Supplement #7

Date of Issue: April 8, 2025

Project: Mowat Middle School Cafeteria and Administration Addition

Bid Package(s):

03A – Cast-in-Place Concrete
03B – Hollow Core Concrete
03C – Insulating Concrete Forming
04A – Masonry
05A – Metals
06B – Interior Architectural Woodwork
07A – Roofing
07B – EIFS
07C – Foam Insulation
08A – Doors, Frames, Hardware
08B – Glass & Glazing
09A – Framing & Drywall
09B – Acoustical
09C – Floor Covering
09D – Resinous Flooring
09E – Painting
10A – Specialties
11A – Food Service Equipment
21A – Fire Protection
22A – Plumbing
23A – Mechanical
26A – Electrical & Low Voltage
31A – Sitework
31B – Soil Improvements

Issued by: Culpepper Construction Company, Inc.

This supplement forms a part of the contract documents and supplements the conditions of contract dated May, 2024.

This supplement consists of 1 page of item 7.1, with attachments.

Item 7.1 This supplement contains architect's addendum 3, **Addendum 3 04-03-25**, see attached. This supplement and attachments forms a part of the bid documents for this project. The attached supplement is erroneously identified as "Addendum 3"; this Addendum 3 is in fact only the second Addendum issued for this project. **ONLY ADDENDUM 1 HAS BEEN ISSUED PRIOR TO THIS ADDENDUM, ADDENDUM 3**.

End of Supplement #7

Addendum #3

MOWAT MIDDLE SCHOOL CAFETERIA AND ADMINISTRATION ADDITIONS

JRA Commission. 20793 CA/BC

Bay District Schools
1311 Balboa Avenue
Panama City, Florida 32401

JRA Architects, Inc.
211 Thomas Drive- Suite 100
Panama City, Florida 32408

Date of Issue of addendum: **April 3, 2025**

The changes herewith form part of the Construction Documents and modify the original "GMP Documents" dated January 6, 2025.

This Addendum consists of **1** page(s), **7** attachment(s) and 4 revised plan sheet(s) attached and as referenced herein.

ITEM 1
Clarification: Refer to **Attachment A** for a list of questions from the contractor and responses to those questions for clarification.

ITEM 2
Construction Key Notes: Refer to the attached **Construction key notes** for explanation of the construction key notes.

ITEM 3
Specifications: Replace specification section **01 91 13 – General Commissioning Requirements** with attached specification section.

ITEM 4
Specifications: Replace specification section **23 05 93 - Testing and Balancing of Mechanical Systems** with attached specification section.

ITEM 5
Specifications: Replace specification section **23 08 00 – Mechanical Systems Commissioning** with attached specification section.

ITEM 6
Specifications: Replace specification section **26 32 13.16 – Gaseous Emergency Engine Generators** with attached specification section.

ITEM 7
Specifications: Replace specification section **26 08 00 – Electrical Systems Commissioning** with attached specification section.

ITEM 8
Drawings: Replace **Drawing sheet A2.5** with attached Drawing with a Revision date of 04/04/25.

ITEM 9
Drawings: Replace **Drawing sheet E7.4** with attached Drawing with a Revision date of 04/03/25.

ITEM 10
Drawings: Replace **Drawing sheets P0.2 and P2.1** with attached Drawings with a Revision date of 04/04/25.

END OF ADDENDUM #3

Attachment A

Mowat Middle School Cafeteria & Administration

4/7/2025

Ref	Date	Issue	Design Team Response/Comments
1	2/20/25	**CBC Construction**: Please provide specifications for the Lift Station (SS4) shown on C1.5.	Lift Station has been constructed.
2	2/20/25	**Wurster Betterground**: Reviewing Section 31 66 13.13 - Rammed Aggregate Piers (RAPs), Item D, indicated that alternate installer will not be accepted unless approved by Owner's engineer and Geopier Company. We install aggregate piers, which are similar to RAPs, using a different construction method, but the final product is the same (a stone column). We are not a licensed installer by Geopier.; Could this contractor and method be approved for this project?	The Base bid shall be in accordance specification section 31 66 13.13. The Construction manager will entertain alternate foundation systems as voluntary bid alternates. For all alternates provide contractor name, description of construction methodology (along with proposed equipment to be used during installation process); also please include 3 sample projects successfully completed as references. (Project Name, Date Installed, Location, Photos, Client Name, Project Owner, Construction Value, etc). In addition please confirm that selected contractor will provide all other requested documenation and materials as described within the construction drawings and specifications as relevant to the proposed scope of work outlined for RAPs.
3	2/27/25	**Universal Electric of Tallahassee**: On Page E7.4 Note 8 states 2000A and MTS-S Shows 1000A. Please clarify.	The note on the actual riser is correct at 1000amps. Note 8 is indicating the incorrect size at 2000amps. This should be 1000amps. All wire sizes indicated are correct.
4	2/27/25	**Birmingham Restaurant Supply, Inc:** Where will the condensing units be located? (Hoods / UDS) Is CaptiveAire or Econ Air needed?	Food service equipment supplier to coordinate location of all food service equipment on shop drawing submittals.
		(Items 134) The equipment schedule lists model DHS-40C while the written specs list model DH-40C, which is correct?	Model DHS-40C is the correct model
		(Item 135.3) This is shown as Item 136 on the equipment schedule. Should we refer to it as Item 136? Additionally, please confirm that the KEC is responsible for furnishing the fans as stated in the itemized portion of the specs.	Fans are #136. The KEC is responsible to furnish and deliver to jobsite
		(Item 137) Please confirm that the KEC is responsible for furnishing the fans as stated in the itemized portion of the specs.	The KEC is responsible to furnish and deliver to jobsite only. The GC's mechanical and electrical contractor shall set in place and final connect.
		(Item 144) The equipment schedule lists model 3602-88. Should it be FG360288WHT per the written specs?	Provide Model FG360288WHT
		(Item 146) The equipment schedule lists 64" AFF, but written specs say 56" AFF. Which is correct?	Provide at 56" A.F.F.
		(Item 163) Item 163 is listed as a spare number in the written specs, but the equipment schedule shows one (1) New Age model 1068TB. Item 163 is not tagged on the floor plan. Should we still quote New Age?	Item #163 shall be an open item
		(Item 170) The equipment schedule lists model SM34-S, but the written specs show SM49HC-S. Which is correct?	Provide Model SM49HC-S current model
		(Item 173) The equipment schedule lists model GRAH-48-TL13, but the written specs show model GRAH-48. Which is correct?	Provide Model GRAH-48 with accessories per specification
		(Item 178) Model MSC-41AA replaces specified model MSC-41AN. Is this acceptable?	Provide MSC-41-AA
		(Item 189) The equipment schedule lists model 79553, but the written specs list model 75395. Which is correct? LTI condensate vent risers: should this item be 190 per the equipment schedule?	Provide current Model 75221 hose reel
		(Item 190.1) The equipment schedule lists model SIF11D, but the written specs show model SIF11DD. Which is correct?	Provide Model SIF11DD. Deliver to job-site for installation and connection by GC
		(Item 191) The equipment schedule lists model CLPS66EN-EGR, but the written specs show CLPS66EN. Which is correct?	Provide Model CLPS66EN
		(Items 129) Area twenty-eight (28) corner guards required?	Provide 36 ea. Corner Guards
		(Items 135) Item 135 is tagged twice, but both the written specs and the equipment schedule list a quantity of one (1). Is item 135 tagged twice because the hood is in two (2) sections?	Yes
		(Items 135.3 / Item 136) The equipment schedule calls for two (2) exhaust fans. Item 136 (Item 135.3 in the specs) is only tagged once on the floor plan. Please advise the correct quantity.	Two fans are required
		(Item 162) The written specs list model 21482K3 and 21482 meant to be 2142NK3?	Provide 2142NK3
		(Item 169) Is a quantity (7) corner gaurds required?	Provide 8 ea. Corner guards
		(Item 197) The equipment schedule and written specs list a quantity of two (2). The floor plan shows one (1). What is the correct quantity for the handrail?	Provide 1 ea. Handrail
		(Item 106): The equipment schedule lists model BEL0105, but written specs show model BEL0115. Which is correct?	Provide Model BEL0115
		(Item 106.1): The equipment schedule lists model BEL0115, but written specs show model BEL0155. Which is correct?	Provide mModel BEL0155
		(Item 106.2: The equipment schedule lists model AKOA1AF, but written specs show model ZS1-02Z0CT30AST. Which is correct?	Provide Model ZS1-02Z0CT30AST
		(Item 165): Please confirm the number of tray slides needed. Is it (26) pairs per each unit or (26) pairs total for both units?	14 Slides per unit
		(Item 166): Please confirm the number of tray slides needed. Is it (28) pairs per each unit or (28) pairs total for both units?	14 Slides per unit
		Are Hand Dryers owner supplied? If CFCI, please specify manufacturer and model.	Hand dryers are to be supplied within the contract. The basis of design for the Hand dryers are to be Pinnacle Dryers - P3-12S - Stainless steel finish
		Are the Baby Changing Stations owner supplied? If CFCI, please specify manufacturer and model.	The basis of design for the Baby Changing Stations are to be supplied within the contract. The baby changing stations are to be Koala Kare - KB300-SS - Surface mounted with stainless steel veneer
		There are notes on the drawings with numbers in square boxes, but no notes to identify what the numbers are identifying. Could these be identifying marker boards and visual displays? Please clarify.	The numbers in squares on sheet A2.4 are Construction Keynotes. See attached Construction Keynotes attachment to this addendum.

Attachment A

Mowat Middle School Cafeteria & Administration

4/7/2025

Ref	Date	Issue	Design Team Response/Comments
6	3/7/25	**Lawson & Lawson Electric:** On 'T', 'AC', and 'SEC' drawings. Work is being shown as being done to the existing band room, adnministration building annex, and a classroom addition to building #1. Please provide revised low voltage drawings indicating the scope of work intended to be a part of this contract.	Low Voltage Package for the Cafeteria & Admin Building does not include work specified within buildings 1, 2 & 3. (any work necessary to tie Cafeteria & Administration Building to campus systems will need to be completed within this contract.)
7	3/12/25	**Boyd Construction Specialties**: [Aluminum Door Hardware] (a) Securitech is saying that the hardware will have to change to Sargent's FM8700 series to meet ICC500 requirements for the equivalent aluminum doors. (b) I can quote this project using Securitech hardware for the aluminum doors, however it will not meet ICC500. (c) Otherwise, the architect will have to let us know what they would like quoted using the FM8700 series and if it will work with the other door components specified. Please advise.	Sargent's FM8700 series to meet ICC500 is acceptable.
8	3/12/25	**Boyd Construction Specialties**: (From Mesker Door Rep) [Aluminum Door Hardware] (a) The architect will have to decide if the doors will have lite kits and not be rated, or flush and be rated. (b) The architect will have to decide what hardware will be used on the inactive doors that currently have flush bolts. Please advise.	These doors will have to be flush and be rated. All doors, frames and hardware will have to meet ICC500 ratings as required by construction documents.
9	3/17/25	**Century Fire Protection**: (a) The exterior canopies appear to be noncombustible with no storage. Please confirm the need for fire protection coverage? (b) Will specs be issued for the dry system or should it be design build?	(a) We need coverage at both canopies as well as over the outdoor dining. (b) the dry system riser coming off the riser is detailed on FP0.1. The sizing/location of heads will be designed by the fire sprinkler contractor, similar to the wet system.
10	3/31/25	Will there be a revised equipment schedule due to the refrigerant changes?	No, These changes were updated on the drawings dated 1/6/25

CONSTRUCTION KEY NOTES

1

1. 8" GALVANIZED METAL STUDS (GMS) AT 16" O.C. WITH 5/8" GWB (MOISTURE RESISTANT GWB AT WET WALLS).

2. 6" GALVANIZED METAL STUDS (GMS) AT 16" O.C. WITH 5/8" GWB (MOISTURE RESISTANT GWB AT WET WALLS).

3. CONSTRUCT WALL FULL HEIGHT. INSULATE WALL WITH BATT INSULATION FULL WALL THICKNESS TO ABOVE CEILING, INSULATE FROM TOP OF BATT TO BOTTOM OF ROOF DECK WITH FOAM-IN-PLACE INSULATION.

3A. FULL HEIGHT WALL, RUN GWB FULL HEIGHT.

4. GWB BULKHEAD ABOVE ON 3 5/8" GMS (U.N.O.) AT 24" O.C., SEE DETAIL 5/A10.1

5. FURR EXISTING WALL WITH 3 5/8" GMS AT 16" O.C. WITH FOAM-IN-PLACE INSULATION AND 5/8" GWB.

6. FURR EXISTING WALL WITH 1 1/2" GMS AT 16" O.C. WITH FOAM-IN-PLACE INSULATION AND 5/8" GWB.

7. ALIGN FACE OF STUD WITH CORNER OF CONCRETE COLUMN. SEE DETAIL.

8. 18" DEEP STORAGE SHELVING, SEE 3/A8.1.

9. 36" DEEP STORAGE SHELVING, SEE 3/A8.1.

10. FILL CAVITY WITH FOAM-IN-PLACE INSULATION.

11. REMOVE AND REINSTALL EXISTING 3-COMPARTMENT SINK IN IT'S CURRENT LOCATION.

12. 8' x 4' MARKERBOARD (BOTTOM OF RAIL AT 32" A.F.F.)

13. 4' x 4' TACKBOARD (BOTTOM OF RAIL AT 32" A.F.F.)

