Peabody Municipal Light Plant

Community Owned. Not for profit. It's Ours.

LEGAL NOTICE

Peabody Municipal Light Plant is asking for bids on:

25KV SWITCHGEAR

Specifications and bid documents may be obtained at the Peabody Municipal Light Plant, 201 Warren Street Extension, Peabody, Massachusetts or at our website WWW.PMLP.COM.

Bids will be received at the Peabody Municipal Light Plant office until 11:30 a.m. on Tuesday, November 28, 2017 at which time they will be publicly opened and read. Proposals must be accompanied by a completed Bid Form.

The Peabody Municipal Lighting Commission reserves the right to reject any or all bids as authorized by law.

PEABODY MUNICIPAL LIGHT PLANT

GLENN TRUEIRA, MANAGER

GT/pas

ADV.: The Salem News – 11/3/17
Dodge Reports

BID PACKAGE & SPECIFICATIONS
APPROVED BY: _____
Division Manager

PEABODY MUNICIPAL LIGHT PLANT

BID - MATERIALS

INSTRUCTIONS TO BIDDERS

1. Peabody Municipal Light Plant (PMLP) will receive bids for 25KV Switchgear until 11:30 a.m., Tuesday, November 28, 2017 at its General Offices at 201 Warren Street Extension, Peabody, Massachusetts, 01960, at which time the bids will be publicly opened and read.

2. BIDS --

   A. All bids must be submitted along with the completed Bid Form provided in these specifications. If additional space is required, it shall be so noted on a supplemental attachment under the bidder's letterhead and entitled "Remarks". This attachment shall become a part of the Bid Form.

   B. The Bid Form shall be without interlineations, alterations, erasures or changes in phraseology.

   C. The Bid Form shall be enclosed in a sealed envelope, clearly marked on the outside with the bidders name and address, and the following bold lettering: **"25KV SWITCHGEAR".** Three copies of all bids, along with two (2) Electronic copies saved to a thumb drive, must be submitted in a sealed envelope and properly marked with the Title of the bid and mailed/delivered to:

      Peabody Municipal Light Plant
      ATTENTION: Glenn Trueira, Manager
      201 Warren Street Extension
      Peabody, MA 01960

      The thumb drive must be labeled with the Bidders name and Project Contract Number. The scanned copy on the thumb drive should include all required signatures and forms.

   D. The Bid Form and supplemental sheets identified on same shall constitute and shall hereinafter be termed the "Bid".

   E. The firm submitting a bid shall assume the responsibility of making a careful examination of the specifications and related documents and all other matters that may affect cost and performance. Bidders will be required, at their own expense, to comply with all statutes, regulations, ordinances and tests which may be applicable.

   F. Each firm shall submit with their bid, evidence of their experience and qualifications to satisfactorily fulfill the specifications and requirements.

G. Each firm submitting a bid shall notify PMLP, in writing, if they find any discrepancies or omissions from the specifications, or if in doubt as to their meaning. If an explanation is necessary, a reply will be made by an addendum issued to all firms who have received specifications. PMLP will not give verbal answers to any inquiries regarding the meanings of the specifications. All inquiries should be addressed to PMLP, Attention: Glenn Trueira, 201 Warren Street Extension, Peabody, Massachusetts, 01960.

3. CHANGES IN SPECIFICATIONS --

PMLP may advise all firms who have received specifications, by means of addenda, of any changes in the Specifications during the bid period. All such changes shall become a part of the Specifications as if originally included therein.

4. SITE INSPECTIONS --

PMLP is not responsible for any inspections, visits, etc., that may be made to any sites or potential sites in connection with this work. The coordination, approval, and expense for such inspections, visits, etc., is the responsibility of the firm submitting the bid.

5. PRICES --

All prices and applicable discounts will be firm for the delivery quoted. Bidders must include on a separate sheet, any discount schedule which may be applicable to this purchase. The bid prices shall include everything necessary for fulfillment of the Contract, including delivery (at PMLP jobsite, Peabody, MA), except as may be otherwise expressly provided in the Contract Documents.

6. ESCALATOR CLAUSES --

Bids which are not subject to any form of upward escalator clause are preferred. If firm prices cannot be quoted, the Bidder shall base the escalation provision upon the index stipulated in the specification attached thereto. If no index is stipulated in the specification, bidder shall state the index upon which his bid is based. Failure to do so will be considered grounds for rejection of the bid.

The PMLP reserves the right to consider any bid which may be offered subject to an escalator clause, up or down, that is clearly defined as to basis of escalation, specifically, a given lowest posted price in a nationally recognized index provided that no other index is stipulated in the attached specifications. Preference will be given to bids in accordance to the first paragraph in this section.

7. EXECUTION OF CONTRACT --

A. The Successful Firm will be notified of the award of the Contract in writing and shall properly and promptly execute a Contract on the PMLP Contract Form, within fifteen (15) days after receiving notification of the Award of the Contract.

B. The Contract, when executed, shall be deemed to include the entire agreement between the parties. The Seller shall not be entitled to any modifications resulting from unauthorized claims or statements made by representatives of PMLP or other persons.

C. PMLP shall have, at its option, the right to increase the contracted quantity bid by up to twice the original quantity which is stated in the bid specifications.

8. TERMS AND CONDITIONS --

The terms and conditions of the contract shall also be in accordance with the attachment entitled "Purchaser's Terms and Conditions." Any exceptions to these terms and conditions must be clearly identified in the bid under the category of exceptions to the Purchaser's Terms and Conditions.

9. DEFINITIONS --

The names and words Peabody Municipal Light Plant, PMLP, Purchaser, Owner, and Buyer as used in these documents are synonymous. The names and words, Bidder, Contractor, Seller, Vender, and Manufacturer as used in these Contract documents are synonymous.

10. RIGHT TO ACCEPT OR REJECT BIDS --

PMLP reserves the right to accept or reject bids or portions thereof, and to reject all bids, to waive any formalities in the process, if it is deemed to be in the best interests of PMLP. Proposals received after the public opening date and time will not be accepted.

11. ITEMS CONTAINED IN THE BID PACKAGE –

- Legal Notice
- Instructions to Bidders
- Purchaser's Terms and Conditions
- Specifications
- Bid Form
- Certified of Non-Collusion & Tax Compliance Certification
- Sample Contract

PURCHASER'S TERMS AND CONDITIONS

MATERIALS CONTRACT

1. ENTIRE AGREEMENT AND AMENDMENTS

The terms and provisions of this Contract, together with the terms and provisions of all documents incorporated herein by reference, constitute the full and entire Contract between the Purchaser and the Seller concerning the matters set forth herein, and no other agreement or understanding of any nature whatsoever has been entered into or will be recognized, nor has the Purchaser made any inducements or representations to the Seller except as expressly stated in this Contract. No modification of this Contract shall be binding or have any force or effect on either party, unless reduced to writing and signed by the Purchaser and the Seller, or the authorized representatives of same. No provision of this Contract is intended or shall be construed to be for the benefit of any third party.

2. PERFORMANCE

Time is of the essence in this Contract. If the Seller shall fail in any respect to prosecute the work with promptness and diligence, the Purchaser may cancel this Contract in part or in its entirety without liability for the cancelled part(s).

3. PATENTS, TRADEMARKS, COPYRIGHTS

It is mutually understood and agreed that the Contract includes all royalties and costs arising from patents, trademarks and copyrights in any way involved in the work. If the Seller, or its subvendors/subcontractors, is required or desires to use any design, device, material or process covered by letters, patent, trademark, or copyright, the Seller indemnifies and holds harmless the Purchaser from any and all claims for infringement by reasons of the use of any such patented design, device, material or process to be performed under the Contract and shall indemnify the Purchaser for any costs, expenses and damages which they may be obligated to pay by reason of such infringement, at any time during the prosecution or after the completion of the work. The Purchaser shall give to the Seller notification of the source of any such suit or proceeding and shall furnish the Seller (at the Seller's expense) all needed information, authority and assistance to enable the Seller to defend the same. If any material, equipment, or work is in any such suit or proceeding held to constitute infringement or its use in enjoined, the Seller, within a reasonable time, shall either secure for the Purchaser, at the Seller's own expense, the right to continue using said material, equipment or work by suspension of the injunction, by procuring for the Purchaser a license, or otherwise, or shall at the Seller's own expense and as the Purchaser may elect, replace such material, equipment or work with non-infringing material, equipment or work, or modify it so that it becomes non-infringing, or remove such infringing material, equipment

or work, and refund the sums paid therefore by the Purchaser all without injury or damage to any other property of the Purchaser.

4. INDEPENDENT CONTRACTOR RELATIONSHIP

The Seller shall perform work as an independent contractor.

5 INSPECTION EXPEDITING

All material, equipment and/or work to be supplied under this contract is subject to inspection and/or expediting by the Purchaser or its representative. The Seller shall allow the Purchaser or its representative free access to Seller's works and provide free access to the works of Seller's subvendors/subcontractors.

6. COMPLIANCE WITH LAW

The Seller will comply with all applicable federal, state, and local laws, rules and regulations. Compliance includes, but is not limited to, the Occupational Safety and Health Act of 1970, Peabody Municipal Light Plant Safety Rules & Regulations, Executive Order 11246 (Equal Opportunity) and guidelines established by the Council on Wage and Price Stability, all as amended periodically.

Seller agrees to comply with the provisions of the Occupational Safety and Health Act of 1970 and the Standards and Regulations issued thereunder and certifies that all items furnished under this Contract will conform to and comply with said standards and regulations. Seller further agrees to indemnify and hold harmless the Purchaser from all damages assessed against the Purchaser as a result of the seller's failure to comply with the Act and the standards issued thereunder and for the failure of the items furnished under this Contract to so comply.

7. RISK OF LOSS

Risk of loss and/or damages shall be upon Seller until goods are physically delivered to the Purchaser's plant, storerooms, job site, or location indicated in the Contract Document. Materials will be considered as delivered only if all goods are physically received in proper condition and accepted by purchaser.

8. DELIVERIES

The Purchaser will receive shipments Monday through Friday, holidays excluded, during its normal receiving hours (8:00 AM -3:00 PM). Any cost associated with shipments made during any time other than this receiving period will be to the Seller's account. All deliveries will be at PEABODY jobsite, Peabody, Massachusetts unless otherwise specified in the Peabody Municipal Light Plant specification section attached hereto.

9. ASSIGNMENT AND SUBCONTRACTING

The Seller's obligations authorized under this Contract are not assignable or transferable, and the Seller agrees not to subcontract any of the work authorized hereunder without the prior written approval of the Purchaser. The Purchaser retains the right to approve or disapprove of all subcontractors for such approved work.

10. CONFIDENTIALITY

The Seller shall keep all services carried out hereunder for the Purchaser (described in the Specifications attached hereto) entirely confidential, and not use, publish, or make known without the Purchaser's written approval, any information furnished by the Purchaser for purposes of such services, to any persons other than personnel of the parties of this Contract.

Any public representation regarding the Purchaser shall be made by the Purchaser, and any requests for information made to the Seller by a Third Party shall be referred to the Purchaser.

11. WAIVER

In the event the Purchaser shall fail to insist on performance of any of the terms or the exercise of any of its rights and privileges, such failure or any breaches, shall not constitute a waiver of such terms, conditions, rights or privileges.

12. CHANGES AND/OR AMENDMENTS

The Purchaser shall have the right, from time to time during the terms of this Contract, by written notice to the Seller, to make changes in or additions to drawings, specifications or instructions for the work covered in the Specifications, including the right to expand, decrease or limit the scope and nature of the work to be undertaken, or redirect work already in progress.

13. WARRANTY

The Seller warrants to the Purchaser that the article(s) provided and/or work performed under this Contract shall be fit for purpose in accordance with the Purchaser's specific instructions, shall be new and free from defects in material, workmanship and title, and shall meet all specifications. If the article(s) purchased and/or work performed do not meet the warranty above, the Purchaser, after determining a defect or non-conformance, will notify the Seller. At the sole discretion of the Purchaser the Seller shall replace, repair, or make good, without cost to the Purchaser, any defects or non-conformance arising within one year after date of acceptance of article(s) furnished and/or work performed.

14. CUMULATIVE REMEDIES

Every right or remedy herein conferred upon or reserved to the Purchaser shall be cumulative and shall be in addition to every right and remedy now or hereafter existing at law or in equity or by statute, and the pursuit of any right or remedy shall not be construed as an election.

15. DELAYS

The Seller expressly agrees to the work schedule provided for in the Contract and such schedule includes allowances for all hindrances and delays incident to the work. No claims shall be made by the Seller for hindrances and/or delays from any cause during the progress of the work except as provided under "SUSPENSION OF WORK" and/or "FORCE MAJEURE".

16. SUSPENSION OF WORK

The Purchaser reserves the right to suspend and reinstate execution of the whole or any part of the work without invalidating the provisions of the Contract. Orders for suspension or reinstatement of work will be issued by the Purchaser to the Seller in writing. The time of completion of the work will be extended for a period equal to the time lost by reason of the suspension. No consideration shall be given by the Purchaser to cost increases or loss of anticipated profits, due to suspension or reinstatement of this Contract.

17. FORCE MAJEURE

A delay in, or failure of, performance of either party hereto shall not constitute default hereunder or give rise to any claim for damage if and to the extent such delay of failure is caused by occurrences beyond the control of the party affected, including, but not limited to, acts of God, or the public enemy, expropriation or confiscation of facilities or compliance with any order or request of a governmental authority, affecting to a degree not presently existing, the supply, availability, or use of materials or labor, acts of war, public disorders, rebellion or sabotage, floods, riots, strikes, or any causes whether or not the class or kind of those specifically named above, not within the control of the party affected and which, by the exercise of reasonable diligence, said party is unable to prevent. Should the work be delayed due to Force Majeure, or otherwise delayed due to conditions beyond the control of or without the fault or negligence of either party, the parties to this Contract shall confer to reach an agreement on the alterations of fees and/or other terms and conditions upon which the work shall be continued, or otherwise terminated.

18. ARBITRATION

Arbitration of all questions and issues in dispute under this Contract shall be submitted to Arbitration in accordance with the provisions of the standard Form of Arbitration of the American Arbitration Association, but only in the event that both parties to this Contract so

agree to such submission for Arbitration. If both parties fail to agree to submit to Arbitration in the manner prescribed above, or to submit to Arbitration in any mutually acceptable form, all questions and issues in dispute will be submitted to a court of competent jurisdiction of the Commonwealth of Massachusetts to be tried according to the applicable laws of the Commonwealth of Massachusetts. Costs of such arbitration will be shared equally by the parties, unless the arbitrator determines that the claim made by one of the parties is without merit, in which event the arbitrator may award costs to the other party.

19. TERMINATION FOR CAUSE

The Purchaser, on written notice, may suspend, postpone, abandon or terminate this Contract, or any part thereof, as a result of the Seller's failure to render to the satisfaction of the Purchaser the materials, work and/or services required of him under this Contract, including the progress of the work. The Purchaser shall be the sole determinant in all termination for cause issues and no consideration shall be given by the Purchaser to the Seller for any costs, claims, or loss of anticipated profits by the Seller as a result of the suspension postponement, abandonment or termination of this Contract, or any part thereof, by the Purchaser for the reason of cause.

20. TERMINATION FOR CONVENIENCE

The Purchaser, on written notice, may suspend, postpone, abandon or terminate this Contract or any part hereof, and such action shall in no event be deemed a breach of the Contract. Such suspension, postponement, abandonment or termination may come about for the sole convenience of the Purchaser. Upon receipt of written notification from the Purchaser that this order, or any part hereof, is to be terminated, the Seller shall immediately cease operations of the work stipulated, and assemble all material that has been prepared, developed, furnished or obtained under the terms of this Contract that may be in its possession or custody, and shall transmit the same to the Purchaser on or before the fifteenth day following the receipt of the above-written notice of termination, together with his evaluation of the cost of the work performed. The Seller shall be entitled to just and equitable payment in accordance with this Contract for any uncompensated work satisfactorily performed prior to such notice.

The Purchaser shall determine the amount of acceptable work performed by the Seller under this Contract. The Purchaser's evaluation shall be used as a basis to determine the amount of compensation due the Seller for this work, provided it shall be made in good faith and supported by substantial evidence.

In determining the value of the work performed by the Seller prior to termination, no consideration will be given to profit which the Seller might have reasonably expected to make on the uncompleted portion of the work.

21. INDEMNIFICATION

The Seller shall defend, indemnify and hold the Purchaser, and its employees free and harmless from and against any and all claims, demands, causes of action, suits or other litigation (including all costs thereof, including attorney's fees) of every kind and character arising on account of bodily injuries, death, damage to property in any way occurring incident to, arising out of or in connection with work performed or to be performed by the Seller hereunder or occurring incident to, arising out of or in connection with the presence of employees of the Seller or any of the Seller's subcontractors on the work premises, due to the sole negligence or willful misconduct of the Seller.

22. LAW OF CONTRACT - JURISDICTION

The Contract shall be construed under and shall be governed by the Laws of the Commonwealth of Massachusetts, and in case of controversy not otherwise settled shall be submitted to the exclusive jurisdiction of the Massachusetts Courts.

23. AUDIT

The Seller shall, at its own expense, keep and maintain complete records and books of account of its costs and expenses relating to the work in accordance with generally accepted accounting practices. Should a dispute arise between the Purchaser and Seller regarding reimbursable amounts and/or credits, the Seller shall grant the Purchaser permission to audit such records and books of account.

24. TAXES

The Seller shall pay all applicable state and local sales and use taxes on sales to, or used by, the Seller of tangible property and services employed by the Seller in the performance of the Order. The Seller shall identify all costs in connection therewith. The Purchaser is an organization exempt from the payment of such state and local taxes of tangible property and services, and will not reimburse the Seller for such taxes paid.

25. BID QUANTITIES

PMLP shall have, at its option, the right to increase the contracted quantity bid by up to twice the original quantity which is stated in the bid specifications.

26. ACCEPTANCE

This order expressly limits acceptance to the terms stated herein. Any additional or different terms proposed by the Seller are objected to and are hereby rejected.

27. COMPLETION OF CONTRACT

This Contract will not be considered complete until all specifications and Contract requirements have been satisfied. These requirements also include the Purchaser's acceptance of all documentation, drawings, manuals, etc. Final payment shall not be construed to relieve the Seller of any of its obligations under this Contract.

28. NOTICE

The Purchaser agrees to give the Seller immediate notice of any and all claims for which the Seller may be liable, and the Seller agrees to give the Purchaser immediate notice of any and all claims for which the Purchaser may be liable. All claims hereunder shall be in writing and shall be deemed to have been duly given if delivered or mailed, first class, registered mail, postage paid.

A. IF TO THE SELLER, ADDRESS

_____

B. IF TO THE PURCHASER, AT PEABODY MUNICIPAL LIGHT PLANT, 201 WARREN STREET EXTENSION, PEABODY, MASSACHUSETTS, 01960

_____

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

IPSWICH RIVER SUBSTATION

25 KV SWITCHGEAR ASSEMBLY

TECHNICAL SPECIFICATION
NO. 919911IR-04

OCTOBER, 2017

PLM

ELECTRIC POWER ENGINEERING

35 MAIN STREET, HOPKINTON, MA 01748 TEL: (508) 435-0200 FAX: (508) 435-4491

IPSWICH RIVER SUBSTATION
25 kV SWITCHGEAR ASSEMBLY

SECTION II
PROJECT ORGANIZATIONAL REQUIREMENTS

COMMUNICATION

All technical communications and correspondence shall be addressed to:

PLM
35 Main Street
Hopkinton, Massachusetts 01748
Attention: Mr. Michael C. Barrett
Phone: (508) 435-0200
FAX: (508) 435-4491
E-Mail: mcbarrett@plmnet.com

All commercial correspondence and copies of technical communications during the project shall be addressed to:

Peabody Municipal Light Plant
201 Warren Street Ext.
Peabody, Massachusetts 01960
Attention: Mr. Roy Simoes
Phone: (978) 573-1231
FAX: (978) 532-8902

ADDITIONAL TERMS AND CONDITIONS

1. Title

   Ipswich River Substation - 25kV Switchgear Assembly

2. Freight

   Freight shall be prepaid and allowed. The Contractor is responsible for all freight and cartage, including any additional freight to and from destination until the apparatus has been received in good condition, field tested, and accepted by Owner and PLM.

3. Terms of Payment

The Contractor shall be entitled to receive 80% of Contract Price upon:

a. Receipt and inspection of apparatus at destination, and

b. Installation and assembly of apparatus at project site, and

c. receipt of instruction manuals and required Certified Calibration information at the PLM office, and

d. satisfactory compliance with this specification as determined at final plant inspection and site inspection.

Payment shall not be made on apparatus damaged in transit until apparatus is received in good condition.

The Contractor shall be entitled to receive 10% of Contract Price upon:

a. Successful completion of field tests by Owner, and

The Contractor shall be entitled to receive final 10% of Contract Price upon:

a. Successful energization of equipment by Owner

4. Warranty

All materials shall be warranted for a period of one year from the date of Final System Acceptance, defined as the successful energization of equipment by Owner, against material defects and workmanship. The warranty shall include parts and labor to repair the defective component(s) at the vendor's facility, and the details of identifying and repairing problems during this warranty period, including response time, turnaround time, etc.

5. Performance Bond

A Performance Bond equal to 100% of the value of the Contract will be required of the successful vendor, prior to contract execution. The Performance Bond will be returned upon completion of the warranty period.

INSPECTION

Owner's Representatives (maximum of 3) shall be allowed free access, at all reasonable times, to the Manufacturer's shops for inspection of the equipment or any of its parts, and to obtain information on the progress of the work. Any work or material found to be defective shall be

rejected and shall be replaced by the Manufacturer at his own expense. Such inspection, however, shall not relieve the Manufacturer from responsibility for the quality and correctness of the work.

WITNESS OF TESTS AND FINAL INSPECTION

Owner's Representatives (maximum of 3) may be available to perform a final physical inspection and to witness final testing of the apparatus, at the Owner's discretion. Such inspection, however, shall not relieve the Manufacturer from responsibility for their quality and correctness of work.

The Manufacturer shall notify PLM of the planned testing dates with at least three (3) weeks notice and notify PLM of any changes of testing dates within sufficient time to make necessary travel arrangements. The Manufacturer shall make every effort to schedule testing dates which coincide during a single work week to eliminate unnecessary delays, and the final tests will continue without interruption until completion.

SECTION III
BID DATA SHEET

BIDDER TO ENTER PRODUCT DATA IN THE APPROPRIATE SPACES ON THE FOLLOWING PAGES AND RETURN WITH BID

A. 25kV Metalclad Switchgear Assembly

Enter guaranteed characteristics for bid evaluation below:

1. 25 KV SWITCHGEAR

a. Manufacturer _____

b. Type _____

c. Each cubicle _____

1) Height, inches _____

2) Width, inches _____

3) Depth, inches _____

d. Cubicles

1) Bus materials _____

a) Main _____

b) Feeder _____

c) Ground _____

2) Bus dimensions

a) Main, inches _____

b) Feeder, inches _____

c) Ground, inches _____

3) Bus insulation material _____

4) Continuous current rating, amps

a) Main bus _____

b) Feeder buses _____

5) Rated short time current, kA _____

6) Rated momentary current, kA _____

7) Rated maximum voltage, kV _____

8) BIL, kV _____

9) Low frequency (1 min.) withstand, kV _____

e. Circuit breaker

1) Manufacturer _____

2) Type _____

3) Catalog number _____

4) Catalog cut _____

5) Rated maximum voltage, kV _____

6) Voltage range factor _____

7) Operating voltage, kV _____

8) Continuous current, amperes _____

9) Capacitance current, amperes _____

10) Nominal three-phase interrupting capability, MVA _____

11) Short circuit current at max. volts, kA, rms, min. _____

12) Max. symmetrical interrupting capability, kA, rms, min. _____

13) Three second short time current carrying capability, kA, rms, min. _____

14) Closing and latching capability, kA, rms, min _____

15) Interrupting time, cycle max _____

16) Low frequency (1 min.) withstand voltage, kV, rms _____

17) Basic impulse level (BIL), kV _____

18) Interrupters, manufacturer _____

19) Breaker operating current requirements

a) Close, 125 volts dc, amps _____

b) Trip, 125 volts dc, amps _____

c) Charging motor at 125 volts dc, amperes _____

20) Minimum operating voltage

a) Close _____

b) Trip _____

f. Voltage transformers

1) Manufacturer _____

2) Type _____

3) Catalog number _____

4) Rated primary voltage (L-N), kV _____

5) Winding ratios _____

6) BIL, kV _____

7) ANSI accuracy class _____

8) Thermal rating _____

g. Current transformers

1) Manufacturer _____

2) Type _____

3) Catalog number _____

4) Ratio, SR or MR

a) Subtransmission breaker _____

b) Bus tie breaker _____

c) Feeder breaker _____

5) Accuracy class _____

6) Burden capability, VA _____

7) Thermal rating _____

8) Mechanical limit, amperes _____

h. Surge arresters

1) All Circuits

a) Manufacturer _____

b) Type _____

c) MCOV, kV _____

d) TOV @ 1 second, kV _____

2. SWITCHGEAR ASSEMBLY

a. Proposed outline drawing showing:

1) Plan view – base, inches _____

2) Front and side elevations, inches _____

3) Base plan showing conduit penetrations in foundation _____

4) Anchoring requirements _____

b. Entire assembly

1) Height, inches _____

2) Width, inches _____

3) Depth, inches _____

c. Largest section shipped

1) Height, inches _____

2) Width, inches _____

3) Depth, inches _____

d. Weight

1) Entire assembly, pounds _____

2) Largest section shipped, pounds _____

e. Exterior walls

1) Material _____

2) Thickness _____

3) Panel width, inches _____

4) Color _____

5) Insulation

a) Material _____

b) Thickness, inches _____

c) Thermal insulating value, R _____

f. Roofing

1) Material _____

2) Thickness _____

3) Panel width, inches _____

4) Color _____

5) Insulation

a) Material _____

b) Thickness, inches _____

c) Thermal insulating value, R _____

g. Personnel doors

1) Height, inches _____

2) Width, inches _____

3) Thickness, inches _____

4) Insulating value (ext. doors), R _____

h. Anti-condensation heater requirements, watts

1) Cubicles (per cubicle) _____

2) Bus duct (per bus duct) _____

i. HVAC units

1) Number of units _____

2) Unit heater power requirements, watts _____

j. Ventilators

1) Type _____

2) Number of units _____

k. Ac station service system

1) Ac panelboards

a) Manufacturer _____

b) Rating, amperes _____

c) Circuit breakers interrupting capability, amperes _____

l. Station battery / DC system

1) Battery

a) Manufacturer _____

b) Catalog number _____

c) Type _____

d) Capacity, ampere-hours _____

e) Number of cells _____

f) Open circuit voltage (fully charged), volts _____

g) Voltage when 90% discharged, volts _____

h) Rack type / length _____

i) Total weight, including rack _____

2) Charger

a) Manufacturer _____

b) Rating, amperes _____

c) Input voltage _____

3) DC panelboard

a) Manufacturer _____

b) Rating, amperes _____

c) Circuit breakers interrupting capability, amperes _____

m. Location of manufacturing facility _____

n. Location of nearest repair facility _____

o. Location of nearest service engineer _____

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

25 kV SWITCHGEAR ASSEMBLY
IPSWICH RIVER SUBSTATION
OCTOBER, 2017

SECTION IV
TECHNICAL SPECIFICATIONS

A. GENERAL

The technical specifications utilize the Construction Specifications Institute (CSI) 16 division format and are written in imperative and streamlined form. The imperative language is directed to Manufacturer unless specifically noted otherwise. The words "shall be" shall be included by inference where a colon (:) is used within sentences or phrases in sections within these Divisions.

