6. Dampers shall be sized to meet flow requirements of the application.
7. Maximum leakage for dampers in excess of sixteen inches square shall be 30 CFM per square foot at static pressure of 1 inch of WC. Testing and ratings to be in accordance with AMCA Standard 500.

U. Low Leakage Automatic Control Dampers. Provide all automatic control dampers not specified to be integral with other equipment.

1. Frames shall be 5 inches wide and of no less than 16-gauge galvanized steel. Inter-blade linkage shall be within the frame and out of the air stream.
2. Blades shall not be over 8 inches wide or less than 16-gauge galvanized steel triple V type for rigidity.
3. Bearings shall be acetyl, oilite, nylon or ball-bearing with ½ inch diameter plated steel shafts.
4. Dampers shall be suitable for temperature ranges of -40 to 180F.
5. All proportional control dampers shall be opposed or parallel blade type as hereinafter specified and all two-position dampers shall be parallel blade types.
6. Dampers shall be sized to meet flow requirements of the application. The sheet metal Contractor shall furnish and install baffles to fit the damper to duct size. Baffles shall not exceed 6". Dampers with dimensions of 24 inches and less shall be rated for 3,000 fpm velocity and shall withstand a maximum system pressure of 5.0 in. w.c. Dampers with dimensions of 36 inches and less shall be rated for 2,500 fpm velocity and shall withstand a maximum system pressure of 4.0 in. w.c. Dampers with dimensions of 48 inches and less shall be rated for 2,000 fpm velocity and shall withstand a maximum system pressure of 2.5 in. w.c.
7. Side seals shall be stainless steel of the tight-seal spring type.
8. Dampers shall be minimum leakage type to conserve energy and the temperature control manufacturer shall submit leakage data for all low leakage control dampers with the temperature control submittal.
9. Maximum leakage for low leakage dampers in excess of sixteen inches square shall be 8 CFM per square foot at static pressure of 1 inch of WC.
10. Low leakage damper blade edges shall be fitted with replaceable, snap-on, inflatable seals to limit damper leakage.
11. Testing and ratings shall be in accordance with AMCA Standard 500.
12. Damper blade width shall be no greater than 8 inches, and dampers over 48 inches wide by 74 inches high shall be sectionalized. Testing and ratings to be in accordance with AMCA Standard 500.

V. Round Motorized Dampers. Round dampers shall be provided where specified and shall be factory mounted in a section of round duct a minimum of 12 inches long, but no less than one inch longer than the duct diameter.

1. Duct shall be sleeve type spiral duct crimped on the downstream end, 24 gage galvanized minimum except duct over 12 inches in diameter shall be 22 gage.
2. Duct shall have an integral galvanized steel actuator mounting plate and a ½ inch zinc-coated steel blade shaft extending a minimum of 2 inches beyond the actuator mounting plate.
3. Shaft bearings shall be flanged bronze oilite pressed into the frame.
4. The blade shall be a minimum 16 gage galvanized steel, and damper frame shall be provided with closed-cell neoprene seals with silicone rubber bead. Damper shall be designed for a 2500 ft/min approach velocity and a 4 inch minimum static pressure.
5. Damper shall be suitable for operation from 32 to 130F temperatures.
6. Damper and actuator combination shall be designed for leakage rates less than 13 cfm per square foot at one inch w.c. differential and 25 cfm at four inches w.c. Actuator shall have an external declutch lever to allow manual blade positioning during equipment and power malfunctions.

W. Control Valves: (Globe Type) Control valves shall be 2-way or 3-way pattern as shown constructed for tight shutoff and shall operate satisfactory against system pressures and differentials.

1. Two-position valves shall be line size.
2. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Manufacturer's specified maximum differential pressure shall not be exceeded in order to prevent cavitation.
3. Two-way proportional valves shall have equal percentage flow characteristics. Three-way valves shall have equal percentage flow characteristics straight through, and linear through the bypass. Rangeability shall be 50:1 or greater.
4. Provide valve position indicator and a method to operate valves manually during system start-up, or actuator power loss or failure on all valves.
5. Leakage rate shall be no more than ANSI Class III (for heating) or ANSI Class IV (for cooling).
6. Valves 1/2 inch through 3 inches shall be screwed pattern except where solder connections are specified for valves 1/2 or 3/4 inches.
7. Three-way valve bypass ports shall be of Cv to provide constant flow through the control loop.
8. Two-way valves shall close off against the net differential pressure resulting from the maximum head pressure of the system pumps less all loop pressure losses. Three-way valves shall close off against the difference in head pressure between the controlled load and the bypass line.
9. Valves 2-1/2 inch and larger shall be flanged and ANSI/ASME-rated to withstand the pressures and temperatures specified.
10. Valves shall have stainless-steel stems and spring loaded Teflon packing with replaceable discs.

X. Control Valves: (Characterized Ball Valves) Control valves 1/2 to 3 inches shall be 2-way or 3-way forged brass screwed pattern constructed for tight shutoff and shall operate satisfactory against system pressures and differentials.

1. Two-position valves shall be line size.

2. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Manufacturer's specified maximum differential pressure shall not be exceeded in order to prevent cavitation.
3. Two-way proportional valves shall have equal percentage flow characteristics. Three-way valves shall have equal percentage flow characteristics straight through and linear flow through the bypass.
4. Leakage rate shall be ANSI Class IV (no more than 0.01% of Cv).
5. Fluid temperature range shall be between -22 and +250 degrees F. water or glycol solutions up to 50%. Piping and valves shall be properly insulated to prevent formation of ice on moving parts.
6. Valves shall be rated for no less than 360 psig at 250 degrees F.
7. Provide a method to operate valves manually during system start-up, or actuator power loss or failure on all valves.
8. Two-way valves shall close off against 70 psi minimum, and three-way valves shall close off against 40 psi minimum.
9. Valves shall have stainless-steel or chemically nickel-plated brass stem and throttling port.
10. Actuator shall be available with NEMA 3R (IP54) rated enclosure suitable for outdoor installation.
11. Valves shall be tagged with Cv rating and model number.

Y. Control Valves: (Characterized Ball Valves) Control valves 4 to 6 inches shall be 2-way or 3-way cast iron ANSI Class 125 flanged connections as shown constructed for tight shutoff and shall operate satisfactory against system pressures and differentials.

1. Two-position valves shall be line size.
2. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Manufacturer's maximum differential pressure shall not be exceeded in order to prevent cavitation.
3. Two-way water valves shall have equal percentage flow characteristics. Three-way valves shall have equal percentage flow characteristics straight through and linear with 20% reduced flow through the bypass. Rangeability shall be 100:1 or greater.
4. A-port leakage rate shall be ANSI Class IV (no more than 0.01% of Cv) or better.
5. Fluid temperature range shall be between -22 and +250 degrees F. water or glycol solutions up to 50%. Piping and valves shall be properly insulated to prevent formation of ice on moving parts.
6. Valves shall be rated for no less than 240 psig at 250 degrees F.
7. Provide a method to operate valves manually during actuator power loss or failure.
8. Two-way valves shall close off against 70 psi minimum, and three-way valves shall close off against 40 psi minimum.
9. Valve ball and stem shall be 316 stainless-steel.
10. Actuator shall be available with NEMA 3R (IP54) rated enclosure suitable for outdoor installation.
11. Valves shall be tagged with Cv rating and model number.

AA. Butterfly Control Valves: Where specified, butterfly control valves 2” to 20" in size shall be cast iron body type for 2-way applications and constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Three-way applications shall consist of 2-way valves assembled to a "Tee" fitting with common actuators and operating linkage.

1. Valves shall have tapped lugs for standard flange connection, and meet

ANSI/ASME requirements to withstand the pressures and temperatures encountered.

2. Valve shall have a corrosion, ultra-violet, and wear-resistant coating for outdoor applications.
3. Resilient-seated valves shall use food-grade elastomeric seats. Seat shall also function as the flange gaskets.
4. Valves shall be designed for isolation and the absence of downstream piping at rated differential pressure.
5. All valves shall be line size.
6. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psid at rated flow (except as may be noted on the drawings) up to a maximum stroke of 60° disk rotation. Manufacturer's maximum fluid velocity shall not be exceeded in order to prevent cavitation.
7. Valves shall be rated for bubble tight shutoff at no less than 150 psi differential pressure for full cut valves, or 50 psi for undercut valves.
8. Valve disc shall be of corrosion-resistant construction appropriate for the controlled media such as nylon-coasted cast iron, aluminum bronze, or stainless steel.
9. Valve stems shall be stainless steel, with inboard top and bottom bearings, and an external corrosion resistant top bearing to absorb actuator side thrust.
10. Actuator mounting flange shall conform to ISO 5211 for actuator interchangeability.
11. Actuator shall be available with NEMA 4X (IP65) rated enclosure suitable for outdoor installation.
12. Valves shall be tagged with Cv rating and model

number. BB. Variable Frequency Drives.

1. Manufacturers:
   a. Cerrus Industrial.
   b. Eaton Corp.: Cutler-Hammer Products.
   c. Emerson Industrial Automation.
   d. General Electric Distribution & Control.
   e. Honeywell Building Controls.
   f. Yaskawa Electric America, Inc. (MagneTek Drives and Systems).
   g. Square D Co.

2. Variable frequency drives shall be UL listed and sized for the power and loads applied. Units shall be provided with main power disconnect and manual bypass starters allowing motor operation from the drive or across the line. This facilitates drive maintenance while the motor continues to operate.
3. Drives shall include built-in radio frequency interference (RFI) filters and be constructed to operate in equipment rooms and shall not be susceptible to electromagnetic disturbances typically encountered in such environments. Similarly, the drives must not excessively disturb the environment within which it is used.
4. All VFDs over 3 horsepower shall be provided with an AC choke.
5. VFDs shall be installed in strict conformance to the manufacturer’s installation instructions, and
shall be rated to operate over a temperature range of 14 to 104 F.
6. VFD automatic operation shall be suitable for an analog input signal compatible with the digital controller output.
7. Each VFD shall be fan cooled and have an integral keypad and alphanumeric display unit for user interface. The display shall indicate VFD status (RUN motor rotation, READY,

STOP, ALARM, and FAULT), and shall indicate the VFD current control source (DDC input signal, keypad, or field bus control). In addition to the alphanumeric display, the display unit shall have three pilot lights to annunciate when the power is on (green), when the drive is running (green, blinks when stopping and ramping down), and when the drive was shut down due to a detected fault (red, fault condition presented on the alphanumeric display).

8. Three types of faults shall be monitored, "FAULT" shall shut the motor down, "FAULT Auto-reset" shall shut the motor down and try to restart it for a programmable number of tries, and "FAULT Trip" shall shut the motor down after a FAULT Auto-reset fails to restart the motor. Coded faults shall be automatically displayed for the following faults:

    a. Over current
    b. Over voltage
    c. Earth ground
    d. Emergency stop
    e. System (component failure)
    f. Under voltage
    g. Phase missing
    h. Heat sink under temperature
    i. Heat sink over temperature
    j. Motor stalled
    k. Motor over temperature
    l. Motor under load
    m. Cooling fan failure
    n. Inverter bridge over temperature
    o. Analog input control under current
    p. Keypad failure
    q. Other product unique monitored conditions
    r. In addition to annunciating faults, at the time of fault occurrence the VFD shall capture and make available to the user certain system data for subsequent analysis during fault trouble shooting, including duration of operation (days, hours, minutes, seconds),output frequency, motor current, motor voltage, motor power, motor torque, DC voltage, unit temperature, run status, rotation direction, and any warnings. The last 30 fault occurrences shall be retained as well as the fault data listed in the previous sentence of each fault. New faults beyond 30 shall overwrite the oldest faults.

9. The display unit keypad shall allow setting operational parameters including minimum and maximum frequency, and acceleration and deceleration times. The display shall offer user monitoring of frequency, unit temperature, motor speed, current, torque, power, voltage, and temperature.

CC. Actuators, General. All automatically controlled devices, unless specified otherwise elsewhere, shall be provided with actuators sized to operate their appropriate loads with sufficient reserve power to provide smooth modulating action or two-position action and tight close-off. Valves shall be provided with actuators suitable for floating or analog signal control as required to match the controller output.

1. Spring Return Direct Coupled Actuators. Actuators shall have torque ratings of 44lb-in., 88 lb-in., or 175 lb-in. Actuators shall be modulating 90 seconds nominal timing or two-position 45 seconds nominal timing types with strokes for 90 degree rotation applications

and designed for operation between -40 and 140 F.

a. Each torque rating group shall have optionally selected control types, floating control, 2- position 24 Vac, 2-position line voltage, or analog input which is switch selectable as 0- 10Vdc, 10-0 Vdc, 2-10 Vdc, or 10-2 Vdc.
b. Actuator spring return direction (open or closed) shall be easily reversed in the field, and actuators shall spring return in no greater than 20 seconds.
c. Actuators serving air stream dampers shall be powered-open type which return to a closed position when power is lost.
d. Actuators shall be direct connected (no linkages), and shall have integral position indication.
e. Actuators shall have NEMA 2 environmental protection rating, and UL approved and plenum rated per UL873.
f. Minimum design life of modulating actuators shall be for 1,500,000 repositions and 60,000 spring returns, except 2-position actuators shall be for 50,000 spring returns.
g. Each actuator shall be provided with a manual power-off positioning lever for manual positioning during power loss or system malfunctions, including a gear-train lock to prevent spring action.
h. Upon power restoration after gear lock, normal operation shall automatically recur.

2. Fast Acting Two Position Fire & Smoke Actuators. Fire/smoke damper actuators shall be direct connected (no linkages) two-position spring return types with stroke for 90 degree nominal rotation applications and designed for 60,000 full stroke cycles and normal operation between 0 and 130 F.

a. Actuators control shall be compatible with SPST control switch and with torque ratings of 30 lb-in.
b. Actuator timing shall be 25 seconds maximum in powered instances and shall spring- return in 15 seconds.
c. Actuators shall be UL listed with UL873 plenum rating with die-cast aluminum housing with integral junction box and conduit knockouts, and designed to operate reliably in smoke control systems requiring UL555S ratings up to 350F.
d. The actuator shall be designed to operate for 30 minutes during a one-time excursion to 350F.
e. Actuator shall require no special cycling during long-term holding, and shall “hold” with
no audible noise at a power consumption of approximately half of the driving power.
f. Actuators shall be 24 volt or 120 volt with models for clockwise (add a B suffix) and counter-clockwise (add an A suffix) spring return.

DD. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels. A complete set of ‘as-built’ control drawings (relating to the controls within that panel) shall be furnished within each control panel.

PART 3 - EXECUTION

3.1 EXECUTION

A. All work described in this section shall be performed by system integrators or Contractors that have a successful history in the design and installation of integrated control systems. The BACS Contractor shall have a minimum of ten years' experience installing, and servicing computerized building systems utilizing the Niagara N4 Platform. All subContractors utilized by the BACS Contractor shall have a minimum of five years' experience within their appropriate trades.

B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

C. Drawings of the BACS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Project Manager shall be furnished and installed without additional cost.

D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this Contractor in accordance with these specifications.

E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by this Contractor.

F. Global metering as described in the mechanical controls drawings shall provide information output in the format included in Appendix A of this specification section.

3.2 WIRING

A. All electrical control wiring and power wiring to the control panels, NAC, computers and network components shall be the responsibility of the this Contractor.

B. The electrical Contractor (Div. 26) shall furnish all power wiring to electrical starters and motors.

C. All wiring shall be in accordance with the Project Electrical Specifications (Division 26), the National Electrical Code and any applicable local codes. All power wiring and BACS wiring shall be installed in either conduit or cable tray as specified in the Project Electrical Specifications (Division 26 and 27) and installed in a neat and workmanlike manner. No exposed conductors or cabling are permitted.

3.3 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Contractor shall provide certification from product manufacturer that the installer is licensed to process potential warranty claims on behalf of the manufacturer. If a product manufacturer warranty cannot be obtained by the installer, the installer shall provide a two-year warranty for equipment, materials and workmanship.

C. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly

(within 48 hours after receipt of notice) repaired or replaced by this Contractor at no expense to the Owner.

3.4 WARRANTY ACCESS

A. The Contractor shall meet the following requirements prior to the Owner allowing the Contractor to access the BACS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period:

1. Obtain Common Access Card (CAC) authorization from DOMs using the GKO State Employee System process.

a. The specific employee for the Contractor will need a Federal employee sponsor.
b. CAC authorization is for an individual not a company. Sharing of a CAC and the associated CAC PIN is forbidden and will result in termination of the CAC authorization.

1) Obtain a State CAC following the normal CAC issuing process at the DEERS/RAPIDS station.

a) Finger printing, and
b) Background check.

2) Complete the Deputy Chief of Staff Information Management (DCSIM) steps necessary to obtain an account on the MEARNG network:

a) Information Assurance (IA) Training
b) Acceptable Use Policy
c) Computer Equipment

B. The Owner shall provide laptop w/operating system meeting DCSIM specifications. The laptop may remain in the Contractor's possession for the warranty period and is the property of the Owner at the end of the warranty period or request by the Owner.

C. The computer equipment shall be configured to the following DCISM standards:
1. In accordance with AR25-2: Section 4-5(a)(6), installation of non-Government-owned computing systems or devices without prior authorization of the appointed Designated Approving Authority (DAA) including but not limited to USB devices, external media, personal or Contractor-owned laptops, and Mobile Computer Devices (MCDs) is prohibited.
2. In accordance with AR25-2: Section 4-31(e), Contractor-owned and operated Information Systems (ISs) will meet all security requirements for Government-owned hardware and software when operating on the Army Enterprise Infrastructure (AEI), managing, storing, or processing Army or DOD data or information, or conducting official communications or business.
3. In accordance with AR25-2: Section 5-8(d), a DAA will be identified for each information system operating within or on behalf of the Department of the Army (DA), to include outsourced business processes supported by private sector IS and outsourced IT (for example, Government owned, Contractor Operated (GOCO) and Contractor

Owned, Contractor Operated (COCO).

D. DCSIM will configure the laptop with software image to meet Army standards.

1. When all the above has been accomplished the Contractor will be given direct access when onsite at a MEARNG location. The CAC and user account privileges are granted on a per individual basis only, not a company. Sharing of a CAC and the associated CAC PIN is forbidden and will result in termination of the CAC authorization. The Contractor will be responsible for complying with all DCSIM automated patch updates and will be subject to automated compliance scans upon connection to the network.

E. The computer provided by the Contractor is subject to the following limitations:

1. The computer that is provided for this use will only be used for accessing the system, server, computer or IT device on the MEARNG Domain.
2. This computer will operate on approved Virtual Local Area Networks (VLANS) designated by the MEARNG Network Manager.
3. The computer will only connect to the Contractors system by connecting directly into the MEARNG infrastructure at a physical MEARNG facility. At no time will remote access or the creation of a virtual private network (VPN) connection from outside the MEARNG Domain from any computer or electronic device be allowed. This includes, but is not limited to: Remote Desktop Connections, VPN clients etc.
4. All Contractor personnel accessing the BACS via the computer shall sign and abide by the Memorandum of Use Policy for MEARNG Components.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, this Contractor shall load all system software and start-up the system. This Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications as well as the sequence of operation.

B. This Contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. Controls testing shall also include operation verification of smoke control sequence, emergency shutdown sequence and emergency and normal power sequence.

D. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner or the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

E. System Acceptance: Satisfactory completion is when this Contractor and the Division 26 Contractor have performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner and the Owner’s Representative. Final system acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

A. During system commissioning and at such time acceptable performance of the BACS hardware and software has been established this Contractor shall provide on-site operator instruction to the Owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. This Contractor shall provide 40 hours of instruction to the Owner's designated personnel on the operation of the BACS and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.

C. The training shall be in three sessions as follows:

1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the Owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
2. First Follow-Up Training: Two days (16 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
3. Warranty Follow Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of the Owner during the one year warranty period. These sessions shall cover topics as requested by the Owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

3.7 BUILDING FIRE ALARM INTERFACING

A. General: Provide all controls for interfacing the building HVAC systems to the building fire alarm system. The building fire alarm system and smoke detectors are specified in Division 28.

B. The fire-alarm system, as described in Division 28, will send a signal to the DDC system to identify when the fire alarm system is in alarm.

C. Upon receipt of the fire alarm signal, the DDC system continues to operate HVAC equipment. It shall be automatically shut down only when activated by the smoke detector(s) located in the air handling unit. Both the supply fan and its related return fan shall be shut down by the same sensor.

3.8 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Operational Test. After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
3. Calibration test electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Engage a factory-authorized service representative to perform startup service.

C. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

D. Verify DDC as follows:

1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
2. Verify operation of operator workstation.
3. Verify local control units including self-diagnostics.

3.9 SYSTEM ACCEPTANCE

A. The system installation shall be complete in all respects and tested for proper operation prior to acceptance testing for the Owner's authorized representative. A letter shall be submitted to the Engineer requesting system acceptance. This letter shall certify all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing will commence at a mutually agreeable time within 30 calendar days of the request. When the system has been deemed satisfactory in whole or in part by the Owner's representative, the system will be accepted for beneficial use which will start the warranty period for the commissioned portion.

B. The building controls system subContractor shall submit a proposed Acceptance Test Agreement for testing the system's functionality and the accuracy of all sensors and actuators.”

3.10 COMMISSIONING

A. Commissioning Agent shall observe testing as required to verify systems have been installed and operate per the contract documents.

Appendix A GLOBAL BUILDING POINTS AND METERING OUTPUT

B. Utility metering shall output data in the format shown by the example tables below. Actual values in the table are for demonstrative purposes only.

General Note: Current HDD or CDD calculation will need an if/and statement for baseline temperature of 65 F.

