Allied Engineering

Structural Mechanical Electrical Commissioning

Service Transformer Replacement
NMCC Edmunds Building
Presque Isle, ME

Addendum No.1

AEI Project # 23016

BGS Project # 3618

December 12, 2023

160 Veranda Street - Portland, ME 04103 - Ph. 207.221.2260 Fax 207.221.2266
www.allied-eng.com

00 11 13
Notice to Contractors

NMCC - Edmunds Center - Transformer Replacement
BGS project number : 3618

Disconnect and remove the existing three phase pad mounted transformer with 4160 volt primary and replace it with a new dual wound primary voltage unit (4,160 volt and 12,470 volt)

The cost of the work is approximately $ 75,000. The contract shall designate the Substantial Completion Date on or before *19 July, 2025*, and the Contract Final Completion Date on or before *16 August, 2025; Note that the owner will coordinate and collaborate with the awarded contractor with regard to the lead times that are currently being experienced in the utility transformer market in order to make resoanable necessary adjustments to the project schedule in order to accommodate the most favorable procurement schedule available to contractor for said transformer*.

1. Bids shall be submitted in sealed envelopes plainly marked "**Bid for *Transformer Upgrade - Edmunds Center***" and addressed to the Bid Administrator:
   Barry Ingraham
   Dean of Technology and Facilities
   Northern Maine Community College
   33 Edgemont Drive
   Presque Isle, Maine 04769

   The envelope shall contain a completed Contractor Bid Form, plus bid security when required, to be received no later than **2:00:00 p.m.** on ***20 December, 2023*** . Bid submissions will be opened and read aloud at *the address shown above in the Information Technology Office located just off the Christie Lobby* at the time and date noted above.

   Any bid submitted after the noted time will not be considered a valid bid and will remain unopened. Any bid submitted by any other means will not be considered a valid bid.

2. The bid shall be submitted on the Contractor Bid Form (section 00 41 13) provided in the Bid Documents. The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.

3. Bid security *is required* on this project.
   If noted above as required, the Bidder shall include a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with the completed bid form submitted to the Owner. The Bid Bond form is available on the BGS website.

4. Performance and Payment Bonds *are required* on this project.
   If noted above as required, or if any combination of Base Bid and Alternate Bids amounts selected in the award of the contract exceeds $125,000.00, the selected Contractor shall furnish a 100% contract Performance Bond (section 00 61 13.13) and a 100% contract Payment Bond (section 00 61 13.16) in the contract amount to cover the execution of the Work. Bond forms are available on the BGS website.

5. Filed Sub-bids *are not required* on this project.

00 11 13
Notice to Contractors

6. There *are no* Pre-qualified General Contractors on this project.
   If Pre-qualified General Contractors are identified for this project, the name of each company, with their city and state, are listed below.

7. An on-site pre-bid conference *will not* be conducted for this project.
   If a pre-bid conference is scheduled, it is *optional* for General Contractors and optional for Subcontractors and suppliers. Contractors who arrive late or leave early for a mandatory meeting may be prohibited from participating in this meeting and bidding. *Contractors interested in a pre-bid site visit can contact Lee Griffin, Manager of Facilities to schedule one; Mr. Griffin can be reached at 207.768.2702 (office phone) or by email at (nlgriffi@nmcc.edu) .*

8. Bid Documents - full sets only - will be available on or about *22 November, 2023* and may be obtained *at no cost* from:
   the Bureau of General Services contracts website address below:
   https://www.maine.gov/dafs/bgs/business-opportunities#invitationforbid

9. Bid Documents may be examined at:

   AGC Maine
   188 Whitten Road
   Augusta, ME 04330
   Phone 207-622-4741 Fax 207-622-1625

   Construction Summary
   734 Chestnut Street
   Manchester, NH 03104
   Phone 603-627-8856 Fax 603-627-4524

MECHANICAL EQUIPMENT SCHEDULE

EQUIPMENT	VOLTAGE	PH	KW	HP	MCA	DISCONNECT SWITCH AMPS	DISCONNECT SWITCH POLES	DISCONNECT SWITCH FUSE	DISCONNECT SWITCH ENCLOSURE	STARTER	PANEL CKT	CKT BRKR A	CKT BRKR P	WIRE SIZE	NOTES
HVAC-1	480	3	–	–	93	100	3	100	NEMA-3R	–	MDP-13,15,17	100	3	(3)#2+(1)#8G	
HVAC-2	480	3	–	–	71	100	3	80	NEMA-3R	–	MDP-14,16,18	100	3	(3)#3+(1)#8G	
HVAC-3	480	3	–	–	105	200	3	125	NEMA-3R	–	MDP-19,21,23	125	3	(3)#1/0+(1)#6G	
AC-1/CU-1	115	1	–	–	15	20	1	NF	NEMA-3R	–	P1-30	20	1	(2)#12+(1)#12G	
CUH-1	115	1	–	1/15	–	20	1	NF	NEMA-1	–	P1-32	20	1	(2)#12+(1)#12G	
CUH-2	115	1	–	1/15	–	20	1	NF	NEMA-1	–	P/O P1-32	–	–	(2)#12+(1)#12G	
EF-1	115	1	.17	–	–	20	1	NF	NEMA-3R	–	P1O-17	20	1	(2)#12+(1)#12G	
EF-2	115	1	–	1/6	–	20	1	NF	NEMA-3R	–	P1-34	20	1	(2)#12+(1)#12G	
EF-3	115	1	–	1/6	–	20	1	NF	NEMA-3R	–	P/O P1-34	–	–	(2)#12+(1)#12G	
EF-4	115	1	–	1/20	–	20	1	NF	NEMA-3R	–	P1-36	20	1	(2)#12+(1)#12G	
EF-5	115	1	–	1/6	–	20	1	NF	NEMA-3R	–	P/O P1-36	–	–	(2)#12+(1)#12G	
EF-6	115	1	–	1/25	–	20	1	NF	NEMA-3R	–	P1-38	20	1	(2)#12+(1)#12G	
EF-7	115	1	–	1/6	–	20	1	NF	NEMA-3R	–	P/O P1-38	–	–	(2)#12+(1)#12G	
EF-8	115	1	–	1/6	–	20	1	NF	NEMA-3R	–	P/O P1-38	–	–	(2)#12+(1)#12G	
EF-9	115	1	.32	–	–	20	1	NF	NEMA-3R	–	P/O P1-34	–	–	(2)#12+(1)#12G	
EF-10	115	1	.08	–	–	20	1	NF	NEMA-3R	–	P/O P1-34	–	–	(2)#12+(1)#12G	
EF-11	115	1	–	1/20	–	20	1	NF	NEMA-1	–	P/O P1-36	–	–	(2)#12+(1)#12G	
CP-1	208	3	–	1.5	–	20	3	15	NEMA-1	0	PQ-19,21,23	20	3	(3)#12+(1)#12G	(1)
CP-2	208	3	–	1.5	–	20	3	15	NEMA-1	0	P/O PQ-19,21,23	–	–	(3)#12+(1)#12G	(1)
CP-3	208	3	–	3	–	20	3	15	NEMA-1	1	PQ-20,22,24	20	3	(3)#12+(1)#12G	(1)
CP-4	115	1	–	1/7	–	20	1	NF	NEMA-1	–	PQ-16	20	1	(2)#12+(1)#12G	
B-1	208	3	–	3	–	20	3	15	NEMA-1	1	PQ-13,15,17	20	3	(3)#12+(1)#12G	(1)
ELEVATOR	480	3	–	25	–	60	3	60	NEMA-1	–	MDP-8,10,12	50	3	(3)#6+(1)#10G	
SUMP PUMP	115	1	–	1/3	–	20	1	NF	NEMA-1	–	P1-23	20	1	(2)#12+(1)#12G	