B. MATERIALS AND WORKMANSHIP

All materials shall be new and of high quality which will yield long life and reliable operation. All equipment shall be modern in design and shall not have been in prior service except as required by factory tests. Workmanship shall be of high quality in every detail.

C. VARIATIONS FROM REQUIREMENTS AND SPECIFICATIONS

No change, variation or deviation from the specifications shall be made except by written order of the OWNER. Should the manufacturer find, at any time during the progress of the work, that in his opinion, existing conditions demand, make desirable or beneficial a modification in requirements covering any particular item or items, he shall promptly report such matters to the OWNER for their decision and instructions.

D. STANDARDS

The latest revision of the standards of ANSI, NEMA, IEEE, AISC, ASTM, and ASME shall be met in design, testing and manufacture of the equipment covered by this specification.

SECTION 01 11 01

SWITCHGEAR ASSEMBLY PROCUREMENT

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Summary of work included in this Contract.

B. Pre-Award Factory Inspection

C. Scheduling

D. Request for Information

E. Design Review Meeting

F. Warranty Requirements

G. Factory Inspection

1.02 WORK INCLUDED

A. Furnish and Deliver one (1) 25 kV Outdoor Metalclad Switchgear Assembly, in accordance with Section 26 13 26.31.

B. Offloading and rigging to place the equipment in the OWNER's substation.

C. Final assembly at destination.

1.03 PRE-AWARD FACTORY INSPECTION

A. The OWNER may, at its discretion, conduct a factory inspection of selected bidders as a part of its bid review and evaluation process.

B. Vendor shall allow OWNER's representatives access to the facilities where the Vendor proposes to manufacture the equipment included in this bid, and shall provide a brief meeting with the proposed design team associated with this project, for the purpose of qualifying the Vendor's capabilities.

1.04 SCHEDULING

A. Vendor shall provide a detailed design and manufacturing schedule for the equipment within 4 weeks of award of this Contract. This schedule shall include, at a minimum, the following line items and associated dates:

1. Receive Award
2. Issue mechanical shop drawings for approval
3. mechanical drawings returned approved
4. Issue electrical shop drawings for approval
5. electrical drawings returned approved
6. Issue bill of material for approval

7. Bill of material returned approved

8. mechanical fabrication

9. electrical wiring

10. factory acceptance tests

11. shipment

12. delivery

13. Assembly

B. This schedule shall include a column with the required date for each task and a column with the actual date for each task, to allow for progress tracking.

C. This schedule shall be updated monthly and issued to the ENGINEER and OWNER.

1.05 REQUESTS FOR INFORMATION

A. During the design and manufacture of the equipment of this Contract, various Requests for Information (RFIs) will be generated by the Vendor.

B. RFI's shall be submitted to the ENGINEER, with copy to the OWNER.

C. To ensure that information is requested and provided in a timely manner, all RFIs shall follow the following procedure:

1. All RFIs shall be numbered. The numbering system will consist of the Vendor's assigned project number plus a sequential RFI number (ie. if Vendor's project number is 2745, then the RFIs generated on this project will be RFI 2745-1, RFI 2745-2, etc.

2. The Vendor shall maintain a log of all RFI's issued on a project. The log shall include columns for RFI number, brief description, date issued, date response is required, date response is provided, and indication of "open" or "closed".

3. In general, a minimum of two weeks shall be allowed for all RFIs, with more time allowed wherever possible.

4. The RFI log shall be kept current, and issued with the monthly issue of the project schedule.

1.06 DESIGN REVIEW MEETING

A. At the OWNER's discretion, a design review meeting may be conducted to go over the submittal drawings prior to final approval for manufacture.

B. The Design Review meeting shall be held at the Vendor's offices.

C. The Vendor shall submit the review package in both electronic and printed form at least two (2) weeks prior to the design review meeting to allow for review and comment preparation.

1.07 WARRANTY REQUIREMENTS

A. Include in the base bid cost a warranty that covers a period of 12 months from the date of energization, or 18 months from the date of acceptance by the OWNER, whichever is shorter.

B. Provide an additional cost in the appropriate line items on the bid form for five (5) year extended warranty coverage in lieu of the standard warranty above. The five year warranty shall provide

coverage for a period of 60 months from energization, or 66 months from date of acceptance by the OWNER, whichever is shorter.

C. Either warranty shall include the entire switchgear assembly as purchased under this order, including all components.

1.08 FACTORY INSPECTION

A. Provide a minimum of twenty one (21) day advance notice of the switchgear inspection dates to allow time for travel arrangements.

B. It is desired to inspect the switchgear towards the end of the Vendor testing activities.

1.09 SPARE PARTS

A. Furnish and deliver spare parts. Make interchangeable with, and same material and workmanship as, corresponding original part. Include price for below list of spare parts in the base switchgear price line item in the Bid Form.

Quantity	Description
6	Switchboard indicating LED lamps of each color
6	Resistors and lamp sockets for each type of indicating lamp
3	spare surge arrestors
50%	Spare primary fuses of each size/rating used for voltage transformers
50%	Spare secondary and control fuses
1 case	White touch-up paint in aerosol cans
1 case	Interior switchgear touch up paint (ANSI No.61 or 70) in aerosol cans
1 case	exterior switchgear touch up paint (ANSI No.61) in aerosol cans

B. Price separately

1. One (1) 2,000 ampere spare circuit breaker, identical to those utilized within the switchgear assembly

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 24

SUBMITTALS AND SHOP DRAWINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittal Procedures

B. Submittal Schedule

C. Number of Copies

D. Final Drawings

1.02 SUBMITTAL PROCEDURES

A. Make submittals as required by the individual specification sections.

B. Coordinate and check all submittals and shop drawings furnished by suppliers and subcontractors for accuracy and conformance with requirements of the Contract Documents.

1.03 SUBMITTAL SCHEDULE

A. Provide a submittal schedule within fourteen (14) calendar days after vendor receipt of order indicating anticipated date of each required submittal.

B. Schedule submittals to expedite the project

C. Deliver submittals to the ENGINEER, with copy of transmittal to the OWNER, at the addresses shown in the specifications.

D. Include the following:

1. Description of each submittal

2. Date by which each submittal will be delivered to ENGINEER and OWNER.

3. Date by which each submittal must be approved to maintain project schedule.

4. Relevant specification section reference

E. Allow a minimum of 3 weeks from date of receipt by ENGINEER of submittal copies for ENGINEER and OWNER to review each submittal.

F. Shop drawing submittals are required no later than the following periods after Contract Award:

1. Outline and weight drawings suitable for foundation design – 8 weeks after vendor receipt of order

2. Remaining Drawings – as required to meet delivery schedule

1.04 NUMBER OF COPIES

A. Submit the following:

1. One set of electronic drawing files, compatible with AutoCAD 2007, supplied on CD or via E-Mail. The transmittal shall include any required plot, shape, font or linetype files to allow for proper plotting. Include a written description of the layer naming and line weight conventions and any instructions for setup of files for proper plotting.

2. One full size PDF print of each drawing shall be provided with the drawing submission.

3. Three copies in addition to the number the Vendor wants returned of all preprinted manufacturer's data, brochures and other information submitted.

1.05 PRESENTATION

A. Present in a clear and thorough manner.

B. Identify field dimensions, show relation to adjacent or critical features.

C. Use sheet size of not less than 8-1/2 by 11 inches and not more than 24 by 36 inches.

1.06 SHOP DRAWING REVIEW COMMENTS

A. ENGINEER's review will be completed within a reasonable time after receipt by ENGINEER of each submittal in proper sequence, and will be returned to CONTRACTOR with one of the following markings:

1. "Approved" indicates submittal has been reviewed and appears to be in conformance with requirements of the Contract Documents. CONTRACTOR may proceed with construction shown on the submittal.

2. "Make corrections noted" indicates submittal appears to be in conformance with requirements of the Contract Documents. CONTRACTOR shall incorporate the corrections noted and may proceed with construction shown on the submittal. No resubmittal is required.

3. "Amend-resubmit" indicates submittal does not appear to be in conformance with the Contract Documents. ENGINEER's comments will be noted on the submittal or in a separate letter. CONTRACTOR shall recheck, make necessary revisions and resubmit.

4. "Submittal not required - no action taken" indicates that the submittal is not called for by the Contract Documents and that no action was taken by ENGINEER on the submittal.

B. Review for conformance with design concepts and compliance with Specifications does not require ENGINEER to review features solely related to construction or all dimensions, quantities and other data. CONTRACTOR shall not rely on ENGINEER's approval as a verification or check of all such items in the submittal or of satisfactory and safe installation and construction. CONTRACTOR shall verify all fabrication and installation requirements, quantities and dimensions.

C. The CONTRACTOR's responsibility for errors and omissions in submittals is not relieved by the ENGINEER's review.

D. Shop drawing acceptance by the OWNER or ENGINEER shall not be construed as approving departures from the Contract requirements.

1.07 AS-BUILT DRAWINGS

A. Revise all drawings to reflect the as-shipped condition of all equipment.

B. Submit as-built drawings, no later than 1 week after date of shipment of switchgear.

C. Indicate "As-Constructed" in revision block and sign. Show all changes and revisions to date of completion. Submit the following quantities:

1. All Drawings – three (3) black on white prints of each drawing (include with O&M manuals, see Section 01730)

2. One set of drawing files, in AutoCAD Release 2000 or 14 format, supplied on 3.5" diskettes, CD or E-Mail.

3. All Drawings - one (1) black on white print of each drawings in 11" x 17" size (reduced scale if necessary).

    a. Nameplate information

    b. Shop order numbers for each item of equipment or component

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 66 02

DELIVERY, STORAGE AND HANDLING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Products

1.02 PRODUCTS

A. Products: means new material, machinery, components, equipment, fixtures, systems and manufactured units used in Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

B. Provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

A. Prepare and load Products in such a manner as to provide protection from damage during shipment. Securely cover and protect Product so that it is not damaged during shipment by environmental factors such as rain, wind, snow, etc. or by physical conditions such as rocks or other objects.

B. Provide advance copy of weight list for each shipment. Weight list to be received by OWNER in accordance with the minimum delivery notice requirements.

C. Ship heavy or bulky equipment in open-top truck to facilitate unloading at OWNER's site

D. Where appropriate, mount heavy parts on skids or crates, and box or bundle securely small parts that may be lost. Mark packaged items for ready identification. Arrange Products exceeding 200 pounds in weight so that slings may be properly attached for lifting by crane.

E. Mark all parts for ease of field assembly.

F. Provide notices and packing lists required by Contract Documents.

G. Vendor to retain responsibility for any damage to Product until it delivery is accepted by OWNER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 23

OPERATION, MAINTENANCE AND INSTALLATION MANUALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparation

B. Contents

C. Submittal

1.02 PREPARATION

A. Provide complete Operations, Maintenance and Installation Manuals covering the Goods furnished under this Contract, as follows:

B. Prepare Manuals in 8 1/2" x 11" format, bound in a substantial binder with three (3) D-type rings (Avery Heavy-duty binder or equal, with clear cover pockets).

C. Internally subdivide the binder contents with permanent page dividers logically organized in accordance with the general table of contents below. Tab titles shall be clearly printed on reinforced, laminated plastic tabs, and keyed to a table of contents.

D. Each copy of the manuals shall be assembled and bound in a substantial binder imprinted on the backbone (spine) and cover with the following:

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

IPSWICH RIVER SUBSTATION
23 kV SWITCHGEAR ASSEMBLY

Manufacturer's Name
Manufacturer's Address

E. Identify individual volumes as “1 of 2", “2 of 2", etc. on backbone and cover if manual requires multiple volumes.

F. Prepare a detailed table of contents for each binder, with material, equipment or system identified, to describe each section of the manual.

1.03 CONTENTS

A. The instruction manuals shall include, as a minimum, the following:

1. Directory listing the Name, address and contact telephone numbers of CONTRACTOR and any local field service facilities

2. General Table of Contents

   a. Descriptions of equipment furnished

   b. Specifications, test data, and curves

c. Instructions in the methods of receiving, inspection, storage, handling, and maintenance

d. Methods of installation and trial operation of the equipment

e. Assembly drawings

f. Parts list

g. Recommended spare parts with pricing

h. Lubrication instructions (if applicable)

i. Nameplate information

j. Shop order numbers for each item of equipment or component

1.04 SUBMITTAL

A. One copy of the equipment instruction manual and one set of the final drawings shall be provided in a pocket on the inside of the control cabinet door on each item of equipment. The manual and drawings shall be placed in the equipment prior to shipment.

B. Two (2) additional sets of printed instruction manuals shall be sent at time of final drawing submittal, this to take place before shipment of equipment.

C. The manuals shall include complete printed documentation for each electronic accessory that is furnished.

D. ENGINEER shall review and approve the manuals and any additional information shall be furnished in sufficient quantities to allow for insertion.

E. Following approval, three (3) electronic copies of each instruction manual shall also be provided. Electronic files shall be in Adobe (PDF) format, and shall be provided on CD. Electronic files shall include the entire instruction manual, with each component in a separate PDF file (ie. do NOT make the entire manual one very large PDF file).

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 26 13 26.31

25 KV METALCLAD SWITCHGEAR ASSEMBLY

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Design, manufacture, assembly, testing, and delivery of 25 kV outdoor protected aisle metalclad switchgear assembly, including insulated enclosure.

B. Transport of equipment from manufacturer to substation site, off loading and placement of equipment on foundation, and final assembly of equipment ready for service

C. All external wiring connections (primary, secondary, control and grounding) will be by others.

1.02 REFERENCES

A. Design, manufacture and test in accordance with this section and applicable sections of the latest version of the following standards:

1. ASCE 7, Minimum Design Loads for Buildings and Other Structures
2. ANSI C37 Series and NEMA SG4, Power Circuit Breakers
3. ANSI C37 Series, Protective Relays
4. ANSI C39.1, Switchboard Instruments
5. NEMA SG5, Power Switchgear Assemblies
6. NEMA SG6, Power Switching Equipment
7. NEMA SG2, High Voltage Fuses
8. ANSI C57.13, Instrument Transformers
9. IEEE, Requirements for Short Circuit Withstand
10. ICEA, Specifications for Wire and Cable
11. NEC, Current Rating of Control Wiring
12. ANSI C62.11, Metal Oxide Surge Arresters and NEMA LA1 for Surge Arresters
13. IEEE 48, High-Voltage Alternating Current Cable Terminations
14. ANSI Z358.1, Emergency Eyewash and Shower Equipment
15. ANSI Z55.1, Standard Gray Finishes for Industrial Apparatus and Equipment
16. OSHA Part 1, Design Safety Standards for Electrical Installations

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

A. General

1. Provide a complete working switchgear assembly, including all components necessary to function in accordance with the Contract Documents.

2. It is required that the switchgear and equipment enclosure be fabricated and assembled together at the same factory.

3. Where available, all switches, lights, receptacles, control and indicating devices, etc. shall be UL (Underwriters Laboratories) or CSA (Canadian Standards Association) approved and listed for the purpose.

4. The switchgear shall be qualified in accordance with IEEE Standard 693-1997, IEEE Recommended Practice for Seismic Design of Substations. The seismic qualification level shall be "MODERATE".

5. Design enclosure and supporting structures to avoid damage or loss of function and remain operational during and following an earthquake as defined by ASCE 7-98. Provide structures seismically designed so that the basic lateral and vertical seismic-force-resisting system conforms to one of the types indicated in Table 9.5.2.2 in ASCE 7-98. Provide a structural system suitable for Seismic Design Category B and in accordance with the height limitations indicated in the table. Use the appropriate response modification coefficient R; system over-strength factor, Ω_0; the deflection amplification factor, C_d; indicated in the table to determine the base shear, element design forces and design story drift.

6. In general, provide a seismic structural design in accordance with the procedures outlined in Sections 9.5 through 9.14 of ASCE 7-98.

7. The electric phase rotation in this equipment is to be NEMA Standard 1-2-3 (A-B-C) counter clockwise. The bus and connection phasing is to be 1-2-3 top to bottom, left to right (facing the front). Mount all relays, instruments, bases and equipment involving three-phase circuits so they are arranged 1-2-3 left to right when facing front of equipment, 1-2-3 top to bottom, 1-2-3 front to back where applicable.

B. Switchgear Equipment Enclosure

1. Outdoor, weatherproof, insulated, metal framed and skinned equipment enclosure, as described herein and on the Contract Drawings.

2. Provide with ac and dc panelboards, wireways, lighting, conduits, etc. as specified herein.

3. Provide with 125 Vdc station battery, racks spill tray and charger.

4. Comply with OWNER's proposed equipment arrangement as shown on the Contract Drawings, or provide alternate arrangement sketch with bid. OWNER reserves the right to modify arrangements that do not comply with the included sketch.

5. Switchgear access control will be via key locks on each door.

6. Switchgear will be mounted on pier (pylon) type foundation. Piers shall be located so as to minimize obstruction of the power cable access areas. The preference is to allow for approximately three feet of cantilever in areas with power cable access (i.e. pier line to be +/- 3 feet inside of outside wall of enclosure). Provide required support pier arrangement drawing with bid. Piers will be provided with embedded steel plates, and switchgear will be welded to these plates.

C. Metalclad Switchgear

1. Fully assembled and integrated within the equipment enclosure at the factory.

2. Provide with two tier vertical sections for horizontal drawout circuit breakers, as described herein and on the Contract Drawings. Circuit breakers to be installed in bottom compartment only.

3. Factory assembled, prewired and pretested

4. Power cable access from below

D. Control Panel/External Interface, SCADA and Fiber Optic Cabinets

1. Provide a control panel/external interface cabinet as described herein.

2. Provide SCADA cabinet and RTU Equipment as described herein.

3. Provide a Fiber Optic cabinet and associated equipment as described herein.

E. Circuit Breakers

1. Medium voltage, alternating current, three-pole, horizontal drawout circuit breakers mounted in the bottom tier only of switchgear sections, for operation on a nominal 22.9 kV, 4-wire, effectively grounded utility distribution system.

2. Circuit breakers to roll out directly on floor of enclosure, without need of a lift device, truck or ramp

3. Circuit breakers shall be manufactured by same vendor, with breakers of like ratings electrically and mechanically interchangeable.

4. Standard design and manufacture

5. Normally used in automatic reclosing duty

6. General purpose circuit breakers for distribution feeder service

F. Relays, Controls and Instruments

1. Provide relays, controls and instruments in accordance with the included Protective/Control Device List. Note that the Protective/Control Device List included with this Specification covers only the major relay and control equipment, and is not intended to address all relay and control items. It is the responsibility of the Manufacturer to provide all required equipment to result in a fully functioning switchgear assembly in accordance with the Contract Documents for the cost identified in the bid form.

2. Provide SCADA equipment as specified herein. Connect all points identified on the SCADA point list to input/output points on the SCADA modules.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 24:

1. Product Data: Catalogs and cut sheets

2. Shop Drawings:

a. Outline showing general arrangement, legend, floor plan, foundation pier location and weights, anchor details, and overall arrangement of switchgear.

b. Interior section and elevation drawings showing sufficient detail to identify all elements mounted within the switchgear enclosure, including panelboards, switches, battery, charger, switchgear cubicles, wireways, etc.

c. Wiring drawings for all internal Equipment Enclosure circuits. These drawings are to be a coordinated part of the overall switchgear drawing package. All enclosure wiring that connects to switchgear wiring circuits and equipment shall be suitably cross referenced to allow for proper understanding and tracing of wiring in the field. All equipment enclosure wiring circuits shall be detailed sufficiently to allow for proper tracing and troubleshooting in the field.

d. Arrangement drawings of each switchgear cubicle showing the physical location and arrangement of all devices, terminal blocks, and power and control cable entrance areas. **Drawings to show drawout elements, such as circuit breakers, PT's and fuse holders, in both the connected and disconnected positions to fully depict the available clearance from devices on the doors.**

e. Installation diagrams showing anchoring method.

f. Bill of material

g. Nameplate and annunciator window schedule

h. Ac schematic (one-line relay and metering, three line) diagrams for all relaying and metering circuits. Typical drawings are not acceptable. Assign wire numbers on each diagram so each segment of circuit can be identified on internal and interconnection wiring diagrams. **One single overall three-line diagram shall be produced to encompass the entire substation in accordance with the one-line diagram**.

i. Individual schematic diagrams for each relay, control, metering and annunciator. Typical drawings are not acceptable. Assign wire numbers on each diagram so each segment of circuit can be identified on internal and interconnection wiring diagrams. Show contact developments of control and selector switches, test switches, DC and AC auxiliary relays, undervoltage relays and lockout relays.

j. Individual internal wiring and interconnection diagram for each cubicle or cabinet. Typical drawings are not acceptable. Prepare wiring diagrams as follows:

1) Use separate wiring diagram for each cubicle.

2) Provide 4-inch clear margin on one side of terminal blocks for OWNER's external cabling information.

3) Show relative physical arrangement and terminal locations of devices and terminal blocks.

4) Use destination terminal address system at both ends of actual wiring. Tabular format wiring lists are not acceptable.

5) Use same wire numbers as assigned on schematic diagrams for terminal block designation.

3. Provide the following for each type of current transformer:

a. Excitation and ratio correction factor curves for each secondary ratio.

b. Resistance of current transformer secondary and connection leads for each ratio.

c. Actual current ratio and turn ratio for each tap

d. Mechanical and thermal short time (one second) ratings

4. Design Data

a. Certified circuit breaker design test report for Design Tests listed in ANSI C37.09.

b. Certified ac switchgear assembly design test report for Design Tests listed in ANSI C37.20 and NEMA SG5.

c. Certified protective relay design test report for surge withstand capability.

d. Manufacturer's certification that all equipment and assemblies conform to the seismic requirements stated in Article 1.03

5. Test Reports

a. Four copies of certified factory test reports after final test for all testing required by this specification, including all testing listed under Quality Assurance.

b. Four copies of certified VT test reports for each separate voltage transformer installed in the switchgear. VT test reports to be identified by VT serial number, and to include the location of the VT within the switchgear (i.e. upper drawer, Phase A-B, etc.)

c. Provide certified test results for each metering current transformer procured under this order. CT test reports to be identified by CT serial number, and to include the location of the CT within the switchgear (i.e. Unit 5 load bushings, Phase A, etc.)

6. As-Built Drawings

a. Show all changes and revisions to date of equipment shipment.

b. On Schematic diagrams, clearly label all terminal points that each circuit connects to, including intermediate terminal block positions. Schematics shall be drawn to represent the actual routing of wires.

B. Operation, Maintenance and Installation Manuals: In accordance with Section 01 78 23.

1.05 QUALITY ASSURANCE

A. Factory Inspection and Testing:

1. Circuit breakers and switchgear sections:

a. Assemble, adjust and complete manufacturer's routine production tests in accordance with ANSI C37 and NEMA standards as well as other tests specified on each item of electrical equipment and similar equipment supplies as spare parts.

1) Install each circuit breaker in its assigned cubicle after the switchgear has been fully assembled.

2) Check each circuit breaker for correct operation of shutters, interlocks, auxiliary contacts, racking mechanisms, and ease of installation and withdrawal.

3) Check the complete assembly for alignment and fit of enclosure panels, bus connections and clearances.

4) Check control and selector switches for proper contact operation.

5) Check device markings, nameplate markings, conductor identification and meter and instrumentation scales.

2. Entire Assembly

a. Completely assemble and wire entire switchgear and associated equipment within its enclosure, in accordance with Part 3 of these specifications.

1) Perform point-to-point circuit continuity tests to ensure physical wiring is in accordance with the requirements.

2) Perform dielectric tests on wiring in accordance with standards.

3) Functionally test all ac and dc control circuits to verify proper operation. Simulate operation by applying ac currents and voltages to CT and VT circuits, and dc voltages to control circuits. Demonstrate proper operation of all circuits.

3. Metering Current Transformers

a. Test each Metering Current Transformer in accordance with ANSI C57.13.

b. Ratio correction factor and phase angle tests for each CT ratio, standard burdens B=0.3 through B=2.0, 0.5 and 5.0 secondary amperes.

c. Resistance of current transformer secondary and connecting leads for each ratio.

d. Excitation and actual current ratio and turn ratio for each tap.

e. Note the individual CT serial number and the location it is installed within the switchgear on each test report.

4. Voltage Transformers

a. Test each Voltage Transformer in accordance with the requirements of ANSI C57.13. Voltage transformers shall be utilized for revenue metering and/or relay duty.

b. Note the individual VT serial number and the location it is installed within the switchgear on each test report.

B. OWNER may inspect switchgear and/or witness all or a portion of the testing procedure.

1.06 DELIVERY, STORAGE AND HANDLING

A. Proceed in accordance with Section 01 66 02.

B. Deliver equipment f.o.b. to substation foundation. MANUFACTURER is responsible for arrangements, paying of freight and shipping, and handling equipment between factory and substation site. MANUFACTURER is responsible for all charges caused by delays in offloading equipment associated with damage during shipment, including excess crane and personnel charges.

C. Equipment to be shipped on open-top truck to facilitate unloading at OWNER's site

D. Provide suitable temporary covering to protect shipping split openings from the effects of weather and hazards of transportation. Temporary covering to be both impervious to water and sufficiently rigid to prevent damage due to road hazards such as rocks thrown up by vehicle tires. For example, plywood covered with plastic sheeting.

E. Equipment unloaded to foundation by MANUFACTURER. Provide minimum 5 business days notice of delivery to OWNER. Foundations will be provided by OWNER.