MEARNG Bldg XXXXX Electrical Use										
21-Nov-16	Avg Outside Air Temperature (F)	Current FY (kWh)	Previous FY (kWh)	Percent Change	Current FY (KW) Demand	Previous FY (KW) Demand	Percent Change	Current FY HDD or CDD	Previous FY HDD or CDD	Percent change
Yesterday	35	186	200	-7%	145	130.00	12%	30	28	7%
Sunday	32	180	175	3%	45.00	30.00	50%	33	31	6%
Monday	36	185	195	-5%	138.00	145.00	-5%	29	35	-17%
Tuesday	29	482	430	12%	120.00	150.00	-20%	36	30	20%
Wednesday	35	455	465	-2%	135.00	145.00	-7%	30	31	-3%
Thursday	32	460	470	-2%	140.00	138.00	1%	33	31	6%
Friday	25	490	495	-1%	138.00	154.00	-10%	40	31	29%
Saturday	40	200	180	11%	149.00	156.00	-4%	25	31	-19%
Month to date	37	9160	9000	2%				630	650	-3%
Semi-Annually to date	65	54,958.8	50000	10%				3500	3400	3%
Annually to date	45	109,917.6	105000	5%				7000	6850	2%
Send Alarm if previous is less than or greater than 15% (adjustable)										
Graph to show running total of current and previous and outside air temperature (selectable)										

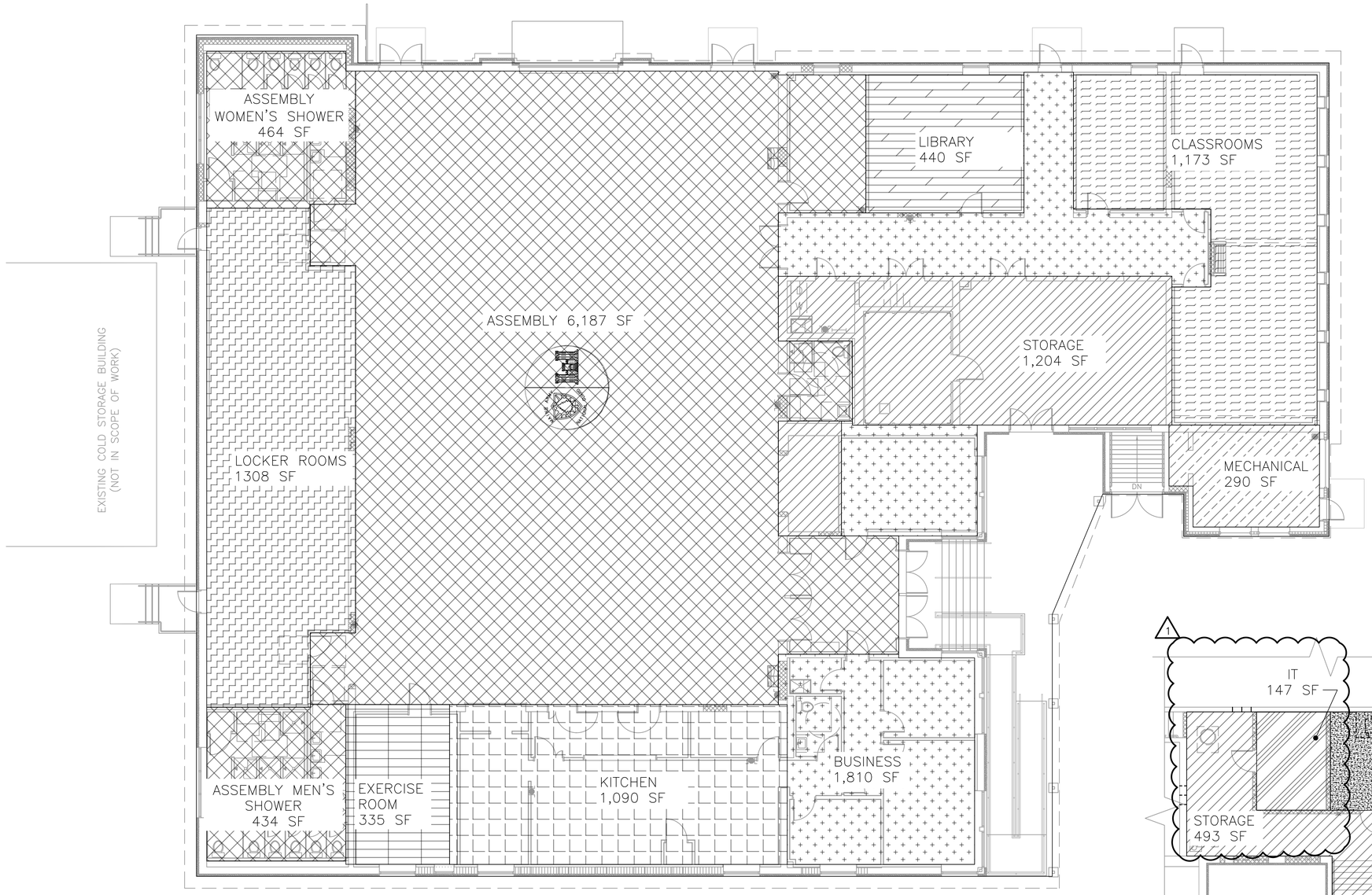
MEARNG Bldg XXXXX Gas Use									
21-Nov-16	Avg Outside Air Temperature (F)	Current FY (Therms or gallons)	Previous FY (Therms or gallons)	Percent Change			Current FY HDD or CDD	Previous FY HDD or CDD	Percent change
Yesterday	35	186	200	-7%			30	28	7%
Sunday	32	180	175	3%			33	31	6%
Monday	36	185	195	-5%			29	35	-17%
Tuesday	29	482	430	12%			36	30	20%
Wednesday	35	455	465	-2%			30	31	-3%
Thursday	32	460	470	-2%			33	31	6%
Friday	25	490	495	-1%			40	31	29%
Saturday	40	200	180	11%			25	31	-19%
Month to date	37	9160	9000	2%			630	650	-3%
Semi-Annually to date	65	54,958.8	50000	10%			3500	3400	3%
Annually to date	45	109,917.6	105000	5%			7000	6850	2%
Send Alarm if previous is less than or greater than 15% (adjustable)									
Graph to show running total of current and previous and outside air temperature (selectable)									

MEARNG Bldg XXXXX Water Data									
21-Nov-16	Avg Outside Air Temperature (F)	Current FY (CCF or gallons)	Previous FY (CCF or gallons)	Percent Change			Current FY HDD or CDD	Previous FY HDD or CDD	Percent change
Yesterday	35	186	200	-7%			30	28	7%
Sunday	32	180	175	3%			33	31	6%
Monday	36	185	195	-5%			29	35	-17%
Tuesday	29	482	430	12%			36	30	20%
Wednesday	35	455	465	-2%			30	31	-3%
Thursday	32	460	470	-2%			33	31	6%
Friday	25	490	495	-1%			40	31	29%
Saturday	40	200	180	11%			25	31	-19%
Month to date	37	9160	9000	2%			630	650	-3%
Semi-Annually to date	65	54,958.8	50000	10%			3500	3400	3%
Annually to date	45	109,917.6	105000	5%			7000	6850	2%
Send Alarm if previous is less than or greater than 15% (adjustable)									
Graph to show running total of current and previous and outside air temperature (selectable)									

END OF SECTION 23 09 02

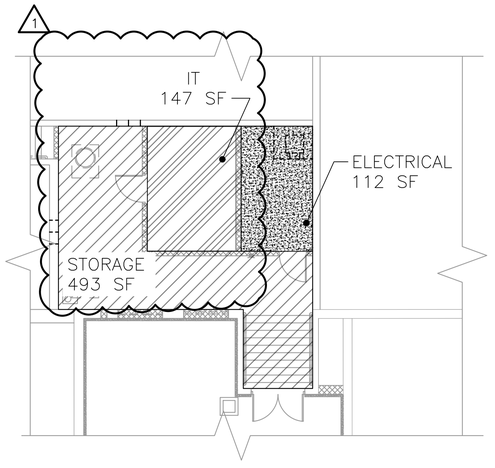
NOTE:

1. SEE DRAWING LS–001 FOR A UFC, IBC, AND NFPA 101 CODE SUMMARY THAT APPLIES TO THIS BUILDING, AND ADDITIONAL NOTES. DRAWING LS–001 DOES NOT CLAIM TO IDENTIFY ALL OF THE REQUIREMENTS THAT NEED TO BE MET BY THE UFC. THE UFC 1–200–01 DIRECTS WHEN AND WHERE TO USE THE RELEVANT INTERNATIONAL CODE COUNCIL SECTIONS AND THE NATIONAL FIRE PROTECTION ASSOCIATION CODES. THE DESIGN PROFESSIONALS AND CONTRACTOR ARE RESPONSIBLE FOR ADHERING TO THE ENTIRETY OF THOSE DOCUMENTS AND PROVIDING A CODE COMPLIANT INSTALLATION.



FIRST FLOOR OCCUPANCY PLAN

SCALE: 1/8" = 1'–0"



BASEMENT OCCUPANCY PLAN

SCALE: 1/8" = 1'–0"

OCCUPANCY LEGEND:

- BUSINESS
- CLASSROOMS
- STORAGE
- KITCHEN
- EXERCISE
- LOCKER ROOMS
- ASSEMBLY
- LIBRARY
- MECHANICAL
- IT
- ELECTRICAL

PLAN NORTH

Scale: 1/8" = 1'–0"

DIRECTORATE OF FACILITIES ENGINEERING DFE CAMP KEYES

PLAN REVISIONS

Rev#	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
CCE JOB #144.054.002
#7A LONG WORK STREET
PORTLAND, MAINE
207.553.7753

DESIGNED BY: SRP
DRAWN BY: SRP
CHECKED BY: RTM
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19–427–D

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

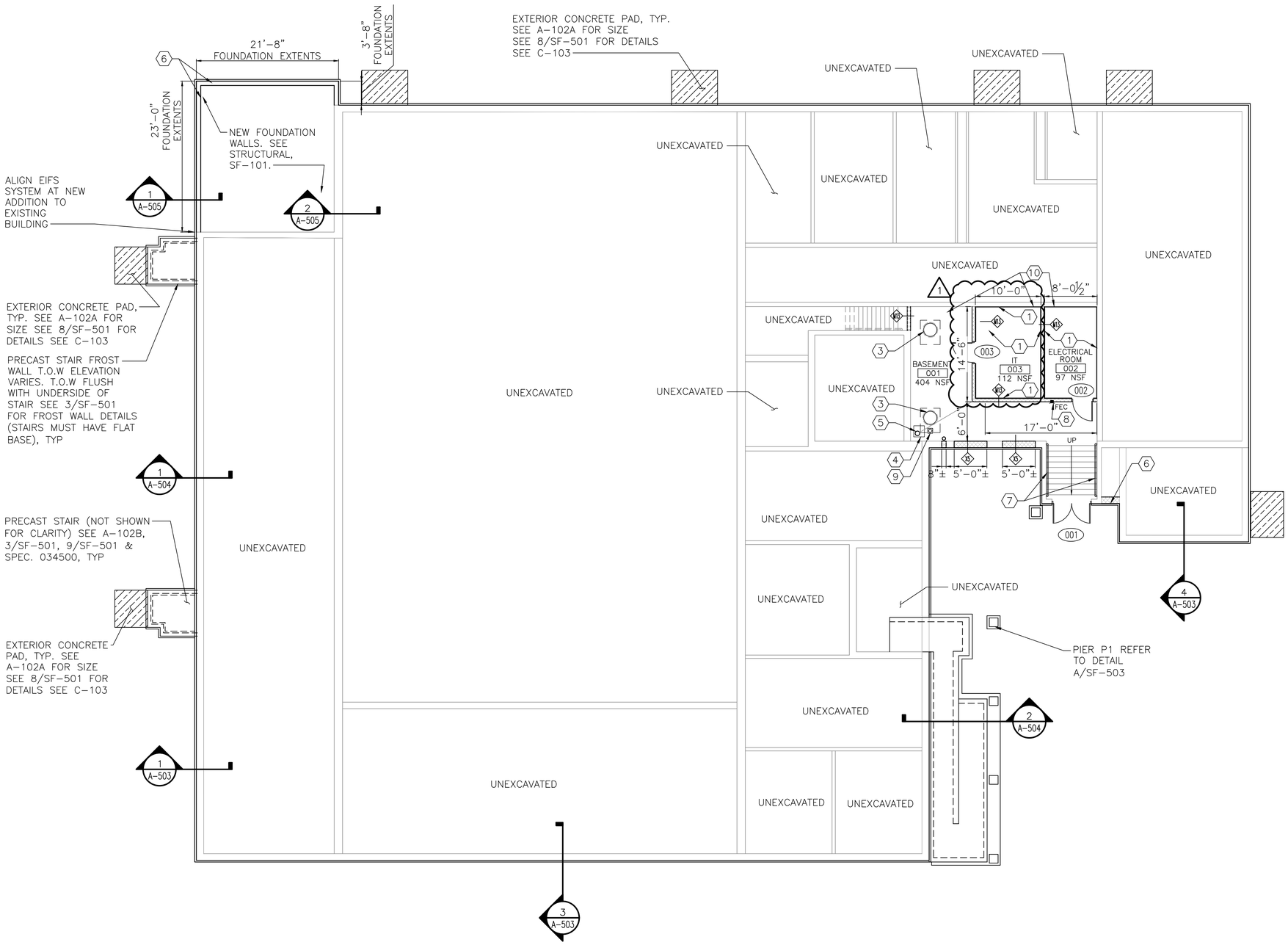
LIFE SAFETY OCCUPANCY LOAD PLANS

PLAN PROGRESS

- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

LICENSED ARCHITECT
RICHARD TODD McSHERRY
3772
STATE OF MAINE
9 APR 2021

SHEET ID:
LS–102
SHEET: 19 OF 145



BASEMENT PLAN

SCALE: 1/8"=1'-0"

NOTES:

1. SEE A-001 FOR ARCHITECTURAL NOTES AND ABBREVIATIONS,
2. SEE MECHANICAL, ELECTRICAL, COMMUNICATIONS, PLUMBING, FIRE PROTECTION AND STRUCTURAL DRAWINGS TO COORDINATE THE WORK.
3. PATCH AND REPAIR ALL EXISTING WALLS IN AREAS OF REMOVAL.
4. CLEAN AND PREPARE ALL BASEMENT WALLS FOR INSTALLATION OF WATER PROOFING MATERIAL. SEE SPECIFICATION SECTION 09 96 00.
5. DIMENSIONS ARE FROM FACE OF WALL TO FACE OF WALL UNLESS NOTED OTHERWISE.
6. WALL TYPES ARE SHOWN ON SHEET A-501 THROUGH A-502.
7. SEE SHEET A-602 FOR DOOR SCHEDULE.
8. PROVIDE BULLNOSED BLOCKS AT ALL NEW EXPOSED CMU CORNERS.
9. PREPARE BASEMENT CEILING TO RECEIVE PAINT. 2 COATS PRIMER 2 COATS PAINT.
10. COORDINATE EXTERIOR BASEMENT PENETRATIONS WITH FIRE PROTECTION, PLUMBING, STRUCTURAL, CIVIL, AND ELECTRICAL DISCIPLINES.
11. SLOPE FLOOR TO DRAIN WHERE PROVIDED.

ARCHITECTURAL KEYED NOTES:

1. PROVIDE AND INSTALL 3/4" FIRE RETARDANT TREATED PLYWOOD ON ALL I.T. WALLS AND ELECTRICAL ROOM WALLS WHERE INDICATED. REFER TO FINISH SCHEDULE FOR PAINT COLOR, LEAVE ONE RATING LABEL VISIBLE ON EACH PANEL. MOUNT 6" A.F.F.. ANCHOR TO WALL WITH STAINLESS STEEL HARDWARE WITH A FLAT HEAD. FINISHED INSTALLATION TO HAVE FLUSH AND LEVEL APPEARANCE WITH COUNTERSUNK SCREW HEADS TO PREVENT SPLITTING OF THE PLYWOOD.
2. NOT USED.
3. PROVIDE AND INSTALL NEW SUMP PIT BASIN AND FLOOR DRAIN, COORDINATE WITH STRUCTURAL AND PLUMBING. COORDINATE WITH REMOVAL OF EXISTING SUMP PIT.
4. INFILL REMAINING AREA OF EXISTING SUMP PIT WITH CONCRETE, LEVEL WITH EXISTING FLOOR SLAB. SEE SF-501.
5. COORDINATE INSTALLATION OF FIRE PROTECTION RISER. SEE C-104.
6. PROVIDE AND INSTALL NEW INSULATED EXTERIOR FOUNDATION WALL. SEE 1/SF-502.
7. PROVIDE AND INSTALL STEEL RAILINGS, PAINTED BLACK. SEE 7/A-507.
8. PROVIDE AND INSTALL SEMI-RECESSED FIRE EXTINGUISHER CABINET.
9. PROVIDE AND INSTALL (2) SEPARATE SUMPS STORM WATER/SANITARY SEWER. SEE P-101
10. CLEAN AND PAINT CONCRETE WALLS AND FLOORS

LEGEND:

- EXISTING TO REMAIN
- SCOPE OF WORK
- NEW CMU WALLS
- NEW METAL STUD WALL INFILL
- NEW EIFS
- FEC — FIRE EXTINGUISHER CABINET LOCATION
- CONCRETE EXTERIOR PAD

PLAN NORTH

Scale: 1/8" = 1'-0"

LICENSED ARCHITECT RICHARD TODD McSHERRY 3772 STATE OF MAINE 9 APR 2021

DIRECTORATE OF FACILITIES ENGINEERING DFE CAMP KEYES

PLAN REVISIONS

Rev#	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

DESIGNED BY: SRP
DRAWN BY: SRP
CHECKED BY: RTM
DATE: 03/31/2020
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
CCE JOB #144.054.002
47A YORK STREET
PO BOX 1440, MAINE
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION
BASEMENT FLOOR PLAN

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

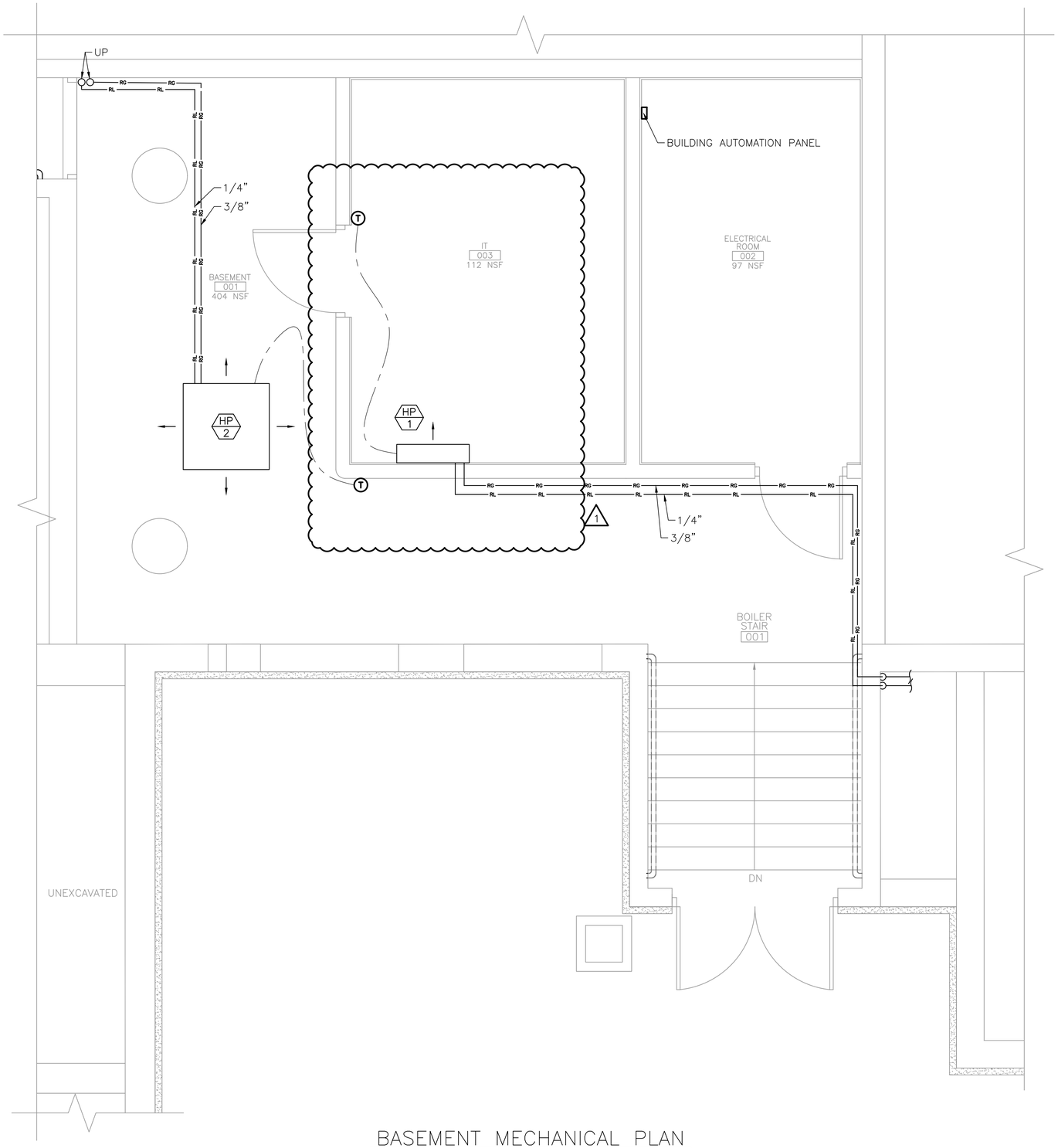
SHEET ID: A-101
SHEET: 48 OF 145

NOTES:

1. REFER TO DRAWING M–001 AND M–002 FOR MECHANICAL NOTES, ABBREVIATIONS, AND LEGENDS.

LINETYPE LEGEND:

- RG ——— REFRIGERANT GAS
- RL ——— REFRIGERANT LIQUID
- —— – —— CONTROL WIRE
- ——— MECHANICAL EQUIPMENT



BASEMENT MECHANICAL PLAN

SCALE: 1/8"=1'–0"

PLAN NORTH

Scale: 1/2" = 1'–0"

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
CCE JOB #144.054.002
47A YORK STREET
PORTLAND, MAINE
207.553.7753

PLAN REVISIONS

Rev#	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

DESIGNED BY: AMV
DRAWN BY: PML
CHECKED BY: DHB
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION
BASEMENT MECHANICAL PLAN

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
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- ☐ FINAL REVIEW
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- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
M–101
SHEET: 79 OF 145

STATE OF MAINE
DAVID H. BROWN
No. 7551
LICENSED PROFESSIONAL ENGINEER
4-09-21

PACKAGED ROOFTOP AIR HANDLING UNIT (HEAT PUMP) SCHEDULE

UNIT NO.	LOCATION	SERVICES	FAN DATA								REFRIGERANT COIL										ENERGY RECOVERY DATA				FURNACE DATA				ELECTRICAL DATA					WEIGHT (LBS)	MANUFACTURER AND MODEL ⟨1⟩⟨2⟩	NOTES
											COOLING				HEATING			HOT GAS REHEAT			WINTER		SUMMER												
			TOTAL (CFM)	OA (CFM)	ESP (IN WG)	TYPE	SUPPLY FAN RPM	SUPPLY FAN HP	EXHAUST FAN RPM	EXHAUST FAN HP	REFRIGERANT TYPE	TOTAL (MBH)	EAT (°F)	LAT (°F)	TOTAL (MBH)	EAT (°F)	LAT (°F)	TOTAL OUT (MBH)	EAT (°F)	LAT (°F)	EAT (F°)	LAT (F°)	EAT (F°)	LAT (F°)	TOTAL OUTPUT (MBH)	EAT (°F)	LAT (°F)	FUEL	VOLTS	PH	HZ	MCA	MOP			
RTU–1	LOW ROOF	LOCKER & BATH	2025	2025	1	DIRECT	1686	4.0	1935	2.3	R–410A	86.5	81.0/67.2	53.3/53.3	75.6	70.0	104.2	36.6	53.3/53.3	70.0/59.6	–10	49.4	95/75	79.6/65.8	320	–10	90	NG	208	3	60	42.7	50	2457	DAIKIN REBEL DPS007A	
RTU–2	HIGH ROOF	ASSEMBLY HALL	4480	4480	1	DIRECT	1793	5.0	1697	4.0	R–410A	186.9	81.0/67.2	53.7/53.7	173.6	70.0	105.4	79.3	53.7/53.7	70.0/59.8	–10	45.1	95/75	80.6/66.4	480	–10	88.7	NG	208	3	60	93.0	125	4222	DAIKIN REBEL DPS018A	

NOTES:
1. INTEGRAL GAS HEAT MODULE.
2. 2–INCH MERV 8 PLEATED FILTER.
3. FUSED DISCONNECT.
4. 2–INCH DOUBLE WALL CONSTRUCTION.
5. BACNET FACTORY ACTIVATION.
6. GFCI CONVENIENCE OUTLET.
7. VFD FAN OPERATION.
8. 14–INCH INSULATED ROOF CURB, SEISMIC RATED.
9. ENTHALPY BASED MODULATING ECONOMIZER.
10. FIXED PLATE HEAT RECOVERY.
11. REFRIGERANT COIL PROVIDES FIRST STAGE HEATING. INTEGRAL GAS–FIRED FURNACE PROVIDES SECOND STAGE HEATING.

KEYED NOTES:

⟨1⟩ MANUFACTURER'S NAME AND MODEL NUMBER ARE USED FOR DESCRIPTIVE PURPOSES ONLY AND ARE INTENDED TO INDICATE THE STANDARD OF MATERIAL OR ARTICLES REQUIRED. DESIGN IS PREDICATED AROUND LISTED MANUFACTURERS AS NOTED ON SCHEDULES AND IS NOT INTENDED TO LIMIT THE CONTRACTOR TO ONE MANUFACTURER.

⟨2⟩ ALL EQUIPMENT PROVIDED IS REQUIRED TO MEET THE BUY AMERICAN ACT.

MAKE UP AIR UNIT SCHEDULE

UNIT NO	LOCATION	SERVES	FAN DATA					FURNACE DATA				FILTER		ELECTRICAL				WEIGHT (LBS)	MANUFACTURER AND MODEL ⟨1⟩⟨2⟩	NOTES
			AIRFLOW (CFM)	ESP (IN WG)	TSP (IN WG)	SPEED (RPM)	MOTOR HP	TOTAL OUTPUT (MBH)	EAT (°F)	LAT (°F)	FUEL	TYPE	THICKNESS (IN)	VOLTS	PHASE	HZ	MCA (AMPS)			
MAU–1	ROOF	KH–1,2,3	4820	1	1.95	1999	3	368.0	–1	70	NATURAL GAS	MERV 13	2	208	3	60	13.9	1001	GREENHECK DGX–P116–H22–MF	1–12
MAU–2	ROOF	KH–4 & KH–5	1010	0.75	1.43	2542	0.43	77.5	–1	70	NATURAL GAS	MERV 13	2	208	3	60	8.9	679	GREENHECK DGX–P109–H12–MF	1–12

NOTES:
1. DOUBLE WALL CONSTRUCTION.
2. HINGED ACCESS DOORS.
3. G90 GALVANIZED UNIT FINISH.
4. DIRECT DRIVE FAN.
5. NEOPRENE FAN AND MOTOR VIBRATION ISOLATION.
6. 24 INCH ROOF CURB GREENHECK MODEL GPI OR APPROVED EQUAL.
7. ACCESSORY SERVICE OUTLET AND SERVICE LIGHTS.
8. GAS PRESSURE REGULATOR.
9. BIRDSCREEN WEATHERHOOD.
10. BACNET INTERFACE FOR MONITORING AND CONTROL.
11. FILTER SECTION FOR INTAKE.
12. INCLUDE STARTER WITH UNIT PACKAGE.