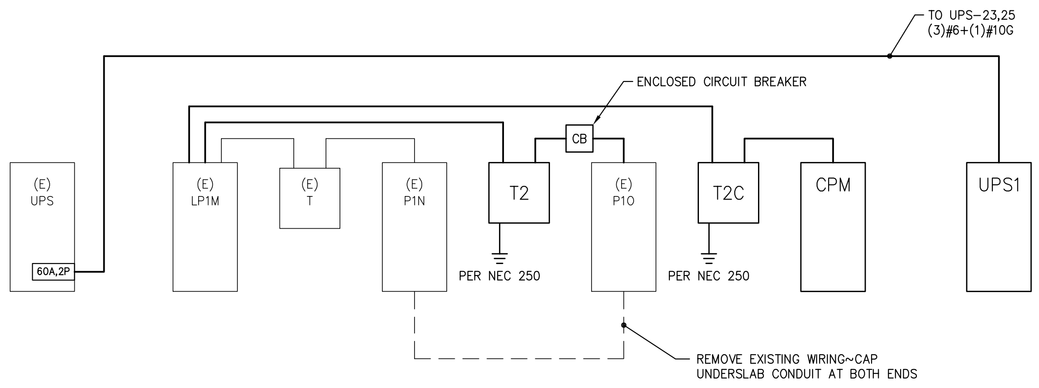
EQUIPMENT SCHEDULE NOTES

FWE = FURNISHED WITH EQUIPMENT NF = NON-FUSED (1) PROVIDE COMBINATION STARTER/FUSED DISCONNECT SWITCH

*COORDINATE ALL COIL VOLTAGES WITH DIVISION 15

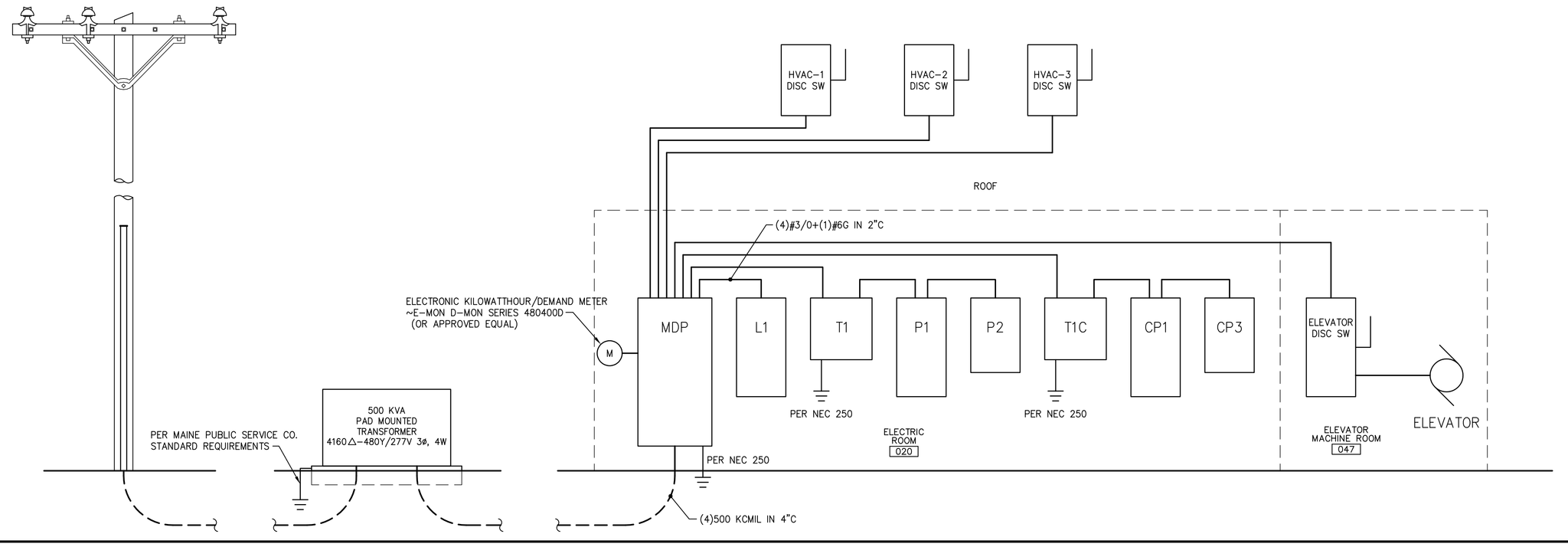
E1 | MECHANICAL EQUIPMENT SCHEDULE

NO SCALE



C1 | PARTIAL POWER RISER DIAGRAM ~ EXISTING LEARNING CENTER

NO SCALE



A1 | POWER RISER DIAGRAM ~ ADDITION

NO SCALE

RECEPTACLES

~MOUNT WITH CENTERLINE 18"AFF UNO~
~MOUNT EXTERIOR WITH CENTERLINE 24"AFG UNO~

- DUPLEX RECEPTACLE~20A, 125V
- GFCI TYPE DUPLEX RECEPTACLE~MOUNT 48"AFF UNO
- WP GFCI RECEPTACLE IN WP ENCLOSURE ON ROOF
- ISOLATED GROUND DUPLEX RECEPTACLE
- 20A TWIST-LOCK RECEPTACLE, RACK MOUNT TO UNDERSIDE OF TOP OF RACK
- DOUBLE DUPLEX ISOLATED GROUND RECEPTACLE

FLOOR DEVICES

- DOUBLE DUPLEX ISOLATED GROUND RECEPTACLE IN FLUSH FLOOR BOX, FSR INC SERIES 500PB (3" DEEP)
- TEL/DATA OUTLET IN FLUSH FLOOR BOX FSR INC SERIES 500PB (3" DEEP) CONSISTING OF ~ (12) CATEGORY 6 WIRES, (1) TELEPHONE OUTLET, AND (6) DATA OUTLETS ~UNLESS NOTED OTHERWISE~ ~WIRING SHALL RUN TO HUB RM 165 ~OUTLETS AND CONNECTIONS BY OWNER

