

REQUEST FOR PROPOSALS

Nutting Hall Transformer

Vermont State Colleges System d/b/a Vermont Technical College

ISSUED BY

Vermont State Colleges d/b/a Vermont Technical College

APPLICATION DEADLINE

January 16th, 2023, 2:00 pm Eastern Time

APPLICATION INSTRUCTIONS

Email PDF versions of all documents to michael.stevens@vsc.edu by the deadline, using the following naming convention:

- **Email Subject Line:** RFP Nutting Hall Transformer
- **Organization and Personnel Qualifications:** Applicant_Name_RFP_Nutting Hall Transformer_Qualifications.pdf
- **List of Sub-contractors:** Applicant_Name_RFP_Nutting Hall Transformer_Sub-contractors.pdf
- **References:** Applicant_Name_RFP_Nutting Hall Transformer_References.pdf
- **Fee Proposal:** Applicant_Name_RFP_Nutting Hall Transformer_Fees.pdf

QUESTIONS REGARDING THE RFP

Questions regarding this RFP may be directed to Michael Stevens, Manager of Transformation Projects and Planning at the Chancellor's Office: michael.stevens@vsc.edu. For fastest response please enter **Nutting Hall Transformer Services RFP Question** in the subject line of your message.

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VERMONT STATE COLLEGES SYSTEM OVERVIEW

The [Vermont State Colleges System](#) (VSCS) is currently comprised of four member institutions – [Castleton University](#) (CU), [Community College of Vermont](#) (CCV), [Northern Vermont University](#) (NVU)¹, and [Vermont Technical College](#) (VTC). Across all four institutions, the system educates over ten thousand Vermonters and non-Vermonters each year, employs over three thousand Vermonters, and in Spring 2020, graduated over eighteen hundred Vermonters and out-of-state students into the workforce with certificates and degrees.²

The VSCS is currently undergoing a significant transformation, with the guidance of the Governor, Legislature, the Board of Trustees, and the State’s *Select Committee on the Future of Public Higher Education in Vermont*. The VSCS began working on internal transformation in summer 2020 with the [VSCS Forward Task Force](#) and several institutional tasks forces including [NVU Strong](#) and [VTC’s Transformation Advisory Team](#).

SERVICES REQUESTED

The Vermont State Colleges System seeks a firm or individuals to install a new electrical service to Nutting Hall at Vermont Technical College on the Randolph campus. The scope of this work is outlined in the Drawings and Specification called VTC Nutting Hall Transformer, published by Pearson and Associates on 12/16/22. Those documents are included below.

The selected firm should provide, at minimum, the following services:

1. Manage and complete the scope of work outlined in the VTC Nutting Hall Transformer Plans and Specifications completed by Pearson and Associates and included here in this RFP
2. Obtain all permits needed.

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¹ Northern Vermont University was created on July 1, 2018 from the merger of Lyndon State College and Johnson State College.

²[VSCS Sourcebooks](#) as well as [Board & Committee Meeting Materials and Minutes](#) are available on the System’s website.

QUALIFICATIONS

Firms must have a minimum of five (5) years demonstrated experience and expertise in the successful work associated with this RFP in public or private higher education institutions, public, or private businesses.

EVALUATION

Responses will be evaluated on experience, references, staffing capacity, services to be provided, and costs.

Method of Award

VSCS will base the evaluation of each proposal to this RFP on its demonstrated competence, compliance, format, cost, and enterprise applicability. This includes, but is not limited to, product availability, quality, prices, service availability, timing, and delivery. The purpose of this RFP is to identify those vendors having the interest, capability, and financial strength to install a new electrical service as designed for Nutting Hall at VTC. If the VSCS does not identify a suitable bidder within the RFP process, the VSCS is not obligated to award the project to any bidder.

The VSCS, in its best interests, reserves the option to accept or reject any or all proposals, to accept or reject any item or combination of items therein, to waive any irregularities or informalities in any proposal or items therein, and/or to negotiate with particular bidders following the evaluation of proposals without right of recourse by other bidders. A top proposal would be assessed in the judgment of VSCS as best complying with all considerations set forth in this RFP. When VSCS has tentatively selected a successful proposal, VSC may engage in discussions with the bidder to formulate plans in greater detail, to clarify unclear items for either party, and to otherwise complete negotiations prior to formal selection.

Evaluation Criteria (no weighting is implied by order of listing):

1. The extent to which the bidder's solution matches the requirements of the VSCS.
3. Bidder's qualifications and references.
4. Cost and length of contract.

GENERAL CONDITIONS

1. This RFP does not commit the Vermont State Colleges System to award a contract.
2. This RFP and the process it describes are proprietary to the VSCS and are for the sole and exclusive benefit of the corporation. No other party, including any Applicant, is granted any rights hereunder. Any response, including written documents and verbal communication, by any Applicant to this RFP, shall become the property of the VSCS and may be subject to public disclosure as described in the Confidentiality section, below

3. Submission of a proposal indicates acceptance by the Consultant of the conditions contained in this RFP, unless clearly and specifically noted in the proposal submitted and confirmed in the contract between Vermont State Colleges System and the chosen Consultant selected
4. Responses shall be binding upon the chosen Consultant and irrevocable for up to 60 days following the close of applications
5. From the release date of this request for proposal until award of the contract, no contact with Vermont State Colleges System personnel or board members related to this solicitation is permitted. Direct all communications to the designated contact on the first page of this request.
6. The Vermont State Colleges System reserves the right to:
 - a. Request clarification and additional information from any Consultant during the evaluation process
 - b. Negotiate with the chosen Consultant to include further services not identified in this RFP
 - c. Re-advertise with either an identical or a revised scope of work or cancel requirements in their entirety
 - d. Issue subsequent RFPs based on refinement of concepts proposed in response to this request
 - e. Conduct investigations of the qualifications of the Applicant as deemed appropriate
 - f. Request the Applicant modify the submitted proposal to more fully meet the needs of the Vermont State Colleges System

CONFIDENTIALITY

The Vermont State Colleges System complies with the Vermont Public Records Act, 1 VSA § 315 *et seq.* which requires public agencies to allow any person to inspect or copy any public record upon request. Accordingly, applicants for this RFP are hereby advised that any communications, data or other information received by the Vermont State Colleges System during the RFP process could be subject to a public records request. However, certain public records are exempt from public inspection and copying, as set forth in 1 VSA § 317(c), including, for example, those portions of a record which meet the statutory definition of a trade secret. Accordingly, consultant should submit a second copy of their proposal, from which any portion of the proposal that the consultant reasonably believes to be exempt from disclosure under the Public Records Act has been redacted. By submitting a proposal, you indicate that you understand the requirements of this section and the potential applicability of Vermont's Public Records Act to your proposal.

SUBMISSION REQUIREMENTS

All submissions are due no later than January 16th, 2023 2:00 pm Eastern Time. In three (3) separate documents, to be named as outlined on Application Instructions page, please provide the following:

1. **Organization and Personnel Qualifications:** Provide a statement of qualifications and capability to perform the services sought by this RFP, including:
 - a. Qualifications, and experience of your proposed project team
 - b. Identification of any and all subcontractors.
2. **Fee Proposal:** Provide a fee proposal for the search.
3. **Redacted Copy:** Provide a second copy of the proposal, redacting any portion of the proposal that is reasonably believed to be exempt from disclosure under the Vermont Public Records Act.