14. INTERACTIVE FLAT PANEL, SEE TECHNOLOGY PLANS.

15. STUDENT MUSIC FOLDER STORAGE. SEE ELEVATION AND DETAIL.

16. 3'-0"W x 2'-6"D x 5'-9"H, SEE N/A8.3.

17. 2'-6"W x 3'-4"D x 5'-9"H, SEE P/A8.3.

18. CONSTRUCT WALL FULL HEIGHT AND TO MATCH WIDTH OF CONCRETE BEAM ABOVE.

19. FLAT PANEL MENU BOARD. OWNER PROVIDED AND CONTRACTOR INSTALLED. COORDINATE WITH TELECOMMUNICATIONS REQUIREMENTS.

20. NEW ELECTRICAL TRANSFORMERS, SEE ELECTRICAL.

21. 6'-0" HIGH CHANILINK FENCE AND PAIR 4'-0" GATES, COORDINATE CLEARANCE WITH MECH/ELEC EQUIPMENT.

22. (5) SETS OF DOUBLE TIER METAL LOCKERS, SEE SPECIFICATIONS.

23. CLOSET SHELF AND ROD. TOP OF SHELF @ 60".

24. PROVIDE 2"x2"x6'-0" STAINLESS STEEL CORNER GUARDS.

25. CEILING MOUNTED CUBICAL CURTAINS

BAY DISTRICT SCHOOLS
MOWAT MIDDLE SCHOOL
CAFETERIA AND ADMINISTRATION ADDITION
GMP DOCUMENTS
JANUARY 6, 2025

SECTION 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS ADDENDUM 3 - 04/03/25

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. Ideally, this is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

Commissioning activities during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1) Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2) Verify and document proper functional performance of equipment and systems.
3) Verify on-going proper performance persistence of systems under changing conditions throughout the first year of operation.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to respectively design, provide, and install a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in the *Specifications* and in the *Commissioning Plan.* Definitions are found in Section 1.6.

A/E-	Architect and design engineers	FT-	Functional performance test
CA-	Commissioning authority	MC-	Mechanical contractor
CC-	Controls contractor	PC-	Prefunctional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to GC
GC-	General Contractor	TAB-	Test and balance contractor
EC-	Electrical contractor		

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning Authority (CA), the owner's Project Manager (PM), the owner's Mechanical Engineer (OME), the designated representative of the General Contractor (GC), the architect and design engineers (particularly the mechanical engineer and the electrical engineer), the Mechanical Contractor (MC), the Plumbing Contractor (PC), the Electrical Contractor (EC),

the TAB representative (TAB), the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment which is part of a system identified to be commissioned. If known, other members of the Owner's building or plant operations / maintenance staff may also a member of the commissioning team.

B. Management. For this project, the CA is hired by the Owner and reports directly to the Owner while copying the Architect / Engineer and the remainder of the Commissioning Team members with all project correspondence. The CA directs and coordinates the commissioning activities. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents. The CA's responsibilities are the same regardless of who hired the CA.

C. Scheduling. The CA will work with the General Contractor according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the General Contractor for scheduling commissioning activities. The General Contractor will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The CA will provide the initial schedule (or possibly just sequence) of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* provides a format for this schedule. As construction progresses more detailed schedules are developed by the CA. The Commissioning Plan also provides a format for detailed schedules.

1.3 COMMISSIONING PROCESS

A. Commissioning Plan. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CA will complete the plan which is then considered the "final" construction phase commissioning plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

Construction / Acceptance Period

1. Commissioning during construction begins with a kickoff meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings, if required throughout construction, will be scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals for use in developing and finalizing project-specific Cx documentation.
4. The CA reviews the commissioned equipment submittals for compliance with contract requirements as well as for aspects related to commissioning and owner maintenance.
5. The CA develops prefunctional checklists to be completed for systems and equipment to be commissioned during the equipment startup and check-out process. These checklists are intended to augment, not replace, the manufacturer's standard start-up / checkout documentation. These checklists are developed and completed using the on-line Cx Plus commissioning platform provided by BES Plus Tech.

6. The CA and the Subs work together to execute and document the prefunctional checklists and perform startup and initial checkout. In general the CA will complete the installation checks portion of the prefunctional checklists while the CA and the Subs will complete the equipment start-up / checkout portions. The CA documents that the checklists and startup were completed according to the approved plans.
7. The CA develops specific equipment and system functional performance test procedures. These tests are developed and completed using the on-line Cx Plus commissioning platform provided by BES Plus Tech.
8. The Controls Contractor sets up trending of system points and automated delivery of the trend reports as directed by CA. This data, if available prior to manual functional testing, is utilized to judge the readiness of systems to be tested.
9. The CA with the assistance of the TAB Contractor completes the Test, Adjust, Balance Verification (TAB-V) process. This must be successfully completed prior to beginning functional testing for each specific system.
10. The manual functional test procedures are executed by the Subs, under the direction of, and documented by the CA.
11. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
12. Commissioning is substantially completed before Final Completion is granted to GC.

Warranty Period

1. For the duration of the Warranty Period the CA monitors the performance of the commissioned systems using the cloud-based Cx-PMOR system (BES Plus Tech Performance Plus). Any items identified by this monitoring shall be resolved through the Contract Warranty Process.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section.

230800	Mechanical Cx	Describes the Cx responsibilities of the mechanical, controls and TAB contractors and the prefunctional testing and startup responsibilities of each.
260500	Electrical Cx	Describes the Cx responsibilities of the electrical contractor.

1.5 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. The responsibilities of the mechanical contractor, TAB and controls contractor are in Division 23 and those of the electrical contractor in Division 26. *It is noted that the services for the Owner Project Manager and the Commissioning Authority are not provided for in this contract. That is, the General Contractor is not responsible for providing their services.* Their responsibilities are listed here to clarify the commissioning process.

B. <u>All Parties</u>

1. Attend Pre-commissioning Meeting and normal construction period Commissioning Meetings, as deemed necessary by the CA, PM, and General Contractor to effectively participate in the Cx Process.
2. Each company / organization identified as being a member of the Cx Team shall designate an employee who is involved and familiar with the project to be the point-of-

contact (POC) for the Cx process.

3. The identified POC shall regularly review the on-line Issue Log at the BES Plus Tech website project portal and the report documents which are emailed to the Cx Team.
4. The POC shall respond to any and all issues assigned to the company / organization that they are representing in the Cx Process within five (5) working days of the date the issue is added to the Log. Failure by a construction team member to effectively participate in the Cx Process, as judged by the Owner, can be considered cause for holding a construction progress payment.

C. Architect

Construction and Acceptance Phase

1. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as specifically contracted to the Owner.
2. Provide any design narrative documentation requested by the CA.
3. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
4. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

Warranty Period

1. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

D. Mechanical and Electrical Designers / Engineers (of the A/E)

Construction and Acceptance Phase

1. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.
2. Provide any design narrative and sequences documentation requested by the CA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
3. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
4. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
5. Provide a presentation at one of the training sessions for the Owner's personnel.

Warranty Period

1. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during warranty-period.

E. Commissioning Authority (CA)

The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the General Contractor and his Subs. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document

performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. At the direction and discretion of the CA, the Contractors will provide tools or the use of tools to start, check-out and functionally test equipment and systems.

Construction and Acceptance Phase

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the General Contractor, ensure that commissioning activities are being scheduled into the master schedule.
3. Plan and conduct a pre-commissioning meeting (Cx Kickoff Meeting) and participate in construction coordination and Owner-Contractor meetings as required to support the Cx Process.
4. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
5. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
6. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the General Contractor reviews.
7. Write and distribute prefunctional tests and checklists.
8. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions / substitutions relating to the commissioning process. Assist in resolving any discrepancies.
9. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures. At the discretion of the CA this testing may be witnessed by an alternate party (e.g. PM, TAB, General Contractor) as approved by the CA, documentation shall be provided to the CA that the testing was completed satisfactorily and according to specifications.
10. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures. At the discretion of the CA this testing may be witnessed by an alternate party (e.g. PM, TAB, General Contractor) as approved by the CA, documentation shall be provided to the CA that the testing was completed satisfactorily and according to specifications.
11. Document equipment installation meets contract requirements by completion of the installation checks portion of the prefunctional checklists. Work together with Subs to complete the equipment start-up and check-out portion of the checklists. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
12. Approve systems startup by reviewing start-up reports and by selected site observation.
13. Review TAB execution plan, discuss concerns and comments with TAB.
14. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
15. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.

16. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing.
17. Analyze functional performance trend logs and monitoring data to verify performance.
18. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
19. Maintain a master deficiency and resolution log (aka 'Issues Log') and a separate testing record. Provide the General Contractor with written progress reports and test results with recommended actions.
20. Provide a final commissioning report (as described in this section).

Warranty Period

1. Configure and maintain the cloud-based Cx-PMOR performance monitoring system throughout the Warranty Period to identify performance and operational issues. Issues shall be documented using On-Going Issues Log and shall be corrected by way of the Contract Warranty Process.
2. Verify completion and effectiveness of required deficiency corrections for issues discovered during Warranty Period.

F. General Contractor (GC)

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and ensure that commissioning activities are being scheduled into the master schedule.
2. Include the cost of providing commissioning assistance to the CA as described in the drawings and this and other related specification sections in the total contract price. *(do NOT include the cost of the Commissioning Authority as they are under contract to the Owner)*
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
6. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
7. Review commissioning progress and deficiency reports.
8. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
9. Assist the Owner PM and the CA in coordinating the training of owner personnel.
10. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
11. Coordinate the training of owner personnel in accordance to Contract Documents.
12. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

Warranty Period

1. Ensure that Subs complete deficiency corrections for issues discovered during Warranty Period.

G. Owner's Project Manager (PM)

Construction and Acceptance Phase

1. Manage the contract of the CA, A/E, and the General Contractor.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the *Commissioning Plan—Construction Phase.*
3. Provide final approval for the completion of the commissioning work.

Warranty Period

1. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

H. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs and as required by individual equipment specification sections.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CA.
4. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.
6. Provide Owner Training activities per individual equipment specification sections to include trainer personnel meeting specification qualification and experience requirements. Training provided shall meet or exceed the time duration as specified in the equipment specification sections unless specifically authorized in writing by the Owner PM that less training is acceptable.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

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

Basis of Design (BOD)- The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included. The document records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

Commissioning Authority (CA) - an independent agent, not otherwise associated with the General Contractor or his Subs. The CA directs and coordinates the day-to-day commissioning activities. Regardless of to whom the CA is contracted, the CA shall report directly to the Owner's Project Manager (PM).

Commissioning Plan - an overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.

Contract Documents - the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, *Cx Plan*, etc.).

Control system - the central building energy management control system.

Cx-PMOR – see PMOR.

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

General Contractor - the contractor providing general construction services and oversight of trade subcontractors as well as providing professionals who comprise the design team such as the HVAC mechanical designer/engineer and the electrical designer/engineer.

Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the General Contractor's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Owner's Project Requirements (OPR) - A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project

goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

Performance Monitoring, Optimization, and Reporting (PMOR) – cloud based SaaS (Software as a Service) which provides automated building operating data acquisition, analysis, archival, and reporting by utilizing data provided from the building automation system to continually analyze and improve the overall performance of the building and its underlying mechanical and electrical systems.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

Project Manager (PM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Sampling. - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 019113, Part 3.6, F for details.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Specifications - the construction specifications of the Contract Documents.

Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

Subs - the subcontractors to the General Contractor who provide and install building components and systems.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures.

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. The following systems or equipment will be commissioned in this project.

1. HVAC Systems:
   a. Air Distribution System Ductwork (all)
   b. Chilled Water Piping System
   c. Air-Cooled Chillers and Chilled Water Distribution Pumps
   d. Gas-Fired Heating Water Boilers and Hot Water Distribution Pumps
   e. Single-Zone Central Station Air Handling units (chilled water cooling)
   f. Multi-Zone Central Station Air Handling units (chilled water cooling)
   g. VAV Air Terminal Units with hot water reheat coils
   h. Fan Coil Unit (Chilled water cooling / hot water heating)
   i. DX Ductless Minisplit Systems
   j. Exhaust Air Fans and Systems
   k. Testing, Adjusting, Balancing
   l. HVAC Control System (a.k.a. Building Automation System)

2. Electrical Systems:
   a. Power Distribution System and Equipment related to HVAC equipment
   b. Lighting Control Systems

3. Other Systems:
   a. Domestic Hot Water Systems

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios, when required, shall be provided by the Division Contractor.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, for the CA to use during functional testing, seasonal testing, and deferred testing. The equipment, tools, and instruments will be returned to the vendor / Subs after successful conclusion of the commissioning effort.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* If not otherwise noted, the following minimum requirements shall apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Humidity sensors shall have a certified calibration within the past 6 months and a resolution of +/- 1%. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 MEETINGS

A. Pre-Commissioning Meeting. The CA will schedule, plan and conduct a pre-commissioning meeting with the entire commissioning team in attendance.

B. Miscellaneous Meetings. Meetings regarding the Commissioning Process that may be required throughout the construction period will be scheduled as agenda items at the General Contractor's regularly scheduled construction coordination meetings or Owner-Contractor meetings. An exception to this policy would be extraordinary meetings which are deemed necessary by the CA and the General Contractor with necessary parties attending in order to resolve outstanding deficiencies toward the end of the construction period.

3.2 REPORTING

A. The CA may provide regular reports to the Owner's PM with copy to the General Contractor, depending on the management structure, with increasing frequency as construction and commissioning progresses.

B. The CA will regularly communicate with all members of the commissioning team keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc. delivered via group email or the commissioning software website.