SPLIT HEAT PUMP SCHEDULE – INDOOR

UNIT NO	LOCATION	SERVES	TYPE	AIRFLOW (CFM)	OA (CFM)	COOLING			HEATING			PIPING		SOUND PRESSURE LEVEL dB(A)	ELECTRICAL				MANUFACTURER AND MODEL ⟨1⟩⟨2⟩	NOTES
						TOT (MBH)	EAT DB/WB (DEG F)	LAT DB/WB (DEG F)	TOT (MBH)	EAT DB (DEG F)	LAT DB (DEG F)	LIQUID (IN)	GAS (IN)		VOLTS	PHASE	HZ	MCA (AMPS)		
HP–1	IT ROOM 003	IT ROOM 003	WALL MOUNT	427	–	12	78.8/65.5	60.5/50.5	14.4	68.0	86.0	1/4	3/8	49	208	1	60	1.0	DAIKIN FTXS12LVJU	1–3
HP–2	BASEMENT 001	BASEMENT 001	CASSETTE	320	–	7.1	78.8/65.5	58.8/49.1	8.7	68.0	90.6	1/4	1/2	31	208	1	60	0.8	DAIKIN FXZQ07MVJU9	1–3
HP–4	CLASSROOM 132	CLASSROOM 132	CONCEALED DUCTED	1377	330	14.2	78.8/65.5	66.3/55.3	55.9	68.0	90.4	3/8	5/8	44	208	1	60	3.4	DAIKIN FXMQ48PBVJU	1–3
HP–5	CLASSROOM 131	CLASSROOM 131	CONCEALED DUCTED	1377	330	14.2	78.8/65.5	66.5/55.3	55.9	68.0	90.4	3/8	5/8	44	208	1	60	3.4	DAIKIN FXMQ48PBVJU	1–3
HP–6	OFFICE 126	OFFICE 126	CONCEALED DUCTED	688	65	22.7	78.8/65.5	61.0/51.0	28.0	68.0	84.7	3/8	5/8	42	208	1	60	1.8	DAIKIN FXMQ24PBVJU	1–3
HP–7	CLASSROOM 130	CLASSROOM 130	CONCEALED DUCTED	560	115	14.2	78.8/65.5	67.1/55.9	17.0	68.0	87.8	1/4	1/2	40	208	1	60	1.5	DAIKIN FXMQ15PBVJU	1–3
HP–8	HALL 127	HALL 127	CONCEALED DUCTED	1130	50	34.0	78.8/65.5	65.2/54.4	41.4	68.0	93.3	3/8	5/8	43	208	1	60	2.9	DAIKIN FXMQ36PBVJU	1–3
HP–9	LEARNING 129	LEARNING 129	CONCEALED DUCTED	450	80	11.4	78.8/65.5	67.9/56.6	13.9	68.0	90.8	1/4	1/2	39	208	1	60	1.4	DAIKIN FXMQ12PBVJU	1–3
HP–10	BREAK 128	BREAK 128	CONCEALED DUCTED	317	50	7.1	78.8/65.5	68.0/56.7	8.8	68.0	86.7	1/4	1/2	33	208	1	60	0.6	DAIKIN FXMQ07PBJVU	1–3
HP–11	READINESS 121	READINESS 121	CONCEALED DUCTED	450	40	11.3	78.8/65.5	62.1/51.9	13.9	68.0	83.2	1/4	1/2	39	208	1	60	1.4	DAIKIN FXMQ12PBVJU	1–3
HP–12	LOBBY 100	LOBBY 100	CASSETTE	307	20	7.1	78.8/65.5	71.6/59.6	8.8	68.0	90.0	1/4	1/2	32	208	1	60	0.3	DAIKIN FXZQ07TAVJU	1–3
HP–13	RAPIDS 116	RAPIDS 116	CASSETTE	353	35	11.4	78.8/65.5	60.7/50.7	13.9	68.0	83.7	1/4	1/2	34	208	1	60	0.4	DAIKIN FXZQ12TAVJU	1–3
HP–14	HALL 117	HALL 117	CASSETTE	300	10	5.4	78.8/65.5	71.7/59.7	6.8	68.0	87.1	1/4	1/2	32	208	1	60	0.3	DAIKIN FXZQ05TAVJU	1–3
HP–15	RECRUITING 115	RECRUITING 115	CONCEALED DUCTED	450	40	11.3	78.8/65.5	62.3/52.1	13.9	68.0	82.8	1/4	1/2	39	208	1	60	1.4	DAIKIN FXMQ12PBVJU	1–3
HP–16	OFFICE 114	OFFICE 114	CASSETTE	300	15	5.4	78.8/65.5	66.1/55.1	6.8	68.0	77.9	1/4	1/2	32	208	1	60	0.3	DAIKIN FXZQ05TAVJU	1–3
HP–17	KITCHEN 111	KITCHEN 111	CONCEALED DUCTED	635	125	17.0	78.8/65.5	67.0/55.8	20.7	68.0	92.2	1/4	1/2	42	208	1	60	1.6	DAIKIN FXMQ18PBVJU	1–3
HP–18	FITNESS 107	FITNESS 107	CONCEALED DUCTED	688	175	22.7	78.8/65.5	63.6/53.1	28.0	68.0	92.5	3/8	5/8	42	208	1	60	1.8	DAIKIN FXMQ24PBVJU	1–3

NOTES:
1. INTEGRAL CONDENSATE PUMP, WIRED TO UNIT POWER WIRING TERMINAL BLOCK.
2. HARD WIRED WALL CONTROLLER.
3. BACNET INTERFACE.

CONDENSING UNIT SCHEDULE

UNIT NO	LOCATION	SERVES	COOLING OPERATING RANGE (DEG F)	COOLING CAPACITY (MBH)	HEATING OPERATING RANGE (DEG F)	HEATING CAPACITY (MBH)	ELECTRICAL					MANUFACTURER AND MODEL ⟨1⟩⟨2⟩	NOTES
							VOLTS	PHASE	HZ	MCA (AMPS)	MOCP (AMPS)		
CU–1	MECHANICAL ROOM	HP–1	–4–115	12	5–65	14.4	208	1	60	9.1	20	DAIKIN RXS12LVJU	1–4
CU–2	MECHANICAL ROOM	VRF HEAT PUMPS	23–182	96	–4–60	103	208	3	60	38.3	45	DAIKIN RXYQ96TATJU	1–4
CU–3	MECHANICAL ROOM	VRF HEAT PUMPS	23–122	158	–4–60	174	208	3	60	55.1	60	DAIKIN RXYQ168TATJU	1–4

NOTES:
1. MOUNT ON BASE RAILS.
2. CONDENSATE DRAIN PAN WITH HEATER. DRAIN TO FLOOR DRAIN IN MECHANICAL ROOM.
3. DUCT TO LOUVER.
4. SECURE TO FLOOR WITH GALVANIZED HEX HEAD FASTENERS OF LARGEST SIZE THAT BASE RAIL MOUNTING HOLES ALLOW.

NOTES:
1. THE CONTRACTOR SHALL PROVIDE THE MANUFACTURER'S CERTIFIED START–UP TEST REPORTS WITH THE EQUIPMENT SUBMITTAL. THE SUBMITTALS WILL BE REJECTED WITHOUT THESE REPORTS.
2. THE CONTRACTOR SHALL PROVIDE THE MANUFACTURER'S CERTIFIED FUNCTIONAL TEST REPORTS WITH THE EQUIPMENT SUBMITTAL. THE SUBMITTALS WILL BE REJECTED WITHOUT THESE REPORTS.
3. IF USING EQUIPMENT FROM DIFFERENT MANUFACTURERS, CONTRACTOR MUST COORDINATE WITH VENDOR TO GET POINTS THAT WILL COMPLY WITH SPECIFICATION PRIOR TO INSTALLATION.

DAVID H. BROWN No. 7551 LICENSED PROFESSIONAL ENGINEER STATE OF MAINE
4 - 09 - 21

DIRECTORATE OF FACILITIES ENGINEERING DFE CAMP KEYES

PLAN REVISIONS

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DFE PROJECT NO: 23SR19–427–D

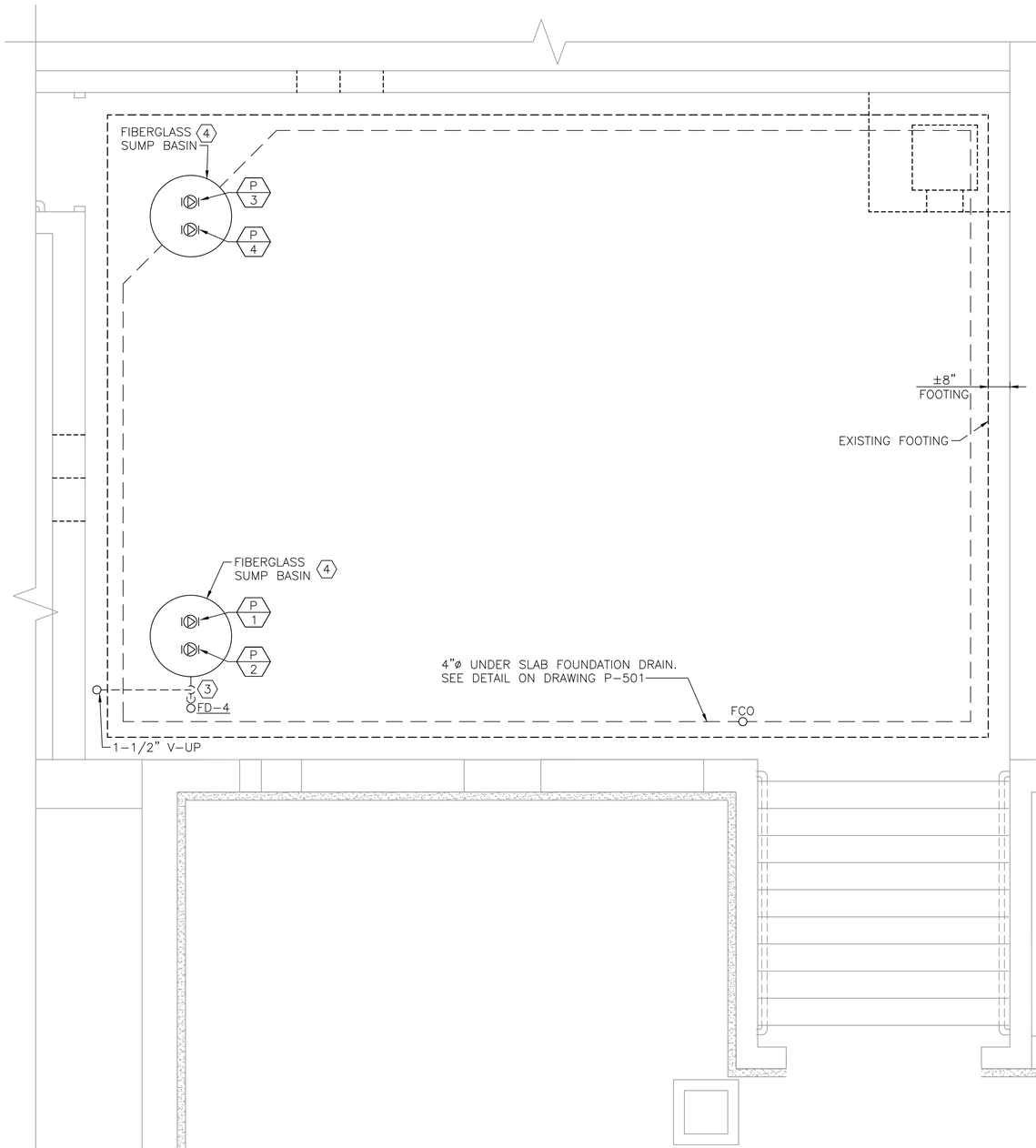
STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
CCE JOB #144.054.002
47A YORK STREET
PORTLAND, MAINE
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION
MECHANICAL SCHEDULES

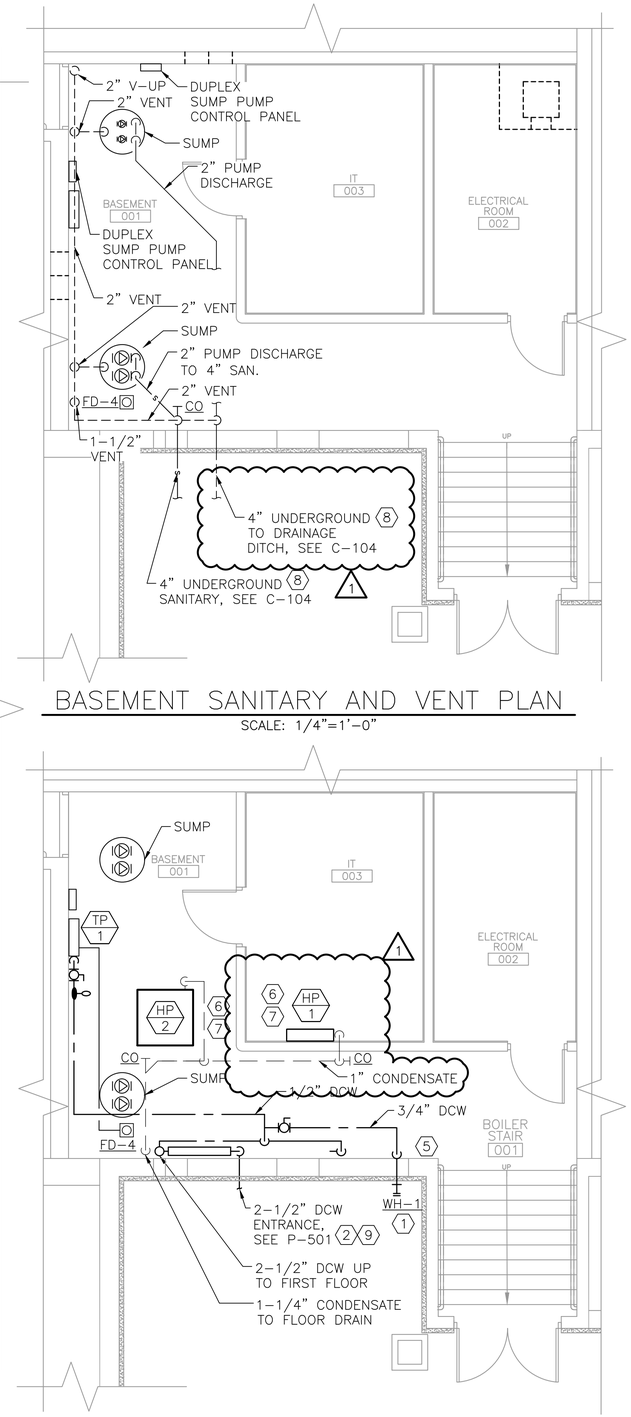
PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID: M–601
SHEET: 88 OF 145



BASEMENT UNDERSLAB PLUMBING PLAN

SCALE: 1/2"=1'-0"



BASEMENT SANITARY AND VENT PLAN

SCALE: 1/4"=1'-0"

BASEMENT DOMESTIC WATER PLAN

SCALE: 1/4"=1'-0"

NOTES:

1. REFER TO DRAWING P-001 FOR NOTES, ABBREVIATIONS, AND LEGENDS.
2. HORIZONTAL TRAP PRIMER PIPING SHOWN IS BELOW OR WITHIN THE SLAB, PEX TUBING.

KEYED NOTES:

1. INSTALL WITH CENTERLINE A MINIMUM OF 12 INCHES ABOVE GRADE. SEE CIVIL.
2. CORE DRILL PENETRATION OF EXTERIOR FOUNDATION WALL. COORDINATE WITH C-104. PROVIDE SLEEVE AND MECHANICAL SEAL AT PENETRATION OF EXISTING FOUNDATION WALL. REFER TO DETAIL ON DRAWING P-502.
3. FOR SPRINKLER SYSTEM DRAIN LINE TO FLOOR DRAIN, REFER TO FIRE PROTECTION.
4. LOCATE SUMP BASIN A MINIMUM OF 24 INCHES FROM BASEMENT WALLS TO AVOID UNDERMINING EXISTING FOOTING. SEE STRUCTURAL DRAWINGS AND DETAIL #1 ON DRAWING SF-501.
5. COORDINATE UNDERSLAB FOUNDATION DRAIN PIPE INSTALLATION IN THIS AREA WITH INSTALLATION OF UNDER SLAB CONDUIT FOR ELECTRICAL SERVICE ENTRANCE.
6. HEAT PUMP WITH CONDENSATE PUMP (SEE MECHANICAL).
7. HEAT PUMP CONDENSATE SHALL CONNECT TO PLUMBING CONDENSATE LINE.
8. PROVIDE WATER TIGHT WALL PENETRATION, SEE P-502.
9. SEE CIVIL FOR CONTINUATION.

LINE TYPE LEGEND:

- CONDENSATE PIPE
- DCW — DOMESTIC COLD WATER
- S — S — SANITARY PIPE
- UNDER SLAB DRAIN PIPING
- SANITARY VENT
- RAINWATER PIPING
- TRAP PRIMER LINE

PLAN NORTH

Scale: 1/4" = 1'-0"

Scale: 1/2" = 1'-0"

PETER W. BROWN No. 5743 STATE OF MAINE REGISTERED PROFESSIONAL ENGINEER

04/09/21

DIRECTORATE OF FACILITIES ENGINEERING — DFE — CAMP KEYES

PLAN REVISIONS

Rev#	Description	Date	Appr.
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STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

BASEMENT PLUMBING PLAN

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
P-101
SHEET: 100 OF 145

ABBREVIATIONS:

ABI	ALTERNATE BID ITEM
AMP	AMPERE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AIC	AMPERE INTERRUPTING CAPACITY
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BAC	BUILDING AUTOMATION CONTROL SYSTEM
BFG	BELOW FINISHED GRADE
BLDG	BUILDING
BOS	BOTTOM OF STEEL
C	CONDUIT
CATV	CABLE TELEVISION
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CLG	CEILING
CT	CURRENT TRANSFORMER
CU	COPPER
DACT	DIGITAL ALARM COMMUNICATOR TRANSMITTER
DB	DIRECT BURIED
DISC	DISCONNECT
DN	DOWN
EMT	ELECTRICAL METALLIC TUBING
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EQP	EQUIPMENT
EXIST	EXISTING
FAA	FIRE ALARM ANNUNCIATOR
FACP	FIRE ALARM CONTROL PANEL
FBO	FURNISHED BY OTHERS
FLR	FLOOR
FWE	FURNISHED WITH EQUIPMENT
FU	FUSE
G	GROUND
GEN	GENERATOR
GFCI	GROUND FAULT CIRCUIT INTERRUPT
GND	GROUND
HP	HORSEPOWER
HTR	HEATER
IDS	INTRUSION DETECTION SYSTEM
IG	ISOLATED GROUND
IMC	INTERMEDIATE METAL CONDUIT
K	KILO
KCMIL	THOUSAND CIRCULAR MILS
KVA	KILOVOLT–AMPERE
KW	KILOWATT
KWH	KILOWATT–HOUR
LTG	LIGHTING
MC	METAL CLAD
MCB	MAIN CIRCUIT BREAKER
MFR	MANUFACTURER
MLO	MAIN LUG ONLY
MNS	MASS NOTIFICATION SYSTEM
MTD	MOUNTED
MVSB	MOTOR VEHICLE STORAGE BUILDING
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEG	NEGATIVE
NEUT	NEUTRAL
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
P	POLE
PF	POWER FACTOR
PH	PHASE
PVC	POLYVINYL CHLORIDE
RFID	RADIO FREQUENCY IDENTIFICATION
RGS	RIGID GALVANIZED STEEL CONDUIT
RM	ROOM
RSC	RIGID STEEL CONDUIT
SN	SOLID NEUTRAL
SPD	SURGE PROTECTIVE DEVICE
STP	SHIELDED TWISTED PAIR
TMGB	TELECOMMUNICATIONS SYSTEM GROUND BAR
TOS	TOP OF STEEL
TYP	TYPICAL
V	VOLT
VA	VOLT–AMPERE
WP	WEATHER PROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF

LINE TYPES

- EXISTING
- NEW
- DEMOLITION
- PART PLAN OUTLINE

SITE ELECTRICAL

- UE — UNDERGROUND ELECTRIC
- EHH ELECTRICAL HAND HOLE

GENERAL NOTES:

1. ALL GENERAL NOTES, SYMBOL LISTS AND DETAILS ARE TO BE CONSIDERED AS APPLICABLE TO ALL ELECTRICAL DRAWINGS FOR THIS PROJECT. SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY AND DO NOT INDICATE THEIR INCORPORATION IN THE DESIGN.
2. DRAWINGS ARE SCHEMATIC AND DIAGRAMMATIC. USE JUDGMENT AND CARE TO INSTALL ELECTRICAL WORK TO FUNCTION PROPERLY AND FIT WITHIN BUILDING CONSTRUCTION AND FINISHES. ELECTRICAL CONDUCTORS, CONDUIT, COMPONENTS, NOT SHOWN OR SPECIFIED, WHICH ARE REQUIRED FOR ANY DEVICE OR SYSTEM TO PRODUCE A COMPLETE AND OPERATIVE SYSTEM ARE REQUIRED TO BE FURNISHED AND INSTALLED.
3. PERFORM ALL WORK IN ACCORDANCE WITH NFPA–70, NATIONAL ELECTRICAL CODE (NEC) 2017.
4. VERIFY THAT FIELD MEASUREMENTS, SURFACES, SUBSTRATES AND CONDITIONS ARE AS REQUIRED, AND READY TO RECEIVE WORK. DO NOT PROCEED WITH WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED. BY BEGINNING WORK, CONTRACTOR ACCEPTS CONDITIONS AND ASSUMES RESPONSIBILITY FOR CORRECTING UNSUITABLE CONDITIONS ENCOUNTERED AT NO ADDITIONAL COST.
5. REMOVE ALL ELECTRICAL EQUIPMENT COMPLETELY WHERE INDICATED. REMOVE ALL CONDUIT, CIRCUIT CONDUCTORS, SWITCHES, LIGHTING FIXTURES AND MISCELLANEOUS APPLIANCES BACK TO ENERGIZING SOURCE OR JUNCTION BOX WHERE MULTIPLE EQUIPMENT IS POWERED.
6. ALL CONDUCTOR MATERIAL, INCLUDING WIRING, PANELBOARD BUSES, TRANSFORMER WINDINGS, AND GROUNDING MUST BE COPPER. ALUMINUM CONDUCTORS ARE NOT ALLOWED.
7. UNLESS OTHERWISE NOTED, FOR 20A–1P BRANCH CIRCUIT WIRING USE 2#12 AWG CONDUCTORS AND #12 GND. HOME RUNS FED FROM 20A–1P CIRCUITS IN EXCESS OF 100 FEET USE #10 AWG.
8. LIGHTING TOGGLE SWITCHES MUST BE COMMERCIAL SPECIFICATION GRADE 277/120 VOLT, SIDE WIRED AND PROVIDED WITH GROUNDING SCREW. LEVITON, PASS AND SEYMOUR OR APPROVED EQUAL. COORDINATE COLOR WITH OWNER.
9. CONVENIENCE RECEPTACLES MUST BE COMMERCIAL SPECIFICATION GRADE GROUNDING TYPE NEMA 5–20R, SIDE WIRED. LEVITON, PASS AND SEYMOUR OR APPROVED EQUAL.
10. PROVIDE GALVANIZED STEEL WALL PLATES FOR ALL MECHANICAL SPACES WIRING DEVICES, NYLON SMOOTH WALL PLATES FOR ALL FINISHED PARTITIONED SPACES WIRING DEVICES, AND THERMOPLASTIC WALL PLATES FOR EXTERIOR WIRING DEVICES.
11. USE THHN/THWN INSULATION FOR ALL INTERIOR DISTRIBUTION AND BRANCH WIRING AND USE XHHW INSULATION FOR ALL EXTERIOR DISTRIBUTION AND BRANCH WIRING.
12. UNLESS OTHERWISE NOTED, PROVIDE TYPE EMT CONDUIT FOR ALL INTERIOR RACEWAY, TYPE RGS CONDUIT FOR ALL EXTERIOR RACEWAY, LIQUID TIGHT FLEXIBLE METAL CONDUIT FOR FINAL CONNECTIONS TO MOTORS, AND FLEXIBLE METAL CONDUIT FOR CONNECTIONS TO LIGHT FIXTURES (MAXIMUM 6FT LENGTH).
13. ALL EQUIPMENT DISCONNECTS AND MANUAL MOTOR STARTERS ARE PROVIDED BY ELECTRICAL CONTRACTOR UNLESS NOTED AS FURNISHED WITH EQUIPMENT (FWE). MOUNT ALL DISCONNECTS AND MOTOR STARTERS IN AN ACCESSIBLE LOCATION WITHIN SIGHT OF THE LOAD SERVED.
14. UNLESS OTHERWISE NOTED MOUNT CONVENIENCE RECEPTACLES 18–INCHES AFF, LAVATORY GFCI RECEPTACLES 48" AFF, KITCHEN COUNTER RECEPTACLES 48" AFF, LIGHTING TOGGLE SWITCHES 48–INCHES AFF, AND TEL/DATA SYSTEM OUTLETS 18–INCHES AFF. ALL MEASUREMENTS ARE MADE TO CENTER OF DEVICE.
15. SEAL ALL PENETRATIONS THROUGH FLOORS, RATED WALLS AND PARTITIONS WITH UL APPROVED FIRE SEALANT MATERIAL TO MAINTAIN THE RATING OF SEPARATION.
16. EQUIPMENT CONNECTIONS ARE SHOWN FOR BASIS–OF–DESIGN PRODUCTS. COORDINATE ALL EQUIPMENT CONNECTIONS – INCLUDING DISCONNECTING MEANS, OVERCURRENT PROTECTION, AND WIRE SIZING – WITH SELECTED MANUFACTURER'S RECOMMENDED INSTRUCTIONS.
17. COORDINATE FINAL DEVICE LOCATIONS IN PARTITIONED SPACES WITH OWNER'S PROPOSED FURNITURE LAYOUT.