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ELECTRICAL GENERAL PROVISIONS 16010 - 1
SECTION 16010 - ELECTRICAL GENERAL PROVISIONS
PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section covers the general provisions that are applicable to all electrical work and the testing of the completed electrical systems. The requirements of other Sections will take precedence over the requirements of this Section.

B. The electrical connections to all equipment and devices, and the requirements for motors, motor starters, panelboards, etc. and other related work are specified in the appropriate Sections of Division 16. Drawings and general provisions of the Contract, including general conditions and supplemental conditions of other specification sections, apply to work in this section.

C. Division 16 covers, in broad detail, the extent of the electrical work and the equipment to be provided and must not be construed as a complete description of all of the details of design and construction required.

D. Drawings

1. Contract Drawings are, in part, diagrammatic and are intended to convey the scope of the work and indicate in general arrangement of the equipment and do not indicate every required offset, fitting, box, etc. Follow these Drawings in laying out the work. Consult all Drawings to become familiar with all conditions affecting the work and to verify spaces in which the work will be installed. Verify all dimensions with architectural plans.

2. Reasonable changes required by job conditions (including offsetting of conduit and light fixtures, etc.) will be made at no additional cost to the owner.

3. Locations of equipment are to be as:

- a. Shown on Drawings;
- b. Directed in the field;
- c. Required for proper connection of equipment to be served;
- d. Required for proper symmetry in the space involved;
- e. With deviations made only with the specific written approval of Architect and/or owner's representative.

E. Definitions - The term "provide" must have the same meaning as "furnish and install". All material so implied either on the Drawings or in these specifications must be furnished and installed unless specifically noted otherwise.

F. Provide all labor, materials, equipment, appliances and tools and perform all work necessary for the complete execution of the electrical work as shown on the Drawings, required by the Specifications and work not specifically shown or specified, yet required to insure proper and complete operation of all systems and to satisfy the design intent inherent in the Work and to comply with all applicable codes, regulations, and Electric Utility Co. requirements.

1.02 QUALITY ASSURANCE

A. All materials, equipment, sizes, capacities and installation of electrical work must conform to the latest requirements of the National Electrical Code, National Electrical Safety Code, the National Electrical Manufacturers Association, the Board of Fire Underwriters, the Underwriter's Laboratories, Inc., the Institute of Electrical and Electronics Engineers, the prevailing State and Local Electrical Codes and to applicable requirements, rules and regulations of the Electric Utility Co. serving the Project.

B. Secure and pay for all permits and inspections required by any of the foregoing authorities. The electrical inspection must be made and approved by the State of Vermont Department of Public and Fire Safety and/or other State and/or local authority having jurisdiction. All certificates must be in duplicate and must be delivered to Engineer and become the property of Owner.

C. Before commencing work, review the Project with the local and State inspectors and Conform, in every respect, with their separate recommendations, unless the recommendations are

inferior to, or in direct conflict with, the Contract Documents, then Engineer's acceptance will be required before proceeding with the Work.

D. Nothing in the Specifications, or shown on the Drawings, must be construed as requiring a violation of any law, code or regulation. Any work or device which fails to receive the approval of any agency must be promptly changed so as to fully comply.

E. All electrical work must be performed by a duly licensed electrician who is qualified to do such work and who is normally engaged in this type of work. Because of the complexity of the electrical work, unskilled labor is not permitted.

F. Electrical Contractor must review the Drawings of other divisions, exchange shop Drawings with them, cooperate in the preparation or prepare space layouts as required, to avoid conflicts and interferences with the installation of other trades in the advanced stages of construction.

G. If, in the interpretation of contract documents, it appears that the Drawings and specifications are not in agreement, the one requiring the greater quantity or superior quality must prevail, as decided by the Engineer.

H. All equipment and materials used on this project must be new. No item will have ever been put into service and all items must have been manufactured less than one year.

1.03 SUBMITTALS

A. Submit electronic copies of all submittal data and/or complete shop drawings as specified in each section for review.

B. Submittals must be complete by specification article. All items specified under the same article as the major item must be included in the submittals. No partial or incomplete submittal will be accepted or reviewed. Submittals for equipment requiring electrical service must include wiring diagrams.

C. Submittals and/or shop drawings are to be edited to show specific data for the equipment that the Contractor intends to provide.

D. Submittals and/or shop drawings are to be identified with numbers and letters identical to those listed on the Drawings and/or specifications.

E. Submit electronic copies of installation instructions and operation and maintenance manuals for all equipment.

F. Submit electronic copies of all required permits.

G. Submit electronic copies of electrical inspection certificates.

I. Submit complete listing of all tests performed and copies of the certified test results.

J. Submit as-built wiring diagrams and a copy of all circuit directories.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver equipment in crates or cartons and do not uncrate until ready for installation. Protect equipment against weather, damage, and vandalism.

B. Properly store all materials and equipment in accordance with the manufacturers' recommendations and as required to protect them from damage and corrosion. Check and properly receipt material "furnished by others", and assume full responsibility for all above materials while in receipt of Contractor and/or in storage with full visible identification and information.

C. Temporarily close all openings to prevent obstruction, damage or the intrusion of foreign materials.

1.05 POWER CHARACTERISTICS

A. Incoming Power – 120/208Y, 3Ø, 60Hz., 4 wire

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials and equipment must be new and must conform to UL Standards and carry the UL Label in every case where UL Standards have been established for the materials or equipment.

B. To the maximum extent possible, all electrical equipment for any one system must be the product of a single manufacturer. Engineer reserves the right to disapprove and reject equipment from various manufacturers when acceptable components can be secured from fewer manufacturers and to require that source of materials be unified to the maximum extent possible.

C. Permission to substitute equal or superior items may be requested. Completion date will not be extended because of any time lost due to consideration or installation of substitutions. All

coordination of substituted equipment will be the Contractor's responsibility.

2.02 NAMEPLATES

A. Provide nameplates for all items of equipment on all panelboards, controllers, selector switches, starters, safety switches, push button stations, and relay and equipment enclosures.

B. Nameplates must be black laminated plastic or bakelite, with four edges neatly beveled.

Lettering must be engraved, white, with a height of approximately 3/16" to 1/4".

C. Provide two holes in nameplate and secure to equipment with non-ferrous screws. If adequate space is not available on item to which nameplate is to be affixed, nameplate may be installed adjacent to and as close to the item as possible, and in a position where it is readily visible.

D. Notations on nameplates must be exactly the same as the corresponding notations that appear on the Drawings.

2.03 EQUIPMENT SUPPORTS

A. Provide all structural supports required for proper attachment of all equipment. Wall mounted equipment may be directly secured to walls with approved anchors.

B. Maintain air space between equipment and supporting walls. Groups or arrays of equipment may be mounted on adequately sized steel or aluminum channels, angles or bars.

Prefabricated steel channels equal to those manufactured by Unistrut or Kindorf are acceptable.

C. Equipment suspended from ceilings must be supported by adjustable threaded steel rods of adequate strength. No hangers may be secured to furred or suspended ceilings or attached to or carried through ductwork.

D. Provide all necessary anchoring devices and supports.

1. Use structural supports suitable for equipment.

2. Check electrical loads and dimensions of equipment with shop drawings.

3. Do not cut or weld to building structural members.

4. Unless otherwise noted herein or on Drawings, supports, anchors, anchoring devices and procedures must conform to the requirements of Division 5.