C. Testing or review approvals and non-conformance and deficiency reports (aka Issue Logs) are made regularly with the review and testing as described in later sections.

D. A final summary construction phase commissioning issues log report will be provided once all the principal commissioning activities during construction are completed and all issues are resolved. Refer to other contract specifications for requirements of a final issue log report to accompany contractor final completion / pay request.

3.3 SUBMITTALS

A. The CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. This request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, and control drawings (e.g. typical formal construction submittals).

B. These submittals to the CA do not constitute compliance for O&M manual documentation and review of the equipment submittals is not for contract compliance. The O&M manuals are the responsibility of the Contractor, though the CA will review and utilize this documentation for purposes of facilitating the Commissioning process. Review of the equipment submittals for contract compliance is the responsibility of the A/E.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.7, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery and thus may have very simplified PCs and startup.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements outlined in the *Commissioning Plan – Construction Phase*.

1. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
2. These checklists and tests are provided by the CA to the Contractor. The CA will complete the installation checks portion of the checklists while the Subs will assist the CA in completing the equipment start-up and check-out portions. Most forms will have more than one trade responsible for its execution.
3. The CA may utilize some or all of a manufacturer's start-up documentation.

D. Sensor and Actuator Calibration.
All field-installed temperature, relative humidity, CO, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner and CA before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.

All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

Sensor Calibration Methods

All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Tolerances, Standard Applications

Sensor	Required Tolerance (+/-)	Sensor	Required Tolerance (+/-)

Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
		Relative humidity	4% of design
AHU wet bulb or dew point	2.0F	Combustion flue temps	5.0F
Hot water coil and boiler water temp	1.5F	Oxygen or CO_2 monitor	0.1 % pts
Outside air, space air, duct air temps	0.4F	CO monitor	0.01 % pts
Watthour, voltage & amperage	1% of design	Natural gas and oil flow rate	1% of design
Pressures, air, water and gas	3% of design	Steam flow rate	3% of design
Flow rates, air	10% of design	Barometric pressure	0.1 in. of Hg

The above stated tolerances shall be considered the most stringent required. Based on field conditions and the relative affect of a sensor to the operation of the system(s) the CA may choose to relax the above tolerances at his discretion subject to approval of the PM.

Valve and Damper Stroke Setup and Check BAS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator.

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the General Contractor who will notify the CA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the CA with the assistance of the Sub or vendor as required. The CA will primarily complete the installation checks portion of the checklists while the Subs will assist with the equipment start-up and check-out portion.
2. The Subs and vendors shall execute startup and complete portions of the checklist on the commissioning website as assigned.
3. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The CA shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully as notes within the checklist on the commissioning website or as a deficiency in the on-line issue log.
2. The CA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the A/E, PM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner and shall notify the CA as soon as outstanding items have been corrected and submit a response to the deficiency in the on-line issue log and request a recheck or retest of the item. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the PM.

3.5 TEST, ADJUST, BALANCE (TAB) VERIFICATION (TAB-V)

A. TAB Agency shall provide labor and instruments to complete TAB Verification process with the Commissioning Agent. TAB Verification (TAB-V) shall be conducted to verify the contents of the Engineer-of-Record reviewed TAB Report. The verification shall include the following sampling rates and strategies:

1. Supply Air Flow: a sample 25% of the total supply air outlets / terminal unit calibrations shall be tested, acceptable tolerance shall be +/- 10% between the measured airflow and the design airflow / DDC indicated airflow. If more than 25% of the sample requires correction at the time of testing then another 10% of the total quantity of supply air outlets shall be tested.

2. Exhaust Air Balance: ALL exhaust air devices and equipment on the project shall be verified to have airflows balanced to +0% / -10% of the design airflow.

3. Outside Air Flow: ALL outside air flow balancing shall be verified and calibrated by the TAB Agency (with assistance of Controls Contractor) to be within +10% / -0% between the measured total airflow and the airflow indicated by the DDC system.

4. Chilled Water Balance: ALL chilled water cooling coils on the project shall be verified to have water flows balanced to +10% / -10% of the design water flow.

5. Heating Water Balance: A sample of 25% of heating water coils on the project shall be verified to have water flows balanced to +10% / -10% of the design water flow.

B. The TAB Agency may be responsible to pay for the additional trip(s) required of the Cx Professional to test additional outlets due to test failures on a time and material basis.

3.6 PERFORMANCE MONITORING, OPTIMIZATION & REPORTING (PMOR)

A. Objectives and Scope.

1. This project will utilize a cloud-based SaaS (Software as a Service) commissioning, performance monitoring, optimization, and reporting (PMOR) system which is provided under the CA contracted scope of work. The system shall be utilized during three distinctive phases of the project: construction, acceptance, and warranty phase.

B. Construction Phase - System Readiness:

1. The PMOR system will be utilized prior to Functional Performance Testing in order to gauge the readiness of the systems to be tested.
2. At least 10 days prior to the scheduled start of functional testing the BAS shall have delivered two weeks of operating data to the PMOR system. If the building automation system communication capabilities are not complete sufficiently to enable the BAS to email trend reports then the Controls Contractor shall manually generate two weeks trend data to a report. This manual report shall be the SAME EXACT REPORT FORMAT as was prior approved and will be used for the permanent reporting (specified elsewhere herein). This manual report shall either be emailed to the CA or shall be emailed to the project's specific PMOR email account.
3. Following receipt of two weeks of operating data (either automatically or manual) the CA shall review the data utilizing the PMOR system to assess the readiness of the specific system to begin on-site functional testing.

4. The CA shall notify the project team of the any deficiencies identified by the trend data analysis that would need to be addressed prior to beginning functional testing.

C. Acceptance Phase – Post Functional Test Monitoring:

1. The PMOR system shall be utilized following on-site Functional Testing to assess dynamic operation stability and to ensure the systems operate properly under varying load conditions and occupancy modes. This is a limited length testing and is intended to be conducted for a short period (approximately two weeks) prior the completion of the formal functional testing.
2. Any deficiencies identified during this monitoring period shall be added to the project Commissioning Issue Log to be addressed by the Contractor as construction deficiencies. Some deficiencies identified by this monitoring may required supplemental on-site functional testing to be performed at the cost of the Contractor.

D. Warranty Phase – Monitoring:

1. The PMOR system will be utilized during the first year following substantial completion to monitor the performance of the building and the individual systems.
2. Any operational deficiency identified by the system will be documented using the system's online Issue Log and the deficiency will be resolved through the contract's Project Warranty process.
3. At eleven months following substantial completion the CA shall provide a comprehensive review of the system operation using the PMOR system to analyze the data provided from the BAS. An updated Warranty Phase Issue Log shall be generated and the Contractor shall resolve all issues determined by the team to be subject to Warranty requirements.
4. At the Owner's option, and additional cost, the services of the CA and the PMOR system may be utilized after the expiration of the Warranty Phase as an On-Going Commissioning process.

3.7 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 019113, Part 1.4. The specific equipment and modes to be tested are found in the *Commissioning Plan – Construction Phase*.

C. The parties responsible to execute each test are listed with each test in the *Commissioning Plan – Construction Phase*.

D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no

flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in the *Commissioning Plan – Construction Phase.*

E. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the PM or General Contractor for review, if requested.

The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

The test procedure forms developed by the CA may include (but not be limited to) the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specific sequence of operations or other specified parameters being verified
8. Formulas used in any calculations
9. Required pre-test field measurements
10. Instructions for setting up the test.
11. Special cautions, alarm limits, etc.
12. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
13. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
14. A section for comments
15. Signatures and date block for the CA

F. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers (if stand-alone dataloggers are required then they will be provided and installed by the CA). The CA will determine which method is most appropriate for tests that do not have a method specified.

2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate set point to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The specific recommended sampling rates are specified in the *Commissioning Plan – Construction Phase*. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

   A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

   xx = the percent of the group of identical equipment to be included in each sample.
   yy = the percent of the sample that if failing, will require another sample to be tested.

   The example below describes a 20% Sampling—10% Failure Rule.

   a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
   b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).

c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

G. Coordination and Scheduling. The Subs shall provide sufficient notice to the CA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the General Contractor and affected Subs. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Test Equipment. Refer to Section 019113, Part 2 for test equipment requirements.

I. Problem Solving. The CA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the General Contractor and his Subs.

3.8 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the PM for review and approval and to the Subs for review. The CA will include the filled out forms in the Commissioning Record.

B. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted in the online issue log and reported to the Cx Team Members via electronic notification or periodic reports generated from the website.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form as well as the online commissioning issue log.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner PM.
4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
   a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:

1) The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CA documents the deficiency in the on-line commissioning issue log and assigns to the Sub for correction. Once the Sub has corrected the deficiency they will notify the CA in the issue log of the resolution and that the item is ready to be retested.
2) The CA reschedules the test and the test is repeated.

b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
1) The deficiency shall be documented on the on-line commissioning log with the Sub's response regarding the deficiency. The deficiency is assigned to the party to whom the CA believes responsible for resolution or whose input is required to proceed to resolution.
2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Architect and his Consultants. Final acceptance authority is with the CA and the Owner Project Manager.
3) The CA documents the resolution process using the online issue log.
4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. Once the responsible party has corrected the deficiency they will notify the CA in the issue log of the resolution and that the item is ready to be retested.

5. Cost of Retesting.
a. At the discretion of the CA, A/E, and the Owner, the cost for the Sub to retest a functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
b. For a deficiency identified, not related to any start-up or initial checkout fault, the following shall apply: The CA and PM will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CA's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
c. The time for the CA to direct any retesting required because a specific start-up or checkout item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.

6. The Contractor shall respond using the commissioning website concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution. Comments shall be provided at least five (5) days after deficiency is noted or prior to a scheduled commissioning meeting whichever occurs first.
7. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA and by the PM, if necessary. The CA recommends acceptance of each test to the PM using a standard form. The PM gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.9 OPERATION AND MAINTENANCE MANUALS / FINAL COMMISSIONING REPORT

A. O&M Manuals.

1. The specific content and format requirements for the project O&M manuals shall be per General Contractors contract requirements with Owner and General Contractor standard format for such. Special requirements for the controls contractor and TAB contractor are found in their respective specification sections.

2. CA Review and Approval. For this project the CA will not be involved in review and approval of the O&M manuals.

2. Final Commissioning Report Details. The final commissioning report shall include the following:

a. Final Construction Phase Commissioning Deficiency Report
b. Completed Prefunctional Checklist forms
c. Completed TAB Verification forms
d. Completed Functional Performance Test forms.
e. Other documentation will be retained by the CA.

3.10 TRAINING OF OWNER PERSONNEL

A. The GC shall coordinate with the Owner for desired training sequencing and scheduling and shall provide the approved schedule of training to the Owner and CA for review and approval. The Mechanical Contractor, Controls Contractor, Electrical Contractor, and Equipment Suppliers shall complete all training activities and documentation as directed by the GC, the approved schedule, and the specific equipment specification sections.

3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the *Specifications.* The *Commissioning Plan—Construction Phase,* lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

Product	Developed By
1. Final commissioning plan	CA
2. Cx Meeting minutes	CA
3. Commissioning schedules	CA with General Contractor
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and General Contractor
6. Prefunctional checklists	CA
7. Final TAB report	TAB
8. Issues Log (deficiencies)	CA
9. Commissioning Progress Record	CA
10. Functional test forms	CA
11. O&M manuals	Subs
12. Overall training plan	GC
13. Specific training agendas	Subs / GC

14. Final commissioning report CA

END OF SECTION 01 91 13

SECTION 23 05 93 - TESTING AND BALANCING OF MECHANICAL SYSTEMS ADDENDUM 3 - 04/03/25

1 GENERAL

1.1 ~~The work of this section is intended to be performed by a test and balance contractor under a separate, stand-alone contract.~~ *Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section. Division-23 Basic Mechanical Materials Sections apply to work of this section.*

1.2 Description of Work:

1.2.1 Extent of testing, adjusting, and balancing work (TAB) is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to work as required.

1.2.2 Coordination: Coordinate with the General Contractor and Mechanical Contractor responsible for the HVAC system installation as required to complete the TAB work.

1.3 The intent of this specification is to balance HVAC systems within the tolerances listed, maintaining the pressure relationships indicated, with a minimum of noise.

1.3.1 Airflow Tolerances:

1.3.1.1 Air Handling: The supply air, return air and outdoor air quantities shall be balanced within 5% of design values.

1.3.1.2 Exhaust Fans: The exhaust fan quantities shall be set as required to maintain the design exhaust terminal flows within 5% of design values. If no exhaust terminals exist, exhaust fan air quantities shall be balanced within 10% of design values.

1.3.1.3 Terminal Units: The air quantities associated with VAV boxes, fan coil units, self-regulating air valves, unit heaters and other similar devices shall be balanced within 5% of design values.

1.3.1.4 Ceiling Diffusers, Supply Registers, Return and Exhaust Inlets: Balance to an air quantity within 10% of the design values.

1.3.2 Temperature Tolerances:

1.3.2.1 Air Handling Temperatures: The controlled temperatures at AHUs shall be verified to be under control within 1ºF of design values.

1.3.2.2 Hot Water Temperatures: The heating hot water controlled temperatures from boilers and heat exchangers and other similar devices shall be under control within 5ºF.

1.3.2.3 Chilled Water Temperatures: The chilled water controlled temperature from chillers shall be

under control within 1ºF.