GENERAL NOTES CONTINUED:

18. PROVIDE ALL MOUNTING HARDWARE NECESSARY FOR A COMPLETE INSTALLATION. MOUNT EQUIPMENT AND ROUTE CONDUIT SO AS NOT TO INTERFERE WITH OPERATIONS SUCH AS OVERHEAD DOORS, DOOR SWINGS, ETC.
19. MANUFACTURERS NAME AND MODEL NUMBERS ARE USED THROUGHOUT THE PROJECT FOR DESCRIPTIVE PURPOSES ONLY AND ARE INTENDED TO INDICATE THE STANDARD OF MATERIAL OR ARTICLES REQUIRED. DESIGN IS PREDICATED AROUND LISTED MANUFACTURERS AS NOTED ON SCHEDULES AND NOTES AND IS NOT INTENDED TO LIMIT THE CONTRACTOR TO ONE MANUFACTURER.
20. PROVIDE A 3–INCH HIGH REINFORCED CONCRETE PAD UNDER ALL FLOOR MOUNTED ELECTRICAL EQUIPMENT.
21. SUPPLY ALL DISTRIBUTION EQUIPMENT FROM THE SAME MANUFACTURER. APPROVED MANUFACTURERS INCLUDE SQUARE D, EATON/CUTLER–HAMMER, SIEMENS, OR APPROVED EQUAL.
22. GROUND THE ELECTRICAL DISTRIBUTION SYSTEM IN ACCORDANCE WITH NEC ARTICLE 250 AND ELECTRICAL SPECIFICATIONS.
23. LABEL ALL NEW EQUIPMENT ENCLOSURES, SWITCHES, RECEPTACLES, AND DEVICES WITH THE SOURCE CIRCUIT AND EQUIPMENT CONTROLLED WHERE APPLICABLE. APPLY APPROPRIATE ARC–FLASH LABELS TO ALL NEW PANELBOARDS AND SWITCHBOARDS.
24. ROUTE INTERIOR CONDUIT CONCEALED WITHIN WALLS AND ABOVE CEILING IN FINISHED SPACES. WHERE SURFACE MOUNTED CONDUIT IS NECESSARY, PAINT CONDUIT TO MATCH SURFACE.
25. ONLY CONDUIT/CONDUCTORS/CIRCUITS SERVING IT ROOM SHALL BE LOCATED IN IT ROOM. DO NOT ROUTE OTHER CIRCUITS THROUGH IT ROOM.
26. CONTRACTOR SHALL PAINT/MARK ALL CONDUIT, CONDUIT FITTINGS, JUNCTION BOXES AND SUPPORTS ACCORDING TO THE MEARNG CONDUIT AND JUNCTION BOX COLOR CODING SHOWN ON LEGEND.
27. CONTRACTOR IS RESPONSIBLE FOR COORDINATING AND CONTRACTING WITH ALL STATE, LOCAL, AND UTILITY ENTITIES AS NECESSARY TO EXECUTE THE CONTRACT DOCUMENTS. UTILITIES AND SERVICES AFFECTED BY THE WORK INCLUDE, BUT ARE NOT LIMITED TO WATER, ELECTRICAL, SANITARY SEWER, FIRE PROTECTION, AND GAS. ALL THIRD PARTY TESTING AGENCIES MUST BE FIRST–TIER SUBCONTRACTORS TO THE CONTRACTOR, AND THE CONTRACTOR MUST PROVIDE COPIES OF ALL TEST REPORTS TO THE SPECIFIED AGENCIES AND THE OWNER. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS AND COORDINATING INSPECTION AND ACCEPTANCE TESTS WITH AUTHORITY HAVING JURISDICTION.

MEARNG CONDUIT AND JUNCTION BOX COLOR CODING

EXPOSED CONDUIT IN FINISHED LOCATIONS:

CONDUIT/JUNCTION BOX USE	COLOR CODING
EQUIPMENT POWER, INCL. DOOR/WINDOW POSITION SWITCHES	2" WIDE SILVER BAND
SECURITY (CCTV, AI PHONE)	1" WIDE SILVER BAND ADJACENT TO A 1" WIDE ORANGE BAND
DATA/TELEPHONE	2" WIDE BLUE BAND
FIRE ALARM	2" WIDE RED BAND
LIGHTS	2" WIDE YELLOW BAND
EMERGENCY LIGHTS	2" WIDE ORANGE BAND
SOUND (SPEAKERS)	2" WIDE GREEN BAND
BUILDING AUTOMATION SYSTEM	2" WIDE PURPLE BAND

CONDUIT AND JUNCTION BOXES LOCATED ABOVE CEILINGS:

CONDUIT/JUNCTION BOX USE	COLOR CODING
EQUIPMENT POWER, INCL. DOOR/WINDOW POSITION SWITCHES	SILVER (GALVANIZED)
SECURITY (CCTV, AI PHONE)	SILVER WITH COUPLERS PAINTED ORANGE
DATA/TELEPHONE	BLUE
FIRE ALARM	RED
LIGHTS	YELLOW
EMERGENCY LIGHTS	ORANGE
SOUND (SPEAKERS)	GREEN
BUILDING AUTOMATION SYSTEM	PURPLE

STATE OF MAINE
JASON M. BEAULIEU
No. 13441
LICENSED PROFESSIONAL ENGINEER
04/09/21

ONE–LINE DIAGRAM

- MOLDED CASE CIRCUIT BREAKER, AMPS
- DISCONNECT, ISOLATION OR SAFETY SWITCH
- FUSED CUTOUT
- GROUND
- FUSE
- POWER TRANSFORMER: OA – LIQUID TYPE SELF COOLED; AA – DRY TYPE SELF COOLED; FA – FAN COOLED; CONNECTION
- SHIELDED ISOLATION TRANSFORMER
- 480/120V POTENTIAL TRANSFORMERS: RATIO; NUMBER REQUIRED
- 600/5 CURRENT TRANSFORMER: RATIO; NUMBER REQUIRED
- TRANSFER SWITCH (N, E, L, ATS): ATS – AUTOMATIC; MTS – MANUAL
- MAGNETIC MOTOR STARTER: FVNR UNLESS OTHERWISE NOTED; FVR – FULL VOLTAGE REVERSING; RVAT – REDUCING VOLTAGE AUTO TRANSFORMER; 2S – TWO SPEED; NEMA SIZE
- GENERATOR
- KWH METER: A AMMETER; HZ FREQUENCY METER; KWH KILOWATT HOUR; KVAR KILOVAR METER; PZ POWER FACTOR METER; V VOLTMETER; VAR VAR METER; W WATTMETER; WH WATT HOURMETER
- DPM DIGITAL POWER METER
- TMGB TELECOMMUNICATIONS GROUNDING BAR

LIGHTING

- Ab — 2x4 LIGHT FIXTURE; ASSOCIATED CONTROL DEVICE; FIXTURE TYPE (SEE LIGHT FIXTURE SCHED.)
- 1x4 LIGHT FIXTURE
- 2x2 LIGHT FIXTURE
- DOWN LIGHT
- EXIT SIGN, CEILING MOUNTED; SHADING INDICATES SIGN FACE; ARROW INDICATES EGRESS DIRECTION
- EXIT SIGN, WALL MOUNTED
- DUAL HEAD EMERGENCY LIGHT BATTERY PACK
- REMOTE EMERGENCY LIGHTING HEAD
- Ao — WALLPACK; ASSOCIATED CONTROL DEVICE; FIXTURE TYPE (SEE LIGHT FIXTURE SCHED.)
- X — OCCUPANCY SENSOR; INDICATES CONTROLLED FIXTURE; INDICATES AIMING DIRECTION
- Sa — SINGLE POLE TOGGLE SWITCH; INDICATES CONTROLLED FIXTURE
- S_3 3–WAY TOGGLE SWITCH
- S_4 4–WAY TOGGLE SWITCH
- PC PHOTO CELL

POWER

- 60 (4) — NON–FUSED SAFETY SWITCH; NEMA ENCLOSURE; AMPERE RATING
- (4) F 60AS 40AF — FUSED SAFETY SWITCH, TOP NUMBER INDICATES SWITCH AMPERE RATING, LOWER NUMBER INDICATES FUSE RATING; NEMA ENCLOSURE (NEMA 1 UNLESS OTHERWISE NOTED)
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- SINGLE RECEPTACLE, 5–20R
- DUPLEX RECEPTACLE, NEMA 5–20R: E – INSTALLED ON EMERGENCY CIRCUIT; SM – SURFACE MOUNTED; S – SWITCHED RECEPTACLE
- DOUBLE DUPLEX (QUADRUPLEX) RECEPTACLE, NEMA 5–20R
- WP — GFCI DUPLEX RECEPTACLE, NEMA 5–20R; WEATHER PROOF
- DUPLEX RECEPTACLE, NEMA 5–20R, FLOOR OUTLET, UNLESS OTHERWISE NOTED
- POWER RECEPTACLE, 208 VOLT, NEMA 14–30R
- PANELBOARD, NORMAL POWER
- CB 100A — ENCLOSED CIRCUIT BREAKER; AMPERE RATING
- J JUNCTION BOX
- M OL — MANUAL MOTOR STARTER, TOGGLE OPERATED, SINGLE PHASE. 1,2 OR 3 POLE AS REQUIRED; OVERLOAD PROTECTION
- (M) METER
- PS POWER SUPPLY
- CCTV SECURITY ACCESS VIDEO CAMERA WITH LENS, ANGLE OF VIEW
- (A) ALARM, AUDIBLE/VISIBLE, SYSTEM AS NOTED

GROUNDING

- EGB ELECTRICAL DISTRIBUTION GROUNDING BUS BAR
- G — BARE COPPER CONDUCTOR RUN EXPOSED

LIGHTNING PROTECTION

- LIGHTNING GROUND ROD
- LIGHTNING ARRESTOR

DIRECTORATE OF FACILITIES ENGINEERING — DFE — CAMP KEYES

PLAN REVISIONS

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DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT
COLBY COMPANY ENGINEER
CCE JOB #144.054.002
476 STATE STREET
AUGUSTA, MAINE
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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL LEGEND AND GENERAL NOTES

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
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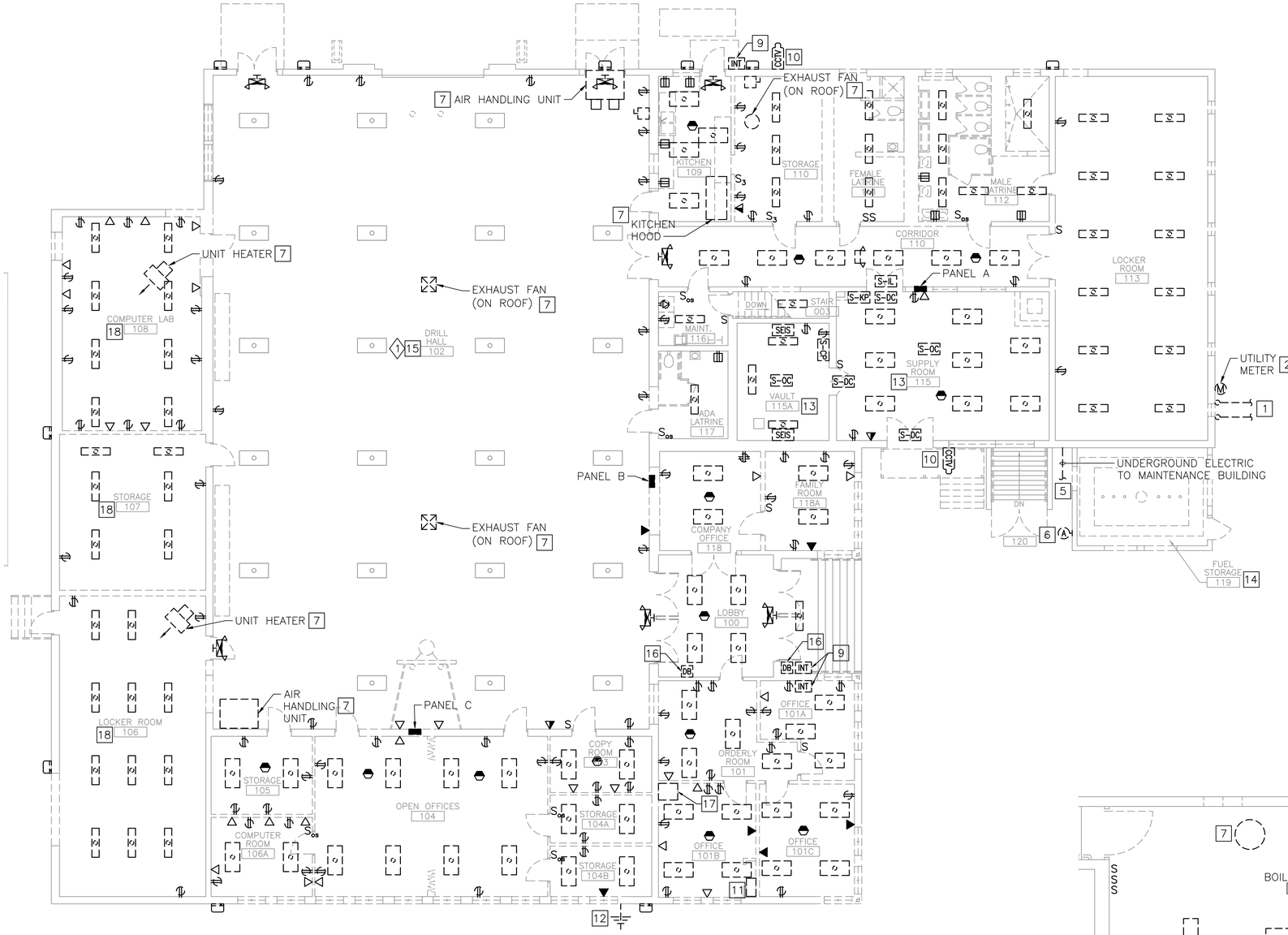
SHEET: 125 OF 145



FIRST FLOOR ELECTRICAL DEMOLITION PLAN

SCALE: 1/8"=1'-0"

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.
2. REMOVE ALL ELECTRICAL EQUIPMENT COMPLETELY UNLESS OTHERWISE INDICATED AND WHETHER EXPLICITLY SHOWN ON THIS SHEET OR NOT. REMOVE ALL CONDUIT, WIRING, AND EQUIPMENT SUPPORTS. REMOVE ALL DISTRIBUTION EQUIPMENT, LIGHTING, AND DEVICES.
3. REMOVE ALL MECHANICAL AND PLUMBING EQUIPMENT CONNECTIONS. SEE MECHANICAL AND PLUMBING DEMOLITION SHEETS (MD, PD) FOR ASSOCIATED EQUIPMENT CONNECTIONS.

LINE TYPES

——————— EXISTING

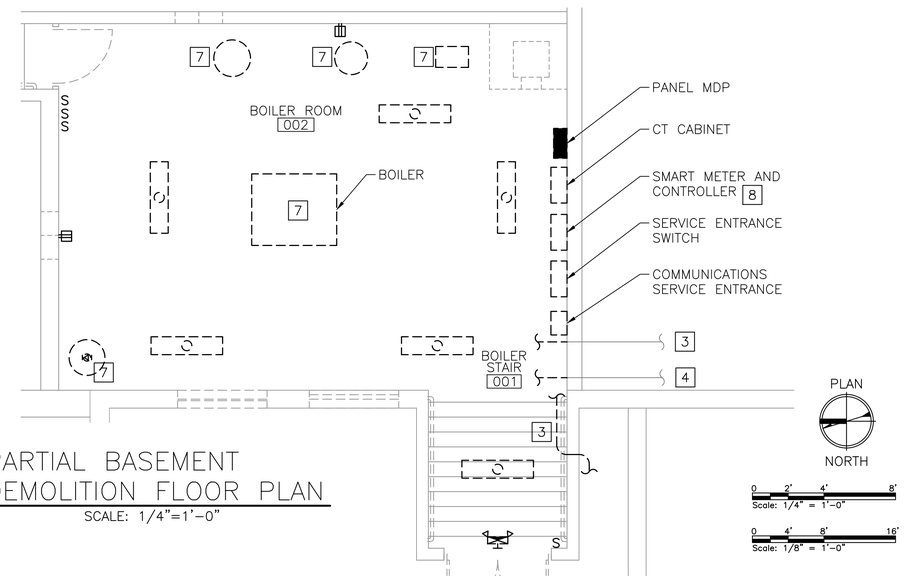
- - - - - - - - - - - - - - - DEMOLITION

DEMOLITION KEYED NOTES:

1. EXISTING OVERHEAD FEEDERS FROM UTILITY POLE. REMOVE OVERHEAD ELECTRICAL AND COMMUNICATION BACK TO UTILITY POLE, INCLUDING WEATHERHEAD. SEE BASEMENT FLOOR PLAN FOR CONTINUATION TO BASEMENT. SEE SHEET C-102 FOR UTILITY POLE LOCATION.
2. COORDINATE REMOVAL OF EXISTING UTILITY METER WITH LOCAL UTILITY. LEAVE CONDUIT IN PLACE.
3. COMPLETELY REMOVE EXISTING ELECTRICAL SERVICE CONDUIT IN BASEMENT, REMOVE UNDERGROUND CONDUIT TO MAXIMUM EXTENT POSSIBLE.
4. COMPLETELY REMOVE EXISTING COMMUNICATIONS SERVICE ENTRANCE CONDUITS IN BASEMENT AREA. ABANDON BELOW GRADE CONDUIT IN PLACE.
5. EXISTING UNDERGROUND CONDUIT FOR FEEDER TO MVSB PANEL, REMOVE CONDUCTORS AND CONDUIT. SEE BASEMENT FLOOR PLAN.
6. REMOVE OIL TANK LEAK ALARM AND ASSOCIATED CIRCUIT.
7. MECHANICAL/PLUMBING EQUIPMENT REMOVED BY MECHANICAL PLUMBING CONTRACTOR. REMOVE ELECTRICAL CONDUIT AND CIRCUITS BACK TO ENERGIZING SOURCE.
8. REMOVE POWER LOGIC SMART METER, CONTROLLER, AND ASSOCIATED CTS/ENCLOSURES AND SAVE FOR REINSTALLATION UNDER NEW WORK.
9. EXISTING INTERCOM SYSTEM TO BE REMOVED AND SAVED BY OWNER FOR REINSTALLATION UNDER NEW WORK.
10. EXISTING EXTERIOR SECURITY CAMERA TO BE REMOVED AND SAVED BY OWNER FOR REINSTALLATION UNDER NEW WORK.
11. LOCATION OF EXISTING COMMUNICATIONS RACK AND TELEPHONE WIRING. CONTRACTOR SHALL HIRE UTILITY FOR REMOVAL OF DEMARCATION POINT. OTHER DEVICES AND EQUIPMENT REMOVED BY OWNER FOR REINSTALLATION.
12. DISCONNECT AND REMOVE EXISTING EXTERIOR MOUNT JMECON ANTENNA. SAVE FOR REINSTALLATION UNDER NEW WORK.
13. SECURITY DEVICES IN ROOM 115 AND 115A REMOVED AND SAVED BY OWNER TO FACILITATE ARCHITECTURAL WORK.
14. COMPLETELY REMOVE ALL ELECTRICAL SENSORS AND CONDUITS FOR #2 FUEL STORAGE TANK.
15. HIGH BAY LIGHTING FIXTURES EXISTING TO REMAIN. REMOVE CONDUIT, AND SWITCHING CIRCUIT CONDUCTORS.
16. REMOVE EXTERIOR DOORBELL AND AUDIO STATION. RETURN TO OWNER.
17. VIDEO SURVEILLANCE STATION REMOVED AND SAVED BY OWNER FOR REINSTALLATION. COMPLETELY REMOVE WALL MOUNTED CONDUIT.
18. CONTRACTOR SHALL REMOVE AND RETURN LIGHT FIXTURES TO OWNER. FIXTURES SHALL BE RETURNED BOXED AND WRAPPED ON PALLET. PROTECT FIXTURES DURING REMOVAL.

ALTERNATIVE BID ITEM (ABI):

1. COMPLETELY REMOVE HIGHBAY LIGHT FIXTURES BACK TO ENERGIZING SOURCE.



PARTIAL BASEMENT DEMOLITION FLOOR PLAN

SCALE: 1/4"=1'-0"

STATE OF MAINE
JASON M. BEAULIEU
No. 13441
LICENSED PROFESSIONAL ENGINEER
04/09/21

DIRECTORATE OF FACILITIES ENGINEERING
DFE
CAMP KEYES

PLAN REVISIONS

Rev#	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

DESIGNED BY: HCG
DRAWN BY: CAW
CHECKED BY: JMB
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
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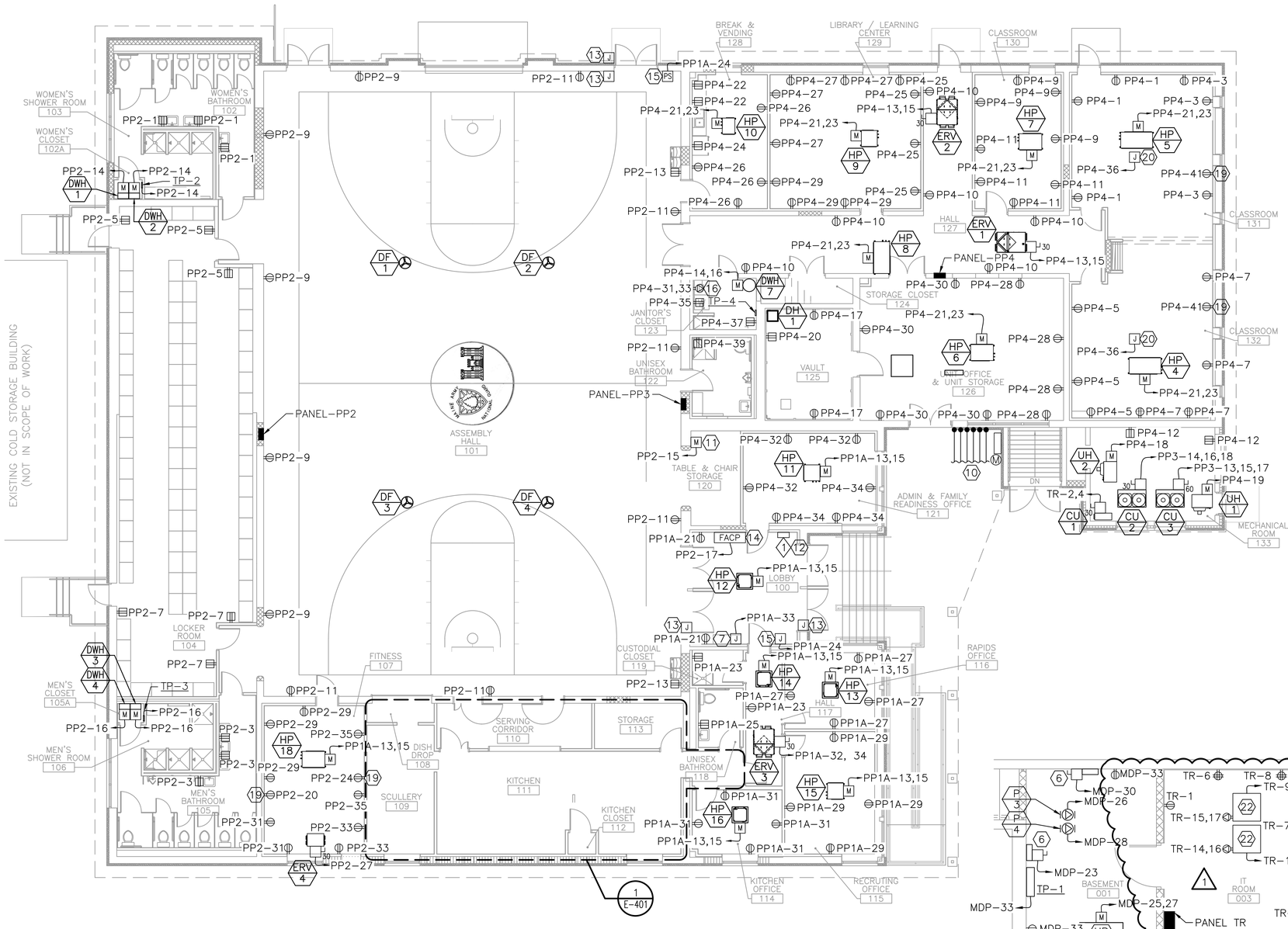
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL DEMOLITION PLANS

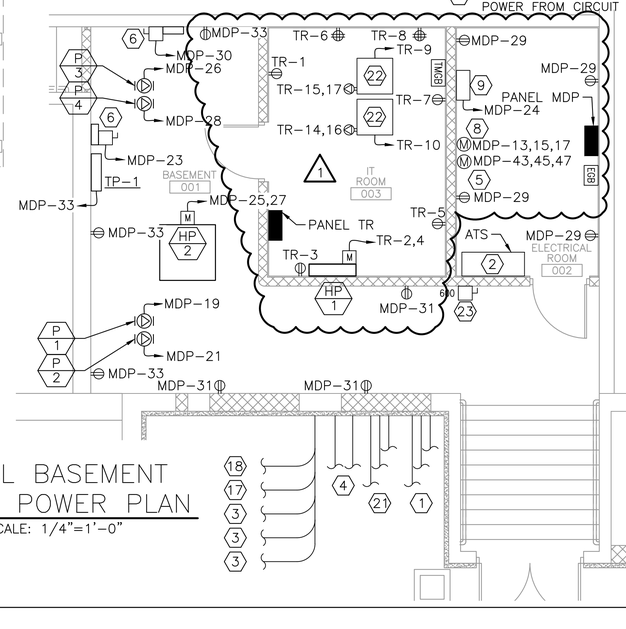
PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
ED-101
SHEET: 126 OF 145



FIRST FLOOR POWER PLAN

SCALE: 1/8"=1'-0"



PARTIAL BASEMENT FLOOR POWER PLAN

SCALE: 1/4"=1'-0"

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.
2. REFER TO SHEET E-501 FOR ELECTRICAL DISTRIBUTION ONE-LINE DIAGRAM.
3. REFER TO SHEET E-601 THROUGH E-604 FOR PANEL SCHEDULE INFORMATION.
4. REFER TO SHEET E-502 FOR ELECTRICAL GROUNDING DETAIL.