2.04 MATERIAL AND CONSTRUCTION REQUIREMENTS

A. Unless otherwise shown on Drawings or specified, all enclosures, motors, wiring and other materials and all construction methods must conform to the following:

1. Indoor, Above Ground, Dry Areas - NEMA 1, General Purpose, with gasketing for general purpose applications where atmospheric conditions are normal. Enclosures must be sheet steel, treated to resist corrosion, prime painted and finished with a gray baked-on enamel. Control stations must have NEMA 12, oil-tight and dust-tight enclosures.

2. Outdoors, Moist Areas and Indoor Below Grade Areas - NEMA 3R, rain-tight.

2.05 OTHER MATERIALS

A. All other materials, equipment, accessories, hardware, and appurtenant items, not specifically described but required for a complete and operable electrical installation, must be new, of respective kinds, and as selected by Contractor subject to the acceptance of Engineer.

2.06 SPECIAL TOOLS/SPARE PARTS

A. Provide all special tools that are necessary for the proper operation and maintenance of the electrical systems.

B. Provide all spare parts that are necessary to insure the proper operation of the electrical systems for the first year of normal operations. Required spare parts are listed in other sections of this division.

C. Furnish two extra sets of fuses for each fuse type and rating incorporated in the Work.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to performing work required under Division 16, carefully inspect all existing conditions and the installed work of all other trades and verify that all conditions and all such work is complete to the point where the electrical work may properly commence.

B. Verify that electrical work may be done in complete accordance with all pertinent laws, codes, regulations and the design.

C. In the event of discrepancy, immediately notify Engineer.

D. Do not proceed with the work in areas of discrepancy until all such discrepancies have been

fully resolved.

E. Notify proper authorities for inspections of Work required by applicable codes, rules or regulations.

3.02 PREPARATION

A. Before any work on the new Electrical upgrade systems, the contractor must develop a work plan and schedule. This schedule must be reviewed and approved by the Owner prior to commencement of any work.

B. Layout all work at the site by consultation with Owner before installing work. Eliminate any conflict between the timing of this work and scheduling concerns.

C. Coordinate electrical work, in advance, with other work. The installation of chases, openings, sleeves, etc., required for panels, boxes, outlets, receptacles, conduit, supports, wireways, etc., must be done at such time as to minimize the need for subsequent cutting and patching.

Before the ordering of any equipment, verify the location, type, and characteristics of service to be furnished.

D. Contractor is cautioned that the power requirements and sizes of various equipment and machinery are subject to change and will be based on the accepted product or substitution actually provided. The actual equipment and machinery installed could result in the need to provide different sized wires, cables, conduits, boxes, starters, overload protection, fuses, and other electrical equipment, controls and materials. As such, the ordering and installation of work is not recommended nor encouraged until all shop drawings and other submissions have been made and have been accepted by Engineer, and all setting and power requirements determined, and then only after Contractor has coordinated all submissions with all equipment suppliers and verified compatibility and determined the sizes required for each individual component. Any such work ordered or installed by Contractor prior to performing this coordination must be his responsibility; and any modifications necessary must be made at no additional cost to provide electrical systems in complete compliance with the Contract Documents, and to accommodate final installed equipment requirements.

3.03 SCHEDULING

A. All work must be coordinated with the owner and tenant. Downtime must be kept to a minimum, with as much preparation accomplished beforehand as possible. A written work schedule must be presented to, and accepted by, the Owner prior to the commencement of any work.

B. All required work must be done as scheduled with the owner and tenant. The Contractor is responsible for all expenses required for overtime. Extra charges for overtime or off-hour work will not be accepted.

C. A written work schedule must be provided to the owner and tenant within 10 days of the award of contract.

3.04 PERFORMANCE

A. Perform all work that is both requisite and essential in completing the intended installation in the proper manner.

B. The Drawings indicate the general arrangement of circuits and outlets, locations of switches, panelboards, conduits and other work. Field verification of all dimensions is required. Specifications and Drawings are for assistance and guidance, but exact locations, distances and levels must be governed by actual field conditions. Conduit runs and grounding are shown diagrammatically only, and the layout does not necessarily show the total number of conduits for the circuit required, nor is the location of indicated runs intended to show the actual routing of conduits. Furnish, install and place in satisfactory condition, ready for operation, all conduits, cables and all other materials needed for the complete lighting, power and other electrical systems as shown or indicated on the Drawings. Install additional conduits and required wiring whenever needed to complete the installation of the specific equipment.

C. If any departures from the Drawings are deemed necessary by Contractor in order to furnish an efficient, complete and satisfactory installation, details of such departures and the reasons therefore must be brought to the attention of Engineer. Layout all work at the site by consultation with the various trades before installing work to eliminate any conflict between this work and work of other trades.

D. Wherever obstructions are encountered in the path or course of the Work that are not shown nor anticipated in the Contract Documents, do not proceed with the installation of the Work

before advising Engineer and receiving detailed information or Drawings or both. Failure to follow this precaution will obligate Contractor to the full extent of all necessary changes and adjustments to conform to the requirements of Engineer.

3.05 INSTALLATION

A. Install all work at the locations shown on the Drawings. Install all work plumb, level and square.

B. Where concealed work is designated, conceal the work within walls, floors, ceilings or underground. Panelboards, switches, receptacles, control stations and other control and wiring devices must be "flush mounted", complete with cover plates or doors, as applicable. Unless otherwise shown or specified, all other work may be "surface mounted".

3.06 PENETRATIONS

A. Except where absolutely necessary, do not penetrate roofs and waterproofed surfaces. Where required, make penetrations prior to the application of roofing and waterproofing materials and provide all sleeves, pitch-pockets and other acceptable items. Advise Engineer in advance before making such penetrations, even where such penetrations are shown on the Drawings.

B. Seal all work and penetrations that enter or leave a room or structure that may contain a corrosive or potentially lethal atmosphere. Install seals in a manner to stop vapors and gases from escaping or from being communicated from such areas, through conduits and wireways, as well as around conduits or wireways.

C. Thoroughly seal all work and penetrations entering or leaving hazardous areas in accordance with NEC requirements.

D. Sleeves through fire rated walls, shafts, floors and partitions must be packed full length with UL listed fill to maintain the rating of the separation.

3.07 BALANCING LOADS

A. Circuit numbering on the Drawings is indicated for clarification only. Because substitutions may produce different electrical loads, balance all light, power and heat loads so that a phase-to-phase difference of 5% is not exceeded.

3.08 FIELD QUALITY CONTROL

A. Check for proper phase sequence and test all parts of the electrical systems before placing them in service.

B. Provide all labor, materials, testing equipment, electricity, fuel, lights, lubricants, equipment, instruments and all other materials required for conducting all tests.

C. All systems must test free from short circuits and grounds, must be free from mechanical and electrical defects, and must show insulation resistance between phase conductors and ground of not less than that required by NEC, or as specified herein.

D. All systems must show proper neutral connections.

E. Insulation test of equipment, motors, cables, etc. must pass the Standard Insulation Test established by the IEEE and must be made before and after all required high potential tests.

All insulation testers must be of the motor driven, direct reading type, unless otherwise noted.

F. Check nameplate data on each piece of equipment and furnish copy of list to Engineer.

G. Check all motors for proper rotation and speed and all starters for proper overload protective elements. Correct all incorrect conditions.

H. Conduct a ground test on each and every circuit with conductors #2AWG and larger. The test results must not be less than those required by the NEC or Underwriters Laboratories. Furnish a detailed record of these tests.