TEL/DATA OUTLETS [1]

- TEL/DATA OUTLET CONSISTING OF ~ (4) CATEGORY 6 WIRES, (1) TELEPHONE OUTLET, (1) DATA OUTLET, AND (2) BLANKS ~WIRING SHALL RUN TO HUB RM 165 ~UNLESS NOTED OTHERWISE~
- TELEPHONE OUTLET ~ (1) CATEGORY 6 WIRE ~WIRING SHALL RUN TO HUB RM 165
- W TELEPHONE OUTLET WALL MOUNT 48"AFF ~ (1) CATEGORY 6 WIRE ~WIRING SHALL RUN TO HUB RM 165
- DATA OUTLET ~ (1) CATEGORY 6 WIRE ~WIRING SHALL RUN TO HUB RM 165
- IS TEL/DATA OUTLET CONSISTING OF ~ (4) CATEGORY 6 WIRES, (1) TELEPHONE OUTLET, (1) DATA OUTLET, AND (2) BLANKS (3) CAT 6 TO "IS WIRE ROOM" 145 FOR DATA, (1) CAT 6 TO "IS WIRE ROOM" 145 FOR TELEPHONE PLATE SHALL BE LABELED "IS"~UNLESS NOTED OTHERWISE~

TEL/DATA NOTE:

[1] WIRING, BOXES AND CONDUIT BY DIVISION 16. PLATES, OUTLETS AND TERMINATIONS BY OWNER. PROVIDE SINGLE BOX AND 3/4" CONDUIT TO 6" ABOVE CEILING OR TO NEAREST ACCESSIBLE CEILING UNLESS NOTED OTHERWISE.

FIRE ALARM SYSTEM

- SMOKE DETECTOR
- HEAT DETECTOR FIXED
- DUCT SMOKE DETECTOR~FURNISHED AND INSTALLED BY OTHERS, WIRED BY DIVISION 16
- MANUAL PULL STATION
- AUDIO/VISUAL INDICATING DEVICE~CANDELA AS NOTED ON PLANS
- VISUAL INDICATING DEVICE~CANDELA AS NOTED ON PLANS
- SPEAKER/STROBE~CANDELA AS NOTED ON PLANS
- RTS REMOTE TEST STATION~WALL MOUNT 6" BELOW CEILING
- MAGNETIC DOOR HOLD OPEN DEVICE~FURNISHED AND INSTALLED BY OTHERS, WIRED BY DIVISION 16

POWER DISTRIBUTION

- PANELBOARD 208Y/120V~FLUSH/SURFACE MOUNTED
- PANELBOARD 480Y/120V~FLUSH/SURFACE MOUNTED
- FUSED DISCONNECT SWITCH
- NON-FUSED DISCONNECT SWITCH
- MOTOR STARTER
- (#) MOTOR
- J JUNCTION BOX~WALL MOUNTED
- T TRANSFORMER~NUMBER INDICATES DESIGNATION SEE TRANSFORMER SCHEDULE
- HOMERUN~(2)#12,(1)#12G UNO [EXCEPT "UPS" & "CP" PANELS COMPUTER CIRCUITS: (1)#12,(1)#10N,(1)#12IG,(1)#12G UNO]
- SINGLE-PHASE HOMERUN OR MULTIPLE HOMERUN UTILIZING THE SAME CONDUIT
- 3-PHASE HOMERUN OR MULTIPLE HOMERUN UTILIZING THE SAME CONDUIT
- J JUNCTION BOX
- W CEILING MOUNTED FUTURE WIRELESS SYSTEM POWER ~ RUN (2)#12+(1)#12G IN 3/4" CONDUIT TO ELECTRIC ROOM ~ TAG AND CAP AT BOTH ENDS
- C (1) CATV OUTLET~F CONNECTOR WITH COAX TO CATV SERVICE & (1) VIDEO OUTLET~(2) BNC F/F OUTLETS WITH (2) RG59 75 OHM TO VIDEO RACK~WIRING SHALL RUN TO HUB RM 165
- CONDUIT RUN UNDERGROUND~CIRCLE INDICATES STUB-UP LOCATION
- GROUND
- EF 1 MECHANICAL EQUIPMENT TAG

LUMINAIRES

- F1 LIGHT FIXTURE~RECESSED, SURFACE OR PENDANT AS INDICATED INDICATES LIGHT FIXTURE TYPE ON LUMINAIRE SCHEDULE~TYPICAL
  o LOWER CASE LETTER INDICATES SWITCHING~TYPICAL
  2 NUMBER INDICATES CIRCUITING~TYPICAL
- ER EXISTING RELOCATED 2x2 PARABOLIC TROFFER
- RECESSED DOWNLIGHT
- WALL MOUNTED LIGHT FIXTURE~TYPICAL
- EXIT SIGN~CEILING MOUNTED~SHADING INDICATES FACE(S) 2 ARROWHEAD INDICATES CHEVRON(S) REQUIRED NUMBER INDICATES CIRCUIT NUMBER
- EXIT SIGN~WALL MOUNTED~SHADING INDICATES FACE(S) 2 NUMBER INDICATES CIRCUIT NUMBER
- SHADING INDICATES FIXTURE WITH EMERGENCY BALLAST ~ TYPICAL
- RB REMOTE BALLAST
- PENDANT LIGHT
- 2x2 DIRECT/INDIRECT LIGHT FIXTURE~LINE INDICATES LONGITUDINAL LAMP DIRECTION

TOGGLE SWITCHES

~CENTERLINE 48" AFF~

- S SINGLE POLE LIGHT SWITCH~20A,125/277V
- Sa LOWER CASE LETTER INDICATES LIGHTS SWITCHED
- S3 THREE-WAY LIGHT SWITCH
- S4 FOUR-WAY LIGHT SWITCH KEY OPERATED SWITCH
- SD DIMMER SWITCH ~ INCANDESCENT
- S# MULTI-GANGED SWITCHES~GANG UNDER ONE PLATE~LOWER CASE LETTER INDICATES SWITCHING
- SP PILOT LIGHT SWITCH
- OS OCCUPANCY SENSOR SWITCH
- PEC PHOTOELECTRIC CONTROL

E5 | ELECTRICAL LEGEND

NO SCALE

TRANSFORMER SCHEDULE

TAG	KVA	PRIMARY: 480V, 3 PHASE, 3 WIRE CKT BRKR	PRIMARY: 480V, 3 PHASE, 3 WIRE 480V FEEDER	SECONDARY: 208Y/120V, 3 PHASE, 4 WIRE CKT BRKR	SECONDARY: 208Y/120V, 3 PHASE, 4 WIRE 208/120V FEEDER	NOTES
T1	75	(3) MDP	(3)#2+(1)#8G	(4)	(3)#4/0+(1)#4/0N+(1)#4G	
T1C	75	(3) MDP	(3)#2+(1)#8G	(4)	(3)#4/0+(1)#4/0N+(1)#4G+(1)#4IG	(2)
T2	15	(3) LP1M	(3)#10+(1)#10G	60	(3)#6+(1)#3N+(1)#10G+(1)#10IG	(5)
T2C	15	(3) LP1M	(3)#10+(1)#10G	(4)	(3)#6+(1)#3N+(1)#10G+(1)#10IG	(2)

TRANSFORMER SCHEDULE NOTES

(1) FEEDER SIZES ARE BASED ON COPPER CONDUCTORS AND ARE MINIMUM. INCREASE CONDUCTOR SIZE AS REQUIRED TO PREVENT VOLTAGE DROP.