KEYED NOTES:

1. ELECTRICAL SERVICE ENTRANCE, THREE (3) 4" CONDUIT. RUN TO NEW SERVICE DISCONNECT SWITCH. LEAVE SPARE CONDUIT OPEN WITH PULL STRING.
2. AUTOMATIC TRANSFER SWITCH. 600A, 3-PHASE, 208Y/120V. PROVIDE CONNECTION TO BACS.
3. SERVICE ENTRANCE FOR GENERATOR, THREE (3) 4" CONDUIT. SEE SHEET C-104 FOR GENERATOR PAD LOCATION. LEAVE SPARE CONDUIT OPEN WITH PULL STRING.
4. INSTALL TWO (2) NEW 4" UNDERGROUND CONDUITS TO MVSB, ONE (1) POWER AND ONE (1) COMMUNICATIONS. FOR POWER CONDUIT, EXTEND CONDUIT RUN TO PANEL MDP AND PROVIDE NEW CONDUCTORS TO MVSB. FOR COMMUNICATIONS CONDUIT, RUN FROM IT ROOM TO MSVB. COORDINATE FINAL LOCATION WITH OWNER. SEE T-101 FOR ADDITIONAL COMMUNICATIONS CONDUIT SCOPE. SEE SHEET C-104 FOR MVSB AND CONDUIT RUN LOCATIONS.
5. PROVIDE POWERLOGIC PM5563 SMART METER. PROVIDE NECESSARY CTS AND ENCLOSURES. PROVIDE DATA CONNECTION TO BACS.
6. DUPLEX SUMP PUMP CONTROL PANEL. DISCONNECT FWE.
7. POWER CONNECTION FOR TROPHY CASE LIGHTING.
8. REINSTALL NGB SMART METER AND BUILDING CONTROLLER. PROVIDE NECESSARY CTS, CONNECTIONS, AND POWER SUPPLIES FOR INSTALLATION. PROVIDE DATA CONNECTION TO IT RACK FOR MONITORING BY NATIONAL GUARD BUREAU.
9. BUILDING AUTOMATION CONTROL SYSTEM PANEL. PROVIDE SURGE PROTECTIVE DEVICE AND 600W UNINTERRUPTIBLE POWER SUPPLY. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
10. UNDERGROUND SERVICE FROM UTILITY POLE FOR ELECTRIC AND COMMUNICATION SERVICES. FOR SERVICE ENTRANCE CONTINUATION AND DESCRIPTION, SEE ENLARGED BASEMENT PLAN. SEE SHEET C-104 FOR NEW UTILITY POLE AND CONDUIT LOCATION. COORDINATE LOCATION OF UTILITY METER AND CT CABINET WITH ELECTRIC UTILITY PROVIDER.
11. PROVIDE MOTOR STARTER FOR CONTROL OF FOUR (4) DF UNITS IN RM 101. CONTROL SHALL BE SEPARATE FROM LIGHTING CONTROLS IN ASSEMBLY HALL. SEE M-603 FOR MECHANICAL SEQUENCE OF OPERATIONS.
12. PROVIDE (2) #12AWG, (1) #12GND, AND (1) RS485 COMMUNICATIONS CABLE (TWO # 24 AWG STP) IN 3/4" CONDUIT FROM ATS TO PROPOSED GENERATOR CONTROL PANEL LOCATION.
13. PROVIDE ADA DOOR OPENER PUSHPADS ON BOTH SIDES OF DOOR. PROVIDE POWER FROM LOCAL ELECTRICAL DOOR HARDWARE POWER SUPPLY.
14. PROVIDE DEDICATED 120V CIRCUIT FOR FIRE ALARM CONTROL PANEL. PANEL PROVIDED BY FIRE ALARM INSTALLER, COORDINATE WITH INSTALLER FOR LOCATION.
15. PROVIDE INDICATED 120V CIRCUIT IN ABOVE CEILING JUNCTION BOX FOR OWNER INSTALLED POWER SUPPLY. ROUTE CONTROL CONDUCTORS FROM POWER SUPPLY TO DOOR HARDWARE IN 1/2" CONDUIT.
16. PROVIDE AND COORDINATE DRYER RECEPTACLE WITH INSTALLED DRYER PLUG TYPE.
17. 1" CONDUIT FOR GENERATOR BATTERY CHARGER AND HEATERS. ROUTE TO MDP, POWER FROM CIRCUIT MDP-22.
18. 1" CONDUIT FOR GENERATOR SIGNALING. ROUTE TO ATS. PROVIDE (4) #12AWG, (1) #12GND, AND (1) RS485 COMMUNICATIONS CABLE (TWO (2) #24AWG STP) FROM ATS IN 3/4" CONDUIT.
19. PROVIDE POWER FOR WALL MOUNTED TV, MOUNT RECEPTACLE AT 7'-6". FINAL LOCATION SHALL BE COORDINATED WITH OWNER, SEE T-101.
20. POWER CONNECTION FOR PROJECTOR. PROVIDE JUNCTION BOX ABOVE FINISHED CEILING FOR INDICATED CIRCUIT.
21. COMMUNICATIONS SERVICE ENTRANCE, TWO (2) 4" CONDUIT AND ONE (1) 2" CONDUIT FROM UTILITY POLE. RUN TO IT ROOM 003. ONE (1) 4" AND ONE (1) 2" TO BE LEFT AS SPARES, LEAVE SPARE CONDUITS OPEN WITH PULL STRING.
22. IT RACK: PROVIDE ONE (1) 120V DUPLEX RECEPTACLE, ONE (1) 208V TWIST-LOCK RECEPTACLE, AND TWO (2) TEN-OUTLET POWER STRIPS ON EACH RACK. MOUNT RECEPTACLES AT 24" AFF. PROVIDE 120V POWER FROM RACK INSTALLED UPS.
23. PROVIDE SERVICE ENTRANCE DISCONNECT. LABEL DISCONNECT TO INDICATE DISCONNECT CONTROLS ONLY NORMAL POWER

ALTERNATIVE BID ITEM (ABI):

1. PROVIDE GENERATOR CONTROL PANEL, COORDINATE FINAL LOCATION IN FIELD.

PLAN NORTH

Scale: 1/4" = 1'-0"

Scale: 1/8" = 1'-0"

LINE TYPES

- EXISTING
- NEW
- PART PLAN OUTLINE

STATE OF MAINE
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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL FLOOR PLANS

PLAN PROGRESS

- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
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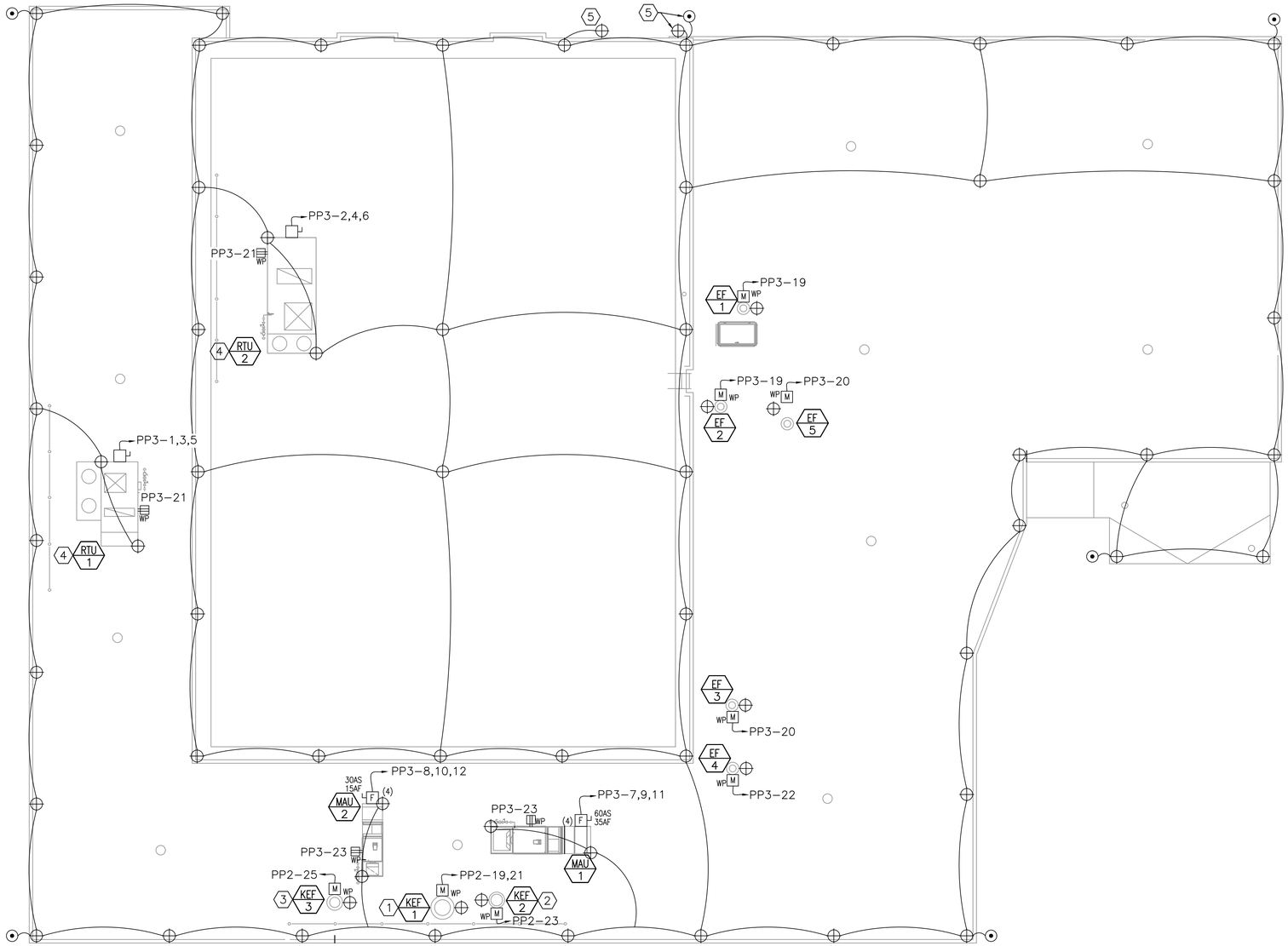

ELECTRICAL ROOF PLAN

SCALE: 1/8"=1'-0"

LINE TYPES

EXISTING

NEW

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.
2. REFER TO SHEET E-601 THROUGH E-604 FOR PANEL SCHEDULE INFORMATION.
3. PERIMETER LIGHTNING PROTECTION SYSTEM ON ROOFTOP SHALL BE COMPLIANT WITH NFPA 780. MAKE CONNECTIONS TO EQUIPMENT AS NECESSARY (MECHANICAL, ANTENNA). SEE DETAIL 1/A-506 FOR AIR TERMINAL MOUNTING DETAIL.

KEYED NOTES:

(1) COORDINATE CONNECTION AND MOTOR STARTER OPERATION OF KITCHEN EXHAUST FAN KEF-1 WITH KITCHEN HOODS KH-1 AND KH-3. SEE SHEET E-401 FOR HOOD LOCATIONS.

(2) COORDINATE CONNECTION AND MOTOR STARTER OPERATION OF KITCHEN EXHAUST FAN KEF-2 WITH KITCHEN HOOD KH-2. SEE SHEET E-401 FOR HOOD LOCATIONS.

(3) COORDINATE CONNECTION AND MOTOR STARTER OPERATION OF KITCHEN EXHAUST FAN KEF-3 WITH KITCHEN HOODS KH-4 AND KH-5. SEE SHEET E-401 FOR HOOD LOCATIONS.

(4) DISCONNECT AND RECEPTACLE FURNISHED WITH EQUIPMENT. PROVIDE POWER FROM CIRCUITS INDICATED.

(5) PROVIDE IN-LINE LIGHTNING ARRESTOR FOR ANTENNA, WITHIN 50' OF EACH CABLE SOURCE END. ARRESTOR SHALL BE POLYPHASER PART#IS-NEMP-CO (1.5-400MHZ) WITH N-STYLE FEMALE CONNECTORS. PROVIDE COPPER GROUND BUS MOUNTED EXTERIOR TO THE BUILDING. CONNECT EACH ARRESTOR TO NEW GROUND BUS. PROVIDE 10' X 3/4" COPPER-CLAD GROUND ROD AND INTERCONNECT GROUND BUS WITH BARE COPPER GROUND WIRE. ANTENNA LOCATIONS SHOWN ON T-101.

PLAN

NORTH

0 4' 8' 16'
Scale: 1/8" = 1'-0"

JASON M. BEAULIEU No. 13441 LICENSED PROFESSIONAL ENGINEER STATE OF MAINE
04/09/21

DIRECTORATE OF FACILITIES ENGINEERING DFE CAMP KEYES

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STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL ROOF PLAN

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
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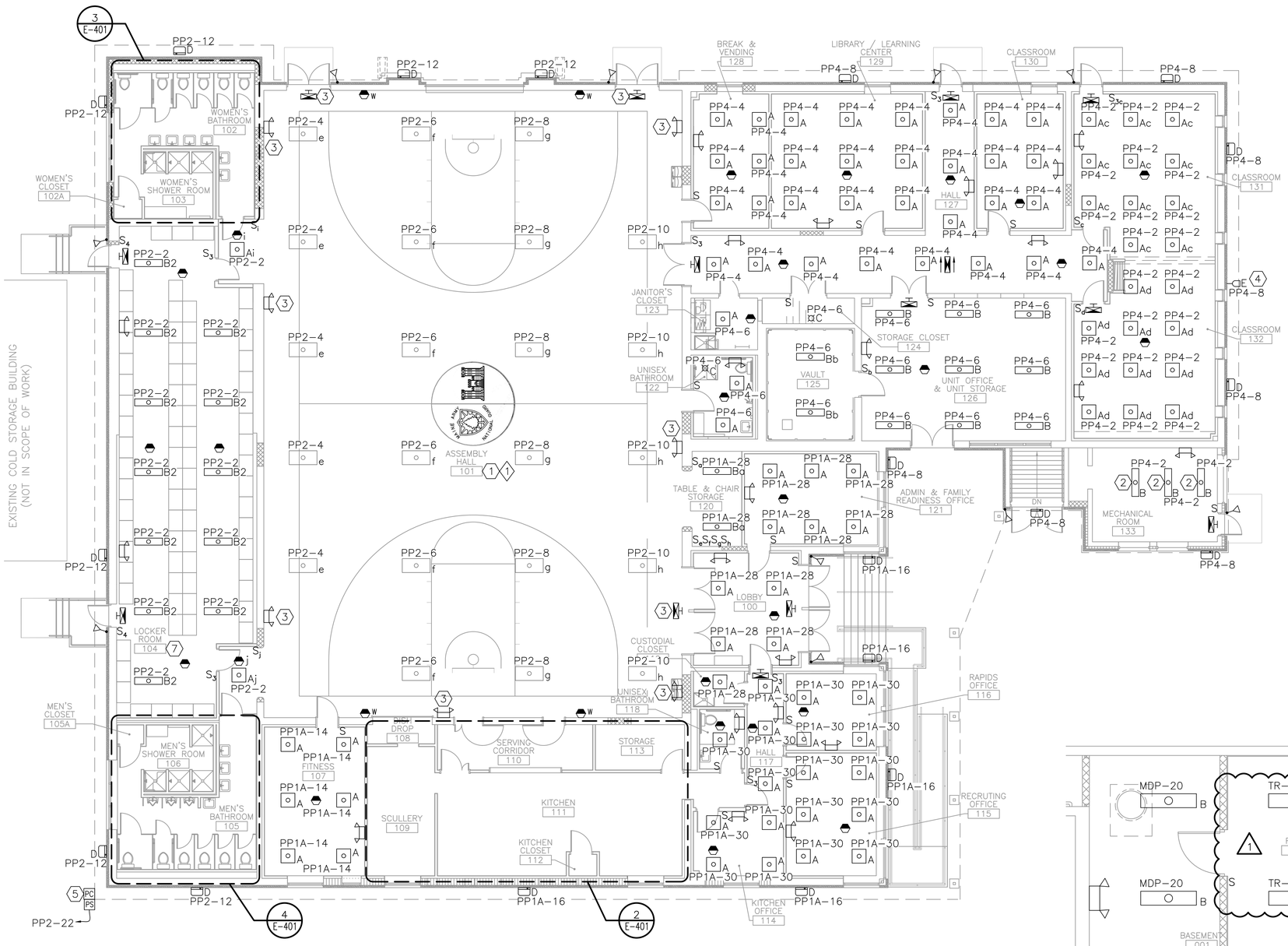
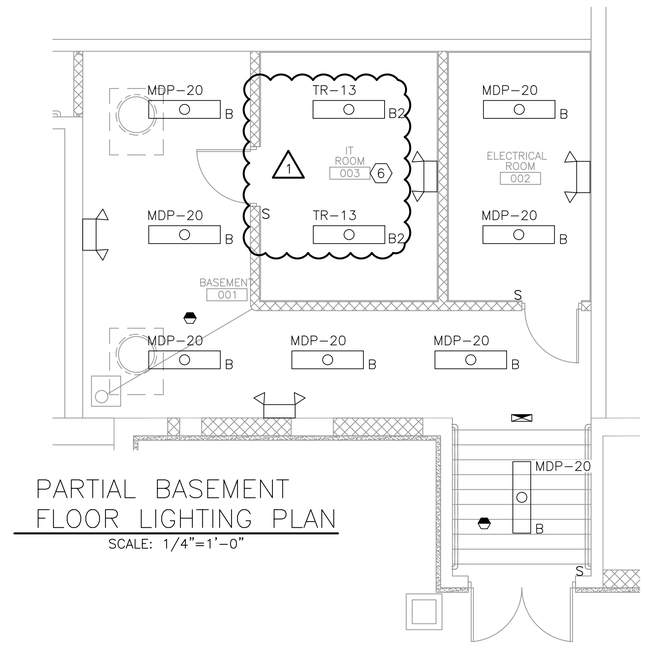
SHEET ID:
E-102
SHEET: 128 OF 145



FIRST FLOOR LIGHTING PLAN

SCALE: 1/8"=1'-0"



PARTIAL BASEMENT FLOOR LIGHTING PLAN

SCALE: 1/4"=1'-0"

LINE TYPES

- EXISTING
- NEW
- PART PLAN OUTLINE

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.
2. REFER TO SHEET E-601 THROUGH E-604 FOR PANEL SCHEDULE INFORMATION.
3. REFER TO SHEET E-604 FOR LIGHTING FIXTURE SCHEDULE.
4. CIRCUIT SCHEDULE DESIGNATORS ATTACHED TO ROOM LABEL INDICATE ALL FIXTURES IN INDICATED ROOM SHALL BE ON INDICATED CIRCUIT.
5. OCCUPANCY SENSOR SHALL CONTROL ACTIVATION OF BOTH LIGHTING AND HVAC IN RESPECTIVE SPACE/ROOM. WALL SWITCHES SHALL BE MANUAL CONTROL OF LIGHTING ONLY.

KEYED NOTES:

1. EXISTING HIGHBAY FIXTURES TO REMAIN. CONNECT FIXTURES TO INDICATED SWITCHING CIRCUITS.
2. COORDINATE LIGHT MOUNTING WITH MECHANICAL CONTRACTOR TO AVOID PIPING AND MECHANICAL UNITS.
3. PROVIDE WIRE GUARD PROTECTION CAGE FOR FIXTURE IN ASSEMBLY HALL, FIELD PAINTED WHITE.
4. PROVIDE FLOODLIGHT FIXTURE FOR ILLUMINATION OF FLAG POLE. MOUNT FIXTURE TO BUILDING CANOPY.
5. PROVIDE EXTERIOR PHOTOCELL FOR CONTROL OF ALL EXTERIOR LIGHT FIXTURES. MOUNT PHOTOCELL UNDERNEATH BUILDING CANOPY. PROVIDE 24V POWER SUPPLY.
6. COORDINATE LIGHT FIXTURE PLACEMENT WITH MECHANICAL UNIT, LADDER RACKS, AND OTHER EQUIPMENT.
7. PROVIDE PENDANT MOUNTING TO MOUNT FIXTURES AT 9' AFF. COORDINATE OCCUPANCY SENSORS WITH DUCTWORK SO SENSORS ARE NOT OBSCURED.

ALTERNATIVE BID ITEM (ABI):

1. PROVIDE NEW LED HIGHBAY LIGHT FIXTURES AS INDICATED ON LIGHT FIXTURE SCHEDULE.

DIRECTORATE OF FACILITIES ENGINEERING — DFE — CAMP KEYES

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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL LIGHTING PLANS

PLAN PROGRESS
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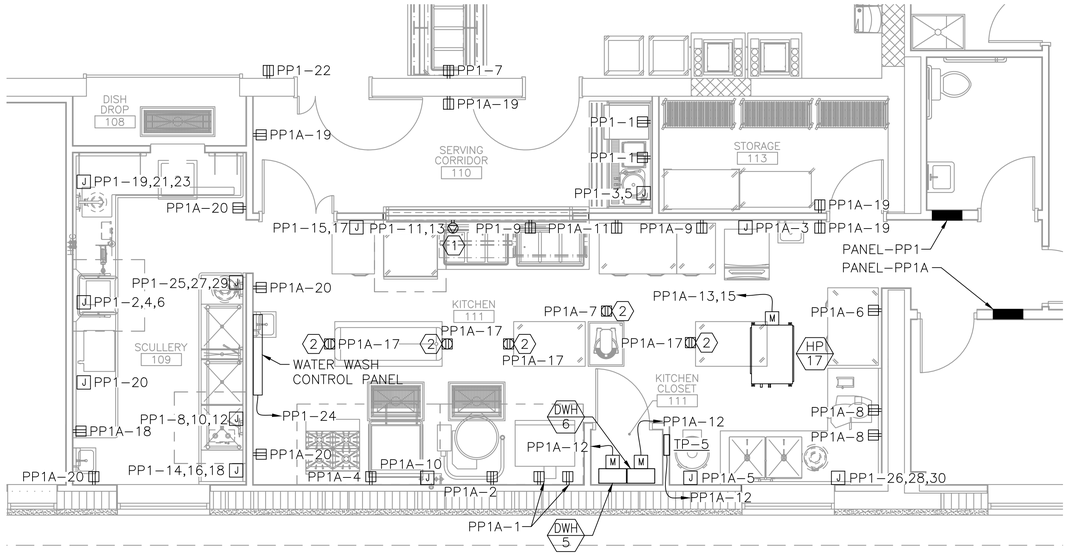
STATE OF MAINE — JASON M. BEAULIEU No. 13441 — LICENSED PROFESSIONAL ENGINEER
04/09/21

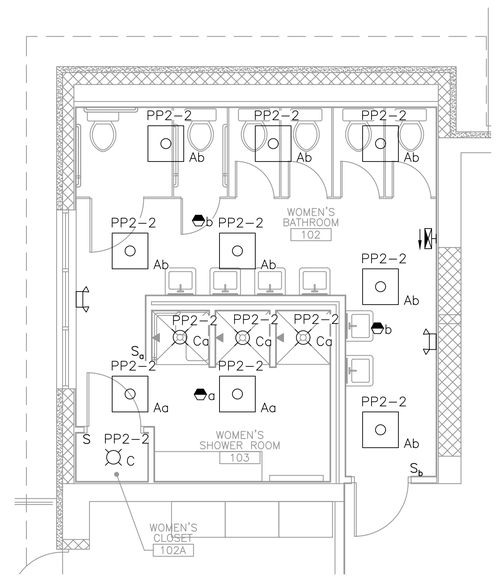
PLAN NORTH

Scale: 1/4" = 1'-0"
Scale: 1/8" = 1'-0"

SHEET ID: E-103
SHEET: 129 OF 145



1 E-401 ENLARGED KITCHEN POWER PLAN
SCALE: 1/4" = 1'–0"



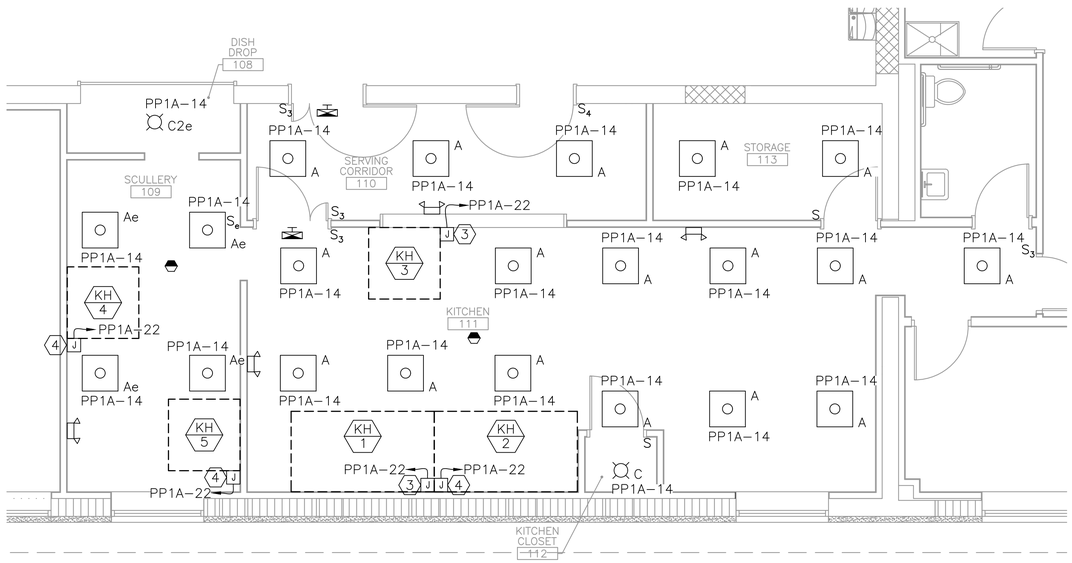
3 E-401 ENLARGED WOMEN'S LATRINE
SCALE: 1/4"=1'–0"

NOTES:

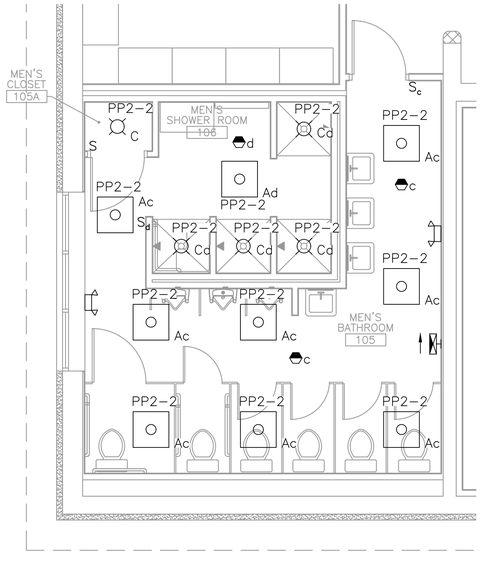
1. REFER TO SHEET E–001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.
2. REFER TO Q SHEETS FOR COMPLETE KITCHEN AND SCULLERY EQUIPMENT INFORMATION, INCLUDING CONNECTION HEIGHTS.
3. REFER TO SHEET E–601 THROUGH E–604 FOR PANEL SCHEDULE INFORMATION.
4. MOUNT CONVENIENCE RECEPTACLES 18" AFF. FOR RECEPTACLES AND JUNCTION BOXES SERVING EQUIPMENT, REFER TO Q SHEETS FOR MOUNTING HEIGHTS.
5. ALL EXPOSED DEVICE/EQUIPMENT CONDUIT IN RM 108 AND RM 111 MUST BE RIGID METAL AND/OR LIQUID–TIGHT FLEXIBLE METALLIC CONDUIT.