I. Test all electrical devices for proper control of motors and equipment.

J. Lamp all fixtures with lamps of designated rating, color and pattern and check operation.

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K. Check amperage in all circuits and compare to nameplate data.

L. Conduct all other tests required to secure approval of the Work from all agencies having jurisdiction.

3.09 ADJUST AND CLEAN

A. Replace any portion of the Work that does not conform to established standards and

requirements.

B. During tests, make all adjustments and changes until the equipment and systems are operating satisfactorily.

C. Should any defects be suspected or found after tests have been completed, make all required adjustments, repairs, and replacements, and retest to the satisfaction of Engineer.

D. Clean all exposed electrical work and remove all unnecessary labels, soil, markings, and foreign material. Do not remove labels required by the Specifications, laws, regulations and codes (e.g. UL Labels) or special labels warning of hazards, denoting special operating and maintenance procedures or labels with other important or meaningful messages, directions or warnings.

E. Thoroughly clean the interior of panelboards and the like and remove all dust, dirt, and other foreign materials which may adversely affect the operation of equipment, damage equipment, or which may create a potential hazard or unsafe condition.

F. Replace or thoroughly dry all electrical appliances or equipment that have been subjected to injury by water. Dielectric test, as directed, all appliances or equipment that is dried.

3.10 PROTECTION

A. Contractor will be responsible for proper protective and safety measures when working overhead, under power lines, underground and in finished areas and must provide all safety equipment and devices and make all repairs, replacements and touch-ups of all work and materials which may become damaged.

B. Where touch-ups do not unnoticeably blend in with adjacent surfaces, as determined by Engineer, replace or completely repaint the entire piece in question.

3.11 INSTRUCTION SERVICES

A. Provide a competent instructor, when requested by Engineer, to instruct Owner and his representatives in the proper operation and maintenance of the electrical systems.

B. Include in the Contract Price, the cost of the instructor on-site time, which may be broken down into several days during the period commencing near the date of final installations and extending through the one-year guarantee period. The instructor's time is totally independent of any time necessarily required of Contractor to return to the Project during the guarantee period for repairs, corrective work or for any other reasons.

END OF SECTION

ELECTRICAL DEMOLITION 16050 - 1

SECTION 16050 – ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide electrical demolition work required for removal / abandonment of systems, equipment and devices, etc. made obsolete by this Project, and as required for demolition and remodeling by other trades.

B. Related work specified elsewhere includes:

Other Electrical Work Division 16

1.02 EXISTING CONDITIONS

A. In general, existing electrical systems, equipment and devices are not shown on the Drawings unless pertinent to the remodeling work. Existing electrical conditions, where indicated, are based on casual field observations and must be field verified by the Contractor. Report any discrepancies to the Engineer before disturbing the existing installation.

B. Before bidding, examine the site to determine all actual observable conditions. No additional compensation will be granted for extra work made necessary by the Contractor's failure to investigate such existing conditions.

1.03 COORDINATION

A. The Contractor must bear in mind that adjoining areas of the building must remain in operation, and electrical systems and services must remain in operation at all times, unless specifically approved otherwise.

B. Scheduling of all demolition Work must be performed by the Contractor. Coordination and cooperation of contractor must be expected in all conditions at all times.

C. Construction traffic and removal of debris will be limited to specific areas and routes. Confirm

with the Owner.

D. The Contractor must perform all electrical work that is necessary for the demolition and upgrading work performed.

1.04 ADJACENT MATERIALS

A. During execution of the demolition work, primary consideration must be given to protecting from damage, the building structure, furnishings, finishes, and the like, which are not specifically indicated to be removed.

B. Existing items or surfaces to remain, which are damaged as a result of this work, must be refinished, repaired or replaced to the satisfaction of the Engineer / Owner, at no cost to the Owner.

C. Locate and identify all electrical conduit and wiring passing through the project area and serving areas outside the work limits. Maintain electrical circuit continuity to all areas outside the work limits unless specifically authorized otherwise in writing by the Engineer / Owner. When through-circuits must be interrupted, provide temporary wiring for affected areas outside the work limits to minimize or eliminate the outage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials used for patching must be in conformance with the applicable sections of the Project Manual. Where materials are not specifically described, but required for proper completion of the Work, they must be selected by the Contractor, subject to approval of the Owner / Engineer.

PART 3 - EXECUTION

3.01 INSPECTIONS - VERIFICATIONS

A. Before commencing work of this section, carefully inspect the project areas and become familiar with existing systems and conditions.

B. Verify with the Owner, all systems, materials and equipment which are to be salvaged and those which must be removed. The Owner reserves the right to salvage any or all existing electrical materials and equipment at the project site.

3.02 COORDINATION

A. Coordinate all demolition work through the Owner and with all other trades and utilities.

3.03 PREPARATION

A. Before any work on the new and existing Electrical systems, the contractor must develop a work plan and schedule. This schedule must be reviewed and approved by the Owner prior to commencement of any work.

B. Layout all work at the site by consultation with Owner before installing work. Eliminate any conflict between the timing of this work and scheduling concerns.

C. Coordinate electrical work, in advance, with other work. The installation of chases, openings, sleeves, etc., required for panels, boxes, outlets, receptacles, conduit, supports, wireways, etc., must be done at such time as to minimize the need for subsequent cutting and patching.

Before the ordering of any equipment, verify the location, type, and characteristics of service to be furnished.

D. Contractor is cautioned that the power requirements and sizes of various equipment and machinery are subject to change and will be based on the accepted product or substitution actually provided. The actual equipment and machinery installed could result in the need to provide different sized wires, cables, conduits, boxes, starters, overload protection, fuses, and other electrical equipment, controls and materials. As such, the ordering and installation of work is not recommended nor encouraged until all shop drawings and other submissions have been made and have been accepted by Engineer, and all setting and power requirements determined, and then only after Contractor has coordinated all submissions with all equipment suppliers and verified compatibility and determined the sizes required for each individual component. Any such work ordered or installed by Contractor prior to performing this coordination will be his responsibility; and any modifications necessary will be made at no additional cost to provide electrical systems in complete compliance with the Contract Documents, and to accommodate final installed equipment requirements.

3.04 PERFORMANCE

A. Remove pertinent existing electrical equipment, devices raceway, wiring and related materials

within the project work limits as indicated on the contract documents and as required for the completion of all work in other divisions.

1. Remove all abandoned devices and all dead wiring back to source.
2. Remove all abandoned conduit, boxes, supports, etc. where exposed, including items above suspended ceilings. Cut conduits flush with walls and ceilings and plug opening with like material.
3. All shutdowns of systems and electrical services must be scheduled and approved in writing by the Owner.
4. All material removed, including light fixtures, ballasts, and tubes are to be disposed of by the electrical contractor in a legal manner that complies with all rules and regulations. This includes electrical material that may be considered hazardous.

3.05 EXISTING WORK TO REMAIN

- A. Existing lighting and power branch circuits and devices that are not removed must be rewired and reconnected to new panels if the panel feeding the branch circuit and/or device is removed.
- B. Where electrical systems in adjoining areas, or electrical systems indicated to remain become disconnected or affected by demolition work, reconnect circuits, etc. as required to restore original operation. Restoration work to comply with requirements of new Work.

3.06 CLEANING

- A. Remove from the Project site, on a daily basis, all dirt, dust, debris, and equipment deemed unwanted by Owner, resulting from demolition operations. Refuse should not be allowed to block or otherwise impair access in corridors, stairs, sidewalks, or other traffic areas.