(2) NON-LINEAR ISOLATION

(3) REFER TO PANEL SCHEDULES FOR PRIMARY CIRCUIT BREAKER SIZE

(4) SECONDARY CONDUCTORS SHALL BE PROTECTED BY MAIN CIRCUIT BREAKER OF SECONDARY PANELBOARD PER NEC. REFER TO PANELBOARD SCHEDULES FOR CIRCUIT BREAKER SIZE

(5) ENCLOSED CIRCUIT BREAKER~FLUSH MOUNTED IN WALL ADJACENT TO PANEL

C5 | TRANSFORMER SCHEDULE

NO SCALE

1. REMOVE ALL EXISTING ELECTRICAL ITEMS WITHIN AREAS TO BE RENOVATED EXCEPT ITEMS INDICATED AS EXISTING TO REMAIN.
2. DISCONNECT, REMOVE, RELOCATE, AND RECONNECT ELECTRICAL CONDUIT, WIRING, DEVICES, BOXES, FIXTURES, EQUIPMENT, ETC. AS REQUIRED TO FACILITATE THE WORK OF DIVISION 16 AND OTHER DIVISIONS WHETHER INDICATED OR NOT.
3. REMOVE ALL EXISTING ELECTRICAL ITEMS AND WIRING FROM WALLS THAT WILL BE DEMOLISHED BY OTHER DIVISIONS. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF WALLS TO BE REMOVED.
4. NO WIRING THAT BECOMES UNUSED AS PART OF THIS PROJECT SHALL BE ABANDONED IN PLACE.
5. WHERE ELECTRICAL ITEMS ARE REMOVED, REMOVE ALL ASSOCIATED WIRING, CONDUIT, ETC. BACK TO SOURCE.

C8 | DEMOLITION NOTES

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1. BRANCH CIRCUIT WIRING NOT SHOWN. CONNECT ITEMS TO CIRCUITS INDICATED.
2. DO NOT SCALE THE DRAWINGS. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT DIMENSIONS.
3. THE LOCATION OF EQUIPMENT, OUTLETS, ETC. AS GIVEN ON THE DRAWINGS, IS APPROXIMATE. IT SHALL BE UNDERSTOOD THAT THESE LOCATIONS ARE SUBJECT TO MODIFICATION AS MAY BE FOUND NECESSARY OR DESIRABLE AT THE TIME OF INSTALLATION IN ORDER TO MEET STRUCTURAL/ARCHITECTURAL REQUIREMENTS. SUCH CHANGES SHALL BE MADE WITHOUT EXTRA CHARGE.
4. ALL ELECTRICAL DEVICES, WHEN INSTALLED, SHALL BE PROTECTED FROM DAMAGE DURING CONSTRUCTION. COVER PLATES SHALL BE INSTALLED AFTER FINISH MATERIALS HAVE BEEN APPLIED.
5. COORDINATE ALL WORK WITH OTHER DIVISIONS AND THE OWNER.
6. VERIFY EXACT POWER REQUIREMENTS OF MECHANICAL EQUIPMENT WITH DIVISION 15 PRIOR TO ROUGH-IN.
7. POWER WIRING FOR EQUIPMENT & CONTROL IS TO BE PERFORMED BY DIVISION 16. CONTROL WIRING BY DIVISION 15.
8. PROVIDE GROUNDING AS REQUIRED BY CODE AND SPECIFICATIONS. ALSO PROVIDE GROUNDING WIRING AND CONNECTION FOR OWNER INSTALLED LIGHTNING ARRESTOR.
9. PROVIDE 2' OF SLACK AT EACH DATA OR TEL/DATA OUTLET LOCATION.
10. PROVIDE 20' OF SLACK IN HUB ROOM, IS WIRE AND EXISTING MAIN COMPUTER ROOM FOR ALL TRUNK CABLING.

B8 | GENERAL NOTES

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ALL ISOLATED GROUND PANELBOARD BUSSES, RECEPTACLES AND FEEDER AND BRANCH CIRCUIT CONDUCTORS SHALL BE PROVIDED UNDER ALTERNATE #5. UNDER BASE BID, PROVIDE EQUIPMENT GROUNDING BUSSES AND CONDUCTORS ONLY AND STANDARD DUPLEX RECEPTACLES.

A8 | ALTERNATE #5

–

ARCHITECTURE INTERIOR DESIGN PLANNING

ARCHITECTS

49 DARTMOUTH STREET PORTLAND, ME. 04101 207-772-2694 FAX

THE MILLYARD 3 NORTH STREET EXETER, NEW HAMPSHIRE 03833 603-580-1432 FAX

allied engineering, inc.
One Westbrook Commons
Westbrook, Maine 04092-2804
Telephone: 207-854-6126
Fax: 207-854-0603
E-Mail: info@allied-eng.com
www.allied-eng.com

allied Project No: 001050

CAD File: 001050E.DWG

NMTC CHRISTIE HALL ADDITION
PRESQUE ISLE, MAINE

PDT JOB NO. –

DRWN. DLL CHK. SM/CAF

SCALE

ISSUE: BID SET 30 MARCH 01

TITLE: ELECTRICAL ~ LEGEND ~ NOTES

SHEET: E-000

PLOT DATE: 03/30/01

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and Drawing conventions.
7. Miscellaneous provisions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Transformer Replacement at the NMCC Edmunds Center in Presque Isle, Maine.