KEYED NOTES:

1. PROVIDE NEMA L6–20P POWER RECEPTACLE.
2. PROVIDE 120–VOLT, 20AMP DUPLEX GFCI RECEPTACLE DROPPED FROM CEILING AT END OF FLEXIBLE CABLE. FINAL RECEPTACLE HEIGHT SHALL BE 84" AFF. PROVIDE WITH RETRACTABLE COVER FOR DEVICE PROTECTION WHEN NOT IN USE.
3. PROVIDE JUNCTION BOX AND 120–VOLT CIRCUIT TO POWER KITCHEN HOOD LIGHTING. LIGHTING FURNISHED WITH EQUIPMENT.
4. PROVIDE JUNCTION BOX AND 120VOLT CIRCUIT TO POWER KITCHEN HOOD LIGHTING. PROVIDE FIXTURE TYPE "F" IN LENGTHS AS FOLLOWS: KH–2 8'–0", KH–4 4'–0", KH–5 4'–0"



2 E-401 ENLARGED KITCHEN LIGHTING PLAN
SCALE: 1/4"=1'–0"



4 E-401 ENLARGED MEN'S LATRINE
SCALE: 1/4" = 1'–0"

LINE TYPES

EXISTING

NEW

STATE OF MAINE
JASON M. BEAULIEU No. 13441 LICENSED PROFESSIONAL ENGINEER
04/09/21

PLAN NORTH

Scale: 1/4" = 1'–0"

DIRECTORATE OF FACILITIES ENGINEERING DFE CAMP KEYES

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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL ENLARGED PLANS

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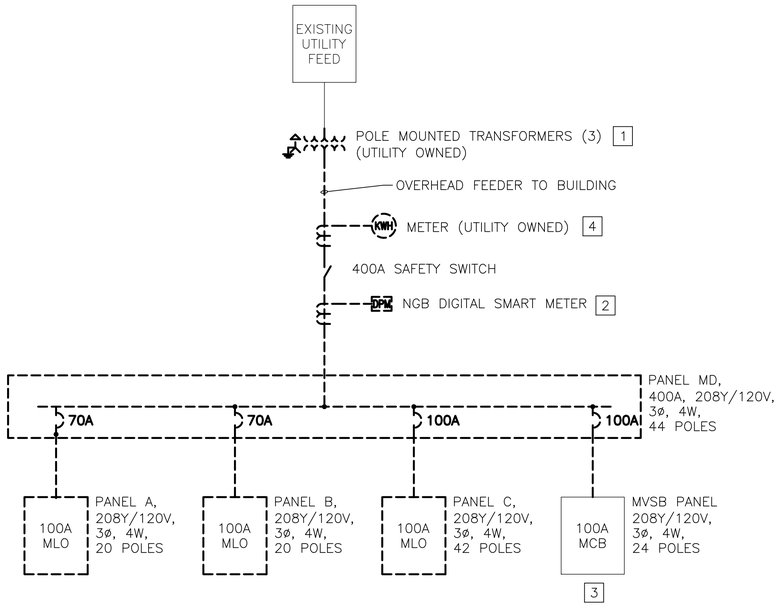
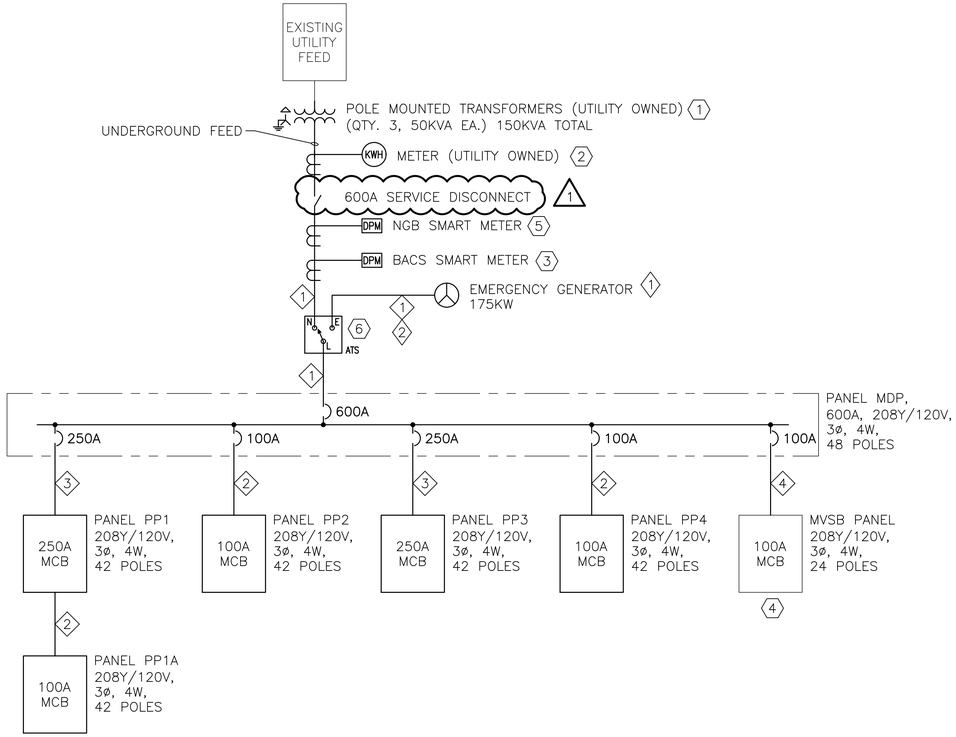


ONE LINE DIAGRAM – DEMO

SCALE: NTS



ONE LINE DIAGRAM

SCALE: NTS

NOTES:

1. SEE E–001 FOR LEGEND ABBREVIATIONS AND GENERAL NOTES.

DEMOLITION KEYED NOTES:

1 CONTRACTOR SHALL HIRE UTILITY PROVIDER TO REMOVE EXISTING TRANSFORMERS AND UTILITY POLE.

2 SCHNEIDER ELECTRIC POWER LOGIC PM5500 DIGITAL POWER METER, REMOVE AND SAVE METER, CONTROLLER, AND ASSOCIATED DEVICES. REINSTALL UNDER NEW WORK.

3 MVSB PANEL TO REMAIN. COMPLETELY REMOVE CONDUCTORS AND CONDUIT BACK TO ENERGIZING SOURCE (PANEL MD).

4 COORDINATE REMOVAL OF EXISTING UTILITY METER WITH UTILITY PROVIDER.

KEYED NOTES:

1 CONTRACTOR SHALL HIRE UTILITY PROVIDER TO PROVIDE NEW UNDERGROUND SERVICE, POLE AND POLE MOUNTED TRANSFORMERS.

2 CONTRACTOR SHALL HIRE UTILITY PROVIDER FOR INSTALLATION OF UTILITY METER ON BUILDING.

3 PROVIDE NEW POWER LOGIC PM5563 SMART METER. PROVIDE NECESSARY CTS, CONNECTIONS AND POWER SUPPLIES FOR INSTALLATION. INSTALL METER AND PROVIDE CONNECTION TO BACS.

4 REFEED EXISTING PANEL IN MVSB FROM NEW MAIN DISTRIBUTION PANEL.

5 REINSTALL NGB SMART METER AND CONTROLLER, PROVIDE CONNECTION TO DATA RACK IN IT ROOM. PROVIDE NECESSARY CTS, CONNECTIONS, AND POWER SUPPLIES.

6 AUTOMATIC TRANSFER SWITCH. 208Y/120V, THREE PHASE, 600AMP.

ALTERNATIVE BID ITEM (ABI):

1 PROVIDE DIESEL EMERGENCY GENERATOR WITH INTEGRAL SUB–BASE, DUAL–WALL FUEL STORAGE TANK. TANK SHALL HAVE CAPACITY TO FUEL GENERATOR AT 100% LOAD FOR 24 HOURS. SEE E–101 FOR ADDITIONAL CONDUITS AND CIRCUITS.

2 PROVIDE CONDUCTORS FOR GENERATOR CONNECTION TO ATS.

CABLE SCHEDULE:

1 2 SETS [(4) 500KCMIL, #2/0 GND, 4"C]

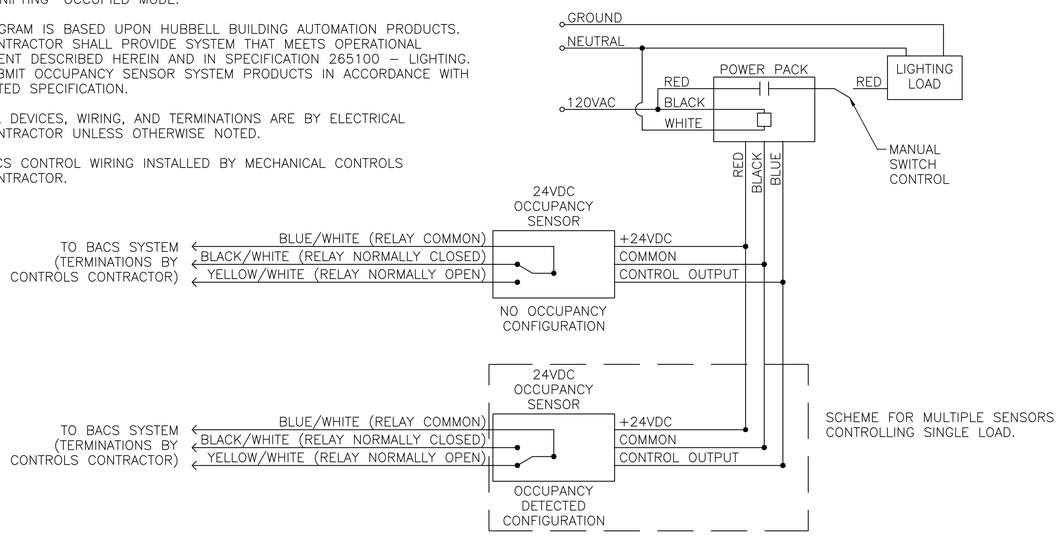
2 (4) #1 AWG, #8 GND, 1 1/2"C

3 (4) 400KCMIL, #4 GND, 3"C

4 (4) #1 AWG, #8 GND, 4"C

OCCUPANCY SENSOR WIRING DIAGRAM NOTES:

1. DIAGRAM IS REPRESENTATIVE OF SPACES IN WHICH OCCUPANCY SENSOR(S) CONTROL LIGHTING FIXTURES AND PROVIDE AN OUTPUT SIGNAL TO THE BUILDING AUTOMATION CONTROL SYSTEM (BACS) SIGNIFYING "OCCUPIED MODE."
2. DIAGRAM IS BASED UPON HUBBELL BUILDING AUTOMATION PRODUCTS. CONTRACTOR SHALL PROVIDE SYSTEM THAT MEETS OPERATIONAL INTENT DESCRIBED HEREIN AND IN SPECIFICATION 265100 – LIGHTING. SUBMIT OCCUPANCY SENSOR SYSTEM PRODUCTS IN ACCORDANCE WITH LISTED SPECIFICATION.
3. ALL DEVICES, WIRING, AND TERMINATIONS ARE BY ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.
4. BACS CONTROL WIRING INSTALLED BY MECHANICAL CONTROLS CONTRACTOR.



OCCUPANCY SENSOR WIRING DIAGRAM

SCALE: NTS

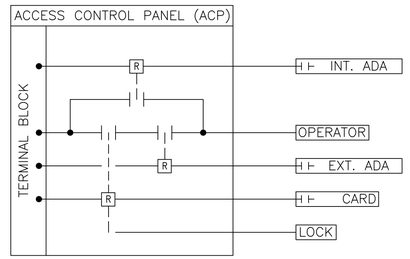
DOOR CONTROL DIAGRAM NOTES:

1. INTENT OF THIS DIAGRAM IS TO ILLUSTRATE OPERATION RELATIONSHIP BETWEEN DOOR HARDWARE, ACCESS CONTROL SYSTEM, AND ADA OPERATORS. ALL WIRING NOT SHOWN FOR CLARITY.
2. DOOR HARDWARE PROVIDER SHALL ALLOW FOR NECESSARY OUTPUTS TO, AND INPUTS FROM, ACCESS CONTROL SYSTEM.
3. EXTERIOR ACCESS (NO ADA):
   - 3.1. CARD READER SATISFIES SECURITY REQUIREMENT AND DOOR IS UNLOCKED.
   - 3.2. MANUAL DOOR OPERATION.
4. EXTERIOR ADA ACCESS:
   - 4.1. CARD READER SATISFIES SECURITY REQUIREMENT AND DOOR IS UNLOCKED.
   - 4.2. EXTERIOR ADA PUSHBUTTON IS DEPRESSED, ALLOWING AUTOMATIC DOOR OPERATION.
   - 4.3. IF ADA PUSHBUTTON IS DEPRESSED WITHOUT SATISFYING SECURITY, AUTOMATIC OPERATOR DOES NOT ENERGIZE; DOOR REMAINS LOCKED.
5. INTERIOR EGRESS (NO ADA)
   - 5.1. PANIC HARDWARE ALLOWS MANUAL DOOR OPERATION.
6. INTERIOR ADA EGRESS
   - 6.1. INTERIOR ADA PUSHBUTTON IS DEPRESSED, ALLOWING AUTOMATIC DOOR OPERATION.
   - 6.2. NO SECURITY REQUIREMENT TO SATISFY.

LEGEND:

R RELAY (OR SIMILAR, AS DETERMINED BY ACCESS CONTROL SYSTEM)

| | CONTACT, NORMALLY OPEN (OR SIMILAR, AS DETERMINED BY ACCESS CONTROL SYSTEM)



DOOR CONTROL DIAGRAM

SCALE: NONE

DIRECTORATE OF FACILITIES ENGINEERING
DFE
CAMP KEYES

PLAN REVISIONS

Rev#	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

DESIGNED BY: HCG
DRAWN BY: CAW
CHECKED BY: JMB
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
CEC–06 #144.054.002
47A YORK STREET
PORTLAND, MAINE
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL DIAGRAMS

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
E–501
SHEET: 131 OF 145

NOTES:

1. SEE E-001 FOR LEGEND ABBREVIATIONS AND GENERAL NOTES.

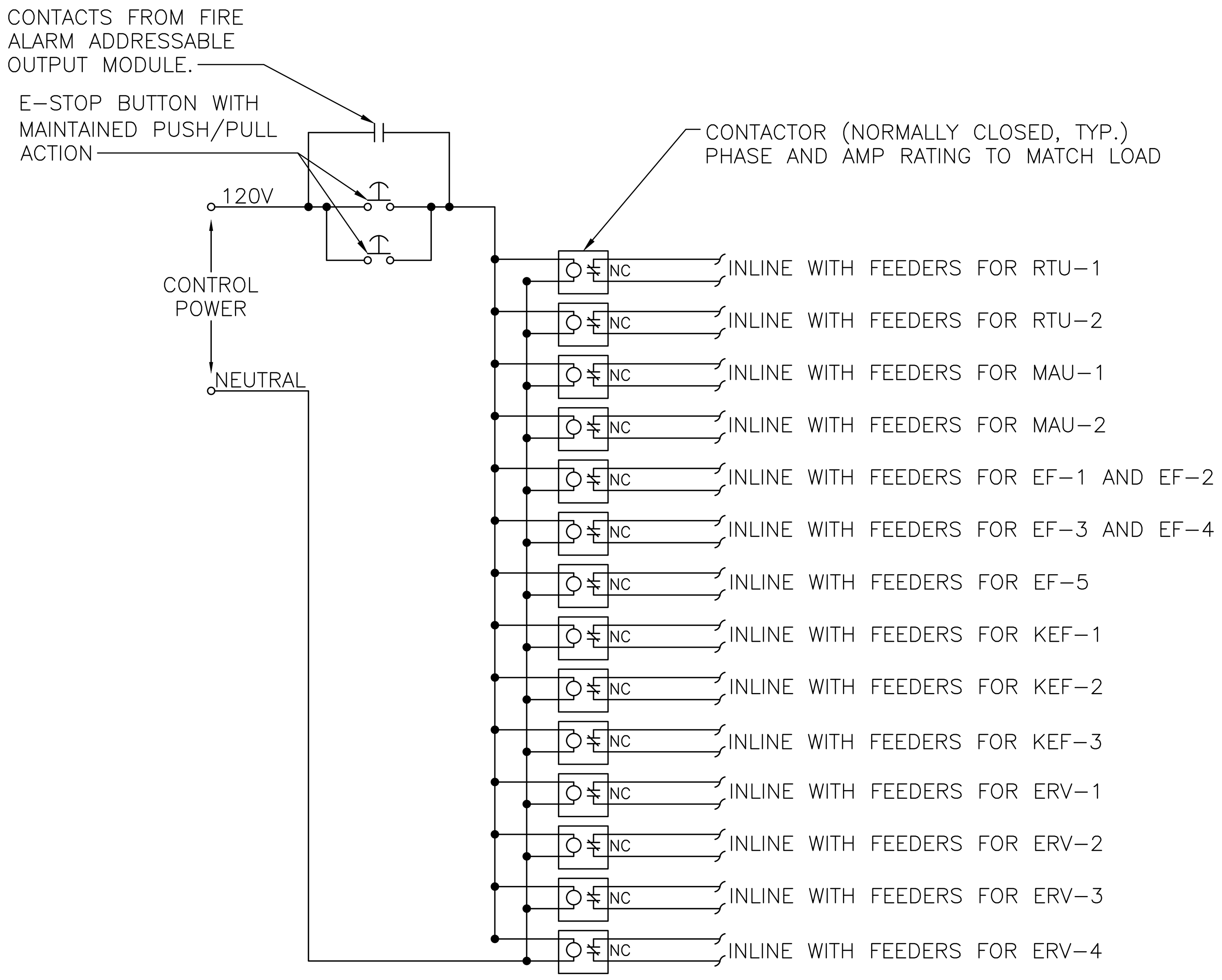


DIAGRAM NOTES:

1. INTENT OF THIS SYSTEM IS TO PROVIDE ONE EMERGENCY SHUTDOWN STATION FOR ALL VENTILATION EQUIPMENT.
2. TOGGLING SWITCH CLOSED SHALL ENERGIZE ALL CONTACTORS AND OPEN-CIRCUIT ALL VENTILATION EQUIPMENT POWER SUPPLIES UNTIL SWITCH IS TOGGLED BACK OPEN.
3. REFER TO SHEET E-101 FOR PUSH BUTTON LOCATION.