END OF SECTION

CONDUITS AND BOXES 16111 - 1

SECTION 16111 - CONDUITS AND BOXES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work covered by this Section includes the furnishing and installation of conduits and boxes.
- B. Related work specified elsewhere includes:
Other Electrical Work Division 16

1.02 QUALITY ASSURANCE

- A. Set all conduits and boxes plumb and level.
- B. All conduits and boxes must be straight, free from blisters and defects, and must bear the Underwriters' Label.
- C. All conduits, boxes, raceways, etc. installed in finished areas must be concealed from view.

1.03 PENETRATIONS

- A. Waterproofed Surfaces - Except where absolutely necessary, do not penetrate roofs and waterproofed surfaces. Where required, make penetrations prior to the application of roofing and waterproofing materials and furnish all sleeves, pitch pockets and other approved items.

PART 2 - PRODUCTS

2.01 RIGID CONDUITS

- A. Except where otherwise noted and described within these specifications, all conduits must be rigid steel conduit or intermediate metal conduit, high grade, mild steel electrical pipe conforming to ANSI C80.1 and NEC Article 344.
- B. Rigid conduit must be galvanized and threaded and delivered with conduit couplings or tightly fitted plastic or fibre thread protectors.

2.02 THINWALL CONDUITS

- A. Thinwall (EMT) conduit must be used for all branch circuit and feeder work in dry locations inside buildings.
- B. Installation must be in accordance with N.E.C. Article 358. Thinwall conduits must be as manufactured by Republic, Triangle, Allied or approved equal. Steel set screw fittings may be installed where allowed by NEC.

2.03 RIGID NON-METALLIC CONDUIT

- A. Rigid non-metallic conduit schedule 40 PVC may be used for service entrance ductbank, -

underground branch circuits and in concrete slabs. Rigid non-metallic conduit for service entrance must be concrete encased under roads and driveways.

B. Installation and fittings must be in accordance with N.E.C. Article 352. Rigid non-metallic conduits must be as manufactured by Carlon or approved equal.

2.04 FLEXIBLE GALVANIZED METAL CONDUIT

A. Flexible galvanized metal conduit must be used between outlet boxes in hung or furred ceilings and flood type lighting fixtures.

B. Installation must be in accordance with N.E.C. Article 348. Materials must be as manufactured by Republic, Allied, Triangle, or approved equal.

2.05 LIQUID-TIGHT FLEXIBLE CONDUITS

A. Make terminal connections to motors and equipment with liquid-tight, flexible conduit of the same size as the conduit run.

B. Maximum length of liquid-tight flexible conduit - 18".

C. Conduit must be single strip, continuous, flexible, interlocked, durable wrapped steel, galvanized inside and outside, and provided with a tough, inert and watertight plastic jacket, conforming to NEC Article 350.

D. Conduits must be Seal-Tite, type V.A. (American Brass Co.), Flex-Seal, Type XI (Columbia Cable & Electric Corporation), or equal.

2.06 CONDUIT FITTINGS

A. Fittings must be malleable or cast iron with threaded hubs and full body design conforming to NSI C80.4.

B. Covers must be of stamped metal heavy cast metal with composition gaskets (weatherproof type or vaportight type, as applicable).

C. Fittings and covers must be galvanized or cadmium plated, inside and outside.

D. For liquid-tight flexible conduits, fittings must have body and gland nut of cast malleable iron, cadmium plated, a one-piece brass grounding bushing which threads to interior of conduit spiral and a molded vinyl sealing ring between gland nut and bushing.

E. Couplings and elbows must be threaded, same as conduit.

F. Fittings must be the "Condulet" type.

2.07 SURFACE RACEWAY

A. Except as otherwise noted, all branch circuit wiring in finished areas must be concealed. Surface raceway may be used only by permission of engineer and owner in existing areas deemed too difficult to conceal wiring.

B. Surface raceway will be allowed in the mechanical and electrical rooms. All other raceways must be concealed above ceilings.

C. Surface metal raceways must be used where indicated on drawings.

D. Provide all surface metal raceways and all couplings, elbows, boxes, support clips and other appropriate fittings to provide a safe and complete installation.

E. Size to accommodate required number of conductors.

F. The surface metal raceway must be Wiremold Co. 500 or 700 series, Walker or approved equal. Color must be determined by architect. Multiple service raceway must be Wiremold Co. G4000 series, Walker or approved equal.

2.08 GENERAL

A. Conduits must be sized per ANSI C1 (National Electrical Code). Unless otherwise noted, minimum size will be 3/4".

B. Each length of conduit must bear the UL label and the manufacturer's name or trademark.

C. Provide No. 12 galvanized pulling wire in each empty conduit and duct, continuous.

D. Provide all unions, reducers, conduit caps and all other fittings and hardware required to complete all conduit runs.

E. Use lock nuts and proper insulating type bushings, as required.

F. Fasten all metallic conduits and armored cable to each adjacent section and to all boxes, fittings and equipment with firm, clean metallic contact to provide a well and continuous grounded system.

G. Provide conduit expansion fittings, complete with bonding jumpers, at all concrete expansion joints, between concrete structures and where conduits are firmly attached to two independent structures.

2.09 JUNCTION, PULL AND OUTLET BOXES

- A. Size and gauge of boxes must be in accordance with ANSI C1 and as required by the construction.
- B. Boxes and covers must be of sheet steel and must be hot dipped galvanized after fabrication. Secure covers to boxes with brass or galvanized machine screws.
- C. Provide cut or punched conduit holes. Torch cutting is not permitted.
- D. All boxes exposed to the weather, moisture or vapor must be cast aluminum with threaded hub. Covers must be gasketed to make boxes vaportight and waterproof.
- E. All boxes must be provided with suitable ground lug.
- F. Where more than two switches or other similar wiring devices are indicated at a single location and at the same elevation, they must be installed in gang boxes with one cover plate.

2.10 UNDERGROUND CONDUIT

- A. Unless otherwise specified or shown on the Drawings, all underground conduits must be coated with an approved asphaltum paint and encased in sand.
- B. Encasements, all around conduit, must be a minimum of 6" of sand, unless otherwise specified or shown on the Drawings.

PART 3 - EXECUTION

3.01 INSPECTIONS - VERIFICATIONS

- A. The Drawings indicate the general locations of outlets, fixtures, equipment, wiring and other electrical devices and the general details for the complete electrical and telephone installations.
- B. Conduit locations are diagrammatic only and do not necessarily indicate the exact location or routing.
- C. Prior to locating and installing conduits and boxes, check the Contract Drawings and the Work to be sure that the locations of all conduits and boxes will not interfere with or be covered by doors, casework, heating and process equipment, or the like, and that conduit stubs for motors and equipment will be placed in the proper locations.