1.3.2.4 Room Temperatures: Balance systems and controls within 2ºF of indicated settings.

1.3.3 Hydronic Flow: Balance hydronic flow rates to within 10% of design values.

1.4 Quality Assurance: The TAB Contractor shall be located within 125 miles of the job site and certified as one of the following:

1.4.1 Tester: A firm certified by National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, who is not the Installer of the systems to be tested and is otherwise independent of the project. Comply with NEBB's "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" as applicable to this work.

1.4.2 Tester: A firm certified by Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project. AABC-certified firms are independent by definition. Comply with AABC's Manual MN-1 "AABC National Standards", as applicable to this work.

1.4.3 Industry Standards: Comply with American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

1.5 Job Conditions:

1.5.1 Do not proceed with testing, adjusting, and balancing work until HVAC work (including Controls) has been completed and is operable. Ensure that there is no residual work still to be completed.

1.5.2 Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discarded building materials.

1.5.3 Do not proceed until architectural work that would affect balancing (walls, ceiling, windows, doors) have been installed.

1.5.4 Testing may proceed system by system, but each HVAC system must be complete as describe herein.

1.5.5 The mechanical contractor shall make any changes in pulleys, belts, and dampers, and/or add dampers as required for correct balancing.

1.6 Approval Submittals

1.6.1 Submit the name of the proposed test and balance company for the Engineer's approval within thirty (30) days after awarding of contract.

1.7 Test Reports and Verification Submittals:

1.7.1 Submit four (4) copies of the dated test and balance report upon completion of TAB work. The report shall include a list of instruments used for the work. The report shall be signed by the supervisor who performed the TAB work.

2 PRODUCTS

2.1 Patching Materials: Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

2.2 Test Instruments: Utilize test instruments and equipment of the type, precision, and capacity as recommended in the referenced standard. All instruments shall be in good condition and shall have been calibrated within the previous six (6) months (or more recently if required by standard).

3 EXECUTION

3.1 General:

3.1.1 Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with TAB work until unsatisfactory conditions have been corrected in manner acceptable to Tester.

3.1.2 Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards, and as modified or detailed herein.

3.1.3 Test, adjust and balance systems during summer season for air conditioning systems and during winter season for heating systems, including at least a period of operation at outside conditions within 5ºF wet bulb temperature of maximum summer design condition, and within 10ºF dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring final temperatures, then take final temperature readings when seasonal operation does permit. The Contractor shall return for a change of seasons test at no additional cost to the Owner and submit the revised TAB report.

3.1.4 Punch List: Prepare a deficiency (punch)list for the Contractor with a copy of the Engineer that lists all items that are incorrectly installed or are functioning improperly. Provide a retest after all items are corrected.

3.1.5 Prepare TAB report of test results, including instrumentation calibration reports, in format recommended by applicable standards, modified as required to include all data listed herein.

3.1.6 Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original Installer.

3.1.7 Permanently Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

3.1.8 Include in the TAB report recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.1.9 Include an extended warranty of ninety (90) days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck, or resetting of any component as listed in test report. The TAB company shall provide technicians and instruments and make any tests required by the Engineer during this time period.

3.2 Controls

3.2.1 Check all HVAC controls for proper location, calibration and sequence of operation.

3.2.2 Check operation of all controllers and controlled devices to verify proper action and direction. Check the operation of all interlocks.

3.2.3 Check all zone damper motors for leakage when in closed position. If leakage is more that 5%, mechanical contractor shall reset damper linkages.

3.2.4 Check all control valves for complete closure and correct action under all operating conditions.

3.3 Air Balancing

3.3.1 Leakage tests on ductwork must have been completed before air balancing.

3.3.2 Set dampers, volume controls and fan speeds to obtain specified air delivery with minimum noise level. Rebalance as required to accomplish this. Simulate fully loaded filters during test.

3.3.3 Set grille deflections as noted on plans. Modify deflections if required to eliminate drafts or objectionable air movement.

3.3.4 Record air terminal velocity after completion of balance work.

3.3.5 Record final grille and register deflection settings if different from that specified on contract drawings.

3.3.6 Record all fan speeds.

3.3.7 Variable Volume Systems: Measure static pressure at all major branches. Adjust fan controllers for minimum required static pressure at the end of each branch. Report the value of the minimum static pressure that will provide proper air flow in the TAB Report and set the static pressure controller for this value. Balance outlets. Check at both modulated and full cooling condition. Traverse main supply and return ducts. Balance the return system. All branches must be above the minimum required static pressure. The supply fan must track and deliver the proper air quantity with no objectionable noise. The system must be stable and operate properly at 30% load.

3.4 Water Balancing:

3.4.1 Verify proper operation of all hydronic system devices to ensure the proper flowrate, flow direction and pressure are maintained.

3.4.2 Set balancing cocks and flow control devices to obtain specified water flow rates to all terminal units, coils, chillers, cooling towers, boilers, and heat exchangers. Coordinate set point for variable speed drives to achieve balance with minimum pump speed. Report the value of the minimum differential pressure that will provide proper flow in the TAB Report and set the differential pressure controller for this value. Pump balancing cocks (if present) shall be fully open. Set maximum speed control for variable speed pumps.

3.4.3 Variable Speed Pumps: Verify proper operation of variable speed pumps and the associated distribution system at 30% and 100% flow.

3.5 Data Collection:

3.5.1 In addition to the data required for any specified performance tests, measure and record the

temperatures, pressures, flow rates, and nameplate data for all components listed herein.

3.5.2 It is the intent of this section to record data on balanced systems, under normal operating or design conditions.

3.5.3 Temperatures:

1. Outside dry and wet bulb temperatures.
2. Dry bulb temperature in each room and at least one wet bulb temperature in each zone.
3. Inlet and outlet temperature of each heat exchange device - both fluids.

3.5.4 Pressures:

1. Suction and discharge static pressure of each fan.
2. Suction and discharge pressure of each pump.
3. Water pressure drop through each heat exchanger.

3.5.5 Flow rates:

1. Flow rate through each fan.
2. Flow rate through each pump.
3. Flow rate through each coil or heat exchange device.

3.5.6 Nameplate Data:

1. Complete nameplate data for all equipment.
2. Motor data to include horsepower, phase, voltage, RPM, full load nameplate current, fuse rating in disconnect switch, number or manufacturer's size designation, and ampere rating of overcurrent and low voltage protection devices in starters.

3.6 All test openings in ductwork and ductwork insulation shall be resealed in an approved manner.

END OF SECTION 23 05 93

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SECTION 23 08 00 – MECHANICAL SYSTEMS COMMISSIONING ADDENDUM 3 - 04/03/25

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 23 responsibilities in the commissioning process.

B. The systems to be commissioned are listed in Section 019113.

C. Commissioning requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Division 01. Division 23 shall be familiar with all parts of Division 26 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.2 RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):

Construction and Acceptance Phases

1. Include the cost of commissioning in the contract price (do NOT include the cost of the Commissioning Authority as they are under contract to A/E).
2. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training requirements.
3. Attend a pre-commissioning meeting and other meetings necessary to facilitate the Cx process. Meetings regarding the Commissioning Process that may be required throughout the construction period will be scheduled as agenda items at the General Contractor's regularly scheduled construction coordination meetings. An exception to this policy would be extraordinary meetings which are deemed necessary by the CA and the General Contractor with necessary parties attending in order to resolve outstanding deficiencies toward the end of the construction period.
4. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment in digital PDF format.
5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.

b. The Commissioning Agent may request further documentation necessary for the commissioning process.
c. This data request may be made prior to normal submittals.

6. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval. O&M manuals shall be provided in print and digital PDF format.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Provide limited assistance to the CA in preparing the specific functional performance test procedures for the *Commissioning Plan – Construction Phase*. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
9. Assist the CA in completion of the prefunctional checklists, in particular execute the mechanical-related start-up and check-out portions of the prefunctional checklists for all commissioned equipment.
10. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
11. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
12. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that the technicians are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
13. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment in the *Commissioning Plan* and Section 019113. Assist the CA in interpreting the monitoring data, as necessary.
14. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, PM and A/E and retest the equipment.
15. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
16. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).
17. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
18. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. If specified, execute seasonal or deferred manual functional performance testing, witnessed by the CA, according to the specifications.
2. Provide assistance to the CA as required to configure the Cx-PMOR performance monitoring system.
3. Correct deficiencies according to the contract warranty process and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing or through the Cx-PMOR system.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.
2. Assist and cooperate with the TAB contractor and CA by:
    a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
    b. Including cost of sheaves and belts that may be required by TAB.
    c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing.
        i. Provide factory fabricated, airtight, and non-corrosive test ports with screw cap and gasket equal to Ventlok type 699 at all locations where TAB Contractor shall make temperature, pressure, or velocity measurements. For duct which is externally insulated provide Ventlok type 699-2 which are 2-5/8" long. Mechanical Contractor shall coordinate location and quantity of TAB test ports with TAB Contractor.
        ii. The TAB team shall permanently mark and identify the location points of the duct test ports with computer generated (DYMO type) labels. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. All test port locations shall be labeled corresponding to final TAB report.
    d. Providing pressure and / or temperature testing taps / ports (a.k.a. P/T ports) according to the Construction Documents to facilitate TAB and commissioning testing or as required based on specified testing procedures.
3. Install a P/T test port at each water sensor which is an input point to the control system. P/T ports shall be located within six inches of the control system sensor. P/T ports installed on insulated piping shall be of the extended length type such that the port's threaded cap clears the specified insulation thickness.
4. Provide hinged and rubber gasketed duct access doors (minimum size of 12"x12" unless duct size does not allow) where indicated by other Division 23 specifications and as per the contract drawings but at minimum access doors shall be provided:
    a. Adjacent to all automatic control dampers (e.g. dampers controlled by BAS / DDC).
    b. Adjacent to all airflow measurement stations (AFMS) or duct-mounted CO2 sensors.
    c. Upstream of all duct-mounted heating coils.
5. List and clearly identify on the as-built drawings the locations of all air-flow stations.
6. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
7. Notify the PM or CA depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the PM or CA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

C. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. Submittals shall be provided to the CA in print and digital PDF format, they shall include:

a. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
b. All interactions and interlocks with other systems.
c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
e. Start-up sequences.
f. Warm-up mode sequences.
g. Normal operating mode sequences.
h. Unoccupied mode sequences.
i. Shutdown sequences.
j. Capacity control sequences and equipment staging.
k. Temperature and pressure control: setbacks, setups, resets, etc.
l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
m. Effects of power or equipment failure with all standby component functions.
n. Sequences for all alarms and emergency shut downs.
o. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
p. Schedules, if known.
q. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal
Submittals shall be provided to the CA in print and digital PDF format, they shall include:
a. The control drawings shall have a key to all abbreviations.
b. The control drawings shall contain graphic schematic depictions of the systems and each component.
c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
d. Provide a full points list with at least the following included for each point:
    1) Controlled system
    2) Point abbreviation
    3) Point description
    4) Display unit
    5) Control point or setpoint (Yes / No)
    6) Monitoring point (Yes / No)
    7) Intermediate point (Yes / No)
    8) Calculated point (Yes / No)
    Key:
    Point Description: DB temp, airflow, etc.
    Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)

Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
Calculated Point: "Virtual" point generated from calculations of other point values.

The Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with the TAB contractor in the following manner:

   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CA in the following manner:

   a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system as specified for the controls contractor in the *Commissioning Plan – Construction Phase*. Assist in the functional testing of all equipment specified in the *Commissioning Plan – Construction Phase*.
   b. Execute all control system trend logs specified in the *Commissioning Plan* or as requested by the CA.

6. Provide the signed and completed DDC Test Readiness Checklist document upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system. CC shall verify with this Checklist that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.

7. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as required to implement the full sequence of control as specified in the Contract Documents.

8. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

9. System Data Trending & Reporting Detailed Requirements. The Controls Contractor for this project shall provide automated data reporting through the building automation system which shall deliver system operating data and utility consumption data (if

available) daily to the PMOR system via trend reports which are automatically emailed to the PMOR system. The complete cost for the Controls Contractor to set up ALL required trending and reporting shall be included in the project contract cost (also see Section 019113, 3.6).

a. Trend reports shall be emailed to the PMOR server on a daily basis between 12am and 6am.
b. The duration of each trend report shall include at least the entire previous day's (e.g. midnight to midnight) data. Optionally, the report could be required to include the previous three days' data so that 1-2 days of missing reports could be made up by the subsequent report. The reports shall NEVER include more than a maximum five days data. The CA shall provide direction as to the desired duration.
c. All required system operating data trends shall report the instantaneous value of the data point being trended at 15-minute intervals unless specifically directed otherwise by the CA. The trend sampling interval for each data point must be consistent, e.g. data cannot start at a five-minute interval and then change to a fifteen-minute interval.
d. All utility consumption data (kWh, ton-hr, btu, etc.) trends shall report the accumulated consumption across the interval period (e.g. electrical consumption, kWh, total for the 15-minute period) and shall not report total accumulating consumption. Demand shall be calculated as a virtual point by the PMOR analysis system.
e. The Contractor shall submit their proposed trending file format to the CA for approval prior to implementing for all requested trend points (CSV or XLS files are preferred format however PDF may also be acceptable). Once approved and set up the trend file formatting shall NOT change from one report to the next. If trend formatting changes due to software upgrade then the Contractor shall be required to compensate CA for any changes required to the PMOR system configuration to accept the new data formatting.
f. The following data point naming convention shall be utilized for all trend reports and for the subject line of emails delivering the automated report:
   < building name >.< system name >.<point name>
   All data point names must be unique from other points in the same project.
g. Minimum Required Monitoring Points:
   i. The final list of points to be monitored will be furnished by CA to the Controls Contractor after the building automation system submittal has been reviewed.
   ii. A formal trend request document will be provided to the Controls Contractor with the monitored points list and this same document shall be completed and returned to the CA as proof that set-up has been completed.
   iii. Example of Monitored Points by System Type:
      1. Variable Air Volume Air Handling Units
         Outside Air Setpoint, cfm
         Outside Air Flow, cfm
         Mixed Air Temperature, deg F
         Return Air Temperature, deg F
         Supply Air Temperature, deg F
         Chilled Water Control Valve, %OPEN
         Heating Water Control Valve, %OPEN
         Supply Fan Speed, %
         Static Pressure Setpoint, " w.c.
         Static Pressure, " w.c.