1.07 PROJECT/SITE CONDITIONS

Isokeraunic level	40 thunderstorm - days/year
Wind velocity	ASCE 7, Basic 3 second gust wind speed of 100 MPH with Importance Factor of 1.15 and Exposure B
Snow Load	40 pounds per square foot
Elevation above sea level	less than 3,300 feet NGVD
Temperature range (min/max)	minus 30 degrees F/plus 115 degrees F
Precipitation	40-45 inches/year average

PART 2 – PRODUCTS

2.01 EQUIPMENT ENCLOSURE

A. General Requirements

1. Furnish outdoor, weatherproof, metal framed, climate controlled equipment enclosure with protected operating/equipment aisles and battery/control area. Design enclosure in conformance with the OWNER's drawings.

2. Material:

   a. Wall panels: Minimum 12 gauge steel.

   b. Roof panels: Minimum 12 gauge steel.

   c. Floor plates: Minimum 1/4" plate steel under walkway areas.

   d. Floor plates: Minimum 1/8" plate steel under switchgear areas.

3. Furnish continuous weatherproof structure as shown on the drawings, consisting of sloped roof, personnel access doors and cubicle rear entry doors.

4. Design operating/equipment aisle to accommodate circuit breaker removal. Minimum aisle width is 120" between switchgear door faces.

5. Design enclosure with rigid, welded, self-supporting structural base of adequate strength for handling and with capability of being installed on foundation piers not completely level.

6. Design enclosure with built-in wireways to accommodate internal switchgear enclosure auxiliary services (lighting, receptacles, HVAC power, smoke detectors, etc.)

7. Provide metallic trough arrangement at top of switchgear cubicles and relay cabinets and around wall (as shown on the drawings) to accommodate all interconnection wiring between cubicles (and between cubicles and panelboards, internal equipment and external equipment connection cabinet) within the switchgear enclosure without need for additional conduit systems.

8. Design enclosure for bottom entry of power cables. Provide substantial gasketed aluminum removable floor plates in the primary compartment of each cubical, sized to accommodate at least six (6) six inch trade size galvanized steel conduits, with lock nuts and bushings.

9. Control cables connecting to external substation equipment shall enter the switchgear enclosure via conduits that enter the enclosure via the identified cable access compartments. Provide internal cable trough system as shown on the drawings and substantial gasketed aluminum removable plates over cutouts in floor to accommodate external conduits. Provide properly protected holes between sections of wireway and trough or cabinets to allow for cable entry.

10. Provide all internal and interconnection wiring necessary for a completely operational assembly.

11. Provide a 60 inch wide by 30 inch deep standard desk, complete with file and kneespace drawers. Provide a book shelf mounted high on wall above desk, designed to accommodate 48 inches of standard 8 1/2" x 11" format binders, with a stop at each end to prevent books from falling off. Provide a roll around type drawing storage rack, “Planhold” 24" wide drop lift roll around rack, or approved equal. Provide minimum of six (6) 24" wide plan holders.

B. Weatherproofing and Insulation

1. Design weatherproof construction to exclude driving rain and snow and provide tight sealing of all openings against environmental conditions stated in this Specification.

2. Provide gasketing on all exterior personnel access doors and rear cubicle doors.

3. Provide undercoating for the underside of all metal surfaces in the base and floor structure to prevent corrosion.

4. Insulate roof, exterior walls, exterior personnel doors and base of enclosure as follows:

   a. roof/ceiling: R-30

   b. walls: R-11

   c. floor: R-19 (utilize spray foam insulation for floor)

C. Doors

1. Rear cubicle doors:

   a. Hinged and gasketed, sized to provide full access to interior of power cable compartment

   b. Separate doors shall be provided for each rear accessible compartment, including cable compartments, CPT compartments, etc.

c. Provide with 3-point latching mechanism with substantial operating handle with provisions for padlocking.

d. Provide with automatic sliding rod type door stops that will hold the door in the open (approx. 135 degrees swing) position and prevent the door from swinging beyond this position.

e. Provide with overlapping door flanges designed to protect the door gaskets from weather.

f. Provide a continuous drip shield over adjacent doors extending far enough from switchgear face to prevent water from dripping onto door, latch or padlocks (minimum projection 8 inches).

g. Provide with filtered ventilation louvers. Filter boxes to be designed such that there are two sets of metal louvers, one towards the outside and one towards the inside of the cubicle. The outer louver shall be removable to allow changing of the filter without requiring access to the high voltage compartment. Provide insect screens attached to the inside of the outer louvers.

h. Provide “Danger - High Voltage” signs on each rear cubical door.

i. Provide minimum 2” x 4” lamacoid nameplates designating the cubical name (in accordance with the nameplate list) on each rear door. Nameplates to be mounted with stainless steel screws, nuts and washers.

2. Exterior personnel doors:

a. Provide 1-3/4 inch thick full flush type hollow metal exterior doors in accordance with SDI 100.

1) Face sheets: 16-gauge bonderized steel conforming to ASTM A525 with G60 galvanized coating.

2) Core construction:

a) Vertical channels or "z" members not lighter than 22-gauge cold rolled steel spaced not more than 6 inches apart and spot welded to face sheets.

3) **OR**

a) Grid pattern of vertical and horizontal 18-gauge cold rolled channels welded at all junctures and spot welded to face sheets.

4) Thermal insulation: R-15 chemically inert, non-combustible, moisture resistant material.

5) Fire rating: 1 1/2 hour class B.

6) Hardware preparation: factory drilled, tapped, and installed.

7) Hardware: Furnish and install at each exterior personnel door.

a) 1 1/2 pair of 4 1/2 by 4 1/2 inch stainless steel butt hinges, full mortise, ball bearing action with removable pins.

b) Threshold with vinyl sweep strip and perimeter weatherstrip.

c) Equipped with interior full width panic bars and locking entry set to permit exit even if doors are locked. Entry set to include large handle and thumb latch.

d) Furnish Sargent entry locksets designed to accept standard lock cylinders. Provide lock cylinder. OWNER will arrange to have cylinder set to OWNER's standard keying later.

e) Finish: US26D, satin chrome.

b. Full height, hinged, gasketed, outward swing

c. Provide with drip shield over door extending far enough from switchgear face to prevent water from dripping onto door or handles (minimum projection 8 inches).

d. Sizes:

1) Provide one (1) single leaf door, 3' wide by 7' tall (switchgear room door).

2) Provide one (1) double leaf door, 6' wide by 7' tall (maintenance room door).

e. Entry Roof:

1) Provide 5' x 8' entry roof over maintenance room entry door.

2) Provide 5' x 5' entry roof over switchgear room entry door.

3) Roof shall be pitched to drain water to the sides, and to support the specified snow load.

4) Entry roof shall be supported with posts to the concrete pad in front of the door, and shall be removed for shipment.

3. Interior personnel doors:

a. Provide 1-3/4 inch thick full flush type hollow metal interior doors in accordance with SDI 100.

1) Face sheets: 16-gauge bonderized steel conforming to ASTM A525 with G60 galvanized coating.

2) Core construction:

a) Vertical channels or "z" members not lighter than 22-gauge cold rolled steel spaced not more than 6 inches apart and spot welded to face sheets.

3) **OR**

a) Grid pattern of vertical and horizontal 18-gauge cold rolled channels welded at all junctures and spot welded to face sheets.

4) Fire rating: 1 1/2 hour class B

5) Hardware preparation: factory drilled, tapped, and installed

6) Hardware: Furnish and install at each exterior personnel door

a) 1 1/2 pair of 4 1/2 by 4 1/2 inch stainless steel butt hinges, full mortise, ball bearing action with removable pins

b) Equipped with full width panic bars and entry set to permit exit even if doors are locked. Entry set to include large handle and thumb latch.

c) Finish: US26D, satin chrome

b. Switchgear to Control Room door:

1) Hinged to swing towards the Control Room

2) Provide a 12” x 12” lexan window centered in the upper section of the door.

3) Equipped with non-locking latch set with full width panic bar on switchgear room side

4) Size: provide one (1) single leaf door, 4' wide by 7' tall

4. Provide a self-contained burglar alarm system as follows:

a. Provide door contacts on each exterior door. Wiring shall be neat and protected from inadvertent contact or damage.

b. Provide control unit with ac power (plug in transformer) and battery backup, local horn and alpha-numeric keypad.

c. Provide external contact wired to SCADA input point

d. Manufacturer: DSC Co., #PC1832 with #PK5500 key pad, or Approved Equal

D. Heaters/Cooling/Ventilation

1. HVAC

a. Provide thermostatically controlled HVAC units to maintain interior temperatures.

b. HVAC units shall be wall-mounted

c. Provide a minimum of two HVAC units, plus any ducting required to properly distribute conditioned air throughout the enclosure. All rooms shall be conditioned.

d. Size HVAC units and provide ducting and/or transfer fans as required to maintain interior temperatures in all areas of the enclosure as follows when exterior temperatures are within the range specified herein (include effects of switchgear anticondensation heaters and thermostatic control of vent fan):

1) All units in service: 70 degrees F (heating) to 80 degrees F (cooling)

2) One unit out of service: 60 degrees F (heating) to 95 degrees F (cooling)

e. HVAC units shall be Eubank Model V4, with barometric damper, disposable filter, Gray color, or Approved Equal.

2. Battery Area Ventilation:

a. Provide forced ventilation of control room to maintain concentration of hydrogen evolved from battery below explosive (1%H) concentrations, and to exhaust excessive heat.

b. Use wall-mounted Exhaust fan(s), located as shown on the drawings. Exhaust fan to be rated as explosion proof, and to be mounted to the outside of the enclosure under a weatherproof hood.

c. Use gravity-actuated, hooded intake louvers, located on the fixed leaf of the control room exterior door. Use standard filters on all louvers.

d. Provide timer to operate fans periodically as required to remove hydrogen, and an adjustable thermostat to operate the fans when the temperature reaches an excessive high level. No timers, switches, thermostats or other devices that may generate a spark shall be located above battery.

3. Provide OWNER adjustable building high and low temperature alarms for each room, wired to annunciator point. High temperature alarm shall have a range of at least 80 to 110 degrees F, and shall be preset for 100 degrees F. Low temperature alarm shall have a range of at least 50 to 20 degrees F, and shall be preset for 40 degrees F.

E. Lighting and receptacles

1. Interior Lights

a. Provide ceiling-mounted heavy duty commercial grade fluorescent fixtures (T-8 lamps with electronic ballasts) over accessible areas of enclosure. Control lights with three-way switch arrangements at the doors to each room (separate switching for Control and Switchgear rooms). Illuminate to level satisfactory for normal operating and equipment maintenance activities.

2. Exterior Lights:

a. Provide 100W equivalent LED wall mounted flood lights as shown on the drawings for yard lighting purposes.

b. Exterior lights shall be switched via the yard lighting switch:

1) Provide a LSR remote operated switch located on the Control Panel. LSR shall be wired to operate via SCADA as well as by manual control.

2) Wire two contacts of the LSR switch to a dedicated 240V 3-wire, 30 ampere circuit, for external yard lighting. Terminate the dedicated circuit (2 hot legs and neutral) on adjacent terminal block positions in the Control Panel/External Interface Cabinet.

3) Wire contact(s) of the LSR switch to dedicated 120V 2-wire, 20 ampere circuit(s), to supply the external building wall lights.

3. Provide 120 V ac, 20 ampere duplex convenience receptacles at the following locations:

a. As shown on the Drawings.

4. Provide four (4) exit signs with battery backup, and four (4) self-contained battery powered emergency lights. Emergency lights to have sufficient battery power to allow at least 60 minutes of light upon loss of power.

a. Wire emergency lights to room lighting circuit ahead of switches.

b. mounted as follows:

1) One mounted above each exterior personnel door

2) One mounted above each side of the interior personnel door between the switchgear aisle and control room.

F. Fire Protection

1. Provide minimum of two (2) ceiling mounted smoke detectors in each room, with contact outputs wired to annunciator. Smoke detectors shall NOT alarm upon loss or restoration of AC power.

2. Provide 20 pound capacity, CO_2 fire extinguisher adjacent to each exterior personnel door. (total of two).

2.02 SWITCHGEAR

A. Principal ratings and electrical characteristics as follows:

1. Electrical ratings

a. Cont. current, Main buses..... 2,000A

b. Cont. current, circuit breakers..... 2,000A

c. Rated short time current ..... 25 kA, rms

d. Rated momentary current ..... 68 kA, rms, min.

e. Rated maximum voltage ..... 27.0 kV, rms

f. Nominal voltage class ..... 25.0 kV, rms

g. Operating voltage ..... 22.9 kV, rms

h. Basic Impulse Level (BIL) ..... 125 kV

i. Low frequency (1 min) withstand voltage ..... 60 kV

B. General Features

1. Switchgear cubicles: Two high stacking configuration with circuit breakers installed in bottom compartments only. Use upper compartments for voltage transformers or auxiliary equipment.

2. Circuit breaker compartments: Closed door drawout design, with CONNECT, TEST and DISCONNECT positions.

3. Circuit breaker compartments to be designed with shutters that effectively close and block access to the bus and load connections when the circuit breaker is withdrawn. Shutters to be clearly marked with phase designations and “bus” or “line” and suitable “Danger - High Voltage” sign.

4. Provide cutouts in top of each cubicle secondary compartment to route control wiring to wireway above, as shown on the Drawings. Protect all edges to prevent damage to wiring.

5. Provide grounded metal barriers to separate high voltage compartments from low voltage compartments.

6. Auxiliary compartments: Provided with rollout trays and fuses for voltage transformers as shown on the Contract Drawings.

C. Heaters and Receptacles

1. Provide anticondensation heaters in the exterior cable and equipment spaces, permanently wired to the 120 volt auxiliary power source through fuses or circuit breakers

in each metalclad cubical. Do not provide heaters in the interior switchgear spaces (interior aisle is space conditioned to control humidity). Utilize 240V rated heaters operated at 120V, sized for reduced output. Install perforated metal heater guards to prevent contact. Provide suitably scaled ammeter on door of each vertical switchgear section to monitor heater circuit for that section. Provide engraved nameplate below ammeter indicating “Heater Ammeter” “Normal = #.#A” (fill in normal ampere reading #.# for each ammeter).

2. Provide 120 V ac, 20 ampere, utility duplex convenience receptacles at the following locations:

   a. On the outside of the lower front door of cubicles as indicated on the Drawings

D. Switchgear compartment front doors

1. Provide hinged full-height doors for each cubicle. Provide three point latching of each door. Door latches to be operable without need of tools. Hinges shall be sufficient to support the expected weight of the door with all equipment and wiring installed and to allow for smooth opening/closing operations.

2. Provide automatic sliding rod type door stops that both prevent the doors from opening beyond approximately 135 degrees (to prevent hitting objects on adjoining doors) and prevent the doors from swinging closed until released.

E. Power Cable Termination Compartments

1. General

   a. Height: 48" minimum from bottom bolt of terminal lug to top of floor plate.

   b. Cable supports: removable, sized to withstand maximum short circuit stresses specified for the switchgear assembly. Locate support bars and barriers such that they will not interfere with the cables or terminations. **Design support bar mounting so that the bars may be moved towards or away from the circuit breaker in 1” increments (minimum adjustment range to be 4” each way from centerline of cable lugs**.

   c. Grounding: provide A. B. Chance Co. Cat. No. C600-2102 grounding ball stud and C4106-0416 grounding stud cover on each cable terminal. Locate so that ball studs are readily accessible for grounding cable installation with a hot stick. OWNER to approve mounting installation prior to fabrication.

   d. Insulating Boots: Provide removable insulating boots for each cable termination compartment to completely insulate each phase connection when complete. Insulating boots to completely cover all exposed live parts, and provide sufficient insulating value to allow operation with no additional taping or insulating of connections.

2. Transformer Main Cable Termination Compartments: designed to accommodate six sets of 25 kV class terminations and one set of specified surge arresters.

3. Feeder Cable Termination Compartments: designed to accommodate two sets of 25 kV class terminations and one set of specified surge arresters.

4. Provide additional ground studs in rear portion of the AUX1 and AUX2 compartments that are connected to and allow safety grounding of each switchgear main bus section.

2.03 CONTROL AND SCADA CABINETS

A. Control Panels/External Interface Cabinet

1. Provide control panels as shown on the Contract Drawings.

2. Control panel to contain a mimic bus of the switchgear and associated 115 kV and 23 kV equipment, annunciator, circuit breaker control switches and indicating lights, feeder voltmeters, ammeters and live line lights, live bus lights and voltmeters, and associated equipment, as shown on the Contract Drawings.

3. Design control panels with front swinging doors for access to rear of panel for wiring access. Doors shall open away from each other to provide full access to inside of compartment. External equipment shall be mounted to doors.

4. Provide openings as shown on the Drawings, or equivalent, in top of control panels for use in routing control cables to terminal strips in control cabinet. Protect edges of openings to prevent cable damage.

5. Terminal Blocks

   a. Provide terminal blocks for all wires entering control panel. Terminal blocks to be mounted in vertical columns along the rear wall of the enclosure

   b. Provide suitable sized panduit type wireways or provisions to tywrap wire bundles to panel between terminal blocks.

   c. Wire all external connections to terminal blocks before wiring to equipment in panel.

   d. Provide 20% spare empty terminal points for OWNER's future use. Logically group all terminal block connections, and group spares together.

6. Mimic Bus:

   a. Provide mimic bus as shown on Contract Drawings.

   b. 3/32 inch thick (min.) and 1/2 inch wide plastic or anodized aluminum

   c. Attached to control panel face with screws or plastic rivets

   d. Mimic bus color: 115 kV: White, 25 kV: Red

B. SCADA Cabinet

1. Provide SCADA Cabinet as shown on the Drawings.

2. Dimensions: 32" wide x 20" deep x 90" high, with front swinging door. Construct identical to control cabinets.

C. PMLP SCADA RTU

1. Furnish and install PMLP SCADA equipment as described in the Protective/Control Device lists, and SCADA Point Lists

D. National Grid SCADA RTU

1. Furnish and install National Grid SCADA equipment as described in the Protective/Control Device lists and SCADA Point Lists

2.04 CIRCUIT BREAKERS

A. Principal ratings and electrical characteristics as follows:

1. Nominal voltage class: ..... 25.0 kV
2. Rated maximum voltage ..... 27.0 kV
3. Voltage range factor: 1.00
4. Operating voltage: ..... 22.9 kV
5. Continuous current: ..... 2,000 A
6. Nominal three-phase interrupting capability: ..... 1,250 MVA
7. Short circuit current at max. volts: ..... 25 kA, rms, min.
8. Max symmetrical interrupting capability: ..... 25 kA, rms, min.
9. 2 second short time current carrying capability: ..... 25 kA, rms, min.
10. Closing and latching capability: ..... 68 kA, rms, min
11. Interrupting time: ..... 3 cycles max
12. Low frequency (1 min) withstand voltage: ..... 60 kV, rms
13. Basic Impulse Level (BIL): ..... 125 kV
14. Control Voltage Range
    a. Closing and Auxiliary Functions ..... 100-140 VDC
    b. Control Voltage Range for Opening Functions ..... 70-140 VDC
15. Spring charging motor operation ..... 125 V dc
16. Operating Endurance, Number of Operations: in accordance with ANSI C37.06
17. **Manufacturer: Square D type VR, catalog number VR-2702520 (No Exceptions)**.

B. Circuit Breaker Features

1. Closing: By electric motor charged, spring operated stored energy mechanism. Spring charging motor shall be universal type suitable for either 120V ac or 125V dc operation.
2. Manual closing: Provide manual handle to charge spring for testing and emergency closing.
3. Tripping: 125 volts dc
4. Breakers of like ratings shall be completely interchangeable.
5. Equipped with self-coupling primary and secondary disconnect contacts
6. Horizontal draw-out type with undercarriage features allowing removal from lower compartment without need of lift device, truck or ramp.
7. Interrupters: high vacuum hermetically sealed interrupter for each phase, utilizing vacuum as the insulating and interrupting medium.

8. Primary disconnect contacts:

    a. Silver plated, high contact pressure, sturdy and self-aligning

    b. An integral part of the element and of the multiple finger spring loaded type

9. Auxiliary switch contacts: Provided so that at least 2 "a" and 2 "b" contacts are unassigned after all connections are made. Arrange so contacts operate in both CONNECT and TEST positions. Wire to terminal blocks for OWNER's use.

10. Mechanism Operated Cell ("MOC") switch contacts: Provided so that at least 8 "a" and 8 "b" contacts are unassigned after all connections are made. Arrange so contacts operate in both CONNECT and TEST positions. Wire to terminal blocks for OWNER's use.

11. Truck Operated Cell ("TOC") switch contacts: Provided so that at least 2 "a" and 2 "b" contacts are unassigned after all vendor connections are made. Arrange so contacts change state when the breaker element is moved from the CONNECT to the TEST positions. Wire to terminal blocks for OWNER's use.

    a. Alarming contacts (SCADA, Annunciator) shall be wired via the TOC such that these alarms are not activated when the circuit breaker is in the TEST or DISCONNECT position.

12. Provide manual means for tripping

13. Provide trip free and non-pumping operation

14. Provide easy to read position indicator

15. Provide operations counter.

16. Provide light and mechanical flag to indicate stored energy mechanism is fully charged

17. Closed door drawout design

18. Provide contact erosion indicator

19. Interlocks

    a. Circuit breakers shall include all safety interlocks required by ANSI, NEMA and OSHA standards.

    b. Circuit breakers shall be mechanically interlocked to:

        1) Prevent moving the circuit breaker to or from the connected position with the vacuum interrupter contacts closed.

        2) Prevent closing the breaker unless it is fully engaged in the connected or test position or completely withdrawn from the cell.

        3) Prevent removal or insertion of the breaker from/into the cell until it is open and the stored energy mechanism is fully discharged.

    c. The circuit breaker interlocking design shall not utilize cable interlocks.

2.05 COMPONENTS

A. Switchgear Busing

1. Main Bus

    a. Copper bar, silver plated at all joints and tap points.

    b. Installed in a grounded metal compartment separate from the other wiring, accessible by removable compartment covers

    c. Insulated its entire length with high dielectric strength, flame retarding, self-extinguishing, moisture-resistant epoxy material. Provide insulated covers at all joints and tap points. Sleeve type insulation is not acceptable.

2. Ground Bus

    a. Copper bar, approximately 1/4-inch by 2 inches minimum, solidly connected to each unit of the switchgear.

    b. Include provisions for external ground connection at each end of the bus.

    c. Extended into the power cable entrance compartment of each cubicle containing provisions for terminating power cable, and equipped with A. B. Chance Co. Cat. No. C600-2102 grounding ball stud, and provisions for grounding cable termination stress cone braids and feeder neutral conductors. Locate so that ball studs are readily accessible for grounding cable installation with a hot stick. OWNER to approve mounting installation prior to fabrication.

B. Raceways

1. Provide minimum 12” wide x 4” high wireway/trough along the top of the switchgear cubicles and cabinets to accommodate all Manufacturer cubicle-cubicle wiring.

2. Size for expected vendor cabling, plus a minimum of 100 percent spare capacity for OWNER's use

3. Provide additional wireways around the switchgear enclosure walls and across the ceiling as shown on the drawings. Wireways shall be screw cover type with the cover on either the top or the side of the wireway (bottom covers are not acceptable.) Interior wireways shall be a minimum of 8" x 8". Interior wireways shall be utilized for internal enclosure services (lighting, etc.) wiring runs.

4. Provide dedicated metallic conduit runs for DC connections between battery and DC disconnects/distribution panels. Main DC leads positive and negative cables shall be run in separate conduits.

5. Provide removable floor plates and cable trough/tray system for external control conduit and cable entry as shown on the drawings.

6. Provide cable trough system as shown on the drawings for MANUFACTURER installed internal control cables.

7. Provide covered cable tray from each AC and DC distribution panel to the trough system.

C. Wiring

1. Provide an ungrounded two-wire, 125 volt dc control bus for each 25 kV switchgear bus section (total of two bus sections). The dc control buses shall be integral with the switchgear cubicles. Each dc control bus shall be terminated on suitable screw-type terminal blocks in the last cubicle of the section, and then extended via wireways to the dc distribution panel.

2. Provide 120 volt ac supply bus for each 25 kV switchgear bus section (total of two bus sections). The ac supply bus shall be integral with the switchgear cubicles. Each ac supply bus shall be terminated on suitable screw-type terminal blocks in the last cubicle of the section, and then extended via wireways to the ac distribution panel.

3. Provide communications cabling in accordance with the Communications diagram.

4. Provide two-pole fusing for DC trip circuit. Label “08T”

5. Provide two-pole fusing for DC close circuit. Label “08C”

6. Provide separate single-pole fusing for AC auxiliary circuits (heater circuit, receptacle, light, etc.). Label “08A”

7. Provide two-pole fusing for motor circuit. Label “08M”

8. Connect current and voltage transformer leads to accessible terminal blocks before wiring to relaying, metering or control devices.

9. Connect current transformers to six point shorting type terminal blocks located in the front section of the associated cubicle.

10. Where a vendor connection is expected to be connected to more than one terminal point (i.e. current transformer circuits could be connected to any one of the ratio taps), then the wire shall be left long enough to reach all such terminals.

11. Use No. 14 AWG minimum stranded tinned copper conductor, 600 volt class, type SIS cross-linked polyethylene insulation for secondary and control circuits, including connections to control panel. Size wire based on circuit requirements.

12. Use No. 12 AWG minimum stranded tinned copper conductor, 600 volt class, type SIS cross-linked polyethylene insulation for current transformer secondary circuits, including connections to control panel.

13. Use No. 10 AWG minimum stranded tinned copper conductor, 600 volt class, type SIS cross-linked polyethylene insulation for DC feeders to switchgear cubicles. Size wire based on circuit requirements.

14. Use appropriately sized stranded tinned copper conductor, 600 volt class, type XHHW cross linked polyethylene insulation for AC station service feeders from transfer switch to AC panel, and from battery to DC panel.

15. Use Multi-strand Class K hinge wire where door openings require bending in service.

16. Use type THHN, THWN, XHHW or XHHW-2 600 volt class copper wire, sized per NEC, for aisleway lighting, receptacles and HVAC circuits.

17. Groups of wires running between terminal blocks and/or instruments or devices shall be neatly laced together or run in suitable wireways or troughs.

18. Where a moving object, such as a door or drawer, will come into contact with a wire, suitable guards shall be provided to protect from chafing of the insulation.

19. Where equipment is mounted to the rear of a door in front of a movable element (circuit breaker, PT rollout, etc.), provide a suitable guard to prevent contact between the rollout device and the door mounted equipment.

20. Connect AC and DC power circuits to separate power terminal blocks.

21. Connect current and voltage transformer leads to accessible terminal blocks before wiring to relaying, metering or control devices.

22. All secondary voltage and control wiring running through primary voltage compartments shall be installed in grounded metal conduit or equal.

D. Terminations

1. Made using short-shank, ring-tongue terminal connectors

2. Crimped using ratcheting type crimping tools designed to ensure a proper crimp by not releasing the connector until the crimp is fully complete (AMP "Certicrimp" hand tools or equivalent).