3.02 INSTALLATION OF CONDUIT

- A. Conform to NEC requirements.
- B. Unless otherwise directed by Engineer or shown on the Drawings, all conduits must be concealed in floors, walls, ceilings or underground.
- C. For exposed work, support conduit every eight (8) feet with galvanized malleable iron one-hole straps and "clampbacks." Secure tightly with screws, bolts or other approved means. Size of bolts must be commensurate with supported weight.
- D. For parallel groups of exposed conduits, provide trapeze hangers or other approved method of installation.
- E. All exposed conduits must be neat and symmetrical and run parallel with adjacent walls, partitions and ceilings. Diagonal runs are not permitted.
- F. Perforated straphangers are not permitted.
- G. "Running thread" type conduit connections are not permitted.
- H. In fill or slabs, run conduits as straight and direct as possible. Where required, use long radius bends. In structural slabs less than 4" thick, conduits having "D" over 1" are prohibited, where "D" is the maximum outside diameter or dimension of the conduit. In structural slabs 4" and thicker, "D" must not exceed 1-½ inches. Where conduits are permitted in the slab, the center-to-center spacing must not be closer than 3 "D" and in no case, less than 2 inches clear.
- I. Conduit runs, through or below equipment foundations, are not permitted.
- J. Unless otherwise specified or directed by Engineer, the minimum depth of cover over underground concrete encasements must be 30", except under roads, parking lots and other traveled areas where it must be 48".
- K. Underground conduit runs must be pitched for drainage, away from the level of entry to buildings or equipment.
- L. In concrete walls below grade provide O. Z. Gedney type "FSK", or approved equal sleeves for all conduits.
- M. The use of wooden plugs inserted into concrete or masonry as a base to fasten conduits is not permitted.
- N. Avoid bends and offsets where possible. Where necessary, use a conduit-bending machine. No bends greater than 90° are permitted in any one run of conduit. Provide pull boxes where

more bends are necessary.

O. Deformed or crushed conduit is not permitted.

P. Cut conduit with powered hacksaw. Cut ends square. Cut threads, clean and ream.

Q. Maintain six (6) inch minimum separation between all conduits and water lines.

R. All couplings must be pulled up tight to provide electrical bond. Ends of conduits terminating in a pressed steel box must be provided with a galvanized locknut and bushing inside and a locknut outside. Fiber or hardwood bushings are not permitted at termination of feeder conduits.

S. Plug and cap all conduit until ready to pull wires and make connections.

3.03 INSTALLATION OF BOXES

A. Locate special function outlets where shown on the Drawings.

B. Make dimension between door openings and wall switches uniform throughout the work.

C. Boxes must be supported independently of all conduits and must be rigidly secured in place.

D. On concrete, brick or other masonry surfaces, secure surface mounted boxes with machine screws or bolts and expansive type shield.

E. On building steel, secure boxes by means of clamp type supports and provide rigid vibrationproof installation.

G. Surface mounted pull and junction boxes, one-foot square or more in area, must be installed to provide a minimum air space between box and mounted surface of one (1) inch.

3.04 ADJUST AND CLEAN

A. Adjust all work to provide a rigid, neat, and clean conduit system.

B. Clear conduits of all obstructions and dirt prior to pulling wires or cables. Use ball mandrel, with a diameter equal to approximately 85% of the inside diameter of the conduit, followed by a close fitting wire brush and wad of felt or similar material. This assembly may be pulled together with, but ahead of, the cable being installed.

C. Clean empty conduits, as specified above.

END OF SECTION

WIRES AND CABLES 16120 -1

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the furnishing and installation of wires and cables and connections to all equipment, motors, meters, lighting fixtures, motor control centers and electrical signal devices.

B. Related work specified elsewhere includes:

Excavating, Trenching and Backfilling

Other Electrical Work Division 16

C. Definitions: AWG - American Wire Gauge

1.02 QUALITY ASSURANCE

A. Acceptable manufacturers of wire and cable are Anaconda, General Electric, Senator or an approved equal.

B. Acceptable manufacturers of solderless pressure type terminals and lugs are O.Z. Manufacturing Co., Burndy Manufacturing Co., Thomas & Betts (T & B), or an approved equal.

1.03 SUBMITTALS

A. Cut-sheets of wires, cables and connectors proposed for use.

B. Description indicating where each type of wire and cable will be used.

C. Manufacturers' descriptive literature.

1.04 DELIVERY - HANDLING

A. Deliver all wires and cables in full coils or reels and protect against injury. UL "Approved Tags" giving grade of insulation, size and length of wire in each coil or reel and the manufacturer's name and date of manufacture must be securely attached to each carton or reel.

PART 2 - PRODUCTS

2.01 WIRES AND CABLES

A. Conductors must be hard drawn copper wire having a conductivity of 98% of that of pure copper (Matthiessen's Standard) throughout their lengths.

B. All wire and cable insulation and all outer covering must be designed for the conditions under which the wire or cable is to be used.

C. Wire for lighting branch circuits must be no smaller than No. 12 AWG. Wires of greater size, as indicated or required, must be used to minimize voltage drops. Use no wire smaller than No. 10 AWG in runs exceeding 50' from the lighting panel to the first outlet or lighting fixture and between fixtures. Conductors of No. 12 AWG may be solid, and conductors of sizes greater than No. 12 AWG must be stranded.

D. Wire and cable for power circuits must be insulated for not less than 600 volts with moisture and heat resistant insulation, Type XHHW or THWN.

E. Cable for lighting circuits must be 600-volt moisture and heat resistant wire, Type THHN or THWN. Where wire is used for direct burial or in conduits that are installed underground, in damp locations and/or exposed to moisture, use Type RHW or XHHW.

F. Cable for 120-volt control circuits must be No. 14 AWG, multi-conductor flame resistant, jacketed, cable. Each single wire must consist of 7 strand bare copper, insulated with Type XHHW. Where control circuits are installed in conduits, single conductor cable may be used in lieu of multi-conductor assembled cable.

G. All conductors for power control, alarm and indication must be solid or as specifically shown on the drawings and other specific areas of the Specification.

H. Cable without conduit may be provided for communication, sound systems and fire systems where concealed and protected. Cable must be UL listed for the application per NEC and be plenum rated.

I. Metal clad cable (Type MC) may be provided for concealed branch circuit wiring per NEC. Exposed MC cable is not permitted.

J. High Voltage cable and terminations must be as specified on the drawings.

2.02 WIRE AND CABLE IDENTIFICATION

A. Conductors must be color coded as follows:

Phase 120/208V 277/480V

A Black Brown

B Red Orange

C Blue Yellow

Neutral White or Grey White

Equipment Ground Wire Green Green

B. Tag cables and wires in pull boxes, panelboards, motor control centers, at equipment, and at electrical devices. Tags must be printed, stamped or engraved to indicate the circuit number, the voltage, the phase and a one-word description of its use or an equipment number designation. (e.g. - For Blower B-1, tag would read "B-1, 208V, 3Ø" --- For lighting, tag would read "LIGHT, CKT 18, 120 V., 1Ø"). Tags must be wrap-around self-laminating, adhesive backed tags equal to Brady B-191, or phenolic cable marker tags equal to those manufactured by Seton Nameplate Corp.

2.03 SOLDERLESS PRESSURE CONNECTORS

A. No. 10AWG and smaller - T & B "Sta-Kon".

B. No. 8AWG and larger - T & B Series 54100.

2.04 UNDERGROUND MARKERS

A. All underground wires, cables and conduits, which are not encased in concrete, must have a plastic ribbon marker installed in the backfill, located directly over the line and approximately 9" below finished grade, unless otherwise noted.

B. Markers must be "Terra Tape" as manufactured by Griffolyn Co., Inc., or equivalent by Seton Nameplate Corp., or equal. Tape must have a magnetic tracing wire.