2. Variable Volume Terminal Units
   Airflow, cfm
   Airflow Required, cfm
   Space Temperature, deg F
   Discharge Air Temperature, deg F
   Effective Temp Setpoint, deg F
   Cooling Loop Output, %
   Heating Loop Output, %
   Primary Air Damper, %OPEN
3. Chilled Water Plant
   Cooling Load, tons
   Chiller Operating Capacity, %
   Chiller CHW EWT, deg F
   Chiller CHW LWT, deg F
   Plant Bypass Valve, %OPEN (to plant)
   Building Supply Temperature, deg F
   Building Return Temperature, deg F
   Building Chilled Water Flow, gpm
   Plant Supply Temperature, deg F
   Plant Return Temperature, deg F
   Plant Chilled Water Flow, gpm
   CH Supply Setpoint, deg F

D. TAB Contractor. The duties of the TAB contractor, in addition to those listed in (A) are:

1. Six weeks prior to starting TAB, submit to the PM the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead. The Owner will approve the site technician's qualifications for this project.
2. Submit the outline of the TAB plan and approach for each system and component to the CA, PM and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
3. The submitted plan will include:
   a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.
   b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.
   c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
   d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
   e. Final test report forms to be used.
   f. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
   g. Details of how *total* flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
   h. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.

i. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
j. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
k. Details of how building static and exhaust fan / relief damper capacity will be checked.
l. Details of methods for making any specified coil or other system plant capacity measurements.
m. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
n. Details regarding specified deferred or seasonal TAB work.
o. Details of any specified false loading of systems to complete TAB work.
p. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
q. Details of any required interstitial cavity differential pressure measurements and calculations.
r. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
s. Plan for formal progress reports (scope and frequency).
t. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and PM at least twice a week.
5. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
7. Provide a final TAB report for the CA with details, as in the draft.
8. Conduct functional performance tests and checks (a.k.a. 'Tab Verification Process) on the original TAB. Tab Verification shall consist of repeating measurements made during the original TAB procedures and comparing results against that of the submitted TAB report as well as the design parameters.

E. Mechanical Designer. Refer to Section 019113 for the responsibilities of the mechanical designer.

1.3 RELATED WORK

A. Refer to Section 019113, Part 1.4 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 019113 Part 1.7 for systems to be commissioned.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 019113 Part 2.1 for additional Division 23 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1 and Section 019113.

3.2 STARTUP

A. The HVAC mechanical and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 019113. Division 23 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and GC. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 TAB

A. Refer to the TAB responsibilities in Part 1.2 above.

3.4 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 019113 Part 1.7 for a list of systems to be commissioned and to Part 3.6 for a description of the process and to the *Commissioning Plan – Construction Phase* for specific details on the required functional performance tests.

3.5 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 019113 Part 3.4 for specific details on non-conformance issues relating to prefunctional checklists and tests.

B. Refer to Section 019113 Part 3.7 for issues relating to functional performance tests.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the General Contractor for inclusion in the O&M manuals, according to this section prior to the training of owner personnel.

C. The CA shall receive a copy of the final compiled O&M manuals for review.

D. Special Control System O&M Manual Requirements. In addition to documentation that may be specified elsewhere, the controls contractor shall compile and organize at minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

1. Three copies of the controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:

    a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.
    b. Full as-built set of control drawings (refer to Submittal section above for details).
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list. In addition to the updated points list required in the original submittals (Part 1 of this section), a listing of all rooms shall be provided with the following information for each room:
        1) Floor
        2) Room number
        3) Room name
        4) Air handler unit ID
        5) Reference drawing number
        6) Air terminal unit tag ID
        7) Heating and/or cooling valve tag ID
        8) Minimum cfm
        9) Maximum cfm

    e. Full print out of all schedules and set points after testing and acceptance of the system.
    f. Full as-built print out of software program.
    g. Electronic copy on disk of the entire program for this facility.
    h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.
    i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
    j. Control equipment component submittals, parts lists, etc.
    k. Warranty requirements.
    l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation
    b. Control drawings
    c. Points lists
    d. Controller / module data
    e. Thermostats and timers
    f. Sensors and DP switches
    g. Valves and valve actuators
    h. Dampers and damper actuators

i. Program setups (software program printouts)

4. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Special TAB Documentation Requirements. The TAB will compile and submit the following with other documentation that may be specified elsewhere in the *Specifications.*

1. Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.

F. Review and Approvals. Review of the commissioning related sections of the O&M manuals shall be made by the A/E and by the CA. Refer to Section 019113, Part 3.8 for details.

3.7. TRAINING OF OWNER PERSONNEL

A. The GC shall coordinate with the Owner for desired training sequencing and scheduling and shall provide the approved schedule of training to the Owner and CA for review and approval. The Mechanical Contractor, Controls Contractor and Equipment Suppliers shall complete all training activities and documentation as directed by the GC, the approved schedule, and the specific equipment specification sections.

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SECTION 26 32 13.16 - GASEOUS EMERGENCY ENGINE GENERATORS ADDENDUM 3 - 04/03/25

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 packaged engine generators for emergency use with the following features:

1. Natural gas engine.
2. Gaseous fuel system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor engine generator enclosure.
7. Vibration isolation devices.
8. Finishes.

B. Related Requirements:

1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.3 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in cubic feet per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8 power factor, with air-supply temperature of 95, 80, 70, and 50 deg F (35, 27, 21, and 10 deg C). Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactance, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For[Installer manufacturer and testing agency.

B. Field quality-control reports.

C. Warranty: For special warranty.

D. This system shall be supplied by an original equipment manufacturer (OEM) who has been regularly engaged in the production of engine-alternator sets, automatic transfer switches, and associated controls for a minimum of 25 years, thereby identifying one source of supply and responsibility. Approved suppliers are Generac Industrial Power or an approved equal.

E. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one-of-a-kind fabrication.

F. Manufacturer’s authorized service representative shall meet the following criteria:

1. Certified, factory trained, industrial generator technicians.
2. Service support 24/7.
3. Service location within 200 miles.
4. Response time of 4 hours.
5. Service & repair parts in-stock at performance level of 95%.
6. Offer optional remote monitoring and diagnostic capabilities.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
b. Operating instructions laminated and mounted adjacent to generator location.
c. Training plan.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
2. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Generac Power Systems

B. Caterpillar

C. Kohler Co.

D. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. B11 Compliance: Comply with B11.19.

B. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 110 requirements for Level 2 EPSS.

C. UL Compliance: Comply with UL 2200.

D. Engine Exhaust Emissions: Comply with EPA Tier 2 requirements and applicable state and local government requirements.

E. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by engine generator, including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 to 104 deg F (Minus 15 to plus 40 deg C).
2. Altitude: Sea level to [1000 feet (300 m).

G. Unusual Service Conditions: Engine generator equipment and installation are required to operate under the following conditions:

1. High salt-dust content in the air due to sea-spray evaporation.

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

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

C. Power Rating: Stand-By.

D. Service Load: **313 kVA**.

E. Power Factor: 0.8, lagging.

F. Frequency: 60 Hz.

G. Voltage: 208-V ac.

H. Phase: Three-phase, four-wire wye.

I. Induction Method: Turbocharged.

J. Governor: Adjustable isochronous, with speed sensing.

K. Mounting Frame: Structural-steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

L. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components.

M. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage, from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency, from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: No greater than 10 seconds to comply with NFPA 110, Type 10, system requirements.

2.4 ENGINE

A. Fuel: Natural gas.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 2 equipment for heater capacity and with UL 499.

E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant-system pressure for engine used. Equip with gage glass and petcock.
3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.

    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer: Commercial type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 12 dB at 500 Hz.
2. Sound level measured at a distance of 25 feet (8 m) from exhaust discharge after installation is complete shall be 80 dBA or less.

G. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 12-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle, with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.

8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to 140 deg F (minus 40 to plus 60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GASEOUS FUEL SYSTEM

A. Natural Gas Piping: Comply with requirements in Section 231123 "Facility Natural Gas Piping."

B. Gas Train: Comply with NFPA 37.

C. Engine Fuel System:

1. Natural Gas, Vapor-Withdrawal System:

    a. Carburetor.
    b. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valve.

2. Fuel Filters: One for each fuel type.
3. Manual Fuel Shutoff Valve.
4. Flexible Fuel Connectors.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Provide minimum run-time control set for 30 minutes, with override only by operation of a remote emergency-stop switch.

C. Comply with UL 508A.

D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.

1. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6.

E. Control and Monitoring Panel:

1. Digital controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments: Located on the control and monitoring panel and viewable during operation.

a. Engine lubricating-oil pressure gage.
b. Engine-coolant temperature gage.
c. DC voltmeter (alternator battery charging).
d. Running-time meter.
e. AC voltmeter, for each phase.
f. AC ammeter, for each phase.
g. AC frequency meter.
h. Generator-voltage adjusting rheostat.

3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication as required by NFPA 110 for Level 2 system, including the following:

a. Cranking control equipment.
b. Run-Off-Auto switch.
c. Control switch not in automatic position alarm.
d. Overcrank alarm.
e. Overcrank shutdown device.
f. Low water temperature alarm.
g. High engine temperature pre-alarm.
h. High engine temperature.
i. High engine temperature shutdown device.
j. Overspeed alarm.
k. Overspeed shutdown device.
l. Coolant low-level alarm.
m. Coolant low-level shutdown device.
n. Coolant high-temperature prealarm.
o. Coolant high-temperature alarm.
p. Coolant low-temperature alarm.
q. Coolant high-temperature shutdown device.
r. Battery high-voltage alarm.
s. Low-cranking voltage alarm.
t. Battery-charger malfunction alarm.
u. Battery low-voltage alarm.
v. Lamp test.
w. Contacts for local and remote common alarm.

x. Remote manual-stop shutdown device.
y. Integral manual-stop NEMA 3R shutdown device installed adjacent to control panel door on exterior enclosure. Push button shall be protected from accidental operation.
z. Hours of operation.
aa. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

F. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
2. Provide connections for datalink transmission of indications to remote data terminals via ModBus. Data system connections to terminals are covered in Section 260913 "Electrical Power Monitoring and Control."

G. Remote Alarm Annunciator: Comply with NFPA 99. An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low coolant level alarm.
8. Low-cranking voltage alarm.
9. Contacts for local and remote common alarm.
10. Audible-alarm silencing switch.
11. Air shutdown damper when used.
12. Run-Off-Auto switch.
13. Control switch not in automatic position alarm.
14. Lamp Test.
15. Generator overcurrent-protective-device not-closed alarm.

H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.

I. Remote Emergency-Stop Switch: Flush; NEMA 3R; wall mounted unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H.

D. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

E. Enclosure: Level 2 Acoustic Weatherproof Enclosure rated for 180mph wind speeds..

F. Instrument Transformers: Mounted within generator enclosure.

G. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
2. Maintain voltage within 30 percent on one step, full load.
3. Provide anti-hunt provision to stabilize voltage.
4. Maintain frequency within 15 percent and stabilize at rated frequency within five seconds.

H. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

I. Subtransient Reactance: 12 percent, maximum.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 180 mph (290 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

1. Sound Attenuation Level: 2.

B. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 180 mph (290 km/h).

C. Hinged Doors: With padlocking provisions.

D. Space Heater: Thermostatically controlled and sized to prevent condensation.

E. Lighting: Provide weather-resistant LED lighting with 30 fc (330 lx) average maintained.

F. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.

G. Muffler Location: Within enclosure.

H. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

I. Interior Lights with Switch: Factory-wired, vaporproof luminaires within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system and connection point for operation when remote source is available.

J. Convenience Outlets: Factory-wired, GFCI. Arrange for external electrical connection.

2.10 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Standard neoprene separated by steel shims.

B. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 FINISHES

A. Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.12 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections to verify actual locations of connections before packaged engine generator installation.

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

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect no fewer than 10 working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Gaseous Fuel Piping:

1. Natural gas piping, valves, and specialties for gas distribution are specified in Section 231123 "Facility Natural Gas Piping."

F. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Gaseous Fuel Connections:

1. Connect fuel piping to engines with a gate valve and union and flexible connector.
2. Install manual shutoff valve in a remote location to isolate gaseous fuel supply to the generator.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

E. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.

a. Visual and Mechanical Inspection:

1) Compare equipment nameplate data with Drawings and the Specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify that the unit is clean.

b. Electrical and Mechanical Tests:

1) Test protective relay devices.
2) Verify phase rotation, phasing, and synchronized operation as required by the application.

3) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
4) Conduct performance test according to NFPA 110.
5) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
c. Verify acceptance of charge for each element of the battery after discharge.
d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and reinspect as specified above.

I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 26 32 13.16

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SECTION 26 08 00 – ELECTRICAL SYSTEMS COMMISSIONING ADDENDUM 3 - 04/03/25

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 26 responsibilities in the commissioning process which are being directed by the CA. Other electrical systems testing is required under the direction of the General Contractor.