1. Project Location: NMCC Edmunds Center, Presque Isle, Maine.

B. Owner: Northern Maine Community College (NMCC).

C. Owner's Representative: Barry Ingraham
Dean of Technology and Facilities
Northern Maine Community College
33 Edgemont Drive
Presque Isle, ME 04769

D. BGS Representative: Deane Rykerson
111 Sewall Street, 77 State House Station

Burton M. Cross Building, 4th Floor
Augusta, ME 04333-0077

E. Engineer: Brian Gardiner

brian.gardner@salasobrien.com

Allied Engineering, Inc, 160 Veranda Street, Portland, Maine 04103.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

Replace the existing 300 kVA pad mounted service transformer serving the existing Edmunds Center with a new unit of same rating and function, however provided with a dual voltage primary. Include replacement of the existing 5 kV primary service cables with 15 kV rated cables.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. The work described herein shall be conducted in a fully occupied and secured facility. The contractor shall keep scheduled interruptions to a maximum duration of two hours. Such shutdowns shall be strictly scheduled with the owner a minimum of two weeks in advance. Power outages shall be limited to those systems associated with the specific gear being replaced under the scope of this project. Refer to the electrical drawings for detailed requirements associated with minimized interruptions and specific work limitations and requirements.

2. Generally, the following limitations/restrictions/requirements shall apply:

a. In preparation for ordering the replacement switch, the contractor shall schedule a shutdown of power associated with the switch to be replaced, shall open up the switch, and shall thoroughly document and measure the internal arrangement of the existing switch, to the extent that a custom switch may be built to replace in kind the existing. In scheduling the shutdown, the contractor shall notify the owner and engineer so that they may both have representatives present for the shutdown. Additionally, the contractor shall submit, prior to the shutdown, a written plan which details the activities and timeline associated with the shutdown, data

collection, and re-energizing of the equipment. The written plan shall include personnel to be in attendance for the shutdown and investigation.

b. Prior to ordering the replacement switch, the contractor shall submit detailed cut sheets and shop drawings for the replacement switch as well as detailed documentation collected at the site for the existing switch, for approval by the owner and engineer.

c. At completion of factory build for the replacement switch, prior to shipping, the contractor shall notify owner and engineer of pending factory test and shall coordinate with the factory to enable owner and engineer to attend and witness the factory testing of the switch at their option.

d. Prior to scheduling the equipment replacement, the contractor shall have the new switch in the space, within close proximity of the switch to be replaced and shall have rigging equipment in place. Additionally, the contractor shall submit a certificate outlining proof of factory load testing with acceptable results.

e. Prior to conducting the shutdown for switch replacement, the contractor shall, again, submit a detailed plan which prescribes their detailed approach to shutdown #1 for back-up power tie in, power up on temporary power, switchgear replacement plan, inspection by owner and engineer for the replacement terminations, shutdown #2 for powering down the temporary power and energizing the new switch, testing the switch. The plan shall include information for personnel to be on site during the replacement, total duration for replacement, and contingency plan for extended temporary power or temporary power restoration in the event of failure of the new equipment on startup. At minimum, the Contractor shall have sufficient materials and/or equipment on-site to provide whole-facility temporary power restoration in the event of new equipment failure.

f. Refer to Notes on Sheet E-100 and Electrical Work Task Matrix on Sheet E-500 for script authoring additional information relative to specific project requirements and coordination.

3. At no time shall power be interrupted to security and access control systems.

4. Notify Owner not less than two weeks in advance of proposed utility interruptions.

5. Obtain Owner's written permission before proceeding with utility interruptions.

6. Shutdowns shall be scheduled with the owner and are expected to occur during May through August months; when classes are not in session.

7. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

8. In the event that the contractor wishes to shut down any portion of the public street or in any way impede access to adjacent facilities to facilitate rigging of equipment to the roof, the contractor shall strictly schedule this work with the City, the Owner, and Authorities Having Jurisdiction. It is preferable that such work, if required, be performed outside of normal working hours.

9. For access to facility parking areas for the purpose of rigging, coordinate these activities strictly with the owner.

B. On-Site Work Hours: It is the intent that work in most areas of the project may be conducted during normal business hours, of 8:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.

C. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.
3. Schedule such activities to occur outside of normal working hours.

D. Dust Control: Erect temporary partitions and plastic sheeting as required to prevent the migration of dust and construction debris to occupied areas of the facility during construction.

E. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 26 05 74 OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

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 a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.

1. Arc-flash study input data, including completed computer program input data sheets.
2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

    a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in

equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Specialist.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, available software developers offering software that may be used for the Work include, but are not limited to, the following:

1. ESA Inc.
2. Operation Technology, Inc.
3. Power Analytics, Corporation.
4. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

F. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

G. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

1. Electric utility's supply termination point.
2. Switchgear.
3. Low-voltage switchgear.
4. Motor-control centers.
5. Standby generators and automatic transfer switches.
6. Branch circuit panelboards.

3.3 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Use the short-circuit study output and the field-verified settings of the overcurrent devices.

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except 240-V ac and 208-V ac systems fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or

decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.4 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
2. Use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Gather and tabulate the following input data to support coordination study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.

8. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
9. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
10. Motor horsepower and NEMA MG 1 code letter designation.
11. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
12. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.5 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:

1. Edmunds Center main electrical room - Main Switchboard.
2. Edmunds Center main electrical room - Distribution Panels
3. Edmunds Center main electrical room – Branch Circuit Panels
4. Edmunds Center Service Transformer.

3.6 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.7 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 26 05 74

SECTION 261219 - PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS

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 pad-mounted, liquid-filled, medium-voltage distribution transformers, with primary and secondary bushings within or without air-terminal enclosures.

1.3 DEFINITIONS

A. BIL: Basic Impulse Insulation Level.

B. Bushing: An insulating structure including a central conductor, or providing a central passage for a conductor, with provision for mounting on a barrier, conducting or otherwise, for the purpose of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

C. Bushing Elbow: An insulated device used to connect insulated conductors to separable insulated connectors on dead-front, pad-mounted transformers and to provide a fully insulated connection. This is also called an "elbow connector."

D. Bushing Insert: That component of a separable insulated connector that is inserted into a bushing well to complete a dead-front, load break or nonload break, separable insulated connector (bushing).

E. Bushing Well: A component of a separable insulated connector, either permanently welded or clamped to an enclosure wall or barrier, having a cavity that receives a replaceable component (bushing insert) to complete the separable insulated connector (bushing).

F. Elbow Connector: See "bushing elbow" above.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings: For pad-mounted, liquid-filled, medium-voltage transformers.

1. Include plans and elevations showing major components and features.

a. Include a plan view and cross section of equipment base, showing clearances, required workspace, and locations of penetrations for grounding and conduits.

2. Include details of equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include single-line diagram.
4. Include list of materials.
5. Include nameplate data.
6. Manufacturer's published time-current curves of the transformer high-voltage fuses, with transformer damage curve, inrush curve, and thru fault current indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement.

B. Qualification Data: For testing agency.

C. Seismic Qualification Certificates: For transformer assembly, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For transformers, signed by product manufacturer.

E. Source quality-control reports.

F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformer and accessories to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. Comply with IEEE C2.

C. Comply with IEEE C57.12.00.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: The transformers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."
2. Component Importance Factor: 1.5.
3. Component Amplification Factor: 2.5.
4. Component Response Modification Factor: 6.0.