C. Tape must be imprinted with appropriate warning words similar to, "CAUTION - BURIED ELECTRIC LINE BELOW".

PART 3 - EXECUTION

3.01 INSPECTION

A. Do not pull wires and cables until conduits have been installed and cleaned and cleared of obstructions.

B. Check all nameplate data of equipment actually furnished to determine wire sizes required.

3.02 INSTALLATION

- A. All circuits must be made up of single conductor wire or cables, unless otherwise noted.
- B. Carefully install conductors to prevent damage to insulation and do not apply excessive strain on the wires.
- C. If lubrication is necessary, install conductors using powdered soapstone or other UL labeled electrical lubricant. Oils, greases or other compounds are not permitted for use as lubricants.
- D. Conductor splices in raceways or fittings are not permitted.
- E. Where enclosure size of terminals at control devices make 7 strand No. 12 AWG wire termination impractical, termination of external circuits may be made in adjacent junction boxes with terminal strips, with No. 14 AWG stranded wires provided between terminal strips at control device and junction box.
- F. Provide all wire connectors, terminal lugs and other items required and necessary to complete all wiring.
- G. Connection of conductors to terminal posts or other conductors must insure a thorough and tight connection without damaging the conductor. Make connections by means of solderless pressure type terminals or lugs. Connectors must be for proper cable size and must have a conductivity not less than that of the wire or cable to which they are attached. Carefully finish and fit to provide a low resistance connection without reducing cable copper.
- H. Installations requiring special tools for proper application must be installed only with those tools and in accordance with the established practice and the recommendations of the manufacturer.
- I. Remove and replace any wire, cable, insulation, connector or other item of work, which has been pinched, scraped, broken, impaired or damaged.
- J. All circuits must have full size neutral conductors. All neutral conductors must be the same size as the phase conductors. No circuits must share neutral conductors.

3.03 PERFORMANCE

- A. The number of wires indicated on the Drawings for all electrical, control, indication, metering, telephone and signal circuits have been determined for the general schemes based upon the requirements of the particular type and size of equipment shown or specified. The actual number of wires needed to complete each system must in no case be fewer than the number indicated and additional wires must be provided where necessary and required by the actual equipment finally installed.
 - B. Prior to energization, test cable and wire for continuity of circuitry, and for short circuits. Correct all malfunctions when detected.
 - C. After wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.
- END OF SECTION

Panelboards & Circuit Breakers 16134 - 1

SECTION - 16134 ELECTRICAL SERVICE, PANELBOARDS, & CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the furnishing and installation of the incoming electrical service, switchboards, metering, lighting, and distribution panelboards, including circuit breakers and metering equipment.

B. All equipment as shown on the drawings.

1.02 ACCEPTABLE MANUFACTURERS

A. Square D, Eaton, Siemens or approved equal.

1.03 SUBMITTALS

A. Manufacturer's catalog cuts and layout drawings, clearly indicating all cabinet sizes, breaker sizes, metering equipment, contactors, bus work and other features, sizes and ratings.

PART 2 - PRODUCTS

2.01 Panelboards and switchboards

A. Electric panels must be panelboard construction.

B. Panelboard and cabinet must conform to the requirements of the Underwriters' Laboratories and must bear the UL label.

C. Panelboards must be surface-mount. Panelboard must have front hinged to box with standard door over interior. Hinged front exposes wiring gutter.

D. Panelboard must be AC circuit breaker type with adequately sized solid neutral and lugs or circuit breaker in the main. Subject to Engineer's approval, circuit schedules may be revised to obtain a more convenient grouping or a better balance of the actual connected load. Provide a separate equipment ground bus in all panels.

E. Mark all circuits, as to their utilization, on a typewritten schedule, in a clear plastic covered window frame inside the door.

F. Panelboards installed indoors, above grade must have NEMA 1.

G. Panelboards must have separate ground bar and neutral bar as required by the National Electric Code (Latest Edition).

2.02 MAIN AND FEEDER CIRCUIT BREAKERS

A. Breakers must be mechanically and electrically similar to molded circuit breakers and must have an interrupting rating as specified on drawings or higher as required with bolt-on attachment.

Electrical Gear Upgrades and Transformer December, 2022

Nutting Hall

Vermont Technical College, Randolph, VT

Panelboards & Circuit Breakers 16134 - 2

B. Breakers must be "integrated equipment short circuit rated" to allow 22,000 AIC branch circuit breakers in lighting and branch circuit panelboards.

2.03 LIGHTING AND BRANCH CIRCUIT BREAKERS

A. Breakers must be mechanically and electrically similar to molded circuit breakers and must have an interrupting rating as specified on drawings, or higher if noted, with bolt-on attachment.

B. Breakers must be Square D, NQOD, or equal.

C. Where double pole breakers are required, two single pole breakers with operating handles joined by a locking bar are not permitted.

2.04 PANELBOARD CIRCUIT BREAKERS

A. Breakers must be mechanically and electrically similar to molded circuit breakers and must have an interrupting rating as specified on drawings with bolt-on attachment.

B. 208/120-volt lighting and branch circuit breakers must be Square D, NQOD, or equal.

C. Notations on nameplates must be as directed by the Owner.

D. Where double pole breakers are required, two single pole breakers with operating handles joined by a locking bar are not permitted.

2.05 NAMEPLATES

A. Provide nameplates for each panelboard.

B. Nameplates must be black laminated plastic or bakelite, with four edges neatly beveled. Lettering must be engraved, white, with a height of approximately 3/16" to 1/4".

C. Provide two holes in nameplate and secure to equipment with non-ferrous screws and in a position where it is readily visible.

D. Notations on nameplates must be the same as the corresponding notations that appear on the equipment.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide and install all feeders, breakers, panels, disconnects, breakers, and all required support structure and required auxiliary equipment.

B. Install panelboard at the locations directed by the Owner. Install panelboards with uppermost breaker at 6'-0".

C. Install, in panelboards, all breakers and other required equipment and appurtenances as directed in these Specifications.

END OF SECTION

GROUNDING 16452 - 1

SECTION - 16452 GROUNDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work covered by this Section includes the furnishing and installation of Electrical System,

Equipment, Appliance, and Motor, device and lighting grounds.

PART 2 - PRODUCTS

2.01 GROUND SYSTEMS

A. Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, terminals (compression lug), grounding rods/electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with the industry standards for applications indicated.

B. The existing grounding/bonding system may be re-used and augmented if code compliant. For bidding purposes, it must be assumed that the existing grounding system is not acceptable. Provide and connect the new required grounding and bonding to the existing grounding grid per NEC.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Electrical system must be grounded in the main distribution Disconnect.

B. All conduits entering metal enclosures must have double locknuts or, if enclosure does not have provision for connecting by locknuts, provide a ground busing, wire jumper, and solderless lug to bond enclosure. All conduits leaving the main distribution panel and main switchboard must be grounded to the ground bus by means of a grounding busing, wire jumper, and solderless lug.

C. A separate ground conductor (green wire) must be installed in all raceways for feeders, lighting power, and receptacle branch circuits, all cables, and where called for on drawings.