3. Made with no more than two conductors per terminal stud

4. Identify at each wire end using white tubular plastic wire markers securely gripping the wire, with black markings in accordance with schematic and wiring diagrams. Wire markers shall completely surround the wire, shall be oriented so as to be easily read when the wiring is installed, and shall not be removable once termination has been crimped on.

E. Terminal Blocks:

1. Rated 30 amperes, 600 volts minimum, or as required by circuit conductors (GE type EB-25 or approved equal).

2. Equipped with insulating barriers between poles and washer-head binding screws on each pole.

3. Furnished with marking strips and installed in sufficient quantity to provide a minimum of 20 percent spare terminal points for each type block. Spare terminal points shall be grouped logically in each cubicle, not distributed throughout the group of terminal strips.

4. Short circuiting type for current transformer terminations (GE type EB-27 or approved equal).

5. Marked to identify source and function

F. Fuses:

1. Install fuses and fuse holders in each cubicle for control and auxiliary power circuit terminations.

2. Fuse holders: dead front, finger safe, with holes to allow probes to access terminal points for testing and with blown fuse indication.

3. Determine the required quantities and ratings from circuit design requirements.

4. In general, provide separate fusing for each separate circuit, including lockout relays, relay power supplies and meter power supplies.

5. Rated 30 amperes, 600 volts minimum, or as required by circuit design.

6. Provide 1, 2 or 3 fuses as required by circuit design.

7. Manufacturer: American Electrical Inc. (www.americanelectrical.com) type ASK6 with blown fuse indication (No Exceptions)

G. Nameplates:

1. Black laminated plastic composition, with permanent white engraved lettering, beveled edge.

2. Fastened to panel using small round head screws or plastic rivets

3. Installed inside cubicle with small round head screws, plastic rivets or cement

4. Nameplate list to be submitted for approval. Nameplates to be provided for both panel front and rear for all devices.

H. Indicating Lamp Assemblies:

1. Low drain, switchboard type, with integrally mounted resistor

2. Complete with LED lamp.

3. Suitable for 125 V dc or 120 V ac operation as necessary.

4. Manufacturer: General Electric Type ET-16 socket with LED lamp. Utilize Ledtronics LED lamp in GE socket for white color.

I. Instrument, Control, and Selector Switches

1. Type: Rotary, heavy duty, rear connected, semi-flush mounted with escutcheon markings left-right facing from front panel.

2. Contact rating: not less than 20 amperes at 600 volts.

3. Breaker control switches: Electroswitch Control Switch Relay, type CSR, with "TRIP, NAT, NAC, CLOSE" operation, target and pistol grip handle.

4. Selector switches: two or three position with black oval handle, Electroswitch Series 24.

J. Meters and Indicating Instruments:

1. AC Ampere Meters:

a. Digital, switchboard, back-connected semiflush mounted.

b. 4 digit display, no fixed zero; accuracy to exceed 0.5% class (ANSI Std. 460), true rms

c. Three-phase display for use with 5 ampere current transformer secondaries

d. RS485 Interface Converter for use with DNP 3.0 protocol communications port

e. Manufacturer: Bitronics

2. Multifunction Meters

a. Digital, multi-function, power monitor

b. Multiple 4-digit displays, as indicated on the Contract Drawings; accuracy to exceed 0.5% class; True rms

c. Three-phase, four wire, three element for use with voltage and current transformer secondaries rated 67or 120 volts ac and 5 amperes.

d. Mass memory module for historical data logging and captured event waveform

e. Manufacturer: Bitronics type M871

3. AC Voltmeters

   a. Digital, switchboard, back-connected semiflush mounted

   b. 4 digit display, no fixed zero; accuracy to exceed 0.5% class (ANSI Std.460), true rms

   c. Single phase display for use with 120V voltage transformer secondaries

   d. Manufacturer: Bitronics

K. Test Switches

1. Provide 10 pole potential type with red handles for each lockout relay. Wire test switch in each normally open lockout relay contact circuit. Connect test switch contact so jaw end is toward lockout relay contact and hinge is towards trip coil.

2. Provide combination current and potential type for relaying and metering current and voltage circuits. Configuration to be per Protective/Control Device List. Utilize black handles for AC blades and red handles for DC blades. Provide with extended terminal where noted.

3. Provide large clear covers.

4. Manufacturer: ABB Type FT-1

L. Relays

1. Type: Back connected, rack or semi-flush mounting, as specified in Protective/Control Device List.

2. Case: Dust tight, moisture resistant.

3. Operation indicator: Internally operated unless otherwise specified, provided with manual reset of target, where required.

4. Trip contacts and target operation: 70 - 140 V dc.

5. Current coils: 5 ampere.

6. Voltage coils: 67 or 120 volt as required.

M. Lockout Relays

1. Type: Rotary, heavy duty, multicontact, high speed, rear connected, semi-flush mounted, with minimum 10 NO and 10 NC contacts.

2. Operating voltage: 70 - 140 V dc

3. Contact rating: 30 amperes, 600 volts, continuous.

4. Response time: 8 ms.

5. Manufacturer: Electroswitch, Type LOR, with red handle.

N. Voltage Transformers

1. Type: Dry, draw-out or tilt-out mounted, equipped with high voltage current limiting type fuses.

2. VT trunnion or tiltout carriage shall be designed in accordance with the following:

a. The VT carriage shall be grounded at all times in all positions.

b. The VT neutral connection shall be connected to switchgear ground at all times and in all positions.

c. When withdrawn to the disconnected position, a positive ground feature shall ground the VT primary leads to the switchgear ground bus.

d. When withdrawn to the disconnected position, a substantial barrier shall be located such as to prevent contact with the live bus stabs. The VT carriage shall have a positive stop to prevent travel beyond the disconnected position.

e. The secondary VT leads shall be disconnected automatically when the VT carriage is in the disconnected position.

3. Impulse level: not less than 125 kV.

4. Total number, ratio and location: As indicated on the Contract Drawings.

5. Accuracy class: 0.3 for standard burdens of W, X, Y and Z ratings. Maximum ratio and phase angle errors when carrying full secondary burdens shall not exceed ANSI standard classifications.

6. Fuse secondary circuits with dual element cartridge fuses mounted in barrier type fuse holders.

O. Current Transformers

1. Type: dry, 600 volt insulation, 5 ampere secondary

2. Impulse level: not less than 10 kV.

3. Thermal and mechanical capabilities: at least equal to that of circuit breakers.

4. Total number, ratio and location: As indicated on the Contract Drawings.

5. Relaying accuracy: C200 minimum.

6. Metering accuracy: 0.3 using standard burdens of B-0.1, 0.2, 0.5 and 2.0

7. Wire all taps directly to shorting terminal blocks. All wires connecting to terminal blocks for multi-ratio CTs shall be long enough to reach all possible tap positions.

P. Surge Arresters

1. Type: Station class, metal oxide, polymer housed, mounted in cable termination compartment

2. Rating: 18 kV, 15.3 kV MCOV

3. Surge arresters shall be suitable for installation within the switchgear enclosure and shall comply with ANSI/IEEE Standard C62.11.

4. Mount surge arrestors in an inverted position, above the cable termination positions.

5. Connect to ground bus with #2 AWG copper conductor.

6. Connect to live bus with #2 AWG copper, 25 kV insulated unshielded cable. Route cables such that they will maintain suitable clearance from switchgear metallic parts or power cables and terminations.

7. Manufacturer: Ohio Brass or approved equal.

Q. Station Service Transformers

1. Dry Type, epoxy cast transformer

2. Rating: 75 kVA, 120/240V, single phase.

3. Provide 25 kV current limiting fuse for primary connection, located in auxiliary switchgear compartment and sized for transformer provided.

4. Provide two (2) 225 ampere, 2-pole main circuit breakers in front of transformer fuse compartment.

5. Provide mechanical or key interlocks between fuse drawout and 120/240 volt main circuit breakers to prevent opening of fuse when either main circuit breaker is closed.

R. Panelboards and Transfer Switch

1. General

a. Construction: in accordance with requirements of UL 67 (Panels), UL50 (Enclosures), Federal Specification WP-115, Type 1, Class 1, and NEMA PB1.

2. Enclosure:

a. Indoor surface mounted, built with gauge of metal in boxes and front conforming to NEC.

b. Provided with hinged access door, trim and wire gutters at top, bottom and sides.

c. Galvanized after fabrication and finished with manufacturer's ANSI 70-light gray, standard paint finish.

d. Provide with neatly typed circuit directory on inside of door. Leave future OWNER and spare circuit breaker positions blank. OWNER will enter correct circuit designations in the field for these circuits.

3. Buses

a. Provide full-size main and neutral buses.

b. Provide neutral bus with sufficient lugs for each branch circuit space.

c. Provide separate neutral and ground buses with provisions for grounding.

d. All buses to be copper.

e. Lugs: solderless type of suitable capacity for incoming line loads.

4. Circuit breakers

a. Sizes: self-contained, bolt-on-type, noninterchangeable trip elements effectively sealed to prevent tampering, sized as specified herein.

b. Tripping elements: thermally-operated, inverse-time type, nontripping on normal momentary overload, but ensuring adequate circuit protection in conformance with NEC standards

c. Operating mechanism: capable of trip-free operation on abnormal overloads and short circuits, with quick make, quick break contact movement during manual or automatic operation.

d. Contacts: nonwelding, silver alloy, with arc-quench protection.

e. Automatic tripping: clearly indicated by the handle automatically assuming a position between the manual ON and OFF positions.

5. Ac Panelboards

a. Provide two (2) 225 ampere, 120/240 volt, single-phase, main lug panelboard, 22 kA interrupting capacity, bolt-on branch circuit breakers.

b. Provide sufficient branch circuit spaces in panelboards for all circuits required by switchgear design, plus all OWNER’s circuits specified herein, plus at least eight additional unassigned single pole positions. The minimum panel size shall be 30 spaces.

c. Provide single-pole and two-pole, 120/240 V ac branch circuit breakers with trip ratings as required by switchgear manufacturer's design.

d. Provide the following specific branch circuit breakers for OWNER's use to supply other substation equipment:

1) In accordance with the preliminary AC panel Schedules included with this specification.

e. Fill the remainder of panel with an equal distribution of 20 A and 30 A single pole spare branch circuit breakers. The entire panel shall be full, and there shall be at least 8 spare single pole circuit breakers.

f. Manufacturer: Eaton/Cutler Hammer type PRL-1A or Approved Equal.

6. Dc Panelboards

a. Provide 200 ampere, 250 V DC, main lug panelboard, 10 kA interrupting capacity, with bolt-on branch circuit breakers.

b. Provide sufficient branch circuit spaces in panelboard for all circuits required by switchgear design, plus all circuits specified herein, plus a minimum of four additional 2-pole spare positions. The minimum panel size shall be 36 spaces.

c. Provide two-pole, 250 V DC branch circuit breakers with trip ratings as required by switchgear manufacturer's design.

d. Provide the following specific branch circuit breakers for OWNER's use to supply other substation equipment:

1) In accordance with the Preliminary DC panel arrangements included with this specification.

e. Fill the remainder of panel with an equal distribution of 20 ampere and 30 ampere two-pole branch circuit breakers. The entire panel shall be full, and there shall be at least four spare 2-pole circuit breakers.

f. Furnish branch circuit breakers with auxiliary contacts for remote indication

g. Manufacturer: Eaton/Cutler Hammer type PRL-3A or Approved Equal.

7. Automatic Transfer Switches

   a. Provide two (2) 225 Ampere automatic transfer switches for transfer of AC station service supply between station service supply transformers.

   b. Transfer switch to be 2-pole, with switched neutral and with equipment ground bus.

   c. Transfer switch to be mounted in NEMA 1 enclosure with external operating handle.

   d. Transfer switch control shall allow for selection of either source as preferred, and to provide an adjustable time delay on transfer.

   e. Provide normally open auxiliary contacts and panel-mounted lights to indicate the following (contacts shall be time delayed to prevent alarm on bus transfer):

      1) Normal source healthy

      2) Emergency source healthy

      3) ATS in Normal position

      4) ATS in Emergency position

   f. Manufacturer: Eaton/Cutler Hammer Model ATHIFDA30225WSU, with ATC-600 logic and optional feature 10, or Approved Equal.

8. Manual Transfer Switches

   a. Provide two (2) 225 Ampere manual transfer switches for transfer of AC station service supply between internal and external station service transformers.

   b. Transfer switch to be 2-pole, with switched neutral and with equipment ground bus.

   c. Transfer switch to be mounted in NEMA 1 enclosure with external operating handle.

9. Meter Socket

   a. Provide a 200A ring type revenue meter socket on wall between each Manual Transfer Switch and its associated AC distribution panel.

   b. Wire so that the meter will record all energy supplied to the AC distribution panel.

   c. OWNER to provide actual meters at project site

S. Annunciator

1. Provide one annunciator, mounted as shown on the Drawings.

2. Annunciator shall be a solid state, modular design for 125 Vdc operation, in accordance with the Protective/Control Device List.

3. Wire each input, spare, and repeater contact to terminal blocks.

4. Annunciator points: Per contract drawings

5. Manufacturer: Ametek Type AN-3100D

T. 125V DC Battery System

1. Battery

    a. Lead-Calcium or Lead-Selenium, 125 Vdc consisting of 60 cells

    b. Rated 250 ampere-hour minimum capacity at 8 hour rate discharge to final voltage at 1.75 V per cell.

    c. Provide flame arrester vent caps.

    d. Provide dual bar intercell connectors, separately bolted to terminals and arranged such that one strap can be removed for cleaning or maintenance without interrupting current flow through the battery.

    e. Provide with hydrometer

    f. Mounted on rack

    g. Manufacturer: **C&D Type KCR-7, ALCAD type LSE-250, or Approved Equal**.

2. Battery Charger

    a. Self contained, SCR static type, constant potential, microprocessor control, modular charger/rectifier.

    b. Provide with output filter to reduce ripple so as to allow operation as a dc supply without connection to a battery.

    c. Provide with automatic and manual equalize charge feature with indication.

    d. Rated 125 Vdc, 25 amperes output, 240 Vac, 60 Hz input.

    e. Equipped with dc ammeter and voltmeter, input and output circuit breakers and alarm lights and relays for the following (two form C contacts each). Wire alarm contacts to annunciator.

        1) AC power failure (with 30 second time delay)

        2) DC low voltage

        3) DC system ground

        4) Battery charger trouble

    f. Manufacturer: **ALCAD Model #AT-130-025-01230100, with DNP communication board, or approved equal**.

3. Battery Rack

    a. Two step, two tier rack, meeting seismic requirements indicated in this Specification.

    b. Located as shown on the Contract Drawings, installed allowing 4" clearance minimum between walls and equipment

    c. Assembled and installed in conformance with ANSI, IEEE and the rack manufacturer's instructions.

    d. Finished with two coats of acid resistant paint

e. Provide stainless steel drip tray under **entire** battery rack to contain any electrolyte spills. Size drip pan at minimum to contain the full volume of one battery jar

f. Provide stainless steel splash guard on walls adjacent to battery to deflect any electrolyte spills away from wall. Splash guard shall cover entire wall behind battery, extend a minimum of 12 inches above and 6 inches beside battery, and lap over edge of drip tray so that spills will run down splash guard into tray.

g. Provide sufficient absorbent pillows/neutralization to fill entire pan. Pillows to be ACRAN model 5NMB0010 or approved equal.

4. Battery/DC Panel Disconnect Switches

a. Provide 200A, fused two pole disconnect switch with 200A fuses to protect the Battery connection.

5. Emergency Eye and Face Wash Station:

a. Wall-mounted, self-contained, self-cleaning, gravity flow, non-clogging, for quick flushing of acid spills on operating personnel

b. Equipped with quick-opening full flow control valves, aerator nozzles and receptor

c. Equipped with own storage tank.

d. Equipped with a drain valve. Provide a clear poly drain tube from drain valve through hole in floor to open under switchgear. Seal tube into hole in floor to prevent entry.

e. Capable of delivering a minimum of 15 minute criss-cross stream of flushing solution

f. Provide with concentrate mix for initial fill and a minimum of two refills.

g. Manufacture and test to meet requirements of ANSI Z 358.1.

h. Fendall PureFlow 1000

2.06 ACCESSORIES

A. Provide the following accessories with the switchgear assembly:

1. Special tools required for proper maintenance, testing and inspection of the equipment.

2. Crank or lever to manually charge the stored energy closing mechanism.

3. Lever or crank to manually rack circuit breakers to and from the connected positions.

4. Wall mounted test cabinet to facilitate operation of a circuit breaker out of its cubicle for test purposes.

5. Test jumper cable for testing the circuit breaker when in the disconnected or removed position, if required.

6. Two (2) test plugs for each type of relay, test switch and meter.

7. Provide a cart mounted motor operated racking device designed to rack circuit breakers into TEST and CONNECT positions by remote control from a distance of 25 feet. The device shall be designed so that the linkage aligns with the breaker compartment without

need to manually lift the device from the floor. The position of the racking mechanism shall be adjustable. A means shall be provided to secure the device to the switchgear without need of tools (wingnuts or large knurled nuts are acceptable). Remote racking device shall operate from the 120 V ac control voltage and operate with the cubicle door closed. Provide a six (6) foot minimum length AC power cord to plug into receptacles on the front of the switchgear.

B. Provide Material Safety Data Sheets (MSDS) for all chemicals supplied with this order, including paint.

2.07 PAINTING

A. Chemically clean, phosphate treat and rinse all uncoated steel after fabrication.

B. Apply a prime coat immediately after cleaning.

C. Apply at least one finish coat of Off-White color paint to interior surfaces of switchgear cubicle control compartments, underside of enclosure ceiling, and interior surfaces of exterior enclosure walls.

D. Apply at least one finish coat of ANSI Z 55.1 No. 61, Light Gray to exterior surfaces of switchgear cubicles, control and SCADA termination cabinets..

E. Apply two finish coats of ANSI Z 55.1 No.70, Light Gray to exterior surfaces of switchgear enclosure.

F. Apply two finish coats of a long-wearing, non-skid epoxy based paint, Light Gray in color to the floor.

G. Apply one additional, third coat of exterior paint to exterior roof surfaces at the project site AFTER switchgear has been completely assembled and sealed.

PART 3 – EXECUTION

3.01 FACTORY ASSEMBLY/PREPARATION FOR SHIPMENT

A. Completely assemble entire switchgear assembly and enclosure at the Manufacturer's plant, including all bolted connections to mechanically and electrically join the units.

B. Install and terminate all control wiring, including wiring that crosses shipping splits. Fabricate shipping split wiring into harnesses that can be easily coiled back for shipment. Arrange so that the shipping split wiring will be disconnected at the Control Panel and the AC and DC Panels. Where there are more than one shipping section per end, do not terminate the shipping split wiring from the first section in the second section, and then pass through to the control room. Rather, prepare a bundle that can be removed from the wireway in the second section and coiled back into the first section for shipment, then reinstalled in the field upon assembly. The intent is to minimize additional termination points in the shipping split cubical.

C. Functionally test all control circuits per Part 1 of this specification.

D. Remove shipping split wiring harnesses at one end and carefully coil back into section for shipment. Protect wiring from damage during shipment.

E. Install any required framing braces to support shipping sections, and install a substantial barrier (i.e. plywood covered with plastic sheeting) to protect the interior from weather, debris and damage during transit to project site.

3.02 DELIVERY

A. Manufacturer is responsible for arranging and paying for delivery of switchgear from manufacturer's plant to substation site.

B. The OWNER desires that the switchgear be provided in as few shipping sections as possible. It is suggested that the Manufacturer review the access to the substation site prior to final design to ensure that the shipping sections can be moved to the location.

C. Manufacturer is responsible for arranging and paying for rigging services to remove switchgear from delivery truck and place on OWNER-furnished foundation. Foundation drawings will be provided to Manufacturer if requested, following final design, to take place following receipt of switchgear outline and weight shop drawings.

3.03 FIELD ASSEMBLY

A. Manufacturer shall fully assemble all parts removed for shipment, assemble the various shipping splits on the foundation, and make any connections across shipping splits, if required.

B. Manufacturer shall complete all assembly required to make the switchgear ready for service (except external connections that are provided by the OWNER as specified herein), including assembly and connection of the battery.

C. Manufacturer shall weld the switchgear enclosure base frame to the steel support frame provided by the OWNER. Weld areas shall be cleaned and painted with suitable paint to prevent rusting. Paint required to touch up weld areas shall be in addition to that required in Section 2.08.

D. Manufacturer shall apply one additional, third coat of exterior finish paint to exterior roof surfaces AFTER all field assembly has been completed.

E. Remove and properly dispose of all packing materials, crates, pallets, etc. Do not leave discarded materials on site.

F. The OWNER shall provide all required external wiring connections to switchgear, including primary, secondary, control and grounding connections.

G. The OWNER will provide for final acceptance testing of the switchgear unit prior to energization. The Manufacturer is responsible to perform any testing required to ensure that any wiring removed for shipping splits or to facilitate shipping is correctly connected.

H. Manufacturer shall promptly correct any deficiencies discovered during OWNER field testing that are caused by the Manufacturer, at no additional cost to the OWNER.

I. The OWNER will make available 120/240V single phase power for use during assembly.

END OF SECTION

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

CONTROL PANEL 1S
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	AC undervoltage relay, type 27N, 150V AC rated voltage, 125V DC power supply 2 form C contacts, 60-110V pick up range, 1-10 seconds time delay. Device: 27AC ABB Cat#: 411T4175
2	1	DC undervoltage relay, type 27S, self-powered, 125V DC rated voltage, operating range 0.7-1.1 of nominal, 0.1-2.0 seconds time delay Device: 27DC ABB Cat#: 439U6345
3	1	RIS programmable annunciator, Type AN-3200, 6 cells high X 5 cells wide. Rack mount, Integral Pushbuttons. Window size – large, 2 per cell, (1.5" H X 3.0" W each), not field expandable. Active points – 58, window color white, operational sequence – alarm condition will cause lamp flash, horn sound and auxiliary relay contact closure. Manual acknowledge will cause steady lamp shine. Manual reset will extinguish lamp only if alarm condition has cleared. Manual test will light all lamps and will not sound horn or close auxiliary relay contact. Manual silence will silence horn. Field contact voltage – 125V DC, field contacts may be either normally open or normally closed. Power supply – 125V DC. Auxiliary relay – one per each point; with contact that is normally open in the non-alarm condition, relay coils energized. DNP 3.0 communications, time stamping of alarms, serial & Ethernet ports, IRIG-B time sync input, window legends printed on transparency – size 6, LED lamps, internal horn Ametek Model #: AN3200-RK-6H-5W-INTB-2-58-W-M-RR-C-D-TP-SPT-ETH-DNP-SER-IB-HN
4	1	Satellite clock display, IRIG-B input, 125VDC/AC Schweitzer Cat#: 34011400XX KEY 3444
5	1 Lot	Schweitzer Axion with RTAC CPU, 10-slot backplane horizontal surface mount, dual power coupler, 72 digital inputs, and 48 digital outputs. Qty & Catalog #: (Qty 1) SEL- 2241X0X213X0XXXXXX KEY 2925 (Qty 1) SEL- 2242S1X0 KEY 2215 (Qty 2) SEL-224311X0 Key: 2049 (Qty 3) SEL-22442424X0 Key: 3114 (Qty 3) SEL-22443131X0 Key: 3084
6	2	Terminal jumpers for Axion unit (item #5) Schweitzer Cat#: 915900240

7	1	Wetting voltage jumpers for Axion unit (item #5) Schweitzer Cat#: 915900241
8	1	RTU, iBox with input/output module, 8 inputs, 2 trip/close pair outputs, 125VDC power supply, firmware SAX0025/00, 19” mounting panel, printed manuals, ConfigPro Software G.E. Cat#: iBox-3-B-U-U-U-A-C-A, 588-0014 (ConfigPro software)
9	1	Input/Output Module, 16 inputs, 4 trip/close pair outputs, barrier terminal blocks, DNP communications, 125VDC wetting voltage, 2 wiring ducts, 19” mounting, power & communications cables G.E. Cat#: DNP-IO-C-314U-UAUU-2, 977-0500/72 (power cable), 977-0502/24 (comm. cable)

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

CONTROL PANEL 1C
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Load tap changer control switch, Type W2, oval handle 2 stage (1stage rotary action & 1 stage lateral action), rotary action only with handle push in, lateral action only when handle is in position 12, spring return to position 12, engraving to be as follows: Title to read “84LR/MA”, position 11 to read “RAISE”, position 12 to read “OFF”, position 1 to read “LOWER” Device: 84LR/MA/T1 Electroswitch Cat#: 505A716G02
2	2	General purpose, plug-in relay 219 series, 300V, 12 pin, DPDT (2 sets of form “C” contacts), 125V DC coil, polycarbonate cover with Cat# 27390 socket. Device: 284L/T1, 284R/T1 Struthers Dunn Cat#: 219XBXP
3	1	Auxiliary relay, B255 series, mechanical latching type, 125V DC reset coil, and operate coil, double pole double throw contacts (two form “C”) clear polycarbonate cover with Cat# 27390 socket. Device: 284MA/T1 Struthers-Dunn Cat#: B255XBXP
4	1	Load tap changer remote position monitor 120V AC, 60HZ input, -1 to +1 mA output, RS-485 port. Intelligent Controls Model#: 1250LTC-1-R-M-120
5	4	Circuit Breaker & MOD control switch relay, series 24 type CSR, Circuit B, one second delay, with anti-pumping feature, 4 decks, spring return, pistol grip handle, escutcheon place engraving to have “TRIP” in position 1 (left) and “CLOSE” in position 2 (right) Device: 52/43CS, 89/43CS Electroswitch Cat#: 8846DB
6	12	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (6 red, 4 green, 2 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
7	6	Indicating light with GE type ET-16, 120V AC socket, resistor and white light emitting diode. Use Ledtronics LED lamp Cat#.UTL1835-1CW
8	5	Local-remote selector switch series 24, detent action rotary switch, double-throw (no off), 6 single pole double-throw maintained contacts, 3-decks, oval handle, escutcheon plate engraving to have “Local” in position 1 and “Remote” in position 2. Device 43L/R Electroswitch Cat#: 24203B

10	5	Remote display units for MFM meters Bitronics Cat#: D650BXU010
11	1	Revenue meter type ION 8650, 32MB memory, form 9/29/35/36S, 5A nominal, 80-160V , DC auxiliary power, 60HZ, infrared optical port, Ethernet (10/100 Base T), RS 232/485 port, RS 485port, password protected, no security lock Device WHM/1T Schneider Electric Cat#: M8650C4C0H6E0A0A
12	1	Test switch, type FT-1, 10 poles, 6 current & 4 potential, clear cover Device MTS (for use with ION meter) ABB Cat#: C129A514G01