VENTILATION EMERGENCY SHUTDOWN DIAGRAM

SCALE: NTS

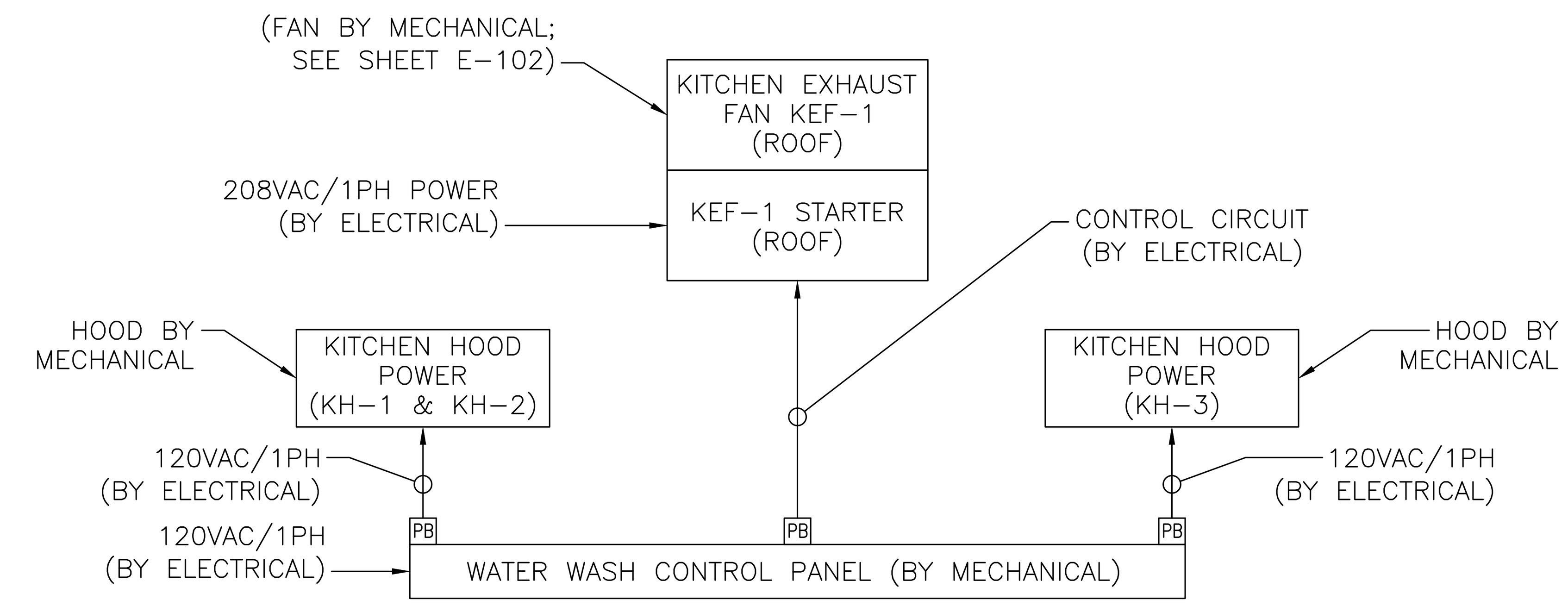
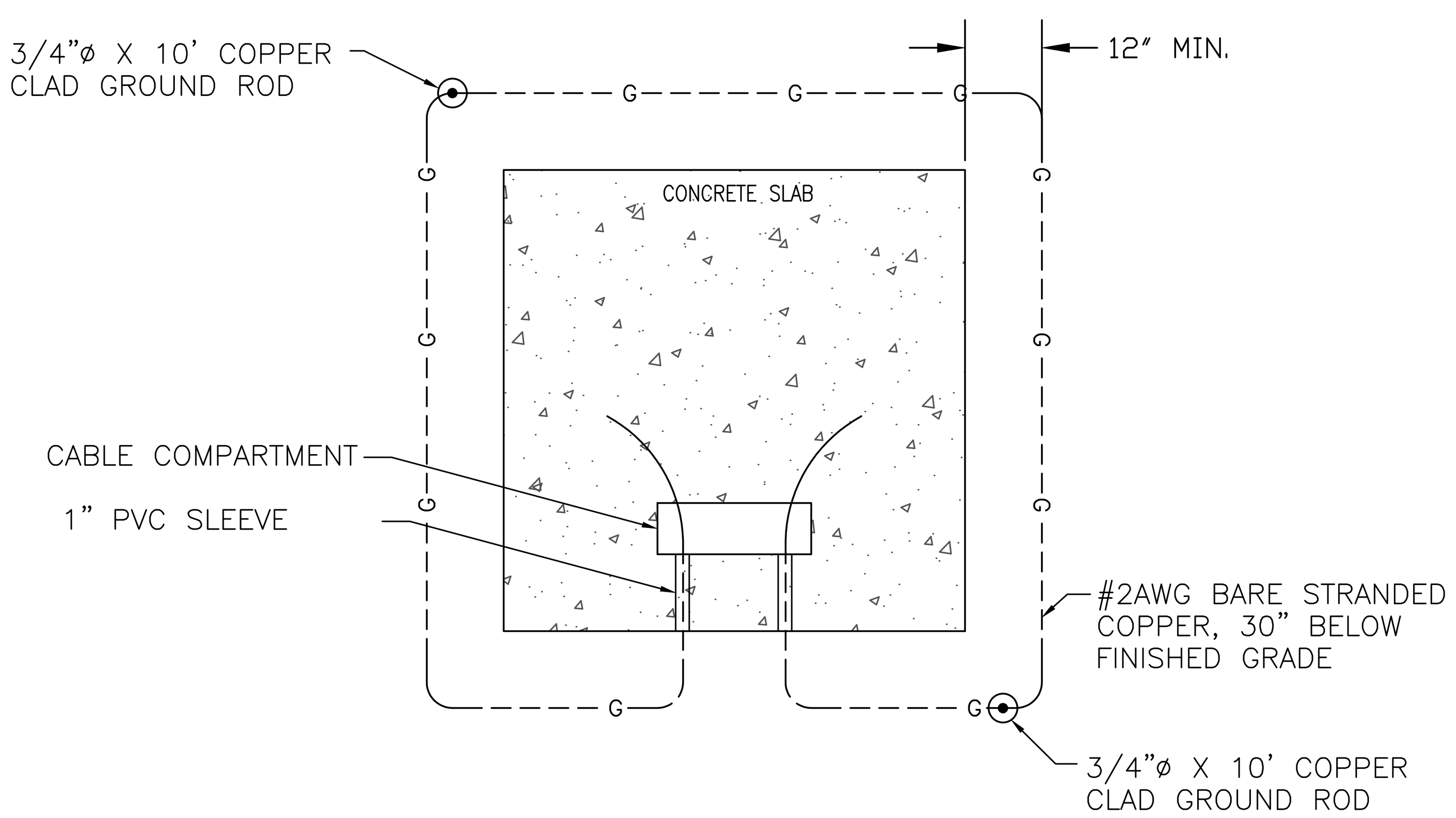


DIAGRAM NOTES:

1. WIRING AND CONDUIT BY ELECTRICAL CONTRACTOR.

KITCHEN EXHAUST CONNECTION DIAGRAM

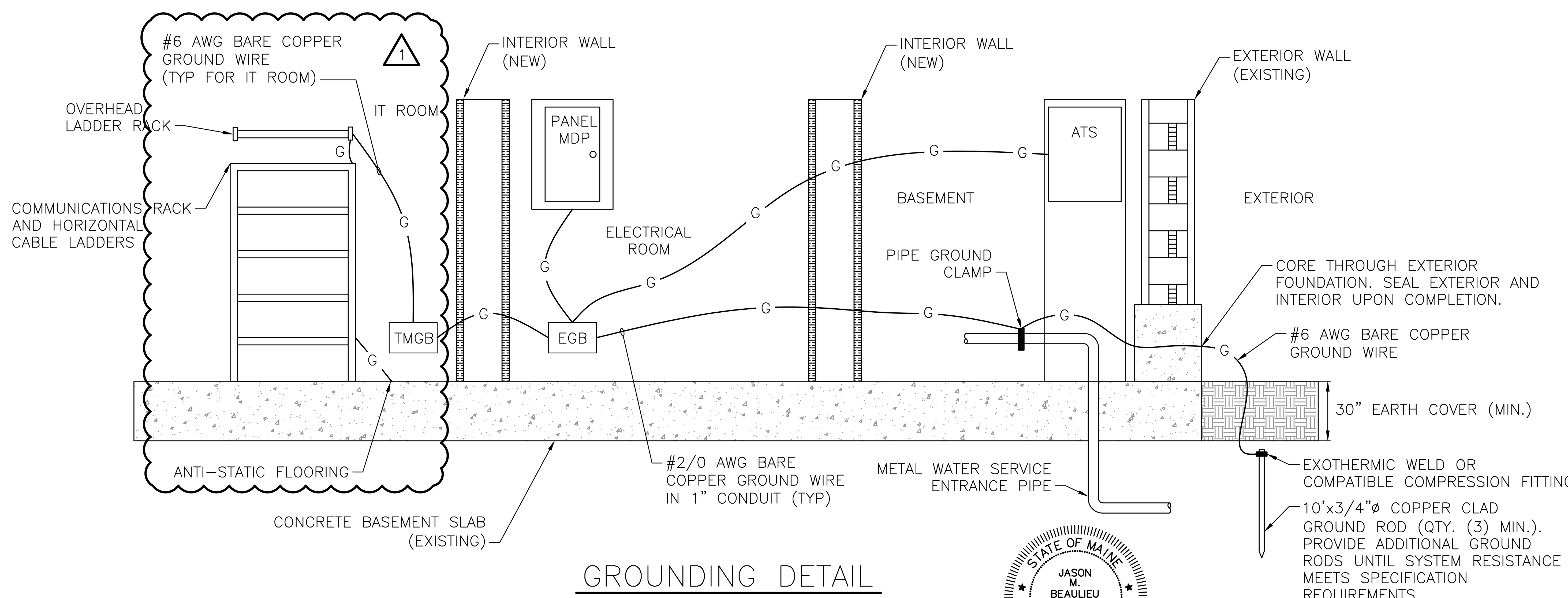
SCALE: NTS



NOTE: COORDINATE INSTALLATION WITH GENERATOR MFR. LOCATE CABLE COMPARTMENT AS REQUIRED.

GENERATOR PAD GROUNDING DETAIL

SCALE: NTS



GROUNDING DETAIL

SCALE: NTS

STATE OF MAINE JASON M. BEAULIEU No. 13441 LICENSED PROFESSIONAL ENGINEER
04/09/21

DIRECTORATE FACILITIES ENGINEERING DFE CAMP KEYES

PLAN REVISIONS

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DESIGNED BY: HCG
DRAWN BY: CAW
CHECKED BY: JMB
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
CCE JOB #144.054.002
47A YORK STREET
PORTLAND, MAINE
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

ELECTRICAL DETAILS

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
E-502
SHEET: 132 OF 145

PANELBOARD NO:	MAIN DISTRIBUTION PANEL			SC RATING:	65 KAIC										
PANELBOARD TYPE:	SURFACE			MOUNTING:	SURFACE						600 AMP MAIN BREAKER				
PANEL LOCATION:	ELECTRICAL ROOM 002			VOLTAGE:	208Y/120V, 3-PHASE, 4-WIRE						600 AMP BUS (COPPER)				
SUPPLIED FROM:	UTILITY / GENERATOR VIA ATS														
CKT NO.	TRIP AMPS	NO. POLES	WIRE / CONDUIT	GND WIRE	LOAD SERVED	LOAD VA	φ	LOAD VA	LOAD SERVED	WIRE / CONDUIT	GND WIRE	NO. POLES	TRIP AMPS	CKT NO.	
1						26790	A	7136						2	
3	250	3	4#400KCMIL / 2-1/2"	#4	PANEL PP1 (1)	26464	B	7783	PANEL PP2	4#1 / 1-1/2"	#8	3	100	4	
5						27008	C	6156						6	
7						24709	A	11397						8	
9	250	3	4#400KCMIL / 2-1/2"	#4	PANEL PP3	24865	B	12251	PANEL PP4	4#1 / 1-1/2"	#8	3	100	10	
11						24625	C	6736						12	
13						100	A	*						14	
15	15	3	3#12 / 3/4"	#12	BACS SMART METER	100	B	*	MAINTENANCE BUILDING PANEL	4#1 / 1-1/2"	#8	3	100	16	
17						100	C	*						18	
19	20	1	2#12 / 3/4"	#12	P-1	1800	A	296	LTG RM 001, 002	2#12 / 3/4"	#12	1	20	20	
21	20	1	2#12 / 3/4"	#12	P-2	1800	B	2400	GENERATOR BATTERY CHARGER, HEATERS	2#8 / 1"	#10	1	40	22	
23	20	1	2#12 / 3/4"	#12	CONTROL PANEL (P-1, P-2)	840	C	600	BUILDING AUTOMATION SYSTEM CONTROL PANEL	2#12 / 3/4"	#12	1	20	24	
25	15	2	2#12 / 3/4"	#12	HP-2	62	A	1800	P-3	2#12 / 3/4"	#12	1	20	26	
27						62	B	1800	P-4	2#12 / 3/4"	#12	1	20	28	
29	20	1	2#12 / 3/4"	#12	RECEPTS RM 002	720	C	840	CONTROL PANEL (P-3, P-4)	2#12 / 3/4"	#12	1	20	30	
31	20	1	2#12 / 3/4"	#12	RECEPTS RM 001	540	A	0	SPARE			1	20	32	
33	20	1	2#12 / 3/4"	#12	RECEPTS RM 001 & TRAP PRIMER TP-1	660	B	0	SPARE			1	20	34	
35	20	1			SPARE	0	C	0	SPARE			1	20	36	
37	20	1			SPARE	0	A	0	SPARE			1	20	38	
39	20	1			SPARE	0	B	0	SPARE			1	20	40	
41	20	1			SPARE	0	C	0	SPARE			1	20	42	
43						100	A	1553						44	
45	15	3	3#12 / 3/4"	#12	NGB SMART METER	100	B	2139	PANEL TR	4#1 / 1-1/2"	#8	3	100	46	
47						100	C	1740						48	
TOTAL PHASE A LOAD =			76.3kVA		NOTES:										
TOTAL PHASE B LOAD =			80.4kVA												
TOTAL PHASE C LOAD =			69.5kVA												
TOTAL CONNECTED LOAD =			226.2kVA												

MAIN DISTRIBUTION PANEL SCHEDULE

SCALE: NONE

PANELBOARD NO:	PANEL PP1			SC RATING:	42 KAIC										
PANELBOARD TYPE:	FLUSH			MOUNTING:	FLUSH						250 AMP MAIN BREAKER				
PANEL LOCATION:	KITCHEN 111			VOLTAGE:	208Y/120V, 3-PHASE, 4-WIRE						250 AMP BUS (COPPER)				
SUPPLIED FROM:	MDP														
CKT NO.	TRIP AMPS	NO. POLES	WIRE / CONDUIT	GND WIRE	LOAD SERVED	LOAD VA	φ	LOAD VA	LOAD SERVED	WIRE / CONDUIT	GND WIRE	NO. POLES	TRIP AMPS	CKT NO.	
1	20	1	2#12 / 3/4"	#12	JUICE DISPENSER & ICE DISPENSER	1056	A	2279						2	
3	30	2	2#10 / 3/4"	#10	COFFEE URN	2496	B	2279	DISHWASHER	3#12 / 3/4"	#10	3	25	4	
5						2496	C	2279						6	
7	20	1	2#12 / 3/4"	#12	COLD FOOD COUNTER	936	A	2999						8	
9	20	1	2#12 / 3/4"	#12	COLD FOOD WELL	720	B	2999	SINK HEATER	3#10 / 3/4"	#10	3	35	10	
11	20	2	2#12 / 3/4"	#12	HOT FOOD WELL	1279	C	2999						12	
13						1279	A	5002						14	
15	20	2	2#12 / 3/4"	#12	HEATED CABINET	811	B	5002	BOOSTER HEATER 1	3#6 / 3/4"	#10	3	60	16	
17						811	C	5002						18	
19						1655	A	360	BOOSTER HEATER 2	2#12 / 3/4"	#12	1	20	20	
21	20	3	3#12 / 3/4"	#12	SINK DISPOSER 1	1655	B	600	TOASTER	2#12 / 3/4"	#12	1	20	22	
23						1655	C	600	WATER WASH CONTROL STATION	2#12 / 3/4"	#12	1	20	24	
25						1655	A	1056						26	
27	20	3	3#12 / 3/4"	#12	SINK DISPOSER 2	1655	B	1056	COUNTER DISPOSER	3#12 / 3/4"	#12	3	20	28	
29						1655	C	1056						30	
31	20	1			SPARE	0	A	0	SPARE			1	20	32	
33	20	1			SPARE	0	B	0	SPARE			1	20	34	
35	20	1			SPARE	0	C	0	SPARE			1	20	36	
37						8513	A	0	SPARE			1	20	38	
39	100	3	4#1 / 1-1/2"	#8	PANEL PP1A	7227	B	0	SPARE			1	20	40	
41						7392	C	0	SPARE			1	20	42	
TOTAL PHASE A LOAD =			26.8kVA		NOTES:										
TOTAL PHASE B LOAD =			26.5kVA												
TOTAL PHASE C LOAD =			27.2kVA												
TOTAL CONNECTED LOAD =			80.5kVA												

PANEL PP1 SCHEDULE

SCALE: NONE

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.

KEYED NOTES:

(1) PROVIDE SUBMETER, CTS AND CONNECTION TO BACS FOR MONITORING OF EQUIPMENT USAGE.

JASON M. BEAULIEU No. 13441 LICENSED PROFESSIONAL ENGINEER STATE OF MAINE
04/09/21

DIRECTORATE DFE CAMP KEYES FACILITIES ENGINEERING

PLAN REVISIONS

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DESIGNED BY: HCG
DRAWN BY: CAW
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SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT
COLBY COMPANY ENGINEERING
CCE JOB #144.054.002
47A TANK STREET
AUGUSTA, MAINE
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

PANEL SCHEDULES

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
E-601
SHEET: 133 OF 145

PANELBOARD NO:	PANEL PP2				SC RATING:	42 KAIC									
PANELBOARD TYPE:	FLUSH				MOUNTING:	FLUSH						100 AMP MAIN BREAKER			
PANEL LOCATION:	ASSEMBLY HALL 101				VOLTAGE:	208Y/120V, 3-PHASE, 4-WIRE						100 AMP BUS (COPPER)			
SUPPLIED FROM:	MDP														
CKT NO.	TRIP AMPS	NO. POLES	WIRE / CONDUIT	GND WIRE	LOAD SERVED	LOAD VA	φ	LOAD VA	LOAD SERVED	WIRE / CONDUIT	GND WIRE	NO. POLES	TRIP AMPS	CKT NO.	
1	20	1	2#12 / 3/4"	#12	RECEPTS RM 102	540	A	1170	LTG RM 102, 102A, 103, 104, 105, 105A, 106	2#12 / 3/4"	#12	1	20	2	
3	20	1	2#12 / 3/4"	#12	RECEPTS RM 105	540	B	1500	LTG RM 101 COL 1	2#12 / 3/4"	#12	1	20	4	
5	20	1	2#12 / 3/4"	#12	RECEPTS RM 104 N	540	C	1800	LTG RM 101 COL 2	2#12 / 3/4"	#12	1	20	6	
7	20	1	2#12 / 3/4"	#12	RECEPTS RM 104 S	540	A	1800	LTG RM 101 COL 3	2#12 / 3/4"	#12	1	20	8	
9	20	1	2#12 / 3/4"	#12	RECEPTS RM 101 W	900	B	1500	LTG RM 101 COL 4	2#12 / 3/4"	#12	1	20	10	
11	20	1	2#12 / 3/4"	#12	RECEPTS RM 101 E	1080	C	420	LTG WALLPACKS W	2#12 / 3/4"	#12	1	20	12	
13	20	1	2#12 / 3/4"	#12	RECEPTS RM 101 WATER COOLERS	360	A	1128	DWH-1, 2 & TRAP PRIMER TP-2	2#12 / 3/4"	#12	1	20	14	
15	20	1	2#12 / 3/4"	#12	DF-1, 2, 3, 4	211	B	1128	DWH-3, 4 & TRAP PRIMER TP-3	2#12 / 3/4"	#12	1	20	16	
(1) 17	20	1	2#12 / 3/4"	#12	FIRE ALARM CONTROL PANEL	360	C	360	FIRE ALARM CIRCUIT SPARE	2#12 / 3/4"	#12	1	20	18	(1)
19	20	2	2#12 / 3/4"	#12	KEF-1	1248	A	600	RECEPT RM 107 W (TELEVISION)	2#12 / 3/4"	#12	1	20	20	
21						1248	B	360	PHOTOCELL POWER SUPPLY	2#12 / 3/4"	#12	1	20	22	
23	20	1	2#12 / 3/4"	#12	KEF-2	1056	C	600	RECEPT RM 107 E (TELEVISION)	2#12 / 3/4"	#12	1	20	24	
25	20	1	2#12 / 3/4"	#12	KEF-3	420	A	0	SPARE			1	20	26	
27	20	1	2#12 / 3/4"	#12	ERV-4	396	B	0	SPARE			1	20	28	
29	20	1	2#12 / 3/4"	#12	RECEPTS RM 107 NW	540	C	0	SPARE			1	20	30	
31	20	1	2#12 / 3/4"	#12	RECEPTS RM 107 SW	360	A	0	SPARE			1	20	32	
33	20	1	2#12 / 3/4"	#12	RECEPTS RM 107 SE	360	B	0	SPARE			1	20	34	
35	20	1	2#12 / 3/4"	#12	RECEPTS RM 107 NE	360	C	0	SPARE			1	20	36	
37	20	1			SPARE	0	A	0	SPARE			1	20	38	
39	20	1			SPARE	0	B	0	SPARE			1	20	40	
41	20	1			SPARE	0	C	0	SPARE			1	20	42	
TOTAL PHASE A LOAD = 8.2kVA						NOTES:									
TOTAL PHASE B LOAD = 8.1kVA															
TOTAL PHASE C LOAD = 7.1kVA															
TOTAL CONNECTED LOAD = 23.4kVA															

PANEL PP2 SCHEDULE

SCALE: NONE

PANELBOARD NO:	PANEL PP3				SC RATING:	42 KAIC									
PANELBOARD TYPE:	FLUSH				MOUNTING:	SURFACE						250 AMP MAIN BREAKER			
PANEL LOCATION:	ASSEMBLY HALL 101				VOLTAGE:	208Y/120V, 3-PHASE, 4-WIRE						250 AMP BUS (COPPER)			
SUPPLIED FROM:	PANEL PP1														
CKT NO.	TRIP AMPS	NO. POLES	WIRE / CONDUIT	GND WIRE	LOAD SERVED	LOAD VA	φ	LOAD VA	LOAD SERVED	WIRE / CONDUIT	GND WIRE	NO. POLES	TRIP AMPS	CKT NO.	
1						4762	A	9752						2	
3	50	3	3#8 / 3/4"	#10	RTU-1 (2)	4762	B	9752	RTU-2 (2)	3#1 / 1-1/2"	#6	3	125	4	
5						4762	C	9752						6	
7						1343	A	864						8	
9	35	3	3#10 / 3/4"	#10	MAU-1 (2)	1343	B	864	MAU-2 (2)	3#12 / 3/4"	#12	3	15	10	
11						1343	C	864						12	
13						4510	A	2855						14	
15	60	3	3#6 / 3/4"	#10	CU-3 (2)	4510	B	2855	CU-2 (2)	3#8 / 3/4"	#10	3	45	16	
17						4510	C	2855						18	
19	20	1	2#12 / 3/4"	#12	EF-1, 2	312	A	312	EF-3, 4	2#12 / 3/4"	#12	1	20	20	
21	20	1	2#12 / 3/4"	#12	RECEPTS RTU UNITS	360	B	420	EF-5	2#12 / 3/4"	#12	1	20	22	
23	20	1	2#12 / 3/4"	#12	RECEPTS MAU UNITS	360	C	0	SPARE			1	20	24	
25	20	1			SPARE	0	A	0	SPARE			1	20	26	
27	20	1			SPARE	0	B	0	SPARE			1	20	28	
29	20	1			SPARE	0	C	0	SPARE			1	20	30	
31	20	1			SPARE	0	A	0	SPARE			1	20	32	
33	20	1			SPARE	0	B	0	SPARE			1	20	34	
35	20	1			SPARE	0	C	0	SPARE			1	20	36	
37	20	1			SPARE	0	A	0	SPARE			1	20	38	
39	20	1			SPARE	0	B	0	SPARE			1	20	40	
41	20	1			SPARE	0	C	0	SPARE			1	20	42	
TOTAL PHASE A LOAD = 24.7kVA						NOTES:									
TOTAL PHASE B LOAD = 24.9kVA															
TOTAL PHASE C LOAD = 24.4kVA															
TOTAL CONNECTED LOAD = 74.0kVA															

PANEL PP3 SCHEDULE

SCALE: NONE

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.

KEYED NOTES:

(1) CIRCUIT BREAKER SHALL BE PAINTED RED AND PROVIDED WITH A LOCKABLE HANDLE.

(2) PROVIDE SUBMETER, CTS AND CONNECTION TO BACS FOR MONITORING OF EQUIPMENT USAGE.