D. All metallic conduits 1-1/4" or larger must have grounding bushings.

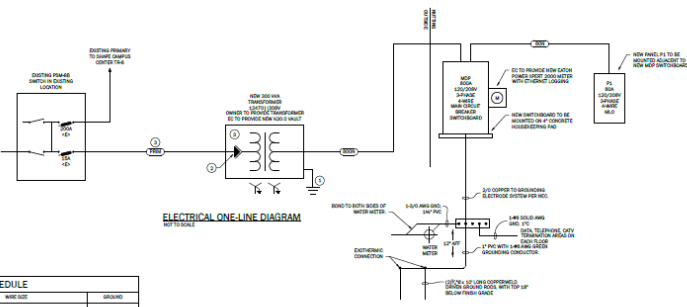
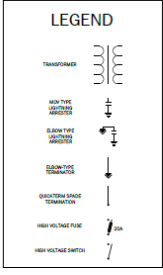
E. All SO-type cords, or equivalent, must have a separate ground wire (green) of equal size to circuit conductor.

F. Equipment ground conductor must be copper with type THHN insulation, green only, up to and including #4 AWG; larger sizes may be black and identified with green tape.

G. Paint, grease or other contaminants must be sanded clean before bonding ground conductor.

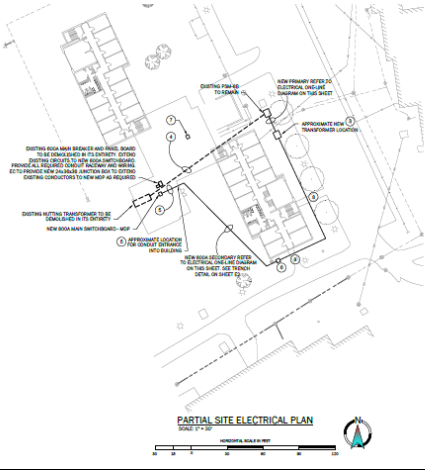
H. All exposed metal pipes such as gas lines, air lines, oil lines, etc. must be bonded per NEC.

I. The existing Generator and all associated equipment must be bonded and grounded to the new equipment per the NEC.



FEEDER SCHEDULE

NO.	WIRE	PHASE	CONDUIT	NOTES
1	1/2"	3	1 1/2"	(1) 10KV AIR INSULATED
2	1/2"	3	1 1/2"	(2) TWO MINIMUM PER PHASE AND NEUTRAL
3	1/2"	3	1 1/2"	(3) MINIMUM PER PHASE AND NEUTRAL



PANEL DESIGNATION SCHEDULE

PANEL NO.	TYPE	LOCATION	DESCRIPTION
1	SPARE	100	SPARE
2	SPARE	100	SPARE
3	SPARE	100	SPARE
4	SPARE	100	SPARE
5	SPARE	100	SPARE
6	SPARE	100	SPARE
7	SPARE	100	SPARE
8	SPARE	100	SPARE
9	SPARE	100	SPARE
10	SPARE	100	SPARE
11	SPARE	100	SPARE
12	SPARE	100	SPARE
13	SPARE	100	SPARE
14	SPARE	100	SPARE
15	SPARE	100	SPARE

PANEL DESIGNATION SCHEDULE

PANEL NO.	TYPE	LOCATION	DESCRIPTION
1	SPARE	100	SPARE
2	SPARE	100	SPARE
3	SPARE	100	SPARE
4	SPARE	100	SPARE
5	SPARE	100	SPARE
6	SPARE	100	SPARE
7	SPARE	100	SPARE
8	SPARE	100	SPARE
9	SPARE	100	SPARE
10	SPARE	100	SPARE
11	SPARE	100	SPARE
12	SPARE	100	SPARE
13	SPARE	100	SPARE
14	SPARE	100	SPARE
15	SPARE	100	SPARE

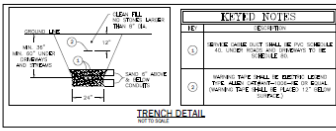
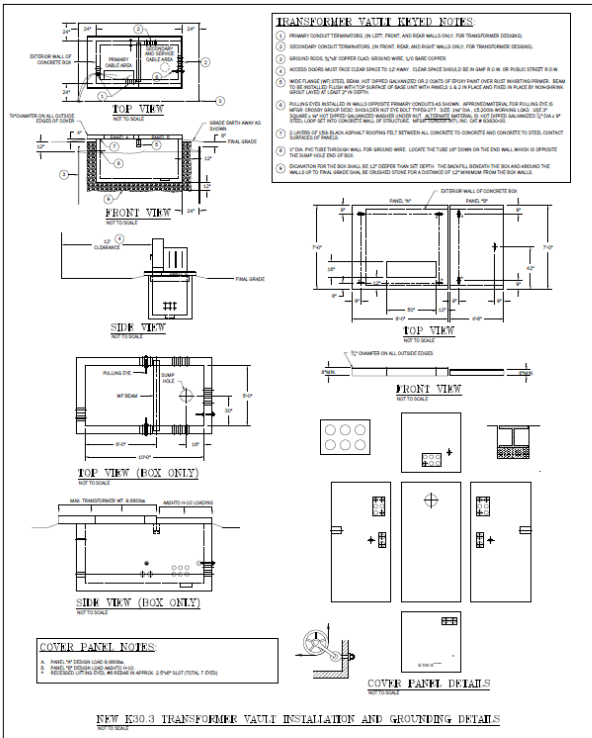
- ### GENERAL NOTES:
1. DETAIL ALL ELECTRICAL ALL DETAILED GROUND AND LANDSCAPING TO BE REFERRED TO THE DETAIL SHEETS.
 2. THE NEW 10KV TRANSFORMER IS TO BE DISCONNECTED FROM THE 10KV BUS BY THE OWNER TO BE INSTALLED BY THE OWNER.
 3. THE NEW 10KV TRANSFORMER IS TO BE DISCONNECTED FROM THE 10KV BUS BY THE OWNER TO BE INSTALLED BY THE OWNER.
- ### KEYED NOTES:
1. TO PROVIDE TRANSFORMER WALK BRIDGE AS SHOWN ON SHEET 100 TO BE INSTALLED AND WALK BRIDGE TO BE INSTALLED ON SHEET 100.
 2. TO PROVIDE TRANSFORMER WALK BRIDGE AS SHOWN ON SHEET 100 TO BE INSTALLED AND WALK BRIDGE TO BE INSTALLED ON SHEET 100.
 3. TO PROVIDE TRANSFORMER WALK BRIDGE AS SHOWN ON SHEET 100 TO BE INSTALLED AND WALK BRIDGE TO BE INSTALLED ON SHEET 100.

Penning & Associates
REGISTERED PROFESSIONAL ENGINEER
ELECTRICAL ENGINEERING

**VTC NUTTING HALL TRANSFORMER
INDIVIDUAL UNIT
ELECTRICAL ONE-LINE AND SITE PLAN**

DATE: 02/16/22
DRAWN BY: [Name]
CHECKED BY: [Name]
APPROVED BY: [Name]

E-1



ISSUED FOR CONSTRUCTION 12/16/22

Penston & Associates
 REGISTERED PROFESSIONAL ENGINEERS
 1000 W. 10th Street, Suite 100
 Grand Rapids, MI 49503
 TEL: 616.276.1111 FAX: 616.276.1112

STATE OF MICHIGAN
 DEPARTMENT OF LICENSING & REGULATION
 REGISTERED PROFESSIONAL ENGINEER
 LICENSE NO. 93000

PROJECT NAME: VTC NUTTING HALL TRANSFORMER
LOCATION: ANN ARBOR, MI
DATE: 12/16/22
DESIGNED BY: [Redacted]
CHECKED BY: [Redacted]
APPROVED BY: [Redacted]
SCALE: AS SHOWN

ELECTRICAL DETAILS

E-2
 SHEET 2 OF 2