B. Windings Material: Copper.

C. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, fully shielded, separable-elbow type, suitable for plugging into the inserts provided in the high-voltage section of the transformer. Connected in each phase of incoming circuit and ahead of any disconnecting device.

D. Winding Connections: The connection of windings and terminal markings shall comply with IEEE C57.12.70.

E. Efficiency: Comply with 10 CFR 431, Subpart K.

F. Insulation: Transformer kVA rating shall be as follows: The average winding temperature rise above a 30 deg C ambient temperature shall not exceed 65 deg C and 80 deg C hottest-spot temperature rise at rated kVA when tested according to IEEE C57.12.90, using combination of connections and taps that give the highest average winding temperature rise.

G. Tap Changer: External handle, for de-energized operation.

H. Tank: Sealed, with welded-on cover. Designed to withstand internal pressure of not less than 7 psi (50 kPa) without permanent distortion and 15 psig (104 kPa) without rupture. Comply with IEEE C57.12.36.

I. Enclosure Integrity: Comply with IEEE C57.12.28 for pad-mounted enclosures that contain energized electrical equipment in excess of 600 V that may be exposed to the public.

J. Mounting: An integral skid mounting frame, suitable to allow skidding or rolling of transformer in any direction, and with provision for anchoring frame to pad.

K. Insulating Liquids:
1. Less-Flammable Liquids:

a. Edible-Seed-Oil-Based Dielectric: Listed and labeled by an NRTL as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D92. Liquid shall be biodegradable and nontoxic, having passed the Organization for Economic Co-operation and Development G.L.203 with zero mortality, and shall be certified by the U.S. Environmental Protection Agency as biodegradable, meeting Environmental Technology Verification requirements.

L. Sound level shall comply with NEMA TR 1 requirements.

M. Corrosion Protection:

1. Transformer coating system shall be factory applied, complying with requirements of IEEE C57.12.28, in manufacturer's standard color green.

2.3 THREE-PHASE TRANSFORMERS

A. Provide one the follow manufacturers or follow the substitution process to seek approval for a manufacturer not listed below:
1. ABB
2. Cooper Power
3. Maddox
4. Schneider Electric (Square D)
5. Sun Belt

B. Description:

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with IEEE C57.12.26.

C. Compartment Construction:

1. Single-Compartment Construction: Clamshell style, with provision for padlocking, hinged cover, and single-point latching.
2. Double-Compartment Construction: Individual compartments for high- and low-voltage sections, formed by steel isolating barriers that extend full height and depth of compartments, with hinged, lift-off doors and three-point latching, with a stop in the open position and provision for padlocking.

D. Primary Fusing: Designed and rated to provide thermal protection of transformer by sensing overcurrent and high liquid temperature.

1. 150-kV BIL current-limiting fuses, conforming to requirements of IEEE C37.47.
2. Interrupting Rating: 50,000 rms A symmetrical at system voltage.
3. Fuse Assembly: Bayonet-type, liquid-immersed, expulsion fuses in series with liquid-immersed, partial-range, current-limiting fuses. Bayonet fuse shall sense both high currents and high oil temperature to provide thermal protection to the transformer.
4. Provide bayonet fuse assembly with an oil retention valve and an external drip shield inside the housing to eliminate or minimize oil spills. Valve shall close when fuse holder is removed and an external drip shield is installed.
5. Provide a conspicuously displayed warning adjacent to bayonet fuse(s), cautioning against removing or inserting fuses unless transformer has been de-energized and tank pressure has been released.

E. High-Voltage Section: Dead-front design.

1. To connect primary cable, use separable insulated connectors; coordinated with and complying with requirements of Section 260513 "Medium-Voltage Cables." Bushings shall be one-piece units, with ampere and BIL ratings the same as connectors.
2. Bushing inserts and feed-through inserts:

    a. Conform to the requirements of IEEE 386.
    b. Rated at 200 A, with voltage class matching connectors. Provide a parking stand near each bushing well. Parking stands shall be equipped with insulated standoff bushings for parking of energized load-break elbow connectors on parking stands.
    c. Provide insulated protective caps for insulating and sealing out moisture from unused bushing inserts and insulated standoff bushings.

3. Bushing wells configured for loop-feed application.
4. Access to liquid-immersed fuses.
5. Dead-front surge (lightning) arresters.
6. Primary voltage operator (dual wound primary unit); 2 positions, 4.16 kV and 12.47 kV
7. Tap-changer operator; 5 positions (2 above, normal, 2 below). Provided for both primary voltage selections.
8. Load-Break Switch:
    a. Loop-feed sectionalizing switches, using three two-position, liquid-immersed-type switches for closed transition loop-feed and sectionalizing operation. Voltage class and BIL shall match that of separable connectors, with a continuous current rating

and load-break rating of 200 amperes, and a make-and-latch rating of 12 kA rms symmetrical. Switch operation shall be as follows:

1) Position I: Line A connected to line B and both lines connected to the transformer.
2) Position II: Transformer connected to line A only.
3) Position III: Transformer connected to line B only.
4) Position IV: Transformer disconnected and line A not connected to line B.
5) Position V: Transformer disconnected and line A connected to line B.

9. Ground pad.

F. Low-Voltage Section:

1. Bushings with spade terminals drilled for terminating the number of conductors indicated on the Drawings, and the lugs that comply with requirements of Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Metering: Coordinated with and complying with requirements of Section 262713 "Electricity Metering." Make provision for the installation by providing mounting space, brackets, and cable and conduit routing as well as the following:

a. Sensors.
b. BAS interface.
c. Kilowatt-hour meter.
d. Kilowatt-hour demand meter.

G. Capacities and Characteristics:

1. Power Rating (kVA): 300 kVA BASE cost. Provide ADD Alternate cost for increasing to a 500 kVA unit.
2. Voltage Ratings: Dual wound primary; 12,470 V and 4160 V. Secondary - 480Y/277 V.
3. Taps: Comply with IEEE C57.12.26 requirements.
4. Transformer BIL (kV): Comply with IEEE C57.12.26 requirements.
5. Minimum Tested Impedance (Percent at 85 deg C): 2.87 (BASE 300 kVA) and 4.03 ADD ALT 500 kVA).
6. K-factor: K1, complying with UL 1562.
7. Comply with FM Global Class No. 3990.
8. Comply with UL listing requirements for combination classification and listing for transformer and less-flammable insulating liquid.

H. Transformer Accessories:

1. Drain and filter connection.
2. Filling and top filter press connections.
3. Pressure-vacuum gauge.
4. Dial-type analog thermometer with alarm contacts.
5. Magnetic liquid level indicator with high and low alarm contacts.
6. Automatically resetting pressure-relief device. Device flow shall be as recommended by manufacturer. With alarm contacts and a manual bleeder.