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

CONTROL PANEL 2C
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
2	5	Local-remote selector switch series 24, detent action rotary switch, double-throw (no off), 6 single pole double-throw maintained contacts, 3-decks, oval handle, escutcheon plate engraving to have “LOCAL” in position 1 (center) and “REMOTE” in position 2 (right) Device: 43L/R Electroswitch Cat#: 24203B
3	4	Circuit Breaker control switch relay, series 24 type CSR, Circuit B, one second delay, with anti-pumping feature, 4 decks, spring return, pistol grip handle, escutcheon plate engraving to have “TRIP” in position 1 (left) and “CLOSE” in position 2 (right), Device: 52CS Electroswitch Cat#: 8846DB
4	12	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (4 red, 4 green, 4 white,). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5	4	Remote display units for MFM meter Bitronics Cat#: D650BXU010
6	6	Indicating light with GE type ET-16, 120V AC socket, resistor, bulb cap and light emitting diode (3 amber, 3 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
7	3	Single phase voltage monitor for use with 14400/120V VT. 24-250V DC power supply, 60HZ, clear anodized face plate displaying A.C. KVOLTS. Device: V Bitronics Cat#: VSAIE220000A
8	1	Bus transfer cut-off switch, series 24, type LSR, detent action rotary switch, double throw, 10 maintained contacts, 5 decks, oval handle. Escutcheon plate engraving to have “ON” in position 1 (center) and “ON” in position 2 (right) Device: AT Electroswitch Cat#: 9205DB

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

CONTROL PANEL 3C
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	4	Local-remote selector switch series 24, detent action rotary switch, double-throw (no off), 6 single pole double-throw maintained contacts, 3-decks, oval handle, escutcheon plate engraving to have “LOCAL” in position 1 (center) and “REMOTE” in position 2 (right) Device: 43L/R Electroswitch Cat#: 24203B
2	3	Circuit Breaker control switch relay, series 24 type CSR, Circuit B, one second delay, with anti-pumping feature, 4 decks, spring return, pistol grip handle, escutcheon plate engraving to have “TRIP” in position 1 (left) and “CLOSE” in position 2 (right), Device: 52CS Electroswitch Cat#: 8846DB
3	9	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (3 red, 3 green, 3 white,). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
4	5	Remote display units for MFM meter Bitronics Cat#: D650BXU010
5	6	Indicating light with GE type ET-16, 120V AC socket, resistor, bulb cap and light emitting diode (3 amber, 3 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
6	3	Single phase voltage monitor for use with 14400/120V VT. 24-250V DC power supply, 60HZ, clear anodized face plate displaying A.C. KVOLTS. Device: V Bitronics Cat#: VSAIE220000A
7	1	Voltage reduction selector switch, series 24, type LSR, detent action rotary switch, double throw, 6 single pole double-throw maintained contacts, 3 decks, oval handle, escutcheon plate engraving to have “OFF” in position 1 (middle) and “5%” in position 2 (right) Device: VR Electroswitch Cat#: 9203DD

8	1	Dead station selector switch, series 24, detent action rotary switch, double throw, 6 single pole double throw maintained contacts, 3 decks, oval handle. Escutcheon plate engraving to have “OFF” in position 1 (middle) and “ON” in position 2 (right) Device: DST Electroswitch Cat#: 24203B

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

CONTROL PANEL 4C
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Load tap changer control switch, Type W2, oval handle 2 stage (1stage rotary action & 1 stage lateral action), rotary action only with handle push in, lateral action only when handle is in position 12, spring return to position 12, engraving to be as follows: Title to read “84LR/MA”, position 11 to read “RAISE”, position 12 to read “OFF”, position 1 to read “LOWER” Device: 84LR/MA/T2 Electroswitch Cat#: 505A716G02
2	2	General purpose, plug-in relay 219 series, 300V, 12 pin, DPDT (2 sets of form “C” contacts), 125V DC coil, polycarbonate cover with Cat# 27390 socket. Device: 284L/T2, 284R/T2 Struthers Dunn Cat#: 219XBXP
3	1	Auxiliary relay, B255 series, mechanical latching type, 125V DC reset coil, and operate coil, double pole double throw contacts (two form “C”) clear polycarbonate cover with Cat# 27390 socket. Device: 284MA/T2 Struthers-Dunn Cat#: B255XBXP
4	1	Load tap changer remote position monitor 120V AC, 60HZ input, -1 to +1 mA output, RS-485 port. Intelligent Controls Model#: 1250LTC-1-R-M-120
5	4	Circuit Breaker & MOD control switch relay, series 24 type CSR, Circuit B, one second delay, with anti-pumping feature, 4 decks, spring return, pistol grip handle, escutcheon place engraving to have “TRIP” in position 1 (left) and “CLOSE” in position 2 (right), Device: 52/43CS, 89/43CS Electroswitch Cat#: 8846DB
6	12	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (6 red, 4 green, 2 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
7	6	Indicating light with GE type ET-16, 120V AC socket, resistor and white light emitting diode. Use Ledtronics LED lamp Cat#.UTL1835-1CW
8	5	Local-remote selector switch series 24, detent action rotary switch, double-throw (no off), 6 single pole double-throw maintained contacts, 3-decks, oval handle, escutcheon plate engraving to have “Local” in position 1 and “Remote” in position 2. Device 43L/R Electroswitch Cat#: 24203B

9	5	Remote display units for MFM meters Bitronics Cat#: D650BXU010
10	1	Revenue meter type ION 8650, 32MB memory, form 9/29/35/36S, 5A nominal, 80-160V , DC auxiliary power, 60HZ, infrared optical port, Ethernet (10/100 Base T), RS 232/485 port, RS 485port, password protected, no security lock Device WHM/2T Schneider Electric Cat#: M8650C4C0H6E0A0A
11	1	Test switch, type FT-1, 10 poles, 6 current & 4 potential,.clear cover Device MTS (for use with ION meter) ABB Cat#: C129A514G01

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – FIBER OPTIC CABINET
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	2	Integrated Communications Optical Network Device, protected line module - 2 cages w/OC-48 SFPs dual fiber,.19" shelf, 125VDC dual power supply, GPS antenna kit Device: ICON Schweitzer Cat#: per SEL proposal # 9163XICN6771-01 (attached) (one to be installed in Fiber Cabinet, one to be shipped loose for installation by OWNER)
2	3	Fiber optic patch panel, 24 single mode fiber optics, LC connectors, 3 adapter panels – 2 duplex LC and 1 blank Device: F.O. Panel Century Fiber Optics Cat#: FTS-175-24LCDLS24-1/B (one to be installed in Fiber Cabinet, two to be shipped loose for installation by OWNER)
3	1	Communications/Fiber Cabinet, approx. 24"W x 24"D x 72"H, with recessed 19" rack mount rails to mount equipment, with smoked lexan front and rear doors. Cables will enter cabinet from top. Device: Fiber Cabinet

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – FDR IR-521
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 51P/51NP/521 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2.	1	Microprocessor-based overcurrent relay with 4 shot reclosing capability, conventional terminal blocks, standard firmware, assembled with rack mount bracket 9100, 125V DC power supply and control voltage, 5A phase and neutral current inputs, standard communications. Device: 51S/51NS/521 Schweitzer Cat#: SEL-0551-003X5B1X KEY 4830
3.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS1 (for use with SEL-351A relay) ABB Cat#: FRXG014123036CX08
4.	3	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (1red, 1green, 1 white,). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS6 (for use with SEL-551 relay & MFM) ABB Cat#: FRXG183036014CX08
6.	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7.	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 1200/5A CT's and 120/1 VT's, 125V DC control power, DNP 3.0 communication port, 4mb memory for historical data logging and captured event waveforms Device: MFM/521 Bitronics Cat#: M8712000B11X
8.	1.	Underfrequency trip selector switch, series 24, detent action rotary switch, double throw (with off), 6 double pole double throw maintained contacts, 3 decks, oval handle, escutcheon plate engraving to have "F1" in position 1 (left), "Off" in position 0 (center), "F2" in position 2 (right). Device 81SS/521 Electroswitch Cat#: 24203B
12	1	Arc–Flash Mode low level control latching switch relay with integral blue LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "OFF" in position 1 (center) and "ON" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "ARC-FLASH MODE" Device: 43AF/521 Electroswitch Cat#: 92PA03MU
13	1	Reclosing cut off low level control latching switch relay with integral white LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "RECLOSING" Device: 79CO/521 Electroswitch Cat#: 92PA03MV
14	1	Ground overcurrent trip selector switch with integral white LED indicating light located in center, series 24, 3 decks, detent action, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, 6 maintained contacts, oval handle. Legend plate to read "GROUND TRIP" Device: 51NCO/521 Electroswitch Cat#: Similar to 24203B except for light addition

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR - FDR IR-522
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1.	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 51P/51NP/522 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2.	1	Microprocessor-based overcurrent relay with 4 shot reclosing capability, conventional terminal blocks, standard firmware, assembled with rack mount bracket 9100, 125V DC power supply and control voltage, 5A phase and neutral current inputs, standard communications. Device: 51S/51NS/522 Schweitzer Cat#: SEL-0551-003X5B1X KEY 4830
3.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS1 (for use with SEL-351A relay) ABB Cat#: FRXG014123036CX08
4.	3	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (1red, 1green, 1 white,). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS6 (for use with SEL-551 relay & MFM) ABB Cat#: FRXG183036014CX08
6.	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7.	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 1200/5A CT's and 120/1 VT's, 125V DC control power, DNP 3.0 communication port, 4mb memory for historical data logging and captured event waveforms Device: MFM/522 Bitronics Cat#: M8712000B11X
8.	1.	Underfrequency trip selector switch, series 24, detent action rotary switch, double throw (with off), 6 double pole double throw maintained contacts, 3 decks, oval handle, escutcheon plate engraving to have "F1" in position 1 (left), "Off" in position 0 (center), "F2" in position 2 (right). Device 81SS/522 Electroswitch Cat#: 24203B
12	1	Arc–Flash Mode low level control latching switch relay with integral blue LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "OFF" in position 1 (center) and "ON" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "ARC-FLASH MODE" Device: 43AF/522 Electroswitch Cat#: 92PA03MU
13	1	Reclosing cut off low level control latching switch relay with integral white LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "RECLOSING" Device: 79CO/522 Electroswitch Cat#: 92PA03MV
14	1	Ground overcurrent trip selector switch with integral white LED indicating light located in center, series 24, 3 decks, detent action, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, 6 maintained contacts, oval handle. Legend plate to read "GROUND TRIP" Device: 51NCO/522 Electroswitch Cat#: Similar to 24203B except for light addition

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – FDR IR-523
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1.	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 51P/51NP/523 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2.	1	Microprocssor-based overcurrent relay with 4 shot reclosing capability, conventional terminal blocks, standard firmware, assembled with rack mount bracket 9100, 125V DC power supply and control voltage, 5A phase and neutral current inputs, standard communications. Device: 51S/51NS/523 Schweitzer Cat#: SEL-0551-003X5B1X KEY 4830
3.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS1 (for use with SEL-351A relay) ABB Cat#: FRXG014123036CX08
4.	3	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (1red, 1green, 1 white,). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS6 (for use with SEL-551 relay & MFM) ABB Cat#: FRXG183036014CX08
6.	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7.	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 1200/5A CT's and 120/1 VT's, 125V DC control power, DNP 3.0 communication port, 4mb memory for historical data logging and captured event waveforms Device: MFM/523 Bitronics Cat#: M8712000B11X
8.	1.	Underfrequency trip selector switch, series 24, detent action rotary switch, double throw (with off), 6 double pole double throw maintained contacts, 3 decks, oval handle, escutcheon plate engraving to have "F1" in position 1 (left), "Off" in position 0 (center), "F2" in position 2 (right). Device 81SS/523 Electroswitch Cat#: 24203B
12	1	Arc–Flash Mode low level control latching switch relay with integral blue LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "OFF" in position 1 (center) and "ON" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "ARC-FLASH MODE" Device: 43AF/523 Electroswitch Cat#: 92PA03MU
13	1	Reclosing cut off low level control latching switch relay with integral white LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "RECLOSING" Device: 79CO/523 Electroswitch Cat#: 92PA03MV
14	1	Ground overcurrent trip selector switch with integral white LED indicating light located in center, series 24, 3 decks, detent action, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, 6 maintained contacts, oval handle. Legend plate to read "GROUND TRIP" Device: 51NCO/523 Electroswitch Cat#: Similar to 24203B except for light addition

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – FDR IR-524
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1.	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 51P/51NP/524 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2.	1	Microprocessor-based overcurrent relay with 4 shot reclosing capability, conventional terminal blocks, standard firmware, assembled with rack mount bracket 9100, 125V DC power supply and control voltage, 5A phase and neutral current inputs, standard communications. Device: 51S/51NS/524 Schweitzer Cat#: SEL-0551-003X5B1X KEY 4830
3.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS1 (for use with SEL-351A relay) ABB Cat#: FRXG014123036CX08
4.	3	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (1red, 1green, 1 white,). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS6 (for use with SEL-551 relay & MFM) ABB Cat#: FRXG183036014CX08
6.	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7.	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 1200/5A CT's and 120/1 VT's, 125V DC control power, DNP 3.0 communication port, 4mb memory for historical data logging and captured event waveforms Device: MFM/524 Bitronics Cat#: M8712000B11X
8.	1.	Underfrequency trip selector switch, series 24, detent action rotary switch, double throw (with off), 6 double pole double throw maintained contacts, 3 decks, oval handle, escutcheon plate engraving to have "F1" in position 1 (left), "Off" in position 0 (center), "F2" in position 2 (right). Device 81SS/524 Electroswitch Cat#: 24203B
12	1	Arc–Flash Mode low level control latching switch relay with integral blue LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "OFF" in position 1 (center) and "ON" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "ARC-FLASH MODE" Device: 43AF/524 Electroswitch Cat#: 92PA03MU
13	1	Reclosing cut off low level control latching switch relay with integral white LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "RECLOSING" Device: 79CO/524 Electroswitch Cat#: 92PA03MV
14	1	Ground overcurrent trip selector switch with integral white LED indicating light located in center, series 24, 3 decks, detent action, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, 6 maintained contacts, oval handle. Legend plate to read "GROUND TRIP" Device: 51NCO/524 Electroswitch Cat#: Similar to 24203B except for light addition

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – MAIN IR541
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Remote display unit for MFM meter Bitronics Cat#: D650BXU010
2	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 2000/5A CT's and 8400/120V PT's, 125V DC control power, DNP 3.0 communication port, 4mb memory for historical data logging and captured event waveforms Device: MFM/B1 Bitronics Cat#: M5712000B11X
3	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS1 (for use with SEL-351 relay) ABB Cat#: FRXG014123036CX08
4	2	Lockout relay, series LOR, 125V DC coil, manual reset, 5 decks, 10 N.O. & 10 N.C. contacts, red handle with testing feature Device: 86P/B1 & 86S/B1 Electroswitch Cat#: T7805D
5	6	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (2 red, 1 green, 3 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
6	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS8 (for use with SEL-351 relay) ABB Cat#: FRXG036036036CX08
7	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 3U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, additional I/O board, standard communications, 2 10/100T Ethernet ports Device: 51S/51NS/B1 Schweitzer Cat#: SEL-035153C4E542X1 KEY 6114
8	3	Indicating light with GE type ET-16, 120V AC socket, resistor and white light emitting diode. Use Ledtronics LED lamp Cat#.UTL1835-1CW

9	1	Microprocessor-based high-impedance differential relay, conventional terminal blocks, 125V DC power supply and control voltage. 2000 Ω stabilizing resistor 20-800V and 0.5-80A range, 5A nominal, horizontal rack mounting, standard communications. Device: 87P/B1 Schweitzer Cat#: SEL-0587Z0X325H12XX KEY 7866
10	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, individual clear covers, ANSI 61 gray Device: TS3 (for use with SEL-587Z relays) ABB Cat#: FRXG171171036CX08
11	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, individual clear covers, ANSI 61 gray Device: TS10 (for use with 86P/B1, 86S/B1 relays & MFM) ABB Cat#: FRXG036014036CX08

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – MAIN IR542
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Remote display unit for MFM meter Bitronics Cat#: D650BXU010
2	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 2000/5A CT's and 8400/120V PT's, 125V DC control power, DNP 3.0 communication port, 4mb memory for historical data logging and captured event waveforms Device: MFM/B2 Bitronics Cat#: M5712000B11X
3	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS1 (for use with SEL-351 relay) ABB Cat#: FRXG014123036CX08
4	2	Lockout relay, series LOR, 125V DC coil, manual reset, 5 decks, 10 N.O. & 10 N.C. contacts, red handle, with testing feature Device: 86P/B2 & 86S/B2 Electroswitch Cat#: T7805D
5	6	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (2 red, 1 green, 3 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
6	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS8 (for use with SEL-351 relay) ABB Cat#: FRXG036036036CX08
7	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 3U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, additional I/O board, standard communications, 2 10/100T Ethernet ports Device: 51S/51NS/B2 Schweitzer Cat#: SEL-035153C4E542X1 KEY 6114
8	3	Indicating light with GE type ET-16, 120V AC socket, resistor and white light emitting diode. Use Ledtronics LED lamp Cat#.UTL1835-1CW

9	1	Microprocessor-based high-impedance differential relay, conventional terminal blocks, 125V DC power supply and control voltage. 2000 Ω stabilizing resistor 20-800V and 0.5-80A range, 5A nominal, horizontal rack mounting, standard communications. Device: 87P/B2 Schweitzer Cat#: SEL-0587Z0X325H12XX KEY 7866
10	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, individual clear covers, ANSI 61 gray Device: TS3 (for use with SEL-587Z relays) ABB Cat#: FRXG171171036CX08
11	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, individual clear covers, ANSI 61 gray Device: TS10 (for use with 86P/B2, 86S/B2 relays & MFM) ABB Cat#: FRXG036014036CX08

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – BUS TIE IR-543
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 50BF/543 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS1 (for use with SEL-351A relay) ABB Cat#: FRXG014123036CX08
3	4	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (1red, 1green, 2 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
4	1	Lockout relay, series LOR, 125V DC coil, manual reset, 10N.O. & 10N.C. contacts red handle, with testing feature Device 86PBF/543 Electroswitch Cat#: T7805D
7	1	Universal switch adjustable time capsule 1-1024 sec. delay on make 19-288V AC or DC, low leakage (for bus transfer scheme) Artisan Cat # 438USA
8	2	Auxiliary relay, 125V DC coil, 4 N.O. contacts, screw terminals; Device:83-1, 83-2 (for Bus Transfer), Siemens Cat#: 3RH1140-1BF40 with 4-pole auxiliary contact (2 N.O., 2 N.C.) block 3RH1911-1GA22
9	1	Time delay relay, 125V DC coil, 2 form C contacts, 1 to 300 sec time delay on pickup. Activated when breaker IR541, IR542 & IR543 are closed simultaneously Device: 62-1 Agastat Cat#: 7012PK

10	1	Auxiliary relay, B255 series, mechanical latching type, 125V DC reset coil, and operate coil, double pole double throw contacts (two form “C”) clear polycarbonate cover with Cat# 27390 socket. Device: 62X1 Struthers-Dunn Cat#: B255XBXP
11	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS10 (for use with 86/BF & MFM) ABB Cat#: FRXG036014036CX08
13	1	Test switch type FT-1, 10 pole, 10 trip, trip blades with red handles, clear cover Device: TS-9 (for use with REA relay) ABB Cat#: C129A539G01
14	1	Arc flash protection system type REA 101- AAA, 125V dc power supply and control voltage, 5A, 60HZ current inputs, central unit with opt link connectors for fibers. Mounting kit (1MRS050209) for flush mounting. Arc protection module type REA103 – AA (quantity as required by coverage requirements of switchgear compartments) Device: AFD/B1 ABB Cat#; 9AAC30401610
15	1	Time delay relay, 125V DC coil, 2 form C contacts, 1 to 10 min. time delay on pickup. Activated when station experience total loss of power Device: 62-DST Agastat Cat#: 7012PF
16	2	Auxiliary relay, 125V DC coil, 4 N.O. contacts, screw terminals; Device :AFD/B1X, AFD/B2X Siemens Cat#: 3RH1140-1BF40
17	1	Time delay relay, 125V DC coil, 2 form C contacts, 1 to 300 sec. time delay on dropout to use with intrusion alarm circuit. Agastat Cat#: 7022 PK
18	1	Remote display unit for MFM meter Bitronics Cat#: D650BXU010
19	1	Test switch type FT-1, 10 pole, 6 current and 4 potential blades, clear cover Device: TS7 (for use with REA relay ABB Cat#: C129A514G01

20	1	Ethernet switch, 20 10/100BASE-T Ethernet ports, 4 SFP cages, dual 125/250 Vdc power supplies, rack mounted Device: 2730M-1 Schweitzer Cat#: 2730M0ARAA1111AAAAX0 KEY 2896

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – LINE IR-545
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1.	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 67P/67NP/545 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2.	1	Microprocessor- based complete line protection relay. Four zones of phase and ground mho elements plus four zones of ground distance quadrilateral elements. Programmable four shots reclosing with synchronism and voltage check logic. Six frequency elements for load shedding and restoration. Conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 67S/67NS/545 Schweitzer Cat#: SEL- 0311C10HH3E54X1 KEY 7230
3.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS1 (for use with SEL-351A relay) ABB Cat#: FRXG014123036CX08
4.	5	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (1red, 1green, 1 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS5 (for use with SEL-311C relay) ABB Cat#: FRXG014036036CX08
6.	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7.	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 1200/5A CT's and 120/1 VT's ,125V DC control power, DNP 3.0 communication port, 4mb memory for historical Data logging and captured event waveforms Device: MFM/545 Bitronics Cat#: M8712000B11X
8	3	Indicating light with GE type ET-16, 120V AC socket, resistor and white light emitting diode. Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
9	1	Arc–Flash Mode low level control latching switch relay with integral blue LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "OFF" in position 1 (center) and "ON" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Device: 43AF/545 Electroswitch Cat#: 92PA03MU
10	1	Reclosing cut off low level control latching switch relay with integral white LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "RECLOSING" Device: 79CO/545 Electroswitch Cat#: 92PA03MV
11	1	Underfrequency trip reset pushbutton switch, heavy duty, 30mm type with extended quard and model KA1G contact block for ring type lugs. Square D Cat#: KR2UH13-Y238
12	2	Lockout relay with electric reset, series LOR/ER. 125 VDC coils, 5 decks, 10 N.O. & 10 N.C. contacts. Device: 81-1/B1X, 81-2/B1X Electroswitch Cat#: 7825DD
13	1	Underfrequency trip cut-off switch, series 24, detent action rotary switch, double throw, 6 maintained contacts, oval handle. Escutcheon plate engraving to have "ON" in position 1 (center) and "OFF" in position 2 (right). Device: 81CO Electroswitch Cat#: 24203B
14	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles,

individual clear covers, ANSI 61 Gray
Device: TS10 (for use with 81-1/B1X, 81-2/B1X relays & MFM)
ABB Cat#: FRXG036014036CX08

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – LINE IR-546
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1.	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 67P/67NP/546 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2.	1	Microprocessor- based complete line protection relay. Four zones of phase and ground mho elements plus four zones of ground distance quadrilateral elements. Programmable four shots reclosing with synchronism and voltage check logic. Six frequency elements for load shedding and restoration. Conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 67S/67NS/546 Schweitzer Cat#: SEL-0311C10HH3E54X1 KEY 7230
3.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS1 (for use with SEL-351A relay) ABB Cat#: FRXG014123036CX08
4.	5	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (1red, 1green, 3 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS5 (for use with SEL-311C relay) ABB Cat#: FRXG014036036CX08
6.	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7.	1	Multifunction power transducer type M871 with remote displays & extensive communication capabilities, 3 element, for use with 1200/5A CT's and 120/1 VT's, 125V DC control power, DNP 3.0 communication port, 4mb memory for historical data logging and captured event waveforms Device: MFM/546 Bitronics Cat#: M8712000B11X
8	3	Indicating light with GE type ET-16, 120V AC socket, resistor and white light emitting diode. Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
9	1	Arc–Flash Mode low level control latching switch relay with integral blue LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "OFF" in position 1 (center) and "ON" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Device: 43AF/546 Electroswitch Cat#: 92PA03MU
10	1	Reclosing cut off low level control latching switch relay with integral white LED indicating light, series 24P, 3 decks, 2 positions, with escutcheon engraved "ON" in position 1 (center) and "OFF" in position 2 (right). Light to be lit in position 2. 3 decks, oval handle, 125VDC coil. Legend plate to read "RECLOSING" Device: 79CO/546 Electroswitch Cat#: 92PA03MV
11	1	Underfrequency trip reset pushbutton switch, heavy duty, 30mm type with extended quard and model KA1G contact block for ring type lugs. Square D Cat#: KR2UH13-Y238
12	2	Lockout relay with electric reset, series LOR/ER. 125 VDC coils, 5 decks, 10 N.O. & 10 N.C. Device: 81-1/B2X, 81-2/B2X Electroswitch Cat#: 7825DD
13	1	Underfrequency trip cut-off switch, series 24, detent action rotary switch, double throw, 6 maintained contacts, oval handle. Escutcheon plate engraving to have "ON" in position 1 (center) and "OFF" in position 2 (right). Device: 81CO Electroswitch Cat#: 24203B
14	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS10 (for use with 81-1/B2X, 81-2/B2X relays & MFM) ABB Cat#: FRXG036014036CX08

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – AUXILIARY SS No.1
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1.	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 50/51S/50N/51NS-T1 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2.	1	Microprocessor- based complete line protection relay. Four zones of phase and ground mho elements plus four zones of ground distance quadrilateral elements. Programmable four shots reclosing with synchronism and voltage check logic. Six frequency elements for load shedding and restoration. Conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Device: 21/T1 Schweitzer Cat#: SEL-0311C10HH3E54X1 KEY 7230
3.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS2 (for use with SEL-351A relay) ABB Cat#: FRXG014202036CX08
4.	2	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (2 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5.	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS6 (for use with SEL-311C relay) ABB Cat#: FRXG014036036CX08
6.	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7	1	Microprocessor-based 4 winding current differential with programmable dual-slope percentage restraint supervised by second and fifth harmonic blocking elements. 125V DC power supply and control voltage, 5A current inputs, 60Hz, ABC phase rotation, 2U horizontal rack mount. Device: 87P/T2 Schweitzer Cat#:SEL-0387A010HX3X34X KEY 7734
8	1	Test switch type FT-19RX (extended length) for rack mounting, three rack units (3U) for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS4 (for use with SEL-387 relay) ABB Cat#: FRXG173183183CX08
9	2	Lockout relay, series LOR, 125 VDC coils, 6 decks, 12 N.O. & 12 N.C. contacts, red handle, with test feature Device: 86P-T1, 86S-T1 Electroswitch Cat#: T7806D
10	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS10 (for use with 86P-T1, 86S-T1 relays & MFM) ABB Cat#: FRXG036014036CX08