B. The list of commissioned equipment and systems is found in Section 019113, 1.7.

C. Commissioning requires the participation of Division 26 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 26 shall be familiar with all parts of Division 01 and the *Commissioning Plan* issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.2 RESPONSIBILITIES

A. Electrical Contractors. The commissioning responsibilities applicable to the electrical contractor are as follows *(all references apply to commissioned equipment only)*:

Construction and Acceptance Phases

1. Include the cost of commissioning in the contract price (do NOT include the cost of the Commissioning Authority as they are under contract to A/E).
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Attend a pre-commissioning meeting and other meetings necessary to facilitate the Cx process. Meetings regarding the Commissioning Process that may be required throughout the construction period will be scheduled as agenda items at the General Contractor's regularly scheduled construction coordination meetings. An exception to this policy would be extraordinary meetings which are deemed necessary by the CA and the General Contractor with necessary parties attending in order to resolve outstanding deficiencies toward the end of the construction period.
4. Contractors shall provide normal cut sheets and shop drawing submittals to the CA of commissioned equipment in print and digital PDF format..
5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.

b. The Commissioning Agent may request further documentation necessary for the commissioning process.
c. This data request may be made prior to normal submittals.

6. Provide a copy of the O&M manuals submittals of commissioned equipment, through normal channels, to the CA for use in developing checklists and tests. O&M manuals shall be provided in digital PDF format.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Provide assistance to the CA in preparation of the specific functional performance test procedures specified in the *Commissioning Plan – Construction Phase*. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
9. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to CA for review.
10. Assist the CA in completion of the prefunctional checklists, in particular execute the electrical-related start-up and check-out portions of the prefunctional checklists for all commissioned equipment.
11. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
12. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
13. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
14. Perform functional performance testing under the direction of the CA for specified equipment in the *Commissioning Plan* and 019113. Assist the CA in interpreting the monitoring data, as necessary.
15. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, PM and A/E and retest the equipment.
16. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
17. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings and final as-builts for contractor-generated coordination drawings.
18. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Electrical Designer/Engineer

1. Refer to Section 019113 for the responsibilities of the Electrical Designer/Engineer.

1.3 RELATED WORK

A. Refer to Section 019113, Part 1.4 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 019113 Part 1.7 for systems to be commissioned and section 019113 Part 1.6 and the *Commissioning Plan* for functional testing requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 26 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 019113 Part 2.1 for additional Division 26 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 26 shall provide submittal documentation relative to commissioning to the CA as requested by the CA. Refer to Section 019113 Part 3.3 for additional Division 26 requirements.

3.2 STARTUP

A. The electrical contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 019113 Part 3.4. Division 26 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the CA and PM. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 019113 Part 1.7 for a list of systems to be commissioned and to Part 3.6 for a description of the process and to the *Commissioning Plan* for specific details on the required functional performance tests.

3.4 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 019113 Part 3.4 for specific details on non-conformance issues relating to prefunctional checklists and tests.

B. Refer to Section 019113 Part 3.7 for issues relating to functional performance tests.

3.5 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Division 26 shall compile and prepare documentation for all equipment and systems covered in Division 26 and deliver to the General Contractor for inclusion in the O&M manuals, according to O&M Documentation requirements elsewhere in these specifications.
B. The CA shall receive a copy of the final compiled O&M manuals for review.

3.6. TRAINING OF OWNER PERSONNEL

A. The GC shall coordinate with the Owner for desired training sequencing and scheduling and shall provide the approved schedule of training to the Owner and CA for review and approval. The Electrical Contractor and Equipment Suppliers shall complete all training activities and documentation as directed by the GC, the approved schedule, and the specific equipment specification sections.

END OF SECTION 26 08 00

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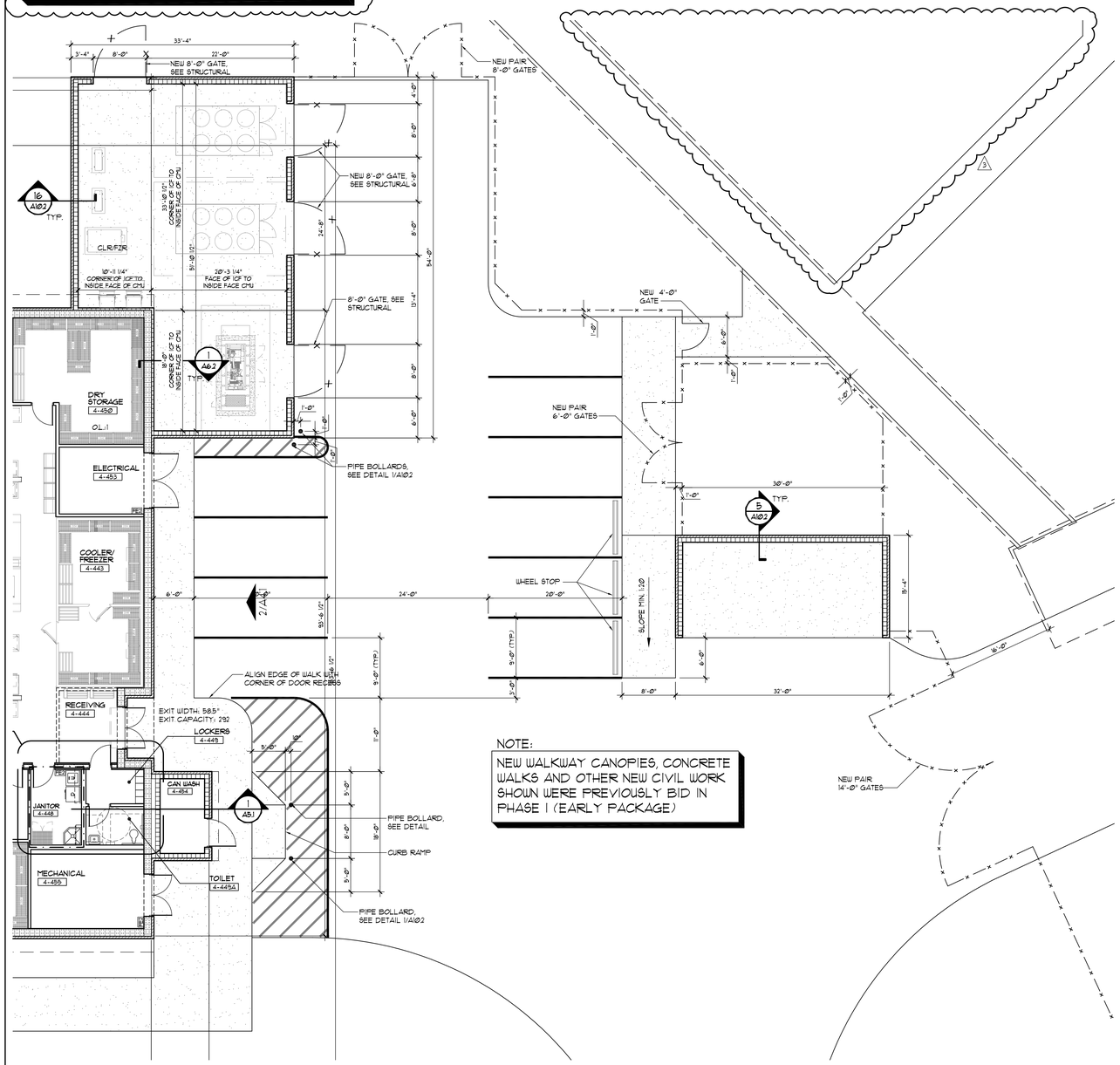
NOTE:
CONTRACTOR TO VERIFY SIZE AND LOCATION OF ALL EQUIPMENT INCLUDING REQUIRED MINIMUM CLEARANCES PRIOR TO COMMENCEMENT OF MECHANICAL YARD ENCLOSURE CONSTRUCTION

3



NOTE:
NEW WALKWAY CANOPIES, CONCRETE WALKS AND OTHER NEW CIVIL WORK SHOWN WERE PREVIOUSLY BID IN PHASE 1 (EARLY PACKAGE)

PARTIAL FLOOR PLAN - BUILDING 4 MECHANICAL YARD AND DUMPSTER PAD

SCALE: 1/8" =1'-0"

REVISIONS:				
NO.	DESCRIPTION	DRAWN	CHECKED	DATE
1	BLDG 3 PKG - ADD #1	ACM	ACM	02/22/23
3	ADDENDUM #3	SLB	SLB	04/04/25
PHASE:		DRAWN	CHECKED	DATE
GMP DOCUMENTS		ACM	ACM	01/06/25

JRA ARCHITECTS
2211 THOMAS DRIVE, SUITE 100
PANAMA CITY BEACH, FL
PHONE: (850) 236-9832
Commission Number: 20793

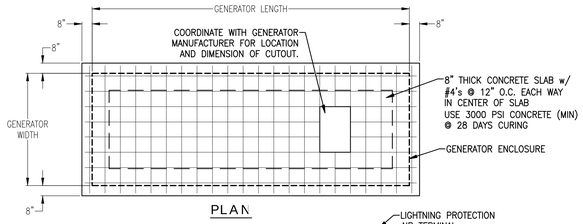
CONSULTANTS:

PROJECT:
MOWAT MIDDLE SCHOOL CAFETERIA AND ADMINISTRATION ADDITION

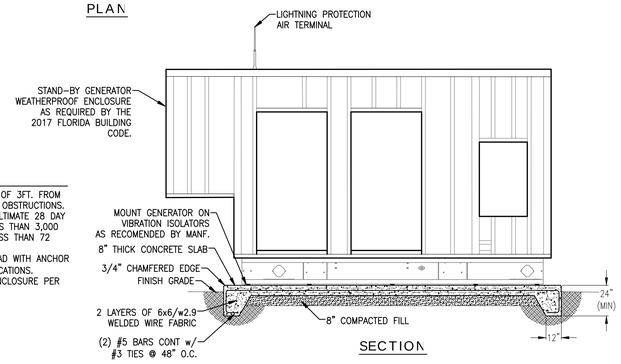
BAY COUNTY, FLORIDA

SHEET TITLE:
PARTIAL FLOOR PLAN - BUILDING 4 MECHANICAL YARD AND DUMPSTER PAD

SHEET NUMBER:
A2.5



PLAN



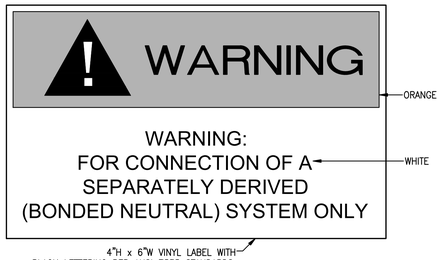
SECTION

NOTES:

1. INSTALL WITH A MINIMUM CLEARANCE OF 3FT. FROM ALL BUILDINGS AND 4 FT. FROM ALL OBSTRUCTIONS.
2. CONCRETE SHALL HAVE A MINIMUM ULTIMATE 28 DAY COMPRESSIVE STRENGTH OF NOT LESS THAN 3,000 LBS. PAD SHALL NOT BE CURED LESS THAN 72 HOURS.
3. SECURE GENERATOR TO CONCRETE PAD WITH ANCHOR BOLTS PER MANUFACTURER'S SPECIFICATIONS.
4. PROVIDE LIGHTING PROTECTION ON ENCLOSURE PER NFPA 780.

GENERATOR PAD MOUNTING DETAIL

NOT TO SCALE

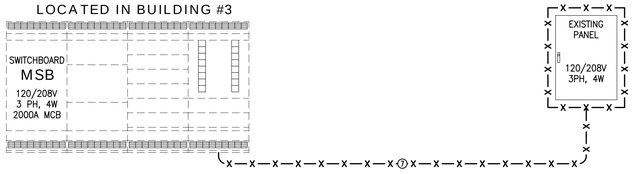


MANUAL TRANSFER SWITCH SYSTEM LABEL DETAIL

NOT TO SCALE

NOTES:

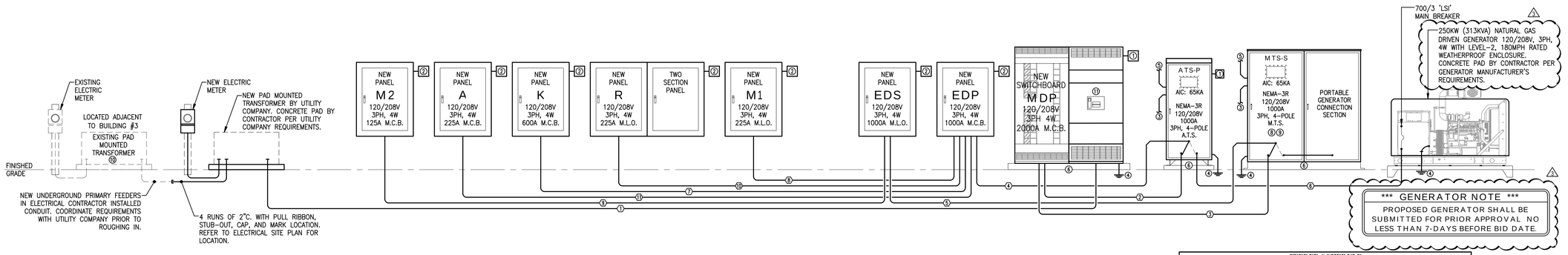
1. INSTALL SURGE PROTECTIVE DEVICE IN BREAKER POSITION NEAREST TO NEUTRAL BAR WITH 3#6, 1#10 GND IN 3/4"C; LEAD LENGTH CANNOT EXCEED UL 1449 4TH EDITION TEST OF 14" – REFER TO SPECS. PROVIDE INTERNAL 60A. FUSING.
2. INSTALL SURGE PROTECTIVE DEVICE IN BREAKER POSITION NEAREST TO NEUTRAL BAR WITH 3#10, 1#10 GND IN 3/4"C; LEAD LENGTH CANNOT EXCEED UL 1449 4TH EDITION TEST OF 14" – REFER TO SPECS. PROVIDE INTERNAL 30A. FUSING.
3. 1" CONDUIT FOR GENERATOR CONTROLS WIRING PER MANUFACTURER'S REQUIREMENTS.
4. REFER TO GROUNDING DETAILS FOR COMPLETE GROUNDING REQUIREMENTS.
5. 1" CONDUIT WITH MANUFACTURER RECOMMENDED CONTROL CABLES TO DDC PANEL. REFER TO MECHANICAL EQUIPMENT SCHEDULE.
6. PROVIDE 4" CONCRETE HOUSKEEPING PAD.
7. EXISTING PANEL FEEDER PREVIOUSLY REMOVED IN PHASE I PORTRION OF THIS PROJECT.
8. INSTALL NEMA 3R; 4-POLE, OPEN TRANSITION MANUAL TRANSFER SWITCH WITH SURGE PROTECTION, PHASE MONITORING, INTEGRAL 1000AMP 'LSIG' BREAKERS ON HOUSE POWER AND GENERATOR SIDES, INTEGRAL PORTABLE GENERATOR CONNECTION CAPABILITY VIA 'CAM STYLE' TYPE CONNECTORS. MANUAL TRANSFER SWITCH EQUAL TO ESL POWER STORM SWITCH SERIES MODEL #SSDX.
9. INSTALL LABEL INDICATING SEPARATELY DERIVED SYSTEM REQUIREMENT. REFER TO "MANUAL TRANSFER SWITCH SYSTEM LABEL DETAIL".
10. EXISTING LIVE FRONT TRANSFORMER TO BE REPLACED (AT UTILITY COMPANY EXPENSE) WITH A NEW DEAD-FRONT TRANSFORMER DURING THE PRIMARY RE-ROUTING PORTION OF THIS WORK. COORDINATE TIMING FOR THIS OCCURRENCE WITH LOCAL UTILITY COMPANY. REFER TO NEW WORK SITE PLAN FOR MORE INFORMATION.
11. PROVIDE SIGNAGE ON PANEL INDICATING THE TYPE AND LOCATION OF THE ON-SITE EMERGENCY GENERATOR PER NEC 701.7(A).



EXISTING SINGLE LINE POWER RISER - BUILDING 4

NOT TO SCALE

Generator Load Calculation Summary		
Load Description	**KVA**	**Amps**
Lighting - Hardened Area Only	**5.15**	14.31
Lighting - Admin Area Only	**2.68**	7.44
Receptacles - Hardened Area Only	**55.20**	153.33
Receptacles - Admin Area Only	**27.94**	77.61
Kitchen Equipment - diversified (65% per NEC 220.56)	**152.58**	423.82
Lift Station	**9.50**	26.40
AHU-4.1 - Non-Hardened Area	**5.66**	15.71
AHU-4.2 - Hardened Area	**15.64**	43.43
AHU-4.3 - Hardened Area	**8.07**	22.42
Shunt Trip Dishwasher in Kitchen	**-52.02**	-144.50
Whole Bldg Total Load (diversified) Permanent Genset Load	**230.39**	639.98
Genset 200KW (200KW/250kva) - 695 amps]	250.00	695.00
Entire Building 4 (all lights and receptacles) No cool air (air circulation only)		



NEW WORK SINGLE LINE POWER RISER - BUILDING 4

NOT TO SCALE

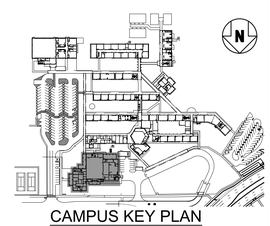
*** SPECIAL NOTE ***
PROVIDE 'LSI' TRIP UNITS FOR BREAKERS GREATER THAN OR EQUAL TO 200A.

LINE TYPE LEGEND

- NEW EQUIPMENT
- EXISTING TO REMAIN
- EXISTING TO BE REMOVED

FEEDER SCHEDULE

DESIGNATION	EQUIPMENT SOURCE	EQUIPMENT TERMINATION	BREAKER TRIP	BREAKER POLE	CONDUCTOR / CONDUIT SIZE RUNS	CONDUIT	CONDUCTORS QTY.	CONDUCTORS SIZE	CONDUCTORS GND	CONDUCTORS MATERIAL
1	UTILITY XFMR	MDP	2000	3	6	3"	4	#400kcmil	-	CU
2	MDP	ATS-P	1000	3	4	3"	4	#250kcmil	#2/0	CU
3	MDP	MTS-S	1000	3	4	3"	4	#250kcmil	#2/0	CU
4	ATS-P	EDP	1000	3	4	3"	4	#250kcmil	#2/0	CU
5	MTS-S	EDS	1000	3	4	3"	4	#250kcmil	#2/0	CU
6	GENSET	ATS-P	700	3	3	2-1/2"	4	#250kcmil	#1/0	CU
7	EDP	K	600	3	2	3"	4	#350kcmil	#1	CU
8	EDP	M1	225	3	1	2-1/2"	4	#4/0	#4	CU
9	EDS	M2	125	3	1	1-1/2"	4	#1	#6	CU
10	EDP	R	225	3	1	2-1/2"	4	#4/0	#4	CU
11	EDP	A	225	3	1	2-1/2"	4	#4/0	#4	CU



CAMPUS KEY PLAN

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PHONE: (850) 878-7891
Commission Number. 21802

SEAL

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CONSULTANTS #2146

REVISIONS

NO.	DATE	DESCRIPTION
3	04/03/25	GENERATOR SIZE REVISION

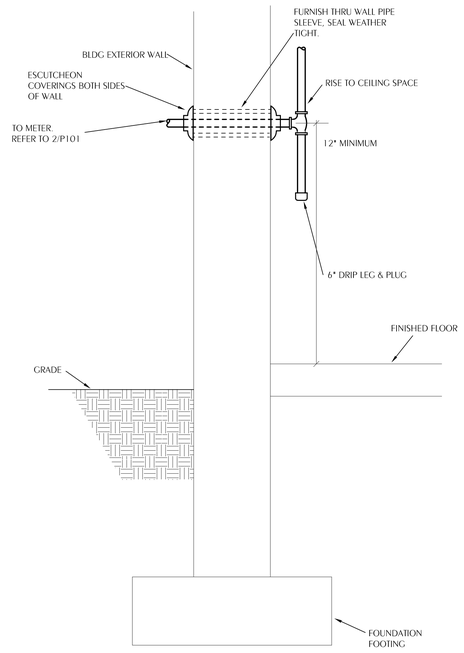
SUBMITTAL

DATE	GMP DOCUMENTS
01/06/2025	

PROJECT NAME / LOCATION:
MOWAT MIDDLE SCHOOL
CAFETERIA AND ADMINISTRATION ADDITION
PANAMA CITY, FLORIDA

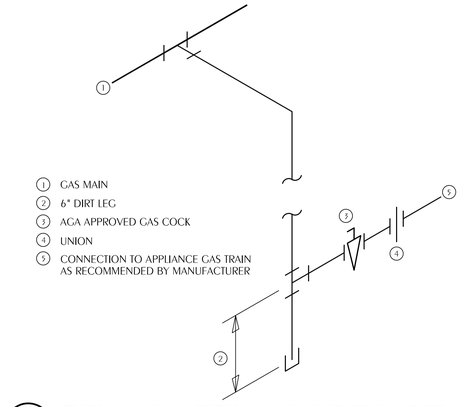
SHEET TITLE:
BUILDING 4 - SINGLE LINE POWER RISER

SHEET NO.:
E7.4



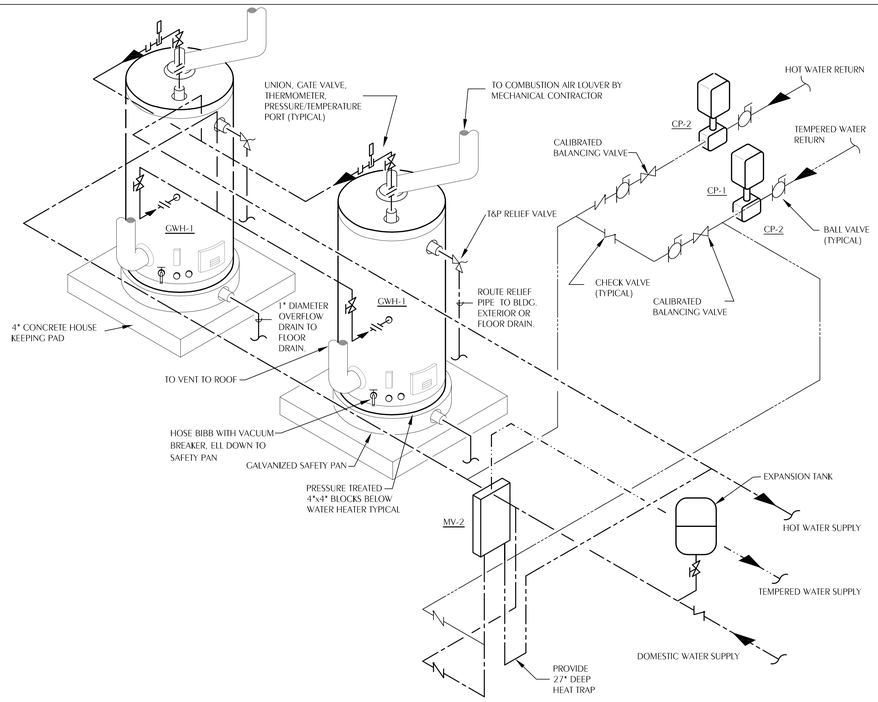
1 P0.2 TYPICAL GAS SERVICE ENTRANCE AT BLDG. EXTERIOR

SCALE: NONE



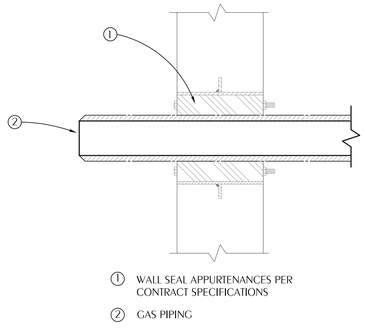
2 P0.2 TYPICAL GAS PIPING CONNECTION DETAIL

SCALE: NONE



3 P0.2 MULTIPLE GAS WATER HEATER DETAIL

SCALE: NONE

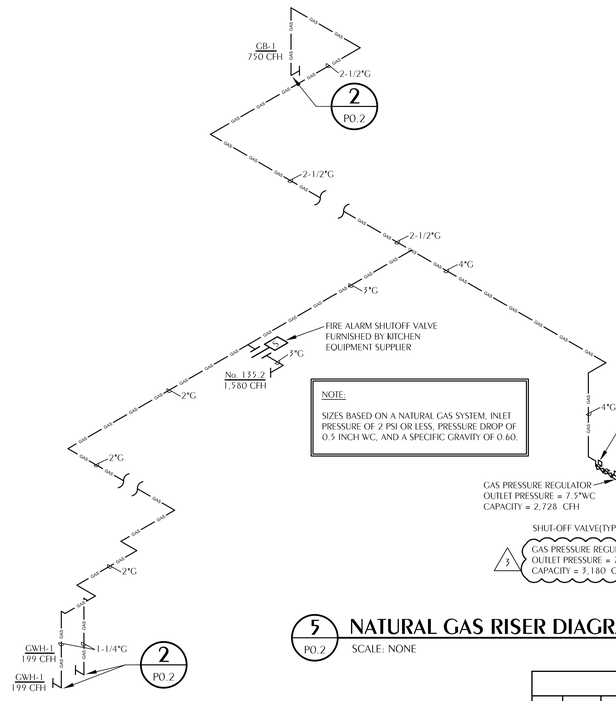


1 WALL SEAL APPURTENANCES PER CONTRACT SPECIFICATIONS

2 GAS PIPING

4 P0.2 TYPICAL GAS PIPE WALL PENETRATION DETAIL

SCALE: NONE



5 P0.2 NATURAL GAS RISER DIAGRAM - CAFETERIA

SCALE: NONE

GAS FIRED EQUIP. SCHEDULE

TAG	INPUT (BTUH)	CONNECTION SIZE	INLET PRESSURE RANGE IN. W.C
GB-1	750000	1"	7" - 28"
GWH-1	199000	3/4"	3.5" - 14"
3 GWH-1	199000	3/4"	3.5" - 14"
3 GENERATOR	3,180000	VERIFY	7"-11"
UDS HOOD	1580000	1-1/2"	7" - 10"

GENERAL NOTES

1. COORDINATE GAS SERVICE AND METERING WITH GAS UTILITY. CONTRACTOR SHALL PAY ALL FEES AND INSTALLATION COST FOR SERVICE TO THE BUILDING.
2. COORDINATE FINAL CONNECTION SIZE AND LOCATION WITH EQUIPMENT SUPPLIED.