7. Stainless-steel ground connection pads.
8. Machine-engraved nameplate, made of anodized aluminum or stainless steel.
9. Sudden pressure relay for remote alarm or trip when internal transformer pressure rises at field-set rate. Provide with seal-in delay.

2.4 SERVICE CONDITIONS

A. Transformers shall be suitable for operation under service conditions specified as usual service conditions in IEEE C57.12.00, except for the following:

1. Altitudes above 3300 feet.
2. Cooling air temperature exceeds limits.
3. Excessive load current harmonic factor.
4. Operation above rated voltage or below rated frequency.
5. Exposure to explosive environments.
6. Exposure to fumes, vapors, or dust.
7. Exposure to hot and humid climate or to excessive moisture, including steam, salt spray, and dripping water.
8. Exposure to seismic shock or to abnormal vibration, shock, or tilting.
9. Exposure to excessively high or low temperatures.
10. Unusual transportation or storage conditions.
11. Unusual grounding resistance conditions.

2.5 CONTROL NETWORK

A. Controllers: Support serial MS/TP and Ethernet IP communications, and able to communicate directly via RS-485 serial networks and Ethernet 10Base-T networks as a native device.

2.6 WARNING LABELS AND SIGNS

A. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

1. High-Voltage Warning Label: Provide self-adhesive warning signs on outside of high-voltage compartment door(s). Sign legend shall be "DANGER HIGH VOLTAGE" printed in two lines of nominal 2-inch-high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background.
2. Arc Flash Warning Label: Provide self-adhesive warning signs on outside of high-voltage compartment door(s), warning of potential electrical arc flash hazards and appropriate personal protective equipment required.

2.7 SOURCE QUALITY CONTROL

A. Provide manufacturer's certificate that the transformer design tests comply with IEEE C57.12.90.

1. Perform the following factory-certified routine tests on each transformer for this Project:

a. Resistance.
b. Turns ratio, polarity, and phase relation.
c. Transformer no-load losses and excitation current at 100 percent of ratings.
d. Transformer impedance voltage and load loss.
e. Operation of all devices.
f. Lightning impulse.
g. Low frequency.
h. Leak.
i. Transformer no-load losses and excitation current at 110 percent of ratings.
j. Insulation power factor.
k. Applied potential, except that this test is not required for single-phase transformers or for three-phase Y-Y-connected transformers.
l. Induced potential.
m. Resistance measurements of all windings on rated voltage connection and at tap extreme connections.
n. Ratios on rated voltage connection and at tap extreme connections.
o. Polarity and phase relation on rated voltage connection.
p. No-load loss at rated voltage on rated voltage connection.
q. Exciting current at rated voltage on rated voltage connection.
r. Impedance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pad-mounted, liquid-filled, medium-voltage transformers upon delivery.

1. Upon delivery of transformers and prior to unloading, inspect equipment for any damage that may have occurred during shipment or storage.
2. Verify that tie rods and chains are undamaged and tight, and that all blocking and bracing is tight. Verify that there is no evidence of load shifting in transit, and that readings from transportation shock recorders, if equipped, are within manufacturer's recommendations.
3. Verify that there is no indication of external damage and no dents or scratches in doors and sill, tank walls, radiators and fins, or termination provisions.
4. Verify that there is no evidence of insulating-liquid leakage on transformer surfaces, at weld seams, on high- or low-voltage bushing parts, and at transformer base.
5. Verify that there is positive pressure or vacuum on tank. Check pressure gauge; it is required to read other than zero.
6. Compare transformers and accessories received with bill of materials to verify that shipment is complete. Verify that transformers and accessories conform with

manufacturer's quotation and shop drawings. If shipment is incomplete or does not comply with Project requirements, notify manufacturer in writing immediately.
7. Verify presence of polychlorinated biphenyl content labeling.
8. Unload transformers carefully, observing all packing label warnings and handling instructions.
9. Open termination compartment doors and inspect components for damage or displaced parts, loose or broken connections, cracked or chipped insulators, bent mounting flanges, dirt or foreign material, and water or moisture.

B. Handling:

1. Handle transformers carefully, in accordance with manufacturer recommendations, to avoid damage to enclosure, termination compartments, base, frame, tank, and internal components. Do not subject transformers to impact, jolting, jarring, or rough handling.
2. Protect transformer termination compartments against entrance of dust, rain, and snow.
3. Transport transformers upright, to avoid internal stresses on core and coil mounting assembly and to prevent trapping air in windings. Do not tilt or tip transformers.
4. Verify that transformer weights are within rated capacity of handling equipment.
5. Use only manufacturer-recommended points for lifting, jacking, and pulling. Use all lifting lugs when lifting transformers.
6. Use jacks only at corners of tank base plate.
7. Use nylon straps of same length to balance and distribute weight when handling transformers with a crane.
8. Use spreaders or a lifting beam to obtain a vertical lift and to protect transformer from straps bearing against enclosure. Lifting cable pull angles may not be greater than 15 degrees from vertical.
9. Exercise care not to damage tank base structure when handling transformer using skids or rollers. Use skids to distribute stresses over tank base when using rollers under large transformers.

C. Storage:

1. Store transformers in accordance with manufacturer's recommendations.
2. Transformers may be stored outdoors. If possible, store transformers at final installation locations on concrete pads. If dry concrete surfaces are unavailable, use pallets of adequate strength to protect transformers from direct contact with ground. Ensure transformer is level.
3. Ensure that transformer storage location is clean and protected from severe conditions. Protect transformers from dirt, water, contamination, and physical damage. Do not store transformers in presence of corrosive or explosive gases. Protect transformers from weather when stored for more than three months.
4. Store transformers with compartment doors closed.
5. Regularly inspect transformers while in storage and maintain documentation of storage conditions, noting any discrepancies or adverse conditions. Verify that an effective pressure seal is maintained using pressure gauges. Visually check for insulating-liquid leaks and rust spots.

D. Examine areas and space conditions for compliance with requirements for pad-mounted, liquid-filled, medium-voltage transformers and other conditions affecting performance of the Work.

E. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will cross section barriers to reach load or line lugs.

F. Examine concrete bases for suitable conditions for transformer installation.

G. Pre-Installation Checks:

1. Verify removal of any shipping bracing after placement.
2. Remove a sample of insulating liquid according to ASTM D923. Insulating-liquid values shall comply with NETA ATS, Table 100.4. Sample shall be tested for the following:

a. Dielectric Breakdown Voltage: ASTM D877 or ASTM D1816.
b. Acid Neutralization Number: ASTM D974.
c. Interfacial Tension: ASTM D971.
d. Color: ASTM D1500.
e. Visual Condition: ASTM D1524.

H. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at transformer location.