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – AUXILIARY SS No.2
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Microprocessor-based directional overcurrent relay with reclosing and fault location, conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 50/51S/50N/51NS-T2 Schweitzer Cat#: SEL-0351A-0H2X3E54X1 KEY 7362
2	1	Microprocessor- based complete line protection relay. Four zones of phase and ground mho elements plus four zones of ground distance quadrilateral elements. Programmable four shots reclosing with synchronism and voltage check logic. Six frequency elements for load shedding and restoration. Conventional terminal blocks, standard firmware, 2U horizontal rack mount, 125V DC power supply and control voltage, wye-connected VT inputs, 5A phase and neutral current inputs, main board only, standard communications, USB port, 2 10/100T Ethernet ports Device: 21/T2 Schweitzer Cat#: SEL-0311C10HH3E54X1 KEY 7230
3	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS2 (for use with SEL-351A relay) ABB Cat#: FRXG014202036CX08
4	2	Indicating light with GE type ET-16, 125V DC socket, resistor, bulb cap and light emitting diode (2 white). Use Ledtronics LED lamp Cat#.UTL1835-1CW for white light indication.
5	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS6 (for use with SEL-311C relay) ABB Cat#: FRXG014036036CX08
6	1	Remote display unit for MFM meter Bitronics Cat#. D650BXU010

7	1	Microprocessor-based 4 winding current differential with programmable dual-slope percentage restraint supervised by second and fifth harmonic blocking elements. 125V DC power supply and control voltage, 5A current inputs, 60Hz, ABC phase rotation, 2U horizontal rack mount. Device: 87P/T2 Schweitzer Cat#:SEL-0387A010HX3X34X KEY 7734
8	1	Test switch type FT-19RX (extended length) for rack mounting, three rack units (3U) for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 gray Device: TS4 (for use with SEL-387 relay) ABB Cat#: FRXG173183183CX08
9	2	Lockout relay, series LOR, 125 VDC coils, 6 decks, 12 N.O. & 12 N.C. contacts, red handle, with test feature Device: 86P-T2, 86S-T2 Electroswitch Cat#: T7806D
10	1	Test switch type FT-19RX (extended length) for rack mounting, three rack unit (3RU) assembly for low position mounting in the rack panel, trip blades with red handles, individual clear covers, ANSI 61 Gray Device: TS10 (for use with 86P-T2, 86S-T2 relays & MFM) ABB Cat#: FRXG036014036CX08

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS

23KV SWITCHGEAR – BUS TIE TRANSITION
IPSWICH RIVER SUBSTATION

PROTECTIVE/CONTROL DEVICE LIST

ITEM NO.	QTY	DESCRIPTION
1	1	Test switch type FT-1, 10 pole, 10 trip, trip blades with red handles, clear cover Device: TS-9 (for use with REA relay) ABB Cat#: C129A539G01
2	1	Arc flash protection system type REA 101- AAA, 125V dc power supply and control voltage, 5A, 60HZ current inputs, central unit with opt link connectors for fibers. Mounting kit (1MRS050209) for flush mounting. Arc protection module type REA103 – AA (quantity as required by coverage requirements of switchgear compartments) Device: AFD/B2 ABB Cat#; 9AAC30401610
3	1	Test switch type FT-1, 10 pole, 6 current and 4 potential blades, clear cover Device: TS7 (for use with REA relay ABB Cat#: C129A514G01
4	1 Lot	Schweitzer Axion, 10-slot backplane horizontal surface mount, dual power coupler, 48 digital inputs, and 32 digital outputs. Qty & Catalog #: (Qty 1) SEL- 2242S1X0 Key: 2215 (Qty 2) SEL-224311X0 Key: 2049 (Qty 2) SEL-22442424X0 Key: 3114 (Qty 2) SEL-22443131X0 Key: 3084
5	2	Terminal jumpers for Axion unit (item #4) Schweitzer Cat#: 915900240
6	1	Wetting voltage jumpers for Axion unit (item #4) Schweitzer Cat#: 915900241

PEABODY MUNICIPAL LIGHT PLANT
IPSWICH RIVER SUBSTATION

Annunciator Points

Point	First line	Second Line	Third Line
1	54N-1T	LOW SF6	ALARM
2	54N-1T	MECHANISM	TROUBLE
3	54N-1T	BREAKER	TRIP
4	54N-1T	BREAKER FAILURE	LOCKOUT
5	54N-1T	LOSS OF	CONTROL PWR
6	54N-1T	TRIP COIL	FAILURE
7	55N-2T	LOW SF6	ALARM
8	55N-2T	MECHANISM	TROUBLE
9	55N-2T	BREAKER	TRIP
10	55N-2T	BREAKER FAILURE	LOCKOUT
11	55N-2T	LOSS OF	CONTROL PWR
12	55N-2T	TRIP COIL	FAILURE
13	ANY 115 KV	DEVICE	IN LOCAL
14	115 KV RELAY	FAILURE	PRIMARY
15	115 KV RELAY	FAILURE	BACKUP
16	TRANS. 1	MAJOR	ALARM
17	TRANS. 1	MINOR	ALARM
18	TRANS. 1	LOCKOUT	
19	TRANS. 2	MAJOR	ALARM
20	TRANS. 2	MINOR	ALARM
21	TRANS. 2	LOCKOUT	
22	SYS1 BATTERY	CHARGER	AC FAILURE
23	SYS1 BATTERY	DC	GROUND
24	SYS1 BATTERY	CHARGER	DC FAILURE
25	SYS1 BATTERY	CHARGER	TROUBLE
26	SYS2 BATTERY	CHARGER	AC FAILURE
27	SYS2 BATTERY	DC	GROUND
28	SYS2 BATTERY	CHARGER	DC FAILURE
29	SYS2 BATTERY	CHARGER	TROUBLE
30	AC STATION	SERVICE	TROUBLE
31	AC STATION	SERVICE	FAILURE
32			
33	CONTROL HOUSE	HIGH/LOW	TEMP
34	CONTROL HOUSE	ENTRY	ALARM
35	CONTROL HOUSE	FIRE	ALARM
36	OIL	CONTAINMENT	TROUBLE
37	23 KV	RELAY	FAILURE
38	ANY 23 KV	DEVICE	IN LOCAL
39	541	TRIP	
40	542	TRIP	
41	542	TRIP	
42	23 KV BUS 1	FDR BKR	LOCKOUT
43	23 KV BUS 2	FDR BKR	LOCKOUT
44	23 KV BUS 1	LOCKOUT	
45	23 KV BUS 2	LOCKOUT	
46	23 KV BUS 1	ARC FLASH	TRIP
47	23 KV BUS 2	ARC FLASH	TRIP
48	23 KV BUS 1	UNDERFREQUENCY	TRIP
49	23 KV BUS 2	UNDERFREQUENCY	TRIP
50	23 KV BUS 1	51NCO	SWITCH IN DISABLE
51	23 KV BUS 2	51NCO	SWITCH IN DISABLE
52	23 KV BUS 1	79CO	SWITCH IN DISABLE
53	23 KV BUS 2	79CO	SWITCH IN DISABLE
54	TRANSGARD	FENCE	OFF
55			
56			
57			
58			

NOTE: THIS LIST DEFINES THE ANNUNCIATOR POINTS
THE ACTUAL PHYSICAL ARRANGEMENT SHALL FOLLOW THE DRAWINGS

Peabody Municipal Light Plant
Ipswich River Substation - RTU Points
Control Points

Pt #	Description	Location	Notes
1	54N-1T-1 MOD	Control Panel	
2	54N-1T-3 MOD	Control Panel	
3	54N-1T Circuit Breaker	Control Panel	
4	55N-2T-1 MOD	Control Panel	
5	55N-2T-3 MOD	Control Panel	
6	55N-2T Circuit Breaker	Control Panel	
7	IR-541 Circuit Breaker	Control Panel	
8	IR-542 Circuit Breaker	Control Panel	
9	IR-543 Circuit Breaker	Control Panel	
10	IR-521 Circuit Breaker	Control Panel	
11	IR-521 79CO Switch	Switchgear	
12	IR-521 43ARC Switch	Switchgear	
13	IR-523 Circuit Breaker	Control Panel	
14	IR-523 79CO Switch	Switchgear	
15	IR-523 43ARC Switch	Switchgear	
16	IR-545 Circuit Breaker	Control Panel	
17	IR-545 79CO Switch	Switchgear	
18	IR-545 43ARC Switch	Switchgear	
19	IR-546 Circuit Breaker	Control Panel	
20	IR-546 79CO Switch	Switchgear	
21	IR-546 43ARC Switch	Switchgear	
22	IR-524 Circuit Breaker	Control Panel	
23	IR-524 79CO Switch	Switchgear	
24	IR-524 43ARC Switch	Switchgear	
25	IR-522 Circuit Breaker	Control Panel	
26	IR-522 79CO Switch	Switchgear	
27	IR-522 43ARC Switch	Switchgear	
28	Bus Transfer Switch	Control Panel	
29	T1 LTC Manual/Auto Sw	Control Panel	
30	T1 LTC Raise/Lower	Control Panel	
31	T2 LTC Manual/Auto Sw	Control Panel	
32	T2 LTC Raise/Lower	Control Panel	
33	Underfrequency Reset	Switchgear	

Peabody Municipal Light Plant
Ipswich River Substation - RTU Points
Intelligent Electronic Device (IED)

Device Name	Protocol	Connection Type	RS-485 Loop	Protocol Address	Location	Notes
MFM/T1	DNP	RS-485	#1		Switchgear	
MFM/T2	DNP	RS-485	#1		Switchgear	
MFM/B1	DNP	RS-485	#1		Switchgear	
MFM/BT	DNP	RS-485	#1		Switchgear	
MFM/B2	DNP	RS-485	#1		Switchgear	
MFM/521	DNP	RS-485	#1		Switchgear	
MFM/523	DNP	RS-485	#1		Switchgear	
MFM/545	DNP	RS-485	#1		Switchgear	
MFM/546	DNP	RS-485	#1		Switchgear	
MFM/524	DNP	RS-485	#1		Switchgear	
MFM/522	DNP	RS-485	#1		Switchgear	
T1 LTC Controller	??	RS-485	#2		Transformer #1	
T2 LTC Controller	??	RS-485	#2		Transformer #2	

Peabody Municipal Light Plant
Ipswich River Substation - RTU Points
Status Points

Pt #	Description	Location	0 State	1 State	Notes
1	54N-1T-1 MOD	Control Panel	Open	Closed	
2	54N-1T-3 MOD	Control Panel	Open	Closed	
3	54N-1T Circuit Breaker	Control Panel	Open	Closed	
4	55N-2T-1 MOD	Control Panel	Open	Closed	
5	55N-2T-3 MOD	Control Panel	Open	Closed	
6	55N-2T Circuit Breaker	Control Panel	Open	Closed	
7	IR-541 Circuit Breaker	Switchgear	Open	Closed	
8	IR-542 Circuit Breaker	Switchgear	Open	Closed	
9	IR-543 Circuit Breaker	Switchgear	Open	Closed	
10	IR-521 Circuit Breaker	Switchgear	Open	Closed	
11	IR-521 79CO Switch	Switchgear	Enabled	Disabled	
12	IR-521 51NCO Switch	Switchgear	Enabled	Disabled	
13	IR-521 43ARC Switch	Switchgear	Enabled	Disabled	
14	IR-523 Circuit Breaker	Switchgear	Open	Closed	
15	IR-523 79CO Switch	Switchgear	Enabled	Disabled	
16	IR-523 51NCO Switch	Switchgear	Enabled	Disabled	
17	IR-523 43ARC Switch	Switchgear	Enabled	Disabled	
18	IR-545 Circuit Breaker	Switchgear	Open	Closed	
19	IR-545 79CO Switch	Switchgear	Enabled	Disabled	
20	IR-545 43ARC Switch	Switchgear	Enabled	Disabled	
21	IR-546 Circuit Breaker	Switchgear	Open	Closed	
22	IR-546 79CO Switch	Switchgear	Enabled	Disabled	
23	IR-546 43ARC Switch	Switchgear	Enabled	Disabled	
24	IR-524 Circuit Breaker	Switchgear	Open	Closed	
25	IR-524 79CO Switch	Switchgear	Enabled	Disabled	
26	IR-524 51NCO Switch	Switchgear	Enabled	Disabled	
27	IR-524 43ARC Switch	Switchgear	Enabled	Disabled	
28	IR-522 Circuit Breaker	Switchgear	Open	Closed	
29	IR-522 79CO Switch	Switchgear	Enabled	Disabled	
30	IR-522 51NCO Switch	Switchgear	Enabled	Disabled	
31	IR-522 43ARC Switch	Switchgear	Enabled	Disabled	
32	Bus Transfer Switch	Control Panel	On	Off	
33	T1 LTC Manual/Auto Sw	Control Panel	Auto	Manual	
34	T2 LTC Manual/Auto Sw	Control Panel	Auto	Manual	
35	Annunciator Window #1	Control Panel	Normal	Alarm	
36	Annunciator Window #2	Control Panel	Normal	Alarm	
37	Annunciator Window #3	Control Panel	Normal	Alarm	
38	Annunciator Window #4	Control Panel	Normal	Alarm	
39	Annunciator Window #5	Control Panel	Normal	Alarm	
40	Annunciator Window #6	Control Panel	Normal	Alarm	
41	Annunciator Window #7	Control Panel	Normal	Alarm	
42	Annunciator Window #8	Control Panel	Normal	Alarm	
43	Annunciator Window #9	Control Panel	Normal	Alarm	
44	Annunciator Window #10	Control Panel	Normal	Alarm	
45	Annunciator Window #11	Control Panel	Normal	Alarm	
46	Annunciator Window #12	Control Panel	Normal	Alarm	
47	Annunciator Window #13	Control Panel	Normal	Alarm	
48	Annunciator Window #14	Control Panel	Normal	Alarm	
49	Annunciator Window #15	Control Panel	Normal	Alarm	
50	Annunciator Window #16	Control Panel	Normal	Alarm	
51	Annunciator Window #17	Control Panel	Normal	Alarm	
52	Annunciator Window #18	Control Panel	Normal	Alarm	
53	Annunciator Window #19	Control Panel	Normal	Alarm	
54	Annunciator Window #20	Control Panel	Normal	Alarm	
55	Annunciator Window #21	Control Panel	Normal	Alarm	
56	Annunciator Window #22	Control Panel	Normal	Alarm	
57	Annunciator Window #23	Control Panel	Normal	Alarm	
58	Annunciator Window #24	Control Panel	Normal	Alarm	
59	Annunciator Window #25	Control Panel	Normal	Alarm	
60	Annunciator Window #26	Control Panel	Normal	Alarm	
61	Annunciator Window #27	Control Panel	Normal	Alarm	
62	Annunciator Window #28	Control Panel	Normal	Alarm	
63	Annunciator Window #29	Control Panel	Normal	Alarm	
64	Annunciator Window #30	Control Panel	Normal	Alarm	
65	Annunciator Window #31	Control Panel	Normal	Alarm	
66	Annunciator Window #32	Control Panel	Normal	Alarm	
67	Annunciator Window #33	Control Panel	Normal	Alarm	

Pt #	Description	Location	0 State	1 State	Notes
68	Annunciator Window #34	Control Panel	Normal	Alarm	
69	Annunciator Window #35	Control Panel	Normal	Alarm	
70	Annunciator Window #36	Control Panel	Normal	Alarm	
71	Annunciator Window #37	Control Panel	Normal	Alarm	
72	Annunciator Window #38	Control Panel	Normal	Alarm	
73	Annunciator Window #39	Control Panel	Normal	Alarm	
74	Annunciator Window #40	Control Panel	Normal	Alarm	
75	Annunciator Window #41	Control Panel	Normal	Alarm	
76	Annunciator Window #42	Control Panel	Normal	Alarm	
77	Annunciator Window #43	Control Panel	Normal	Alarm	
78	Annunciator Window #44	Control Panel	Normal	Alarm	
79	Annunciator Window #45	Control Panel	Normal	Alarm	
80	Annunciator Window #46	Control Panel	Normal	Alarm	
81	Annunciator Window #47	Control Panel	Normal	Alarm	
82	Annunciator Window #48	Control Panel	Normal	Alarm	
83	Annunciator Window #49	Control Panel	Normal	Alarm	
84	Annunciator Window #50	Control Panel	Normal	Alarm	
85	Annunciator Window #51	Control Panel	Normal	Alarm	
86	Annunciator Window #52	Control Panel	Normal	Alarm	
87	Annunciator Window #53	Control Panel	Normal	Alarm	
88	Annunciator Window #54	Control Panel	Normal	Alarm	
89	Annunciator Window #55	Control Panel	Normal	Alarm	
90	Annunciator Window #56	Control Panel	Normal	Alarm	
91	Annunciator Window #57	Control Panel	Normal	Alarm	
92	Annunciator Window #58	Control Panel	Normal	Alarm	

National Grid SCADA

National Grid will be provided with the following status and analog points:

Status:
54N-1T Breaker Open/Closed
55N-2T Breaker Open/Closed
54N-1T-1 MOD Open/Closed
55N-2T-1 MOD Open/Closed
54N-1T-3 MOD Open/Closed
55N-2T-3 MOD Open/Closed
23 kV T1 Low Side IR-541 Open/Closed
23 kV T2 Low Side IR-542 Open/Closed
T1 23 kV Alive
T2 23 kV Alive

Analogs:
T1 MW/MVAR/MVA/KV (23 kV side)
T2 MW/MVAR/MVA/KV (23 kV side)

SCHWEITZER ENGINEERING LABORATORIES, INC.
2350 NE Hopkins Court • Pullman, WA 99163-5603 USA
Phone: (509) 332-1890 • Fax: (509) 336-4445
Internet: www.selinc.com

To: *Peabody Municipal Light Plant*
Peabody, MA

Proposal: 9163XICN6771-01

Attn: *Mr. Brian Abcunas*
babcunas@pmlp.com

19-Sep-2017

Payment Terms:	Delivery:	8 Weeks	FOB:
Net 30 Days	Validity:	60 Days	Shipping Point

Item	Description	Price USD
1	Two (2) SEL-ICON node network provided per the attached equipment lists and network diagram. ***Orders placed against this proposal must reference the proposal number listed above.*** ICON nodes and circuits will be pre-provisioned and tested at SEL's Solutions Delivery Center in Pullman WA prior to delivery, and labeled for specific site installation unless specifically stated otherwise. SEL-5051 NMS software is a one time fee. The software may be copied and distributed as required in order to provide necessary engineering, management, and operational support of the optical network. There is no annual recurring licensing fee. Software upgrades with new features will be available from time to time for a nominal upgrade fee.	$28,197.00
	TOTAL USD:	**$ 28,197.00**

Place orders through:
Robinson Sales Inc., Fax (802) 463-1413, email: laurie.noyes@robinsonsales.com

10 years WORLDWIDE WARRANTY

	SEL	Purchaser's Acceptance
By:	*Bob Ince*	
Title:	Communications Engineer	
Date:	19-Sep-2017	
Signature:		

To accept this proposal and the attached terms, please return this sheet, signed and dated.

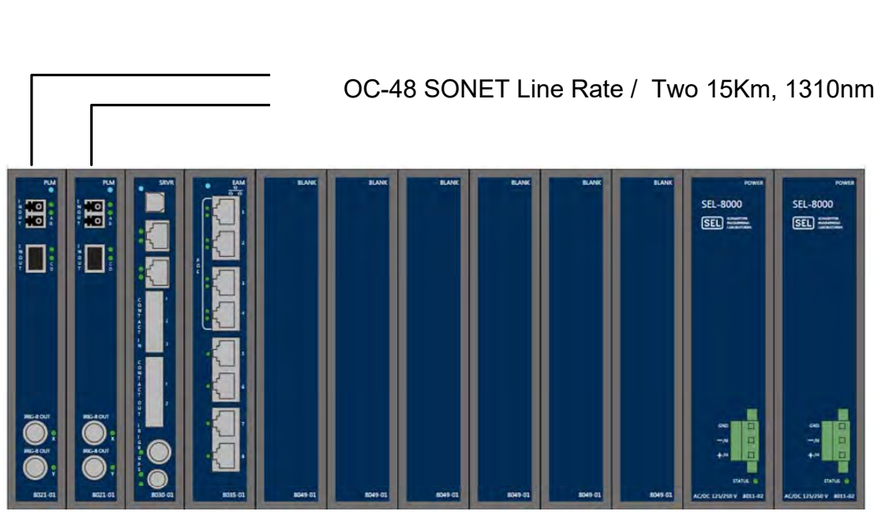
Part #	Description	Unit Price	Site 1 Ipswich
8001-01	19" shelf	$920.00	1
	Power Modules		
8011-02	HV AC/DC 110-240V 92W Power Module for 19" shelf. Terminal Block	$400.00	2
	Control Modules		
8021-01	Protected Line Module, 2 cages. Must add SFPs	$1,500.00	2
8030-01	Server Module	$600.00	1
	Access Module (Full Height)		
8035-01	Ethernet Access Module, Octal 10/100 RJ45	$700.00	1
8049-01	Access Module Cover	$15.00	6
	Small Form Factor Pluggables (SFPs)		
	OC-48 SFPs Dual Fiber (Single Mode)		
8121	OC-48, 1310 nm LC Connector ≈ 15Km	$1,608.00	2
	Software		
505113WX4	SEL-5051 NMS Client software	$5,000.00	
505120XX4	SEL-5051 node license	$750.00	1
	Services		
8190	Manufacturing System Engineering	$500.00	1
9191	Manufacturing Assembly Wire and Test	$750.00	1
	GPS Antenna		
9524A	GPS Antenna, 5V 40dB Gain	$250.00	
915900043	Bullet GPS Antenna Mounting Kit	$125.00	
915900139	Gas Tube Coaxial Surge Protector Kit	$106.00	
C965-8	(Key: 1832) 8' RG-8 Cable, TNC Connectors on Both Ends	$18.00	
C965-75	(Key: 1857) 75' RG-8 Cable, TNC Connectors on Both Ends	$46.00	
		TOTAL $	**$11,326.00**

SEL ICON Equipment List

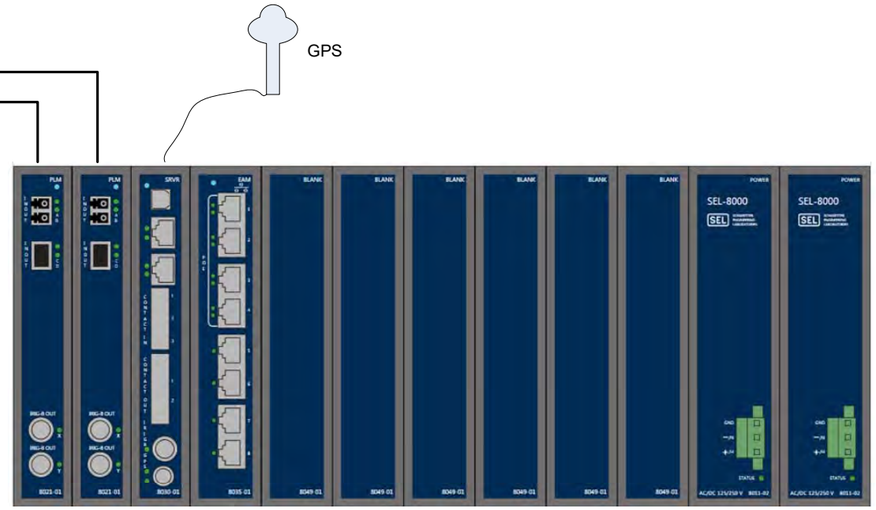
Part #	Description	Unit Price	Site 2 PMLP Office
8001-01	19" shelf	$920.00	1
	Power Modules		
8011-02	HV AC/DC 110-240V 92W Power Module for 19" shelf. Terminal Block	$400.00	2
	Control Modules		
8021-01	Protected Line Module, 2 cages. Must add SFPs	$1,500.00	2
8030-01	Server Module	$600.00	1
	Access Module (Full Height)		
8035-01	Ethernet Access Module, Octal 10/100 RJ45	$700.00	1
8049-01	Access Module Cover	$15.00	6
	Small Form Factor Pluggables (SFPs)		
	OC-48 SFPs Dual Fiber (Single Mode)		
8121	OC-48, 1310 nm LC Connector ≈ 15Km	$1,608.00	2
	Software		
505113WX4	SEL-5051 NMS Client software	$5,000.00	
505120XX4	SEL-5051 node license	$750.00	1
	Services		
8190	Manufacturing System Engineering	$500.00	1
9191	Manufacturing Assembly Wire and Test	$750.00	1
	GPS Antenna		
9524A	GPS Antenna, 5V 40dB Gain	$250.00	
915900043	Bullet GPS Antenna Mounting Kit	$125.00	
915900139	Gas Tube Coaxial Surge Protector Kit	$106.00	
C965-8	(Key: 1832) 8' RG-8 Cable, TNC Connectors on Both Ends	$18.00	
C965-75	(Key: 1857) 75' RG-8 Cable, TNC Connectors on Both Ends	$46.00	
		TOTAL $	**$11,326.00**

Part #	Description	Unit Price	Accessories GPS Antenna and Accessories
8001-01	19" shelf	$920.00	
	Power Modules		
8011-02	HV AC/DC 110-240V 92W Power Module for 19" shelf. Terminal Block	$400.00	
	Control Modules		
8021-01	Protected Line Module, 2 cages. Must add SFPs	$1,500.00	
8030-01	Server Module	$600.00	
	Access Module (Full Height)		
8035-01	Ethernet Access Module, Octal 10/100 RJ45	$700.00	
8049-01	Access Module Cover	$15.00	
	Small Form Factor Pluggables (SFPs)		
	OC-48 SFPs Dual Fiber (Single Mode)		
8121	OC-48, 1310 nm LC Connector ≈ 15Km	$1,608.00	
	Software		
505113WX4	SEL-5051 NMS Client software	$5,000.00	
505120XX4	SEL-5051 node license	$750.00	
	Services		
8190	Manufacturing System Engineering	$500.00	
9191	Manufacturing Assembly Wire and Test	$750.00	
	GPS Antenna		
9524A	GPS Antenna, 5V 40dB Gain	$250.00	1
915900043	Bullet GPS Antenna Mounting Kit	$125.00	1
915900139	Gas Tube Coaxial Surge Protector Kit	$106.00	1
C965-8	(Key: 1832) 8' RG-8 Cable, TNC Connectors on Both Ends	$18.00	1
C965-75	(Key: 1857) 75' RG-8 Cable, TNC Connectors on Both Ends	$46.00	1
		TOTAL $	**$545.00**

Part #	Description	Unit Price	NMS SEL - 5051 Network Management Software
8001-01	19" shelf	$920.00	
	Power Modules		
8011-02	HV AC/DC 110-240V 92W Power Module for 19" shelf. Terminal Block	$400.00	
	Control Modules		
8021-01	Protected Line Module, 2 cages. Must add SFPs	$1,500.00	
8030-01	Server Module	$600.00	
	Access Module (Full Height)		
8035-01	Ethernet Access Module, Octal 10/100 RJ45	$700.00	
8049-01	Access Module Cover	$15.00	
	Small Form Factor Pluggables (SFPs)		
	OC-48 SFPs Dual Fiber (Single Mode)		
8121	OC-48, 1310 nm LC Connector ≈ 15Km	$1,608.00	
	Software		
505113WX4	SEL-5051 NMS Client software	$5,000.00	1
505120XX4	SEL-5051 node license	$750.00	
	Services		
8190	Manufacturing System Engineering	$500.00	
9191	Manufacturing Assembly Wire and Test	$750.00	
	GPS Antenna		
9524A	GPS Antenna, 5V 40dB Gain	$250.00	
915900043	Bullet GPS Antenna Mounting Kit	$125.00	
915900139	Gas Tube Coaxial Surge Protector Kit	$106.00	
C965-8	(Key: 1832) 8' RG-8 Cable, TNC Connectors on Both Ends	$18.00	
C965-75	(Key: 1857) 75' RG-8 Cable, TNC Connectors on Both Ends	$46.00	
		TOTAL $	**$5,000.00**



OC-48 SONET Line Rate / Two 15Km, 1310nm Singlemode Fiber Pairs



OC-48 SONET Network						**Peabody Municipal Light Plant Preliminary SONET Network**	
						125 Vdc / Vac	125 Vdc / Vac
						Ipswich	PMLP Office
STS	Type	VT	DS0	Description	Type	A B	A B
1 - 12	Bulk	N/A	N/A	Available			
13 - 14	Bulk	N/A	N/A	VoIP	100mb	●	●
15 - 16	Bulk	N/A	N/A	SCADA	100mb	●	●
17 - 18	Bulk	N/A	N/A	Corporate	100mb	●	●
19 - 48	Bulk	N/A	N/A	Available			

SEL	Customer: Peabody Municipal Light Plant	icon INTEGRATED COMMUNICATIONS OPTICAL NETWORK
	Title: Preliminary SONET Two Node Network	
	Sheet 1 of 1	
	Project Number: ICN6771 / Date: 9/19/2017	

SALES TERMS FOR
SCHWEITZER ENGINEERING LABORATORIES, INC.