UDS HOOD GAS FIRED EQUIP. SCHEDULE

TAG	INPUT (BTUH)	CONNECTION SIZE	INLET PRESSURE RANGE IN. W.C
132	144000	1/2"	4.5" - 14"
134	150000	1/2"	4.5" - 14"
138	90000	1"	7"
FUTURE	1,134	1-1/2	-

E Q U I P M E N T U T I L I T Y S C H E D U L E

ITEM NO	QTY	EQUIPMENT CATEGORY	HOT WATER SIZE (IN)	HOT WATER AFF (IN)	COLD WATER SIZE (IN)	COLD WATER AFF (IN)	DIRECT DRAIN SIZE (IN)	DIRECT DRAIN AFF (IN)	INDIR DRAIN SIZE (IN)	MBTUH	GAS SIZE (IN)	GAS AFF (IN)	PLUMBING REMARKS
106	1	EVAPORATOR COIL- COOLER							3/4"				PLUMBER SHALL EXTEND I.W. TO NEAREST FUNNEL DRAIN
106.1	1	EVAPORATOR COIL-FREEZER							3/4"				PLUMBER SHALL EXTEND I.W. TO NEAREST FUNNEL DRAIN
114	1	DISPENSER-HOT WATER			1/2"	30"			1/2"				FILTER BY KEC. SHUT-OFF VALVE AND FINAL CONNECTION BY PLUMBER
123	1	VEG. PREP. TABLE WITH SINKS											
123.1	1	PRE RINSE W/16" NOZZLE -SPLASH MOUNT	1/2"	16"	1/2"	16"							SHUT-OFF VALVE AND FINAL CONNECTION TO FAUCET BY PLUMBER
124	1	2 HP DISPOSER WTH CONTROL			1/2"	20"	2"	16"					PLUMBER SHALL CONNECT TO DIRECT WASTE
128	6	HAND SINK - WALL MOUNT	1/2"	24"	1/2"	24"	1-1/2"	20"					SHUT-OFF VALVE AND FINAL CONNECTION TO FAUCET & DIRECT WASTE BY PLUMBER
130	1	MEAT PREP TABLE WITH SINK							1-1/2"				PLUMBER SHALL EXTEND I.W. TO NEAREST FLOORSINK
130.1	1	FAUCET-16" NOZZLE -SPLASH MOUNT	1/2"	16"	1/2"	16"							SHUT-OFF VALVE AND FINAL CONNECTION TO FAUCET BY PLUMBER
131	"	CONVECTION STEAMER (FUTURE ITEM)											PROVIDE PLMB. & GAS UTILITY REQUIREMENTS FOR STEAMER IN #135.2UDS
132	1	TILT SKILLET 40 GAL- GAS	1/2"		1/2"						1/2"	144	PLUMBING CONTRACTOR TO INTER-CONNECT TO #135.2, UDS
133	2	S/S FLOOR TROUGH WITH FIBERGLASS GRATE							4"				KEC TO PROVIDE TROUGH. PLUM. CONTRACTOR TO SET AND FINAL CONNECT
134	1	TILT KETTLE 40 GAL- GAS	1/2"		1/2"						1/2"	150	PLUMBING CONTRACTOR TO INTER-CONNECT TO #135.2, UDS
135	1 LOT	ISLAND EXHAUST HOOD											
135.2	1 LOT	UTILITY DISTRIBUTION SYSTEM	3/4"	120"	3/4"	120"					3/4"	1134	REFER TO SHEET FS6.0, FS6.1, FS6.2, FS6.3, FS6.4, FS6.5, FS6.6
138	1	2 BURNER RANGE- GAS									1"	90	PLUMBING CONTRACTOR TO INTER-CONNECT TO #135.2, UDS
140	2	COMBI OVEN - ELECTRIC-10 PAN			3/4"				2"				PLUMBING CONTRACTOR TO INTER-CONNECT TO #135.2, UDS & EXTEND I.W. TO FLOOR TROUGH
141	2	S/S FLOOR TROUGH WITH FIBERGLASS GRATE							4"				KEC TO PROVIDE TROUGH. PLUM. CONTRACTOR TO SET AND FINAL CONNECT
149	1	ICE MAKER-CUBE	1/2"	78"					3/4"				SHUT-OFF VALVE AND FINAL CONNECTION THRU #149.1, WATER FILTER TO ICE MAKER & I.W. BY PLUMBER
149.1	1	WATER FILTER											WATER FILTER SHALL BE MOUNTED AT CONV HEIGHT AND ACCESSIBLE FOR CHANGING FILTER
149.2	1	ICE BIN							3/4"				PLUMBER SHALL EXTEND I.W. TO #150, FLOOR TROUGH
150	1	FLOOR TROUGH WITH FIBERGLASS GRATE							4"				KEC TO PROVIDE TROUGH. PLUM. CONTRACTOR TO SET AND FINAL CONNECT
167	1	SPRAY SYSTEM-WALL MOUNT	3/4"	12"	PROVIDE A STANDARD FLOOR DRAIN UNDER UNIT								SHUT-OFF VALVE AND FINAL CONNECTION SPRAY UNIT. BY PLUMBER. PROVIDE FL. DRAIN UNDER UNIT
175	3	HOT FOOD PAN -4 PAN							3/4"				PLUMBER SHALL EXTEND I.W. TO NEAREST FLOORSINK
176	3	COLD PAN-4-WELL							3/4"				PLUMBER SHALL EXTEND I.W. TO NEAREST FLOORSINK
187	1	SOILED DISHTABLE	1/2"	24"	1/2"	24"	(2) 2"	16"					SHUT-OFF VALVE AND FINAL CONNECTION TO DISPOSER & DIRECT WASTES BY PLUMBER
188	1	DISPOSER											
189	1	HOSE REEL											
191	1	DISHWASHER L-R W/BUILT IN BOOSTER	1/2"	24"	1/2"	24"			2"				SHUT-OFF VALVE AND FINAL CONNECTION TO DISWASHER & IND. WASTE BY PLUMBER
194	1	TURBOWASH POTSINK W/ELECT.TANK HEAT	(2)3/4"	12"	(2)3/4"	12"			(3) 2"				SHUT-OFF VALVE AND FINAL CONNECTION TO POT WASHER & IND. WASTE BY PLUMBER

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REVISIONS

NO.	DATE	DESCRIPTION
3	4/4/25	RESIZED GAS PIPING

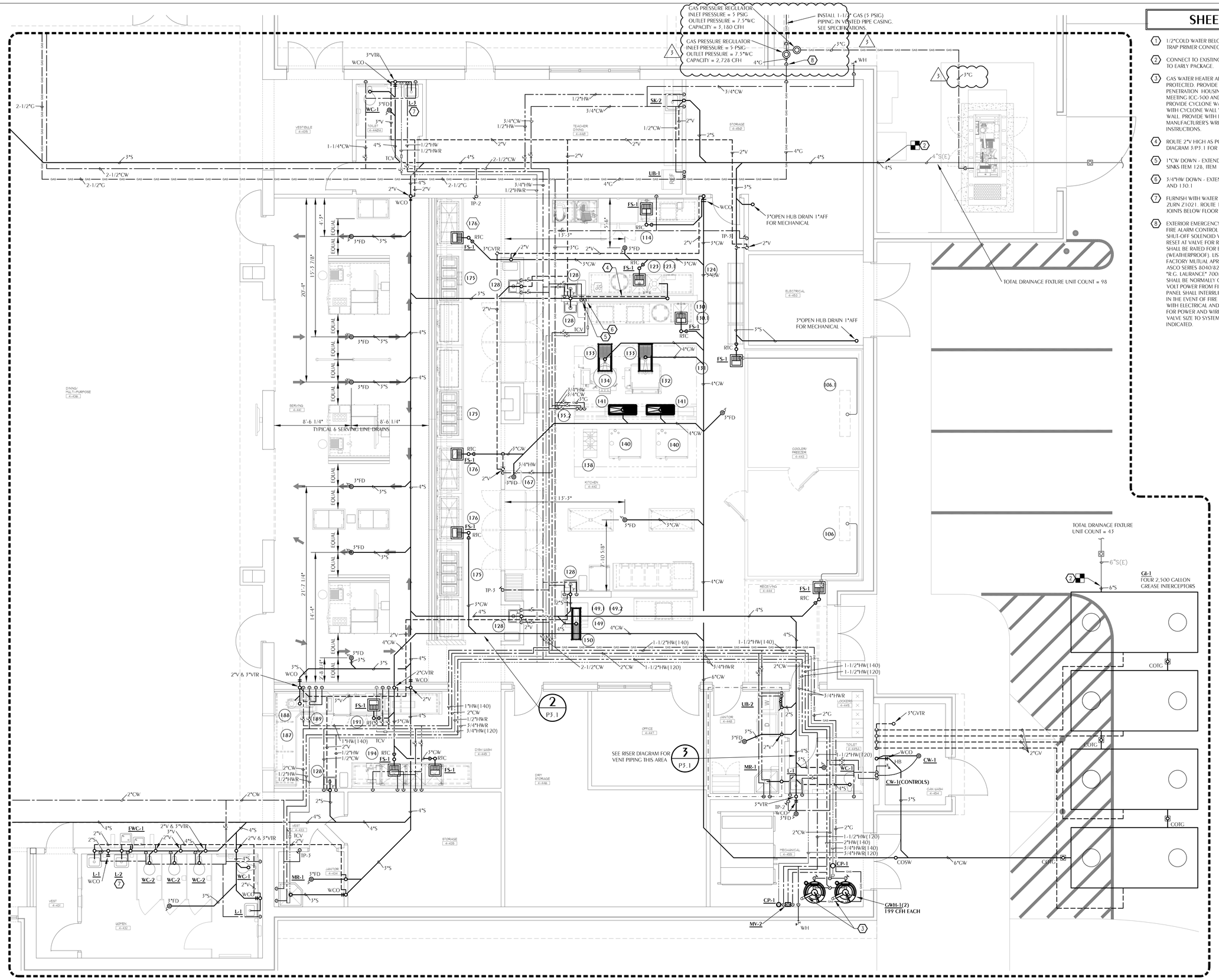
SUBMITTAL

DATE	
GMP DOCUMENTS	01/06/2025

PROJECT NAME / LOCATION:
MOWAT MIDDLE SCHOOL
CAFETERIA AND ADMINISTRATION ADDITION
PANAMA CITY, FLORIDA

SHEET TITLE:
PLUMBING DETAILS

SHEET NO.:
P0.2



SHEET NOTES

1. 1/2"COLD WATER BELOW SLAB. STUB UP FOR FUTURE TRAP PRIMER CONNECTION.
2. CONNECT TO EXISTING BELOW GRADE PIPING. REFER TO EARLY PACKAGE.
3. GAS WATER HEATER AIR INTAKE AND EXHAUST SHALL BE PROTECTED. PROVIDE PRODUCTS BY ROOF PENETRATION HOUSING, LLC OR APPROVED EQUAL MEETING ICC-500 AND FEMA 361 STANDARDS. PROVIDE CYCLONE WALL VAULT AT WALL PENETRATION, WITH CYCLONE WALL VAULT SHROUD ON THE EXTERIOR WALL. PROVIDE WITH EXIT SEALS. INSTALL PER MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.
4. ROUTE 2"V HIGH AS POSSIBLE IN LOW WALL - SEE RISER DIAGRAM 3/P3.1 FOR CONTINUATION.
5. 1"CW DOWN - EXTEND AND CONNECT TO TWO HAND SINKS ITEM 128, ITEM 123.1, ITEM 124, AND ITEM 130.1
6. 3/4"HW DOWN - EXTEND AND CONNECT TO ITEMS 123.1 AND 130.1
7. FURNISH WITH WATER SAVER TRAP PRIMER EQUAL TO ZURN Z1021. ROUTE 1/2"CW TO FLOOR DRAIN. NO JOINTS BELOW FLOOR SLAB.
8. EXTERIOR EMERGENCY GAS SHUT-OFF VALVE TIED INTO FIRE ALARM CONTROL PANEL. EMERGENCY MAIN SHUT-OFF SOLENOID VALVE SHALL REQUIRE MANUAL RESET AT VALVE FOR RESUMPTION OF SERVICE. VALVE SHALL BE RATED FOR EXTERIOR INSTALLATION (WEATHERPROOF). LISTED FOR FUEL GAS SERVICE, AND FACTORY MUTUAL APROVED AS MANUFACTURED BY ASCO SERIES 8040/8215, "WATTS" C7000 SERIES, OR "R.G. LAURANCE" 700/800 SERIES. SOLENOID VALVE SHALL BE NORMALLY CLOSED AND HELD OPEN BY 24 VOLT POWER FROM FIRE ALARM PANEL. FIRE ALARM PANEL SHALL INTERRUPT PPOWER TO SOLENOID VALVE IN THE EVENT OF FIRE ALARM CONDITION. COORDINATE WITH ELECTRICAL AND FIRE ALARM SUBCONTRACTOR FOR POWER AND WIRING REQUIREMENTS. MATCH VALVE SIZE TO SYSTEM CAPACITY AND PIPE SIZE INDICATED.

PLUMBING NEW WORK PLAN - BUILDING 4 - MULTI-PURPOSE/KITCHEN

N 1 P2.1

SCALE: 1/4" = 1'-0"

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REVISIONS

NO.	DATE	DESCRIPTION
3	4/4/25	REVISED GAS PIPING TO GENERATOR

SUBMITTAL

	DATE
60MP DOCUMENTS	01/06/2025

PROJECT NAME / LOCATION:
MOWAT MIDDLE SCHOOL
CAFETERIA AND ADMINISTRATION ADDITION
PANAMA CITY, FLORIDA

SHEET TITLE:
ENLARGED KITCHEN PLUMBING PLAN

SHEET NO.:
P2.1