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

3.2 INSTALLATION

A. Transformer shall be installed level and plumb and shall tilt less than 1.5 degrees while energized.

B. Comply with requirements for vibration isolation and seismic control devices specified in Section 260529 "Hangers and Supports for Electrical Systems" and Section 260548.16 "Seismic Controls for Electrical Systems."

C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and IEEE C2.

3.3 CONNECTIONS

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

1. For counterpoise, use tinned bare copper cable not smaller than No. 4/0 AWG, buried not less than 30 inches below grade interconnecting the grounding electrodes. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode

system with bare copper conductors, sized as shown. Keep lead lengths as short as practicable, with no kinks or sharp bends.

2. Fence and equipment connections shall not be smaller than No. 4 AWG. Ground fence at each gate post and corner post and at intervals not exceeding 10 feet. Bond each gate section to fence post using 1/8 by 1 inch tinned flexible braided copper strap and clamps.
3. Make joints in grounding conductors and loops by exothermic weld or compression connector.
4. Terminate all grounding and bonding conductors on a common equipment grounding terminal on transformer enclosure.
5. Complete transformer tank grounding and lightning arrester connections prior to making any other electrical connections.

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

1. Maintain air clearances between energized live parts and between live parts and ground for exposed connections in accordance with manufacturer recommendations.
2. Bundle associated phase, neutral, and equipment grounding conductors together within transformer enclosure. Arrange conductors such that there is not excessive strain that could cause loose connections. Allow adequate slack for expansion and contraction of conductors.

C. Terminate medium-voltage cables in incoming section of transformers according to Section 260513 "Medium-Voltage Cables."

3.4 SIGNS AND LABELS

A. Comply with installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with 29 CFR 1910.269.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform the minimum tests and inspections listed below, but not limited to.

1. General Field-Testing Requirements:

   a. Comply with provisions of NFPA 70B Ch. "Testing and Test Methods."
   b. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
   c. After installing transformer but before primary is energized, verify that grounding system at the transformer is tested at specified value or less.
   d. After installing transformer and after electrical circuitry has been energized, test for compliance with requirements.
   e. Visual and Mechanical Inspection:

1) Verify equipment nameplate data complies with Contract Documents.
2) Inspect bolted electrical connections for high resistance using one of the following two methods:

    a) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    b) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

f. Remove and replace malfunctioning units and retest.
g. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

2. Medium-Voltage Surge Arrester Field Tests:

    a. Visual and Mechanical Inspection:

        1) Inspect physical and mechanical condition.
        2) Verify arresters are clean.
        3) Verify that ground lead on each device is individually attached to a ground bus or ground electrode.

    b. Electrical Test:

        1) Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to comply with recommended minimum insulation resistance listed in that table.
        2) Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

3. Liquid-Filled Transformer Field Tests:

    a. Visual and Mechanical Inspection:

        1) Test dew point of tank gases if applicable.
        2) Inspect anchorage, alignment, and grounding.
        3) Verify bushings are clean.
        4) Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
        5) Verify that liquid level in tanks is within manufacturer's published tolerances.

6) Perform specific inspections and mechanical tests recommended by manufacturer.
7) Verify presence of transformer surge arresters and that their ratings are as specified.
8) Verify that as-left tap connections are as specified.

b. Electrical Tests:

1) Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; the value of the index shall not be less than 1.0.
2) Perform power-factor or dissipation-factor tests on all windings according to test equipment manufacturer's published data. Maximum winding insulation power-factor/dissipation-factor values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.3.
3) Measure core insulation resistance at 500-V dc if the core is insulated and the core ground strap is removable. Core insulation-resistance values shall not be less than 1 megohm at 500-V dc.
4) Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
5) Remove a sample of insulating liquid according to ASTM D923, and perform dissolved-gas analysis according to IEEE C57.104 or ASTM D3612.

3.6 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After Substantial Completion, if requested by Owner, but not more than six months after Final Acceptance, perform the following voltage monitoring:

1. During a period of normal load cycles as **established** by Owner, perform seven days of three-phase voltage recording at the outgoing section of each transformer. Use voltmeters with calibration traceable to the National Institute of Science and Technology standards and with a chart speed of not less than 1 inch per hour. Voltage unbalance greater than 1 percent between phases, or deviation of any phase voltage from the nominal value by more than plus or minus 5 percent during test period, is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:

   a. Adjust transformer taps.
   b. Prepare written request for voltage adjustment by electric utility.

3. Retests: Repeat monitoring, after corrective action is performed, until satisfactory results are obtained.
4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove all necessary covers prior to inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of transformer's electrical power connections.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 deg C at 30 deg C.
3. Record of Infrared Inspection: Prepare a certified report that identifies testing technician and equipment used, and lists results as follows:

a. Description of equipment to be tested.
b. Discrepancies.
c. Temperature difference between area of concern and reference area.
d. Probable cause of temperature difference.
e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
f. Identify load conditions at time of inspection.
g. Provide photographs and thermograms of deficient area.

4. Act on inspection results according to recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.

3.7 DEMONSTRATION

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

END OF SECTION 261219

Allied Engineering
Structural Mechanical Electrical Commissioning

ADDENDUM NO. 1

BGS PROJECT NUMBER: **3618** Date of Issuance: 12-12-23

Project Name: Northern Maine Community College – Edmunds Center Transformer Replacement

Supplemental Instruction #: **Scope Revisions-Specifications and plans**

Attention: Deane Rykerson

Company: BGS

Fax:

Address:

AEI Proj. No. 23016

cc: Lee Griffin, Barry Ingraham, Julie Edgecomb AEI cc:

N:\Projects\2022\22017 - Oxford County Jail Renovations\Oxford County Jail HVAC and Electrical Upgrades\3 - Construction\3 PDF SK-Sketches & Supplemental Instructions\ASI 1- Scope Revisions for the District Court Building 12-06-23.doc

Based on contractor and owner questions and comments received on 12-06-23, the following document is offered as an Addendum No.1 to the contract documents for Edmunds Center Transformer Replacement at NMCC. This document is intended to provide scope revisions to the contract documents based upon received bid document questions and comments.

Please replace the following documents with the updated versions included with this Addendum:

1. Specification Cover Sheet, dated 12/12/23.
2. Specification section 011000 – Summary, dated 12/12/23
3. Specification section 260574 – Overcurrent Protective Device Arc Flash Study, dated 12/12/23
4. Specification section 261219 – Pad Mounted, Liquid-Filled, Medium-Voltage Transformer, dated 12/12/23
5. Front End Specification section 001113 -Notice to Contractors for Paper Bid, dated 12/12/23

Please add the following documents included for reference, as requested, with this Addendum:

1. Existing Condition drawing; Electrical – Legend and Notes; Sheet E-000, dated 3/30/01

Attachments: Revised specification sections Cover, 011000, 250574, 261219, 001113 and existing conditions drawing sheet E-000

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