1. General Terms. These terms ("Terms") shall govern all sales of Products and Services to Buyer by Schweitzer Engineering Laboratories, Inc. ("SEL, Inc."), its affiliates, subsidiaries, and/or divisions, (collectively, "SEL"), unless otherwise agreed by SEL, Inc. in writing. For the purposes of these Terms and unless stated otherwise, "Products" shall mean the products manufactured by SEL, including SEL systems or control enclosure structures, specified on the SEL sales order acknowledgment, including without limitation any accessories, enclosed documentation and embedded software; and "Services" shall mean any SEL training, consulting, technical support and any other services specified on the SEL sales order acknowledgment, except for projects governed by an SEL Engineering Services Proposal. By accepting delivery of Products or Services, Buyer agrees to be bound by these Terms. No order shall be deemed accepted until the SEL sales order acknowledgment has been sent to Buyer, and all orders are subject to SEL's ability to obtain, on appropriate terms and within a reasonable amount of time, any export or import license or permit required by applicable law or regulation. SEL shall have the right to cancel any order at any time for failure of Buyer to agree to these Terms or for any material breach by Buyer of these Terms, including without limitation failure to pay any amounts due, violation of the then-current SEL Software License Agreement or noncompliance with the then-current SEL credit requirements.

2. Prices, Taxes and Payment Terms. Prices shall be the prices in effect on the date of the SEL sales order acknowledgment, and are subject to change without notice. Each quotation or proposal is valid for sixty (60) days from its date, unless specified otherwise. For sales to Buyers within the continental United States, prices include ground freight prepaid to Buyer's place of business. For sales to Buyers outside the continental United States, prices are exclusive of any freight, packing or insurance charges and any customs, sales, use, value-added, property or similar taxes, tariffs or duties. For Services performed on a time and expense basis, charges shall include time and expenses incurred in the previous calendar month. For Services performed on a fixed-price basis, charges shall include the price of major deliverables substantially completed in the previous calendar month. For Services, additional charges may result from modifications to the desired Services or from unforeseen conditions. Payment terms for all Products and Services are net thirty (30) days from date of invoice. All payments shall be made in United States Dollars, unless specified otherwise. Buyer must meet the then-current SEL credit requirements to purchase on credit. If, in the judgment of SEL, the financial condition of Buyer at any time prior to delivery does not justify the payment terms, SEL may require payment in advance or postpone or cancel any outstanding order, whereupon SEL shall be entitled to receive reasonable cancellation charges. Delays in delivery or non-conformities in any installments shall not relieve Buyer of its obligation to pay any remaining installments. SEL may, at its sole discretion, impose a late charge equal to the lesser of 1.5% per month or the highest applicable rate allowed by law on all amounts not paid when due. Any payment made by Buyer shall be applied to amounts due before being applied to current orders. Notwithstanding the foregoing, Buyer's failure to pay amounts due shall be deemed a material breach of these Terms, and any acceptance by SEL of late payments shall not be deemed a waiver of such breach. To the extent allowed by law, SEL shall be entitled to recover all costs incurred in collecting amounts due from Buyer, including without limitation legal fees and other costs (including without limitation disbursements).

3. Delivery, Documentation and Disclosure of Information. Delivery dates are approximate, based upon prompt receipt of all necessary information from Buyer and do not constitute a contractual obligation. If drawing approval is required, drawings must be returned on schedule to maintain estimated shipping dates. SEL shall pack and ship Products according to its standard procedure, and all shipments shall be sent to Buyer using the SEL standard freight forwarder or carrier. Buyer shall pay for any increased costs due to special packing, shipment (including freight forwarders or carriers required by Buyer) or insurance requests, as well as any detention charges. For Products shipped to addresses within the United States, title and risk of loss or damage shall pass to Buyer upon delivery to Buyer's place of business. Buyer must unpack and examine Products immediately and, if damage is discovered, (i) maintain Products at the place of examination, (ii) retain the shipping container and packing material, (iii) notify the carrier of any apparent damage in writing on carrier's delivery receipt and request carrier to make an inspection, (iv) notify SEL within three (3) days of delivery and (v) send SEL a copy of carrier's inspection report. For Products shipped to addresses outside the United States, title and risk of loss or damage shall pass to Buyer at the SEL factory upon delivery to the freight forwarder or carrier, and Buyer shall have a reasonable time after receipt of Products to inspect and reject or accept Products. In any event, acceptance shall be deemed to have occurred no later than fifteen (15) days after shipment. Buyer may not return any Product without prior written consent of SEL. When applicable, SEL shall provide Buyer with one (1) copy of instructions for each Product. Buyer may not reproduce such instructions. Buyer may order additional copies from SEL. All instructions and related documentation shall be in English. Although SEL or its representatives may from time to time provide translations of such instructions and documentation as a courtesy, the English version shall govern in the event of, and SEL shall not be liable for, any discrepancies. The English versions are available at selinc.com. Any information, suggestions or ideas transmitted by Buyer to SEL in connection with performance hereunder shall not be regarded as proprietary or confidential, unless identified in writing by Buyer and acknowledged in writing by SEL.

4. Intellectual Property. Buyer shall not challenge the validity of any SEL intellectual property, including without limitation any trademarks, service marks, trade dress, patents, copyrights, trade secrets or licenses. Buyer acknowledges that SEL intellectual property is the sole property of SEL. By sale of Products or Services to Buyer, SEL does not transfer any SEL intellectual property rights (including without limitation rights to designs or other work product). Buyer shall not remove or alter any trademarks, service marks or trade dress that identify SEL, nor use any trademarks, service marks, trade dress or any other intellectual property that, in the sole discretion of SEL, is confusingly similar to those of SEL. Any software (including firmware) included with Products is owned by SEL (or its licensors) and is licensed, not sold, to Buyer. Buyer may use such software only with Products and only as intended by SEL. All software shall be provided subject to the then-current SEL Software License Agreement.

5. Product Warranty and Services Commitment. SEL warrants to Buyer that Products are free from defects in material and workmanship for ten (10) years after shipment for all SEL Products, including SEL-manufactured control enclosure structures and panels. Such warranty shall be for five (5) years after shipment for Fault Indicator and Sensor Division Products. This warranty is conditioned upon proper storage, installation, connection, operation and maintenance of Products, prompt written notice to SEL of any defects and, if required, prompt availability of Products to SEL for correction. This warranty shall be void in its entirety if Buyer fails to implement required Product upgrades, modifies Products without prior written consent to and subsequent approval of any such modifications by SEL or uses Products for any applications that require product listing or qualification not specifically included in the SEL written quotation or proposal. If any Product fails to conform to this warranty, Buyer properly notifies SEL of such failure and Buyer returns the Product to SEL factory for diagnosis (and pays all expenses for such return), SEL shall correct any such failure by, at its sole discretion, either repairing any defective or damaged Product part(s) or making available, freight prepaid, by SEL (Carriage Paid To (CPT) customer's place of business) any necessary replacement part(s) or Product(s). Any Product repair or upgrade shall be covered by this warranty for the longer of one (1) year from date of repair or the remainder of the original warranty period. TO THE MAXIMUM EXTENT PERMITTED BY LAW, THIS WARRANTY SHALL BE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER STATUTORY, EXPRESS OR IMPLIED (INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE AND WARRANTIES ARISING FROM COURSE OF PERFORMANCE OR DEALING OR USAGE OF TRADE), EXCEPT TITLE AND PATENT INFRINGEMENT. SEL shall, whenever possible, pass the original manufacturer warranty to Buyer for non-SEL products. SEL does not warrant non-SEL products, including non-SEL control enclosure structures, and non-SEL products within SEL panels, control enclosure structures and systems, and products or prototypes provided by SEL for testing, marketing, or loan purposes. SEL shall perform Services in a manner consistent with the degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances. SEL shall reperform (or, at SEL's option, pay a third party to reperform) any

defective Services (including Services performed in conjunction with SEL systems) at no cost upon receipt of notice detailing the defect(s) within one (1) year of performance of the original Services.

6. Limitation of Liability, Indemnity and Insurance. In no event, whether as a result of breach of contract, indemnity, warranty, tort (including negligence), strict liability or otherwise, shall SEL liability to Buyer or its insurers for any loss or damage exceed the price of the specific Product or Service that gave rise to the claim, and any liability shall terminate upon the expiration of the warranty period. No claim, regardless of form, arising from these Terms may be brought by Buyer more than one (1) year from the date such claim accrues. In no event, whether as a result of breach of contract, indemnity, warranty, tort (including negligence), strict liability or otherwise, shall SEL be liable for any special, consequential, incidental, liquidated or punitive damages, including without limitation any loss of profit or revenues, loss of use of Products or associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, downtime costs or claims of Buyer's customers for such damages. If SEL or its subcontractors or suppliers provide Buyer with advice or other assistance, including input of customer-provided or customer-requested settings and advice related thereto, concerning any Product or any system or equipment in which any such Product may be installed, the provision of such advice or assistance shall not subject SEL to any liability, whether as a result of breach of contract, indemnity, warranty, tort (including negligence), strict liability or otherwise. SEL shall not be liable for any claims or losses resulting from any unauthorized access to Products. Buyer confirms that it has read the manuals and instructions for use of Products (or that it will do so) and shall not install or operate Products unless Buyer is competent to do so. Buyer shall indemnify, defend and hold harmless SEL and all related parties from and against any claims, demands, causes of action, losses, costs and expenses, including without limitation legal fees and other costs, arising directly or indirectly from, as a result of or in connection with the acts or omissions of Buyer, its officers, employees, agents or representatives, including without limitation (i) Buyer's modification or integration of any Product, (ii) Buyer's specifications, (iii) Buyer's relay settings, which may or may not be based on relay setting examples or guides from SEL, (iv) any changes made by Buyer or others related to design documents produced by SEL, (v) any unauthorized use or reuse of the designs, drawings, plans and specifications furnished by SEL, (vi) Buyer's failure to fully utilize the password protection available in any Product (including without limitation Buyer's failure to use passwords or to change default passwords to unique Buyer passwords) or (vii) any breach of these Terms by Buyer. Buyer shall maintain commercially reasonable insurance (including waiver of subrogation) against liability and property damage, including without limitation all standard commercial, environmental and, for any Products used in connection with any nuclear facility or activity, nuclear incident insurance.

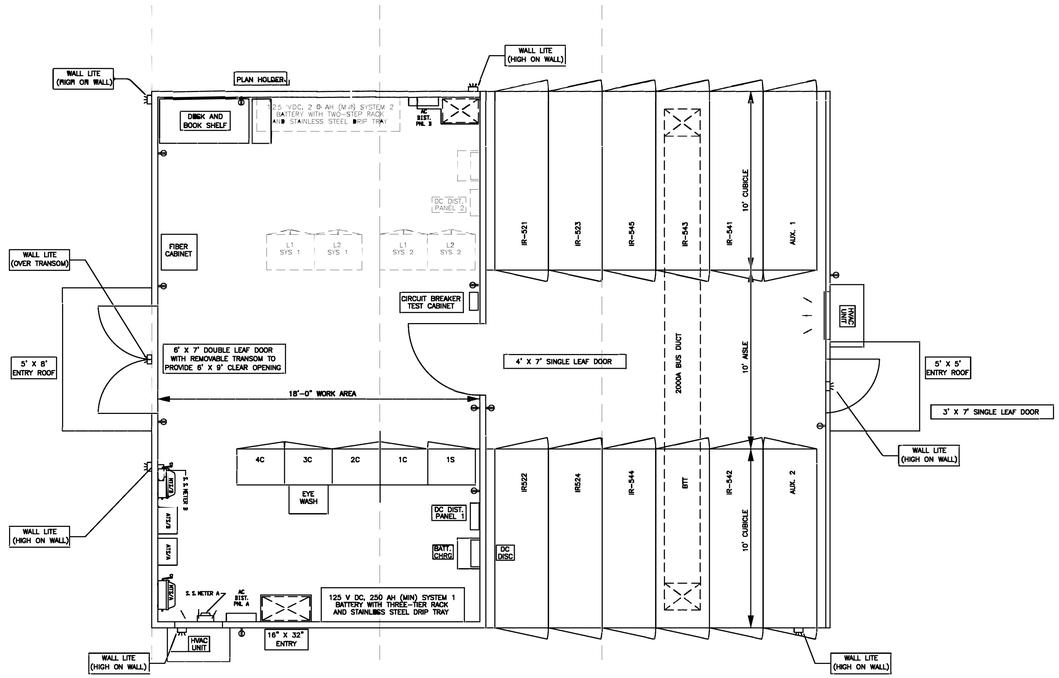
7. Patent Indemnity. SEL shall defend any action brought against Buyer based on a claim that any Product as provided by SEL infringes any United States patent, and SEL shall pay any award or settlement recovered against Buyer in any such action and shall reimburse Buyer for reasonable costs incurred by Buyer in the defense of any such action, provided that Buyer gives SEL prompt notice of such action, reasonable assistance in the defense thereof and full opportunity to control all aspects thereof, including settlement, and does not take any position adverse to SEL in connection with such action. In the event such Product is held to constitute infringement and use of the Product is enjoined (or SEL foresees a substantial risk of such event), SEL shall, at its sole discretion, exchange the Product with a non-infringing Product, acquire the right for Buyer to continue using it, modify it so that it becomes non-infringing or repurchase it from Buyer for a fair portion of the original price. SEL shall not be liable for damages that arise after SEL offers one of the foregoing remedies in good faith. SEL shall not be liable for any patent infringement claim arising from any custom Product, modification of any Product, integration of any Product not as intended by SEL, or integration of any Product with any non-SEL product, and Buyer shall fully indemnify, defend and hold harmless SEL and all related parties from and against any such patent infringement claim.

8. Transfer to End-User Other Than Buyer. Prior to resale of any Product, Buyer shall obtain written authorization from SEL for any such resale. To obtain such authorization, Buyer shall provide SEL, initially and on an ongoing basis, with complete and accurate end-user data for each Product. Buyer shall provide the end-user of each Product with all product notices, warnings, instructions, recommendations, bulletins and similar materials provided directly or indirectly by SEL. In the event Buyer transfers to a third party any Product or any right or interest therein, Buyer shall indemnify, defend and hold harmless SEL and all related parties from and against any claims against SEL in excess of any SEL obligations under these Terms by such transferee or any other party. Any assignment or transfer of any Product without prior written authorization from SEL shall void the SEL warranty. Buyer may not assign or transfer any Product where such assignment or transfer would violate any applicable export laws, regulations or orders. Buyer warrants that the shipping information is true and accurate to the best of their knowledge. The attempted assignment or transfer by Buyer of these Terms or any rights or duties hereunder without prior written consent of SEL shall not relieve Buyer of any obligations to SEL.

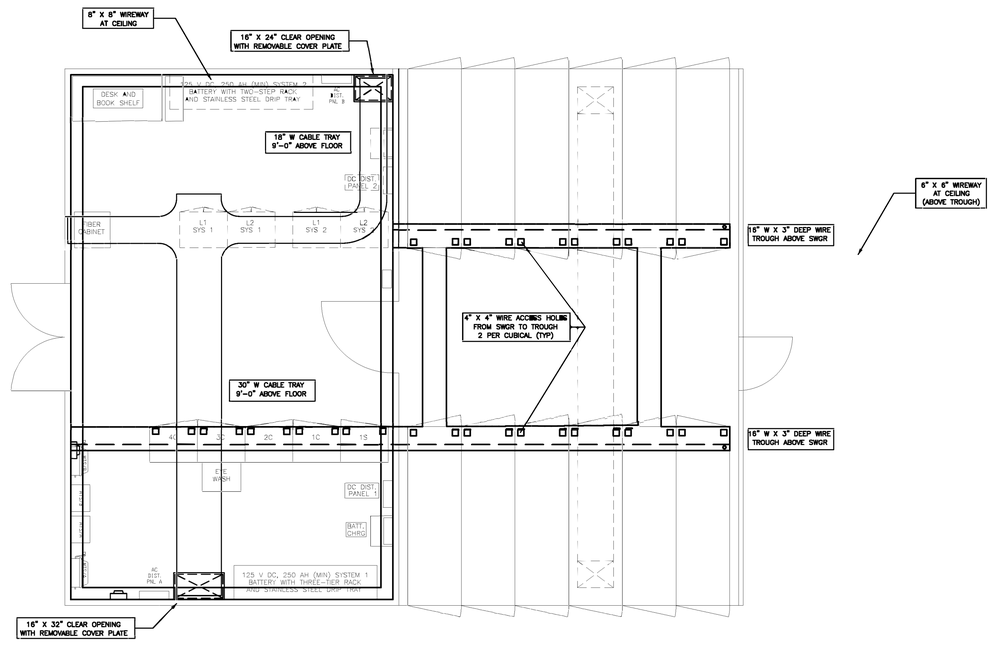
9. Contract Variations. If Buyer requires approval of drawings, such approval must be received by SEL no later than ten (10) working days after submittal of drawings by SEL to Buyer. Buyer's failure to comply with this requirement may result in additional costs and delays, which shall be Buyer's sole responsibility. Where Buyer's specifications lack sufficient detail, SEL reserves the right to design Products in accordance with good commercial practice, as determined at the sole discretion of SEL. If at any time Buyer makes changes to its design specifications, the SEL sales order acknowledgment shall be subject to renegotiation of price terms and delivery to reasonably cover any resulting costs or delays. Any order may be terminated by Buyer only upon written notice and payment of reasonable termination charges, including without limitation a reasonable restocking fee plus all costs incurred up to the date of termination. Any order delayed at Buyer's request shall be subject to the prices and Terms in effect at the time of release of such delay. Any such order delayed beyond a reasonable period shall be treated as a Buyer termination, and Buyer shall be responsible for reasonable delay and termination costs.

10. Governing Law and Dispute Resolution. The laws of the State of Washington, USA, excluding conflict of laws principles, shall govern these Terms. The parties reject any applicability of the United Nations Convention on Contracts for the International Sale of Goods. Any controversy or claim arising out of or relating to these Terms, or the breach thereof, shall be settled by binding arbitration administered by the American Arbitration Association in accordance with its Commercial Arbitration Rules, and judgment on the arbitration award may be entered in any court of competent jurisdiction. Arbitration shall be held in Seattle, Washington, or another location agreed upon by the parties, and shall be conducted in English. The prevailing party to any dispute shall be entitled to recover legal fees and other costs (including without limitation arbitration fees, disbursements, and collection costs).

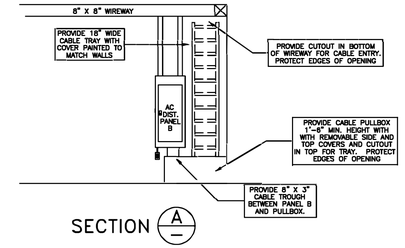
11. Miscellaneous. These Terms constitute the entire agreement between SEL and Buyer, and supersede any prior or contemporaneous verbal or written agreements, negotiations, commitments, representations or correspondence between the parties, including without limitation any terms on any purchase order form. SEL rejects any representation, express or implied warranty, course of performance or dealing, trade usage or any different or additional terms not set forth herein. SEL reserves the right to modify or revoke any quote or order to comply with applicable laws and market conditions. Any notice pursuant to these Terms shall be deemed given when sent by registered mail, certified mail (return receipt requested), overnight delivery, or fax (receipt confirmed) to an authorized officer at the address or fax number provided on the SEL sales order acknowledgment or, if no such address or fax number is provided, at the registered headquarters of the other party. All rights and duties hereunder shall be for the sole and exclusive benefit of Buyer and SEL, and not for the benefit of any other party. No failure or delay by either party in exercising any right or remedy, or insisting upon strict compliance by the other party with any obligation in these Terms, shall constitute a waiver of any right thereafter to demand exact compliance with these Terms. The invalidity, in whole or part, of any provision in these Terms shall not affect the remainder of such provision or any other provision and, where possible, shall be replaced by a valid provision that effects as close as possible the intent of the invalid provision. Neither party shall be liable for failure to perform or delay in performance of any obligation under these Terms (except payment of amounts already due and owing) where such failure or delay results from any event beyond its reasonable control. Any modification of these Terms must be in a writing signed by an authorized officer of SEL.