DIRECTORATE OF FACILITIES ENGINEERING — DFE — CAMP KEYES

PLAN REVISIONS

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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

PANEL SCHEDULES

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
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- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

STATE OF MAINE — JASON M. BEAULIEU No. 13441 — LICENSED PROFESSIONAL ENGINEER
04/09/21

SHEET ID: E-602
SHEET: 134 OF 145

PANELBOARD NO:	PANEL PP4				SC RATING:	42 KAIC								
PANELBOARD TYPE:	FLUSH				MOUNTING:	FLUSH					100 AMP MAIN BREAKER			
PANEL LOCATION:	HALL 127				VOLTAGE:	208Y/120V, 3-PHASE, 4-WIRE					100 AMP BUS (COPPER)			
SUPPLIED FROM:	MDP													
CKT NO.	TRIP AMPS	NO. POLES	WIRE / CONDUIT	GND WIRE	LOAD SERVED	LOAD VA	ϕ	LOAD VA	LOAD SERVED	WIRE / CONDUIT	GND WIRE	NO. POLES	TRIP AMPS	CKT NO.
1	20	1	2#12 / 3/4"	#12	RECEPTS RM 131 NW	540	A	771	LTG RM 131, 132, 133	2#12 / 3/4"	#12	1	20	2
3	20	1	2#12 / 3/4"	#12	RECEPTS RM 131 NE	540	B	960	LTG RM 127, 128, 129, 130	2#12 / 3/4"	#12	1	20	4
5	20	1	2#12 / 3/4"	#12	RECEPTS RM 132 SW	540	C	553	LTG RM 122, 123, 124, 125, 126	2#12 / 3/4"	#12	1	20	6
7	20	1	2#12 / 3/4"	#12	RECEPTS RM 132 SE	720	A	446	LTG WALLPACKS NE	2#12 / 3/4"	#12	1	20	8
9	20	1	2#12 / 3/4"	#12	RECEPTS RM 130 NE	720	B	1080	RECEPTS RM 127	2#12 / 3/4"	#12	1	20	10
11	20	1	2#12 / 3/4"	#12	RECEPTS RM 130 SW	720	C	360	RECEPTS RM 133	2#12 / 3/4"	#12	1	20	12
13	20	2	2#12 / 3/4"	#12	ERV-1, 2	998	A	2496	DWH-7	2#10 / 3/4"	#10	2	30	14
15						998	B	2496						16
17	20	1	2#12 / 3/4"	#12	RECEPTS RM 125	360	C	810	UH-2	2#12 / 3/4"	#12	1	20	18
19	20	1	2#12 / 3/4"	#12	UH-1	810	A	708	RECEPT FOR DH-1	2#12 / 3/4"	#12	1	20	20
21	15	2	2#12 / 3/4"	#12	HP-4, 5, 6, 7, 8, 9, 10 ⟨1⟩	1238	B	360	RECEPTS RM 128 COUNTER	2#12 / 3/4"	#12	1	20	22
23						1238	C	600	RECEPT RM 128 REFRIGERATOR	2#12 / 3/4"	#12	1	20	24
25	20	1	2#12 / 3/4"	#12	RECEPTS RM 129 E	720	A	720	RECEPTS RM 128	2#12 / 3/4"	#12	1	20	26
27	20	1	2#12 / 3/4"	#12	RECEPTS RM 129 NW	720	B	720	RECEPTS RM 126 E	2#12 / 3/4"	#12	1	20	28
29	20	1	2#12 / 3/4"	#12	RECEPTS RM 129 SW	540	C	720	RECEPTS RM 126 W	2#12 / 3/4"	#12	1	20	30
31	20	2	2#12 / 3/4"	#12	RECEPT DRYER	1200	A	540	RECEPTS RM 121 NE	2#12 / 3/4"	#12	1	20	32
33						1200	B	540	RECEPTS RM 121 SW	2#12 / 3/4"	#12	1	20	34
35	20	1	2#12 / 3/4"	#12	RECEPT WASHER	360	C	720	PROJECTORS RM 131, 132	2#12 / 3/4"	#12	1	20	36
37	20	1	2#12 / 3/4"	#12	RECEPT RM 123 & TRAP PRIMER TP-4	300	A	0	SPARE			1	20	38
39	20	1	2#12 / 3/4"	#12	RECEPT RM 122	180	B	0	SPARE			1	20	40
41	20	1	2#12 / 3/4"	#12	RECEPTS RM 131, 132 (TELEVISIONS)	1200	C	0	SPARE			1	20	42
TOTAL PHASE A LOAD = 11.0kVA					NOTES:									
TOTAL PHASE B LOAD = 11.8kVA														
TOTAL PHASE C LOAD = 8.7kVA														
TOTAL CONNECTED LOAD = 31.4kVA														

PANEL PP4 SCHEDULE

SCALE: NONE

PANELBOARD NO:	PANEL PP1A				SC RATING:	42 KAIC								
PANELBOARD TYPE:	FLUSH				MOUNTING:	SURFACE					100 AMP MAIN BREAKER			
PANEL LOCATION:	KITCHEN 111				VOLTAGE:	208Y/120V, 3-PHASE, 4-WIRE					100 AMP BUS (COPPER)			
SUPPLIED FROM:	PANEL PP1													
CKT NO.	TRIP AMPS	NO. POLES	WIRE / CONDUIT	GND WIRE	LOAD SERVED	LOAD VA	ϕ	LOAD VA	LOAD SERVED	WIRE / CONDUIT	GND WIRE	NO. POLES	TRIP AMPS	CKT NO.
1	20	1	2#12 / 3/4"	#12	CONVECTION OVEN	1848	A	600	KETTLE	2#12 / 3/4"	#12	1	20	2
3	20	1	2#12 / 3/4"	#12	ICE MACHINE	1380	B	1800	TILT SKILLET	2#12 / 3/4"	#12	1	20	4
5	20	1	2#12 / 3/4"	#12	PEELER	1560	C	1176	FREEZER	2#12 / 3/4"	#12	1	20	6
7	20	1	2#12 / 3/4"	#12	MIXER	720	A	852	SLICER AND CAN OPENER	2#12 / 3/4"	#12	1	20	8
9	20	1	2#12 / 3/4"	#12	REFRIGERATOR (SINGLE SECTION)	624	B	120	WATER METER	2#12 / 3/4"	#12	1	20	10
11	20	1	2#12 / 3/4"	#12	REFRIGERATOR (DUAL SECTION)	828	C	1128	DWH-5, 6 & TRAP PRIMER TP-5	2#12 / 3/4"	#12	1	20	12
13	15	2	2#12 / 3/4"	#12	HP-11, 12, 13, 14, 15, 16, 17, 18 ⟨1⟩	634	A	852	LTG RM 107, 108, 109, 110, 111, 112, 113	2#12 / 3/4"	#12	1	20	14
15						634	B	300	LTG WALLPACKS SE	2#12 / 3/4"	#12	1	20	16
17	20	1	2#12 / 3/4"	#12	RECEPTS RM 111 DROP CORDS	720	C	180	RECEPT RM 109 COUNTERTOP	2#12 / 3/4"	#12	1	20	18
19	20	1	2#12 / 3/4"	#12	RECEPTS RM 110, 111, 113	720	A	720	RECEPTS RM 109, 111	2#12 / 3/4"	#12	1	20	20
21	20	1	2#12 / 3/4"	#12	RECEPTS RM 100	360	B	320	LTG KITCHEN HOODS	2#12 / 3/4"	#12	1	20	22
23	20	1	2#12 / 3/4"	#12	RECEPTS RM 117, 119	360	C	360	DOOR EQUIP. PWR SUPPLIES	2#12 / 3/4"	#12	1	20	24
25	20	1	2#12 / 3/4"	#12	RECEPT RM 118	180	A	360	ADA DOOR OPENER	2#12 / 3/4"	#12	1	20	26
27	20	1	2#12 / 3/4"	#12	RECEPTS RM 116	720	B	404	LTG RM 100, 119, 120, 121	2#12 / 3/4"	#12	1	20	28
29	20	1	2#12 / 3/4"	#12	RECEPTS RM 115	720	C	540	LTG RM 114, 115, 116, 117, 118	2#12 / 3/4"	#12	1	20	30
31	20	1	2#12 / 3/4"	#12	RECEPTS RM 114	720	A	499	ERV-3	2#12 / 3/4"	#12	2	15	32
33	20	1	2#12 / 3/4"	#12	LTG TROPHY CASE	180	B	499						34
35	20	1			SPARE	0	C	0	SPARE			1	20	36
37	20	1			SPARE	0	A	0	SPARE			1	20	38
39	20	1			SPARE	0	B	0	SPARE			1	20	40
41	20	1			SPARE	0	C	0	SPARE			1	20	42
TOTAL PHASE A LOAD = 8.7kVA					NOTES:									
TOTAL PHASE B LOAD = 7.3kVA														
TOTAL PHASE C LOAD = 7.6kVA														
TOTAL CONNECTED LOAD = 23.6kVA														

PANEL PP1A SCHEDULE

SCALE: NONE

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.

KEYED NOTES:

⟨1⟩ PROVIDE SUBMETER, CTS AND CONNECTION TO BACS FOR MONITORING OF EQUIPMENT USAGE.

DIRECTORATE OF FACILITIES ENGINEERING — DFE — CAMP KEYES

PLAN REVISIONS

Rev#	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

DESIGNED BY: HCG
DRAWN BY: CAW
CHECKED BY: JMB
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

COLBY COMPANY ENGINEERING
CCE JOB #144.054.002
47A YORK STREET
PORTLAND, MAINE
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

PANEL SCHEDULES

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

STATE OF MAINE — JASON M. BEAULIEU No. 13441 — LICENSED PROFESSIONAL ENGINEER
04/09/21

SHEET ID: E-603
SHEET: 135 OF 145

NOTES:

1. REFER TO SHEET E-001 FOR ELECTRICAL NOTES, SYMBOLS LEGEND, AND ABBREVIATIONS.

PANELBOARD NO: PANEL TR
PANELBOARD TYPE: SURFACE
PANEL LOCATION: IT ROOM 003
SUPPLIED FROM: MDP

SC RATING: 42 KAIC
MOUNTING: FLUSH
VOLTAGE: 208Y/120V, 3-PHASE, 4-WIRE

100 AMP MAIN BREAKER
100 AMP BUS (COPPER)

CKT NO.	TRIP AMPS	NO. POLES	WIRE / CONDUIT	GND WIRE	LOAD SERVED	LOAD VA	φ	LOAD VA	LOAD SERVED	WIRE / CONDUIT	GND WIRE	NO. POLES	TRIP AMPS	CKT NO.
1	20	1	2#12 / 3/4"	#12	RECEPT RM 003 DUPLEX 1	180	A	759	HP-1, CU-1	2#12 / 3/4"	#12	2	15	2
3	20	1	2#12 / 3/4"	#12	RECEPT RM 003 DUPLEX 2	180	B	759						4
5	20	1	2#12 / 3/4"	#12	RECEPT RM 003 DUPLEX 3	180	C	360	RECEPT RM 003 QUAD 1	2#12 / 3/4"	#12	1	20	6
7	20	1	2#12 / 3/4"	#12	RECEPT RM 003 DUPLEX 4	180	A	360	RECEPT RM 003 QUAD 2	2#12 / 3/4"	#12	1	20	8
9	20	1	2#12 / 3/4"	#12	IT RACK 1, UPS CKT 1	600	B	600	IT RACK 2, UPS CKT 1	2#12 / 3/4"	#12	1	20	10
11	20	1			SPARE	0	C	0	SPARE			1	20	12
13	20	1	2#12 / 3/4"	#12	LTG RM 003	74	A	312	IT RACK 2, 208V RECEPTACLE	2#12 / 3/4"	#12	2	20	14
15	20	2	2#12 / 3/4"	#12	IT RACK 1, 208V RECEPTACLE	312	B	312						16
17						312	C	0	SPARE			1	20	18
19	20	1			SPARE	0	A	0	SPARE			1	20	20
21	20	1			SPARE	0	B	0	SPARE			1	20	22
23	20	1			SPARE	0	C	0	SPARE			1	20	24

TOTAL PHASE A LOAD = 1.9kVA
TOTAL PHASE B LOAD = 2.8kVA
TOTAL PHASE C LOAD = 0.9kVA
TOTAL CONNECTED LOAD = 5.5kVA

NOTES:

PANEL TR SCHEDULE

SCALE: NONE

TYPE	DESCRIPTION	VOLT	MANUFACTURER (OR EQUAL)	LAMPS	MOUNTING	NOTES
A	2X2 RECESSED LED FIXTURE	120	COLUMBIA LCAT22-35LWG-EU	30W LED	GRID	PROVIDE DAMP LOCATION RATED FIXTURE IN BATHROOM AND SHOWER AREAS.
B	4' LED WRAPAROUND FIXTURE	120	COLUMBIA LAW4-35LW-EU	37W LED	SURFACE	
B2	4' LED PENDANT WRAPAROUND FIXTURE	120	COLUMBIA LAW4-35LW-EU-S18	37W LED	PENDANT	STANDARD MOUNTING HEIGHT OF 8'-6" AFF, UNLESS OTHERWISE NOTED.
C	3" RECESSED LED DOWNLIGHT FIXTURE	120	KURT VERSEN F213-113512D	14W LED	RECESSED	PROVIDE DAMP LOCATION RATED FIXTURE IN BATHROOM AND SHOWER AREAS.
C2	PENDANT LED DOWNLIGHT FIXTURE	120	EUREKA LIGHITNG 4273-14-LED-35-120V-S10	28W LED	PENDANT	STANDARD MOUNTING HEIGHT OF 8' AFF, UNLESS OTHERWISE NOTED.
D	EXTERIOR LED WALLPACK FIXTURE	120	HUBBELL OUTDOOR LNC3-24L-5K-075-4-U-DB-PCU	60W LED	SURFACE (EXTERIOR)	MOUNT TOP OF FIXTURE 6" UNDER BUILDING CANOPY AT ALL LOCATIONS. FIXTURE SHALL BE CONTROLLED BY EXTERIOR MOUNTED PHOTOCELL (SEE E-103).
E	EXTERIOR LED FLOODLIGHT FIXTURE	120	HUBBELL OUTDOOR RFL2-25-5K-PC	26W LED	SURFACE (EXTERIOR)	COORDINATE EXACT MOUNTING LOCATION AND ANGLE WITH OWNER IN FIELD. FIXTURE SHALL BE CONTROLLED BY EXTERIOR MOUNTED PHOTOCELL (SEE E-103).
F	LED FLEXIBLE LINEAR STRIPLIGHT FIXTURE	120	JESCO LIGHTING DL-AC-FLEX-35-MC-M	20W LED	SURFACE	FOR USE WITH KITCHEN HOODS KH- 2, KH-4 AND KH-5.
	SURFACE MOUNT LINEAR HIGH BAY STRIPLIGHT LED FIXTURE	120	LUMAX LIGHTING CILLED94L35K46-9-FAR-SM	82W LED	SURFACE	PROVIDE "64320" WIRE GUARD WITH FIXTURES.
	LED EMERGENCY EXIT SIGN WITH SELF-TESTING/SELF-DIAGNOSTICS, MAINTENANCE-FREE NICKEL CADMIUM BATTERY	120	DUAL LITE SE SERIES	LED	SURFACE (CEILING / WALL)	CONNECT TO UNSWITCHED LEG OF LOCAL LIGHTING CIRCUIT. PROVIDE "WGLX" WIRE GUARD WITH UNITS INDICATED ON DRAWINGS.
	DUAL LAMP EMERGENCY LIGHT FIXTURE WITH SELF DIAGNOSTICS, MAINTENANCE-FREE NICKEL METAL HYDRIDE BATTERY	120	DUAL LITE EZ SERIES	LED	SURFACE (WALL)	CONNECT TO UNSWITCHED LEG OF LOCAL LIGHTING CIRCUIT, UNLESS OTHERWISE NOTED. PROVIDE "WGEL" WIRE GUARD WITH UNITS INDICATED ON DRAWINGS.
	EMERGENCY REMOTE LIGHTING HEADS, OUTDOOR RATED	6	DUAL LITE OCR SERIES	LED	SURFACE (EXTERIOR)	SHALL BE COMPATIBLE WITH AND POWERED FROM LOCAL EMERGENCY FIXTURE
	OCCUPANCY SENSOR, DUAL TECHNOLOGY WITH ISOLATED RELAY FOR INTEGRATION WITH BACS	24	LEGRAND DT-300	N/A	SURFACE	
W	WALL MOUNTED OCCUPANCY SENSOR, DUAL TECHNOLOGY WITH ISOLATED RELAY FOR INTEGRATION WITH BACS	24	LEGRAND DT-200	N/A	SURFACE (WALL)	MOUNT DEVICES AT 10' AFF.
PC	EXTERIOR PHOTOCELL SENSOR	24	HUBBELL CONTROLS DLCPCO	N/A	SURFACE (EXTERIOR)	

LIGHT FIXTURE SCHEDULE

SCALE: NONE

JASON M. BEAULIEU No. 13441 LICENSED PROFESSIONAL ENGINEER STATE OF MAINE
04/09/21

DIRECTORATE OF FACILITIES ENGINEERING — DFE — CAMP KEYES

PLAN REVISIONS

Rev#	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

DESIGNED BY: HCG
DRAWN BY: CAW
CHECKED BY: JMB
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
DEPARTMENT OF DEFENSE, VETERANS AND EMERGENCY MANAGEMENT

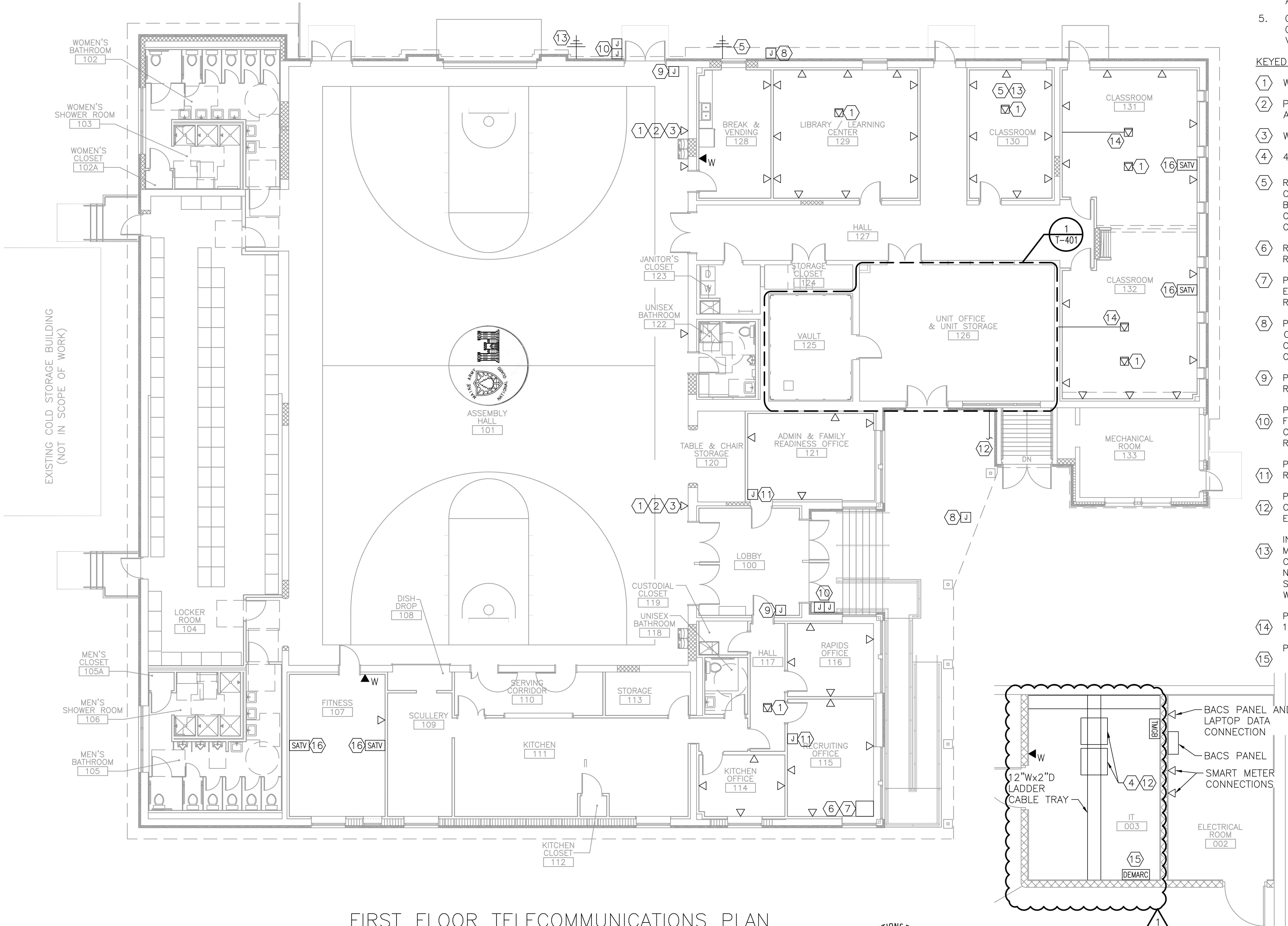
COLBY COMPANY ENGINEERING
CEC-06 #144.054.002
47A TORK STREET
PORTLAND, MAINE
207.553.7753

WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

PANEL SCHEDULES AND LIGHT FIXTURE SCHEDULE

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
- ☐ FINAL REVIEW
- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
E-604
SHEET: 136 OF 145



FIRST FLOOR TELECOMMUNICATIONS PLAN

SCALE: 1/8"=1'-0"

LINE TYPES

EXISTING

NEW

PARTIAL BASEMENT FLOOR PLAN – IT ROOM 003

SCALE: 1/4"=1'-0"

Bicsi — John A. Tabb — BICSI ID # 137723 — Expires 12-31-23 — REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER — RCDD — 04/09/2021

NOTES:

1. SEE T-501 FOR DETAILS.
2. PERFORM ALL COMMUNICATIONS WORK IN ACCORDANCE WITH APPLICABLE TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) STANDARDS. FOLLOW SELECTED MANUFACTURERS' RECOMMENDED INSTALLATION AND CONNECTION PROCEDURES. COORDINATE ALL TELEPHONE AND DATA INSTALLATIONS WITH OWNER'S REPRESENTATIVE.
3. INSTALL AND TEST ALL TELECOMMUNICATIONS CABLING ACCORDING TO TIA STANDARDS. PROVIDE TYPE CATEGORY 6 FOR ALL VOICE CONTROL AND DATA CABLES.
4. SEE SPECIFICATION SECTIONS 270526, 271100, AND 2715600 FOR APPLICABLE CODES AND STANDARDS.
5. CONTRACTOR SHALL PROVIDE ALL JUNCTION BOXES, CONDUIT, COMPRESSION FITTINGS, BACKER PLATES NECESSARY FOR INSTALLATION. VERIFY FINAL LOCATIONS AND PENETRATIONS WITH OWNER IN FIELD.

KEYED NOTES:

1. WIRELESS ACCESS POINT LOCATION.
2. PROVIDE NON-METALLIC PROTECTIVE CAGE FOR WAP LOCATIONS IN ASSEMBLY HALL.
3. WALL MOUNTED DATA JACK FOR WAP TO BE MOUNTED AT 7'-6" AFF.
4. 45U 4-POST 19" RACKS.
5. REINSTALL SALVAGED JMECON ANTENNA ON EAVE OF HIGH ROOF. PROVIDE 2" CONDUIT AND LMR400 COAX CABLE FROM ANTENNA TO ROOM 130. TERMINATE BOTH CABLE ENDS WITH N-STYLE MALE CONNECTORS. COIL AN ADDITIONAL 20' OF CABLE, LEAVE COIL SUSPENDED ABOVE CEILING TILES IN ROOM 130. COORDINATE FINAL LOCATIONS WITH OWNER, SEE A-507 FOR MOUNTING DETAIL.
6. REINSTALLATION OF SITE SURVEILLANCE AND ACCESS CONTROL EQUIPMENT IN RECRUITING OFFICE ROOM 115 BY OWNER.
7. PROVIDE FOUR (4) 3/4" AND TWO (2) 1" CONDUITS FROM ACCESS CONTROL EQUIPMENT TO ASSOCIATED DEVICE BOXES FOR FUTURE CAMERA AND CARD READER.
8. PROVIDE ONE (1) EXTERIOR DEVICE BOX FOR FUTURE CAMERA CONNECTION. COORDINATE EXACT MOUNTING HEIGHT WITH OWNER. ROUTE ONE (1) 3/4" CONDUIT BACK TO ACCESS CONTROL EQUIPMENT ROOM 115. REINSTALLATION OF CAMERA BY OWNER.
9. PROVIDE CONTROL BOX CO-LOCATED WITH DOOR POWER SUPPLY (SEE E-101). ROUTE ONE (1) 1" CONDUIT TO ACCESS CONTROL EQUIPMENT ROOM 115.
10. PROVIDE TWO (2) DEVICE BOXES WITH 2-GANG STAINLESS STEEL DEVICE PLATE FOR FUTURE AIPHONE AND CARD READER DEVICES. MOUNT 48" AFF. ROUTE ONE (1) 3/4" CONDUIT TO INTERIOR ACCESS CONTROL SYSTEM CONTROL BOX. REINSTALLATION OF AIPHONE DEVICES BY OWNER.
11. PROVIDE DEVICE BOXES, MOUNT 48" AFF FOR FUTURE AIPHONE RECEIVERS. ROUTE (1) 3/4" CONDUIT TO ACCESS CONTROL EQUIPMENT ROOM 115.
12. PROVIDE 12-STRAND FIBER AND FIBER ENCLOSURE IN IT RACK. PROVIDE CONNECTION BACK TO EXISTING MSVB IT RACK IN NEW 4" CONDUIT (SEE E-101).
13. INSTALL OWNER FURNISHED SINCGARS ANTENNA ON EAVE OF HIGH ROOF, MINIMUM 10' FROM JMECON ANTENNA. PROVIDE 2" CONDUIT AND LMR400 COAX CABLE FROM ANTENNA TO ROOM 130. TERMINATE BOTH CABLE ENDS WITH N-STYLE MALE CONNECTORS. COIL AN ADDITIONAL 20' OF CABLE, LEAVE COIL SUSPENDED ABOVE CEILING TILES IN ROOM 130. COORDINATE FINAL LOCATIONS WITH OWNER, SEE A-507 FOR MOUNTING DETAIL.
14. PROVIDE DATA DROP FOR PROJECTOR MOUNTED ABOVE CEILING. PROVIDE (2) 1" CONDUIT FOR FUTURE AV CABLING.
15. PROVIDE 110 BLOCK PATCH PANEL FOR COMMUNICATIONS DEMARCATION POINT.
16. SATV COAXIAL CABLE AND JACK, PROVIDE CONDUIT FROM JACK TO SATV RECEIVER IN IT ROOM 003. MOUNT OUTLET AT 7'-6" FOR WALL MOUNTED TV.

LEGEND:

- ▼W TELEPHONE WALL JACK
- ▽ DATA OUTLET, FOUR (4) CAT6 JACKS
- ☒ CEILING MOUNTED DATA OUTLET, ONE (1) CAT6 JACK
- RADIO ANTENNA
- TMGB TELECOMMUNICATIONS SYSTEM GROUND BUSBAR
- COMBINATION VOICE/DATA OUTLET
- SATV SATELLITE TELEVISION OUTLET
- DEMARC COMMUNICATIONS DEMARCATION POINT
- J JUNCTION BOX

PLAN NORTH

Scale: 1/4" = 1'-0" (0, 2', 4', 8')

Scale: 1/8" = 1'-0" (0, 4', 8', 16')

DIRECTORATE — DFE — CAMP KEYES — FACILITIES ENGINEERING

PLAN REVISIONS

Rev.	Description	Date	Appr.
1	ADDENDUM	4/16/21	CBC
0	ISSUED FOR BID	4/09/21	CBC

DESIGNED BY: JAT
DRAWN BY: CAW
CHECKED BY: JMB
DATE: 04/09/2021
SCALE: AS NOTED
DFE PROJECT NO: 23SR19-427-D

STATE OF MAINE
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CCE JOB #144.054.002
47A YORK STREET
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WESTBROOK ARMORY
WESTBROOK, MAINE
BUILDING RENOVATION

TELECOMMUNICATIONS PLAN

PLAN PROGRESS
- ☐ DRAFT
- ☐ 35% REVIEW
- ☐ 65% REVIEW
- ☐ 95% REVIEW
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- ☒ FOR BIDDING
- ☐ ISSUED FOR CONSTRUCTION
- ☐ RECORD DRAWINGS

SHEET ID:
T-101

SHEET: 137 OF 145