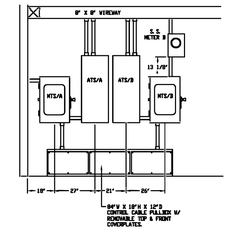
EQUIPMENT PLAN



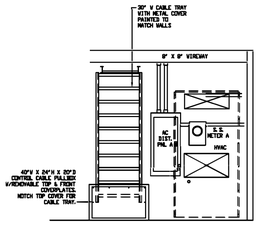
WIREWAY PLAN



SECTION (A)



SECTION (B)



(C) SECTION

GRAPHIC SCALE IN FEET

4 0 4 8

1/4"=1'-0"

DATE	BY	NO.	REVISIONS
04/15/17	PLM / MCB	A	ISSUED FOR REVIEW

PLM

ELECTRIC POWER ENGINEERING

35 MAIN STREET (508) 435-0200 HOPKINTON, MA 01748

DRAWN PLM

CKD MB

APPD MCB

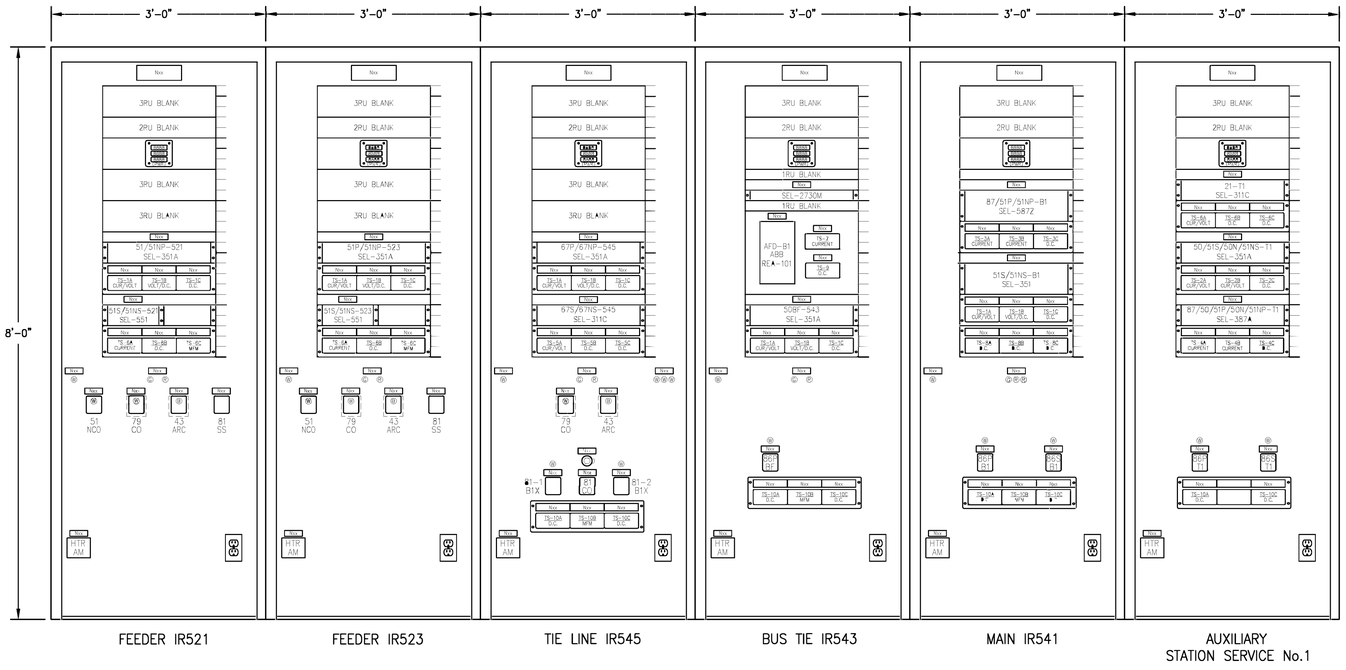
DATE 04/15/17

SCALE 1/4"=1'-0"

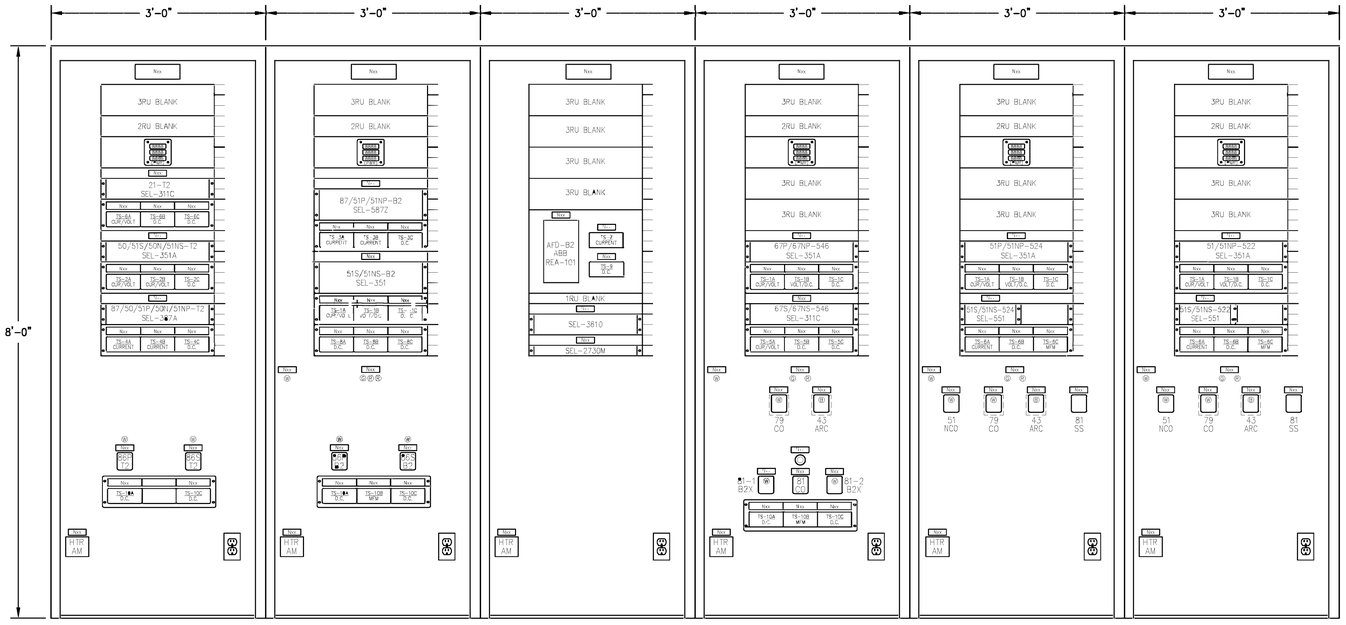
PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS
IPSWICH RIVER SUBSTATION

23 KV SWITCHGEAR PLAN VIEWS AND ELEVATIONS

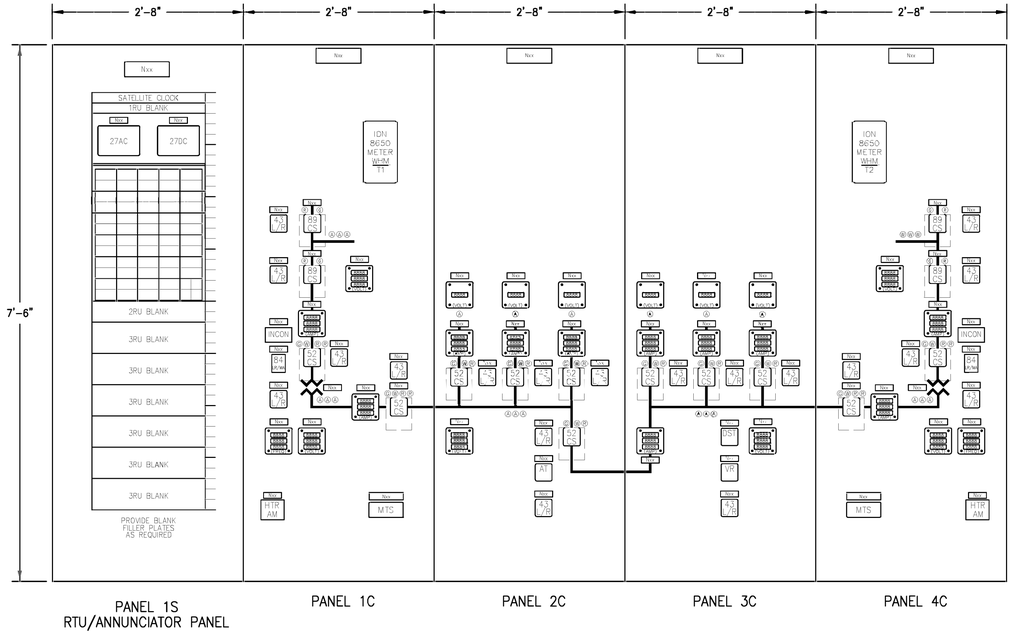
NO. 919911IR-E190-A



23kV BUS 1
CUBICLE DOOR FRONT VIEWS



23kV BUS 2
CUBICLE DOOR FRONT VIEWS



CONTROL CUBICLES
CUBICLE DOOR FRONT VIEWS

DATE	BY	No.	REVISIONS

PLM
ELECTRIC POWER ENGINEERING
35 MAIN STREET (508) 435-0200 HOPKINTON, MA 01748

DRAWN: PLM
CKD: MTO
APPD:
DATE: 04/15/17
SCALE: NONE

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS
IPSWICH RIVER SUBSTATION

SWITCHGEAR ASSEMBLY AND CONTROL PANEL FRONT VIEW ELEVATIONS

No. 919911IR-E191-A

NGRID 115kV LINE B-154N TO WARD HILL

NGRID 115kV LINE B-154N TO SOUTH DANVERS

NGRID 115kV LINE C-155N TO WARD HILL

NGRID 115kV LINE C-155N TO SOUTH DANVERS

84kV MCOV

54N-1T-3

54N-1T-1

55N-2T-3

55N-2T-1

43/R

89/CSR

52/CSR

EMM T1

EMM T2

MTS

REVENUE METERING

2000:5A MR 1200:5A TAP

54N-1T 2000A

55N-2T 2000A

IR-541 2000A

IR-542 2000A

IR-543 2000A N.O.

SEL-351A

27/59 T1

27/59 T2

50/51S T1

50/51S T2

50N/51NS T1

50N/51NS T2

51TNS T1

51TNS T2

25 T1

25 T2

50N T1

50N T2

MFM T1

MFM T2

A

V

TRANSFORMER T1 ALARMS (TO ANNUNCIATOR)

TRANSFORMER T2 ALARMS (TO ANNUNCIATOR)

63PR1 T1A

63PR2 T1A

26Q T1A

49 T1A

71T T1A

71Q T1A

27 DC1

63SP T1

63PR1 T2A

63PR2 T2A

26Q T2A

49 T2A

71T T2A

71Q T2A

27 DC2

63SP T2

86P T1

86P T2

LOR

TRIP TC1 BREAKERS 54N-1T & IR-541, TRIP & L.O. MOD 54N-1T-1, L.O. BREAKERS 54N-1T, IR-541 & ANN.

TRIP TC1 BREAKERS 54N-2T & IR-542, TRIP & L.O. MOD 55N-2T-1, L.O. BREAKERS 55N-2T, IR-542 & ANN.

TRIP TC2 BREAKERS 54N-1T & IR-541, TRIP & L.O. MOD 54N-1T-1, L.O. BREAKERS 54N-1T, IR-541 & ANN.

TRIP TC2 BREAKERS 54N-2T & IR-542, TRIP & L.O. MOD 55N-2T-1, L.O. BREAKERS 55N-2T, IR-542 & ANN.

TRIP BREAKER IR-541

TRIP BREAKER IR-542

TRIP BREAKER IR-543

TRANSFORMER T1 115/23kV ±10% LTC 36/48/60 MVA

TRANSFORMER T2 115/23kV ±10% LTC 36/48/60 MVA

1200:5A MR 1200:5A TAP

2000:5A MR

2000:5A MR 2000:5A TAP

87 T1

87 T2

51TNP T1

51TNP T2

SEL-387A

TS4

TO LTC T1

TO LTC T2

18kV 15.3kV MCOV

SEL-311C

AFD B1

AFD B2

AFD 543

REA101

REA103

REA105

AS REQUIRED

INITIATE B.F. BREAKER IR-543

TRIP 86S-B1 & ANN.

TRIP 86S-B2 & ANN.

RH

TRIP TC1 BREAKERS 54N-1T & IR-541

TRIP TC1 BREAKERS 55N-2T & IR-542

TRIP & L.O. BREAKERS IR-541 & IR-542 L.O. BREAKER IR-543 & ANN.

86BF 543

62 543

25/27 543

50BF 543

VOLTAGE TRANSFORMER 14,400/120V

SEL-587Z

51NP B1

51NP B2

87 B1

87 B2

86P B1

86P B2

INITIATE B.F. BREAKER IR-543

TRIP & L.O. BREAKERS IR-541, IR-543, IR-523, IR-545, IR-521 & ANN.

TRIP & L.O. BREAKERS IR-542, IR-543, IR-522, IR-546, IR-524 & ANN.

TRIP IR-523 & IR-521 ON FREQUENCY 1 ELOR TRIP IR-523 & IR-521 ON FREQUENCY 2

TRIP IR-522 & IR-524 ON FREQUENCY 1 ELOR TRIP IR-522 & IR-524 ON FREQUENCY 2

81SS

61-1 B1

61-2 B1

61-1 B2

61-2 B2

25/27 B1

25/27 B2

59 B1

59 B2

78S B1

78S B2

51S B1

51S B2

51NS B1

51NS B2

TRIP & L.O. BREAKERS IR-541, IR-543J IR-523, IR-545, IR-521 & ANN.

TRIP & L.O. BREAKERS IR-542, IR-543, IR-522, IR-546, IR-524 & ANN.

23kV BUS 1, 2000A

23kV BUS 2, 2000A

2000:5A SR

2000:5A MR 2000:5A TAP

STA. SERV. No.1 13,280-120/240V kVA

STA. SERV. No.2 13,280-120/240V kVA

STA. SERV. No.3 13,280-120/240V kVA

AUTO TRANSFER SWITCH NORMAL EMERGENCY

MANUAL TRANSFER SWITCH NORMAL EMERGENCY

INTLK

FROM STREET

ANNUNCIATOR

WHM

AC PANEL

27 AC

430ST

27 T1

27 T2

27 B1

27 B2

TD 6 MIN.

TD 3 MIN.

TRIP 54N-1T, 55N-2T

TRIP BREAKER IR-543

IR-541

IR-542

IR-543

1200:5A MR 600:5A TAP

1200:5A MR 1200:5A TAP

43 ARC

51N CO

79CO LSR

79 CO

81 SS

43/R

52/CSR

IR-521 1200A

IR-523 1200A

IR-545 1200A

IR-546 1200A

IR-524 1200A

IR-522 1200A

MFM 521

MFM 523

MFM 545

MFM 546

MFM 524

MFM 522

SEL-551

SEL-311C

SEL-351A

51P 521

51P 523

51P 545

51P 524

51P 522

51NP 521

51NP 523

51NP 545

51NP 524

51NP 522

67S 545

67NS 545

67P 545

67NP 545

25/27 521

25/27 523

25/27 545

25/27 546

25/27 524

25/27 522

79 521

79 523

79 545

79 546

79 524

79 522

14,400/120V 4A VT

FEEDER 221

FEEDER FUTURE

LINE 2405

LINE 2404

FEEDER (FUTURE)

FEEDER 222

NOTE:

* LOCATED ON CONTROL PANEL

TRANSFORMER DEVICES

26QA	OIL TEMPERATURE – ALARM
49A	WINDING TEMPERATURE – ALARM
63PR1A	TRANSFORMER PRESSURE RELIEF – ALARM
63PR2A	LTC PRESSURE RELIEF – ALARM
63SP	TRANSFORMER SUDDEN PRESSURE –TRIP
71TA	TRANSFORMER OIL LEVEL – ALARM
71QA	LTC OIL LEVEL – ALARM

METERS

EMM	ELECTRONIC BILLING MULTI-METER
MFM	DIGITAL MULTI-FUNCTION METER
A	AMPS MODULE DISPLAY
F	FREQUENCY MODULE DISPLAY
P	POWER MODULE DISPLAY (KW, KVAR, PF)
V	VOLTS MODULE DISPLAY

SWITCHES

MTS	BILLING METER TEST SWITCH
TS	RELAY TEST SWITCH
TSM	DISPLAY METER TEST SWITCH

RELAYS

AFD	ARC FAULT DETECTION RELAY
21	DIRECTIONAL DISTANCE RELAY
25	SYNCHRONISM CHECK RELAY
27	UNDERVOLTAGE RELAY
27/DC	DC LOW VOLTAGE ALARM RELAY
50/51	PHASE INSTANTANEOUS AND TIME OVERCURRENT RELAY
50N/51N	GROUND INSTANTANEOUS AND TIME OVERCURRENT RELAY
59	OVERVOLTAGE RELAY
62	TIME DELAY RELAY
67	PHASE DIRECTIONAL OVERCURRENT RELAY
67N	GROUND DIRECTIONAL OVERCURRENT RELAY
78	LOAD BLINDER RELAY
79	RECLOSING RELAY
81U	UNDERFREQUENCY
86	LOCKOUT RELAY
87	DIFFERENTIAL RELAY

EQUIPMENT

52	CIRCUIT BREAKER
A	AMBER INDICATING LIGHT
W	WHITE INDICATING LIGHT
M	MOTOR OPERATED DISCONNECT SWITCH

DATE	BY	No.	REVISIONS

PLM

ELECTRIC POWER ENGINEERING

35 MAIN STREET (508) 435-0200 HOPKINTON, MA 01748

DRAWN GJP

CKD MTO

APPD MCB

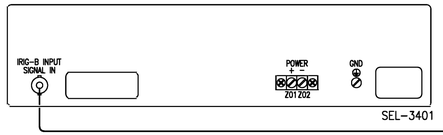
DATE 6/30/14

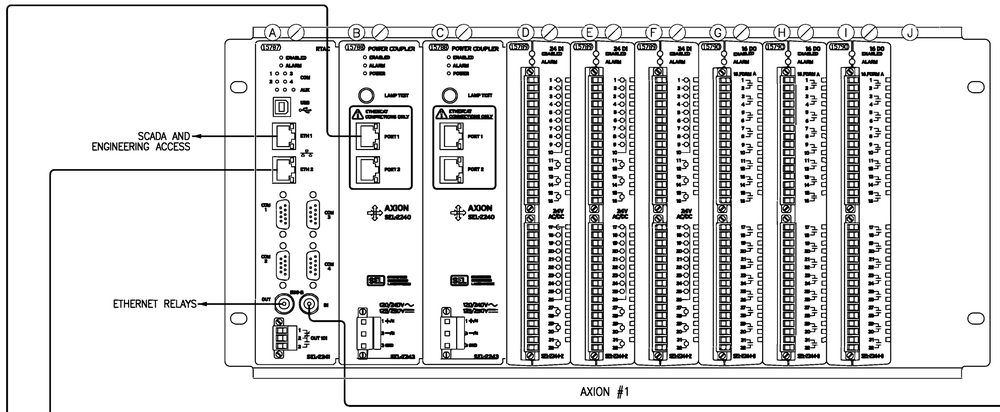
SCALE NONE

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS
IPSWICH RIVER SUBSTATION

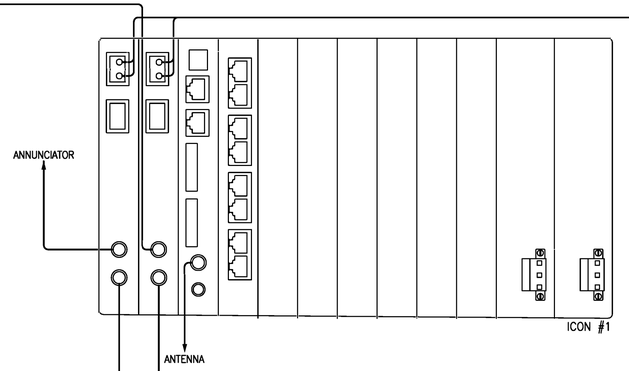
RELAY AND METERING ONE LINE DIAGRAM

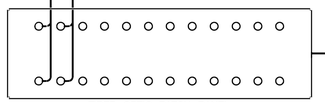
No. 919911IR-E200-0A



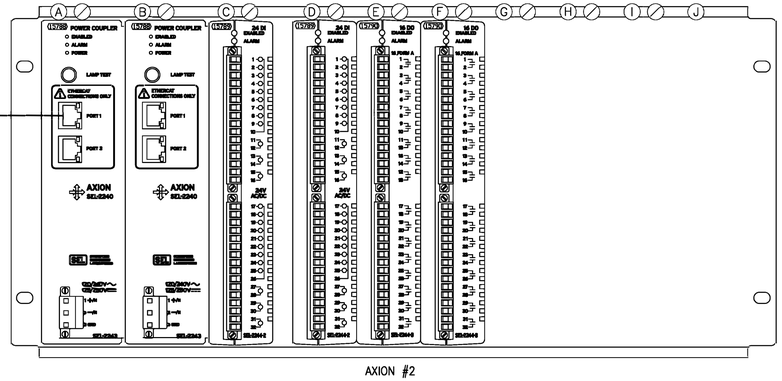


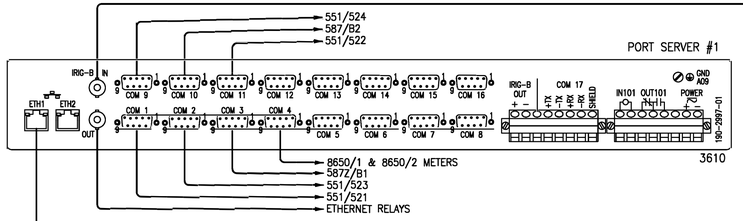
CONTROL CUBICLE 1S

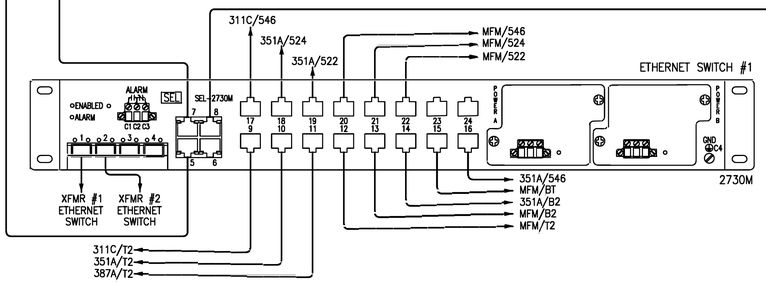




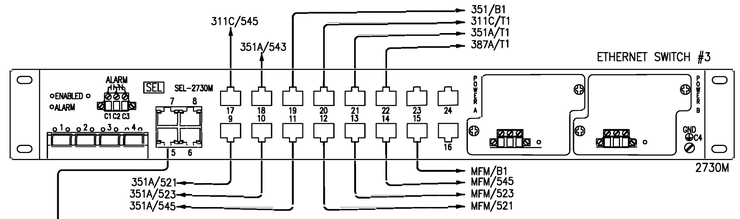
FIBER CABINET







BUS TIE TRANSITION SWITCHGEAR CUBICLE



BUS TIE IR543 SWITCHGEAR CUBICLE

DATE	BY	No.	REVISIONS

PLM — ELECTRIC POWER ENGINEERING
35 MAIN STREET (508) 435-0200 HOPKINTON, MA 01748

DRAWN	GJP
CKD	AJM
APP'D	
DATE	9/27/17
SCALE	NONE

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS
IPSWICH RIVER SUBSTATION

COMMUNICATIONS SYSTEM DIAGRAM

No. 919911IR–E220–A

PEABODY MUNICIPAL LIGHT PLANT
PEABODY, MASSACHUSETTS
25 KV SWITCHGEAR ASSEMBLY
IPSWICH RIVER SUBSTATION

BID FORM

Peabody Municipal Light Plant
201 Warren Street Extension
Peabody, MA 01960

_____

_____

(Bidder)

_____

(Date)

1. Pursuant to your Invitation for Bids inviting Bids for the equipment described in the Contract Documents of which this Bid is part, the undersigned Bidder hereby certifies and represents that it has examined and thoroughly understands the Contract Documents including the following:

ADDENDA NO.	DATE

2. The undersigned Bidder, having made such examinations and reached such understandings:

   a. encloses the required Bid Deposit in the amount of 5% of the total Bid amount.
   b. accepts the obligation of a Bidder incurred by submitting this Bid.
   c. agrees to the rights reserved to the Owner set forth in the Instruction to Bidders.
   d. proposes to execute the Contract as set forth in the Contract Documents, of which this Bid Form is a part.
   e. has signed and included the Non-Collusive Bidders Certificate
   f. also encloses Switchgear Bid Data sheet information

3. The following statements of experience, personnel, equipment and general qualifications of the Bidder are submitted as a part of this Bid and the Bidder represents and guarantees the truthfulness and accuracy thereof:

   a. Our organization has been in business continuously from _____.

   b. Our organization has had experience in manufacturing equipment comparable to that required under the proposed contract, a prime manufacturer, for _____ years, as a component manufacture for _____ years, or as an equipment supplier for _____ years.

BID SCHEDULE		
25 kV Switchgear Assembly		
BID ITEM	**DESCRIPTION AND AMOUNT**	
1.	Furnish One (1) 25 kV Switchgear Assembly, complete as specified herein, for the lump sum of: _____ _____ and_____/100 Dollars	$ _____
1a.	Furnish five (5) year extended warranty, complete as specified herein, for the lump sum of: _____ _____ and_____/100 Dollars	$ _____
1b.	Furnish one (1) spare 2000 ampere circuit breaker, complete as specified herein, for the lump sum of: _____ _____ and_____/100 Dollars	$ _____

All bid prices shall be firm for sixty (60) days from the date of the Bid Opening.

All bid prices shall exclude the Commonwealth of Massachusetts Sales and Use Taxes, PMLP State Sales Tax Exempt No. E04-600-1407.

The Owner reserves the right to reject any or all Bids, waive irregularities or informalities, and to award a contract by individual items, in aggregate or a combination thereof.

The above proposal is in complete compliance with Technical Specifications: **Yes** ☐ **No** ☐

The above proposal is in complete compliance with PMLP's Terms and Conditions: **Yes** ☐ **No** ☐

Name, address and telephone number of three (3) references for which you have provided a similar service or product:

Reference Company Name: _____

Contact and Phone # _____

Reference Company Name: _____

Contact and Phone # _____

Reference Company Name: _____

Contact and Phone # _____

DELIVERY INSTRUCTIONS

The equipment and all related accessories will be delivered to the location designated herein. Please indicate your ability to meet the specified delivery by entering your proposed best delivery periods in the following table (weeks **After Vendor Receipt of Order**):

EQUIPMENT DELIVERY			
BID ITEM	**DESCRIPTION**	**DESIRED DELIVERY LEAD TIME**	**PROPOSED DELIVERY LEAD TIME**
1	Outline & Weight Drawings	6 weeks ARO	_____ weeks ARO
1	Remaining Shop Drawings	As required to meet delivery	_____ weeks ARO
1	Equipment Delivery	32 weeks ARO (Early Delivery will not be acceptable)	_____ weeks ARO

Firm Name: _____

Address: _____

Contact #: _____

Signature: _____

Title and Date _____

Remarks: _____

BID FORM

The party by whom this Bid is submitted and by whom the contract will be entered into, in case this Bid is accepted is a

___,

("Corporation", "Partnership", or "Individual")

doing business at _____, _____,
(Street) (City)

_____, _____, to which address Notice of Acceptance of Bid and all
(State) (Zip)

other written notices may be mailed or delivered until further written notice is given the Owner.

_____
(Legal Name of Bidding Organization)

By: _____
(Signature of Authorized Person)

_____
(Printed Name)

_____
(Title)

The undersigned hereby certifies and represents to the Owner that the person signing this Proposal on behalf of the Bidder is authorized to do so.

_____
(Partner of Partnership
or Official of Corporation)

CERTIFICATE OF NON-COLLUSION

THE BELOW SIGNED QUOTER HAS NOT DIVULGED TO, DISCUSSED OR COMPARED HIS QUOTE WITH OTHER QUOTES AND HAS NOT COLLUDED WITH ANY OTHER QUOTER OR PARTIES TO A QUOTE WHATSOEVER. The undersigned certifies under penalties of perjury, that this accompanying bid or proposal is not the result of, or affected by, any unlawful act of collusion with any other person or company engaged in the same line of business or commerce, or any other fraudulent act punishable under the Commonwealth of Massachusetts or United States Law. As used in this certification, the "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

Note: No premiums, rebates or gratuities to any employee are permitted with, prior to, or after any delivery of materials. Any such violation will result in the cancellation and/or return of material (as applicable) and the removal from the master bidders list.

Contractor's Full Legal Name: (PLEASE TYPE OR PRINT)	
Authorized Signature:	
Date:	

TAX COMPLIANCE CERTIFICATION

Pursuant to MGL c. 62C, §49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

Contractor's Full Legal Name: (PLEASE TYPE OR PRINT)	
Duly Authorized Signature:	
Date:	
Social Security # or FID #:	

S A M P L E

C O N T R A C T

AGREEMENT made this «Day» by and between the Peabody Municipal Light Plant, a business duly established under the laws of the Commonwealth of Massachusetts and having a usual place of business at 201 Warren Street Extension, Peabody, Massachusetts 01960, hereinafter referred to as "PMLP" and «Name», having a usual place of business at «Address», hereinafter referred to as «Nickn».

WITNESSETH, that the PMLP and «Nickn», for the consideration hereinafter stated, agree as follows:

1. That «Nickn» shall furnish «Material» as set forth in the specifications incorporated in the bid opened on «Date».

2. All material shall be furnished and delivered to the PMLP jobsite as defined in the attachments hereto.

3. The Contract price for the material shall be the bid price of «Amount» as set forth on the bid form dated «Biddate» and herein incorporated by reference.

4. «Nickn» shall not assign or transfer this contract, or any part thereof, or any sum due or to become due hereunder without the written consent of the PMLP.

5. This AGREEMENT together with the Instructions to Bidders, Purchaser's Terms and Conditions, PMLP Specifications, and Vendor's Bid, hereto attached, form this Contract and are as fully a part of this Contract as if herein repeated.

IN WITNESS WHEREOF, the parties hereto have executed this AGREEMENT the day and year above first written.

«Company»

BY_____
(NAME)

_____
(TITLE)

DATE:_____

PEABODY MUNICIPAL LIGHT PLANT

BY_____
GLENN TRUEIRA, MANAGER