



**Date:** March 29, 2022

**Addendum #:** 1

**Project Name:** Grand Traverse Substation Panels

**Bid Due Date:** Tuesday, April 5, 2022, at 2:00PM EST

Attached are revised documents for Relay Panel BOM and Section 16292 – Relay Control Panel.

**TRAVERSE CITY LIGHT & POWER DEPARTMENT  
 GRAND TRAVERSE SUBSTATION  
 CONTROL PANELS - BILL OF MATERIAL  
 CONTROL PANEL NO.1**

ITEM NO.	EST. QUANTITY	SPARE QUANTITY	ITEM DESCRIPTION	MANUFACTURER	PART #
	Owner Furnished	0	Multi function meter, 4 wire, 3 element, 125VDC, DNP3.0	Novatech (Bitronics)	M650B3U511
	3	1 lamp only	Indicating light, White, 120 VAC, with LED lamp	G.E. ET-16	#116B6708G4-5-W73-N4
	2	1 lamp only	Indicating light, Amber, 125 VDC 2000 ohm, with LED lamp	G.E. ET-16	#116B6708G43A73A4
	1	0	SEL3530 Real-Time Automation Controller RTAC	Schweitzer	SEL-3530 (35303B0DX211A0XXXXXX)
	1	0	Multi function relay, overcurrent, ground, reclosing, event recording, metering, 125VDC, DNP3.0, Load Profiling	Schweitzer	SEL-311C (Bus) (0311C113H4E54X1)
	1	0	Synchroscope, "Slow -Fast"	Crompton	007-146A-PRAE-C6
	1	0	SEL2523 36 window annunciator with configurable lables, 125VDC	Schweitzer	SEL-2523 (2523013100XA0XX)
	2	0	Bus Tripping Relay , 125 VDC, Hand Reset	Electroswitch	Series LOR 7808D
	1	0	Test switch (1TS1 THRU 1TS3) for SEL311C, FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=036, POS C=036	ABB FT-19R	FR3G183036036
	1	0	Test switch (1TS4 THRU 1TS6) for LOR, FT-19, 30 pole, Full Length Clear Covers Pos A = 036, POS B=036, POS C=036	ABB FT-19R	FR3G036036036
	16	1	12 pt Terminal blocks, Slide-Link, #10-32 studs terminals, with white marking strip	States	Series NT M-25012
	5	1	4pt Terminal block, Shorting type, #10/32 stud treminals, with white marking strip	States	Series NT M-25104G
	2	0	SEL Comunication Cable 10'	Schweitzer	SEL C273A
	2	0	3-pole Fuse Block, Class K, 30A, 250V, Class R	Bussman	R25030-3
	6	6	Fuse, 6A, 250V. Class K-1, Limitron, Potential circuit	Bussman	FRN-R-6

**TRAVERSE CITY LIGHT & POWER DEPARTMENT  
GRAND TRAVERSE SUBSTATION  
CONTROL PANELS - BILL OF MATERIAL**

**CONTROL PANEL NO.2**

ITEM NO.	EST. QUANT	SPARE QUANTITY	ITEM DESCRIPTION	MANUFACTURER	PART #
	1	0	Multi function relay, transformer differential, overcurrent, 125VDC	Schweitzer	SEL-587 (0587103X531)
	1	0	Multi function relay, overcurrent, metering, 125VDC	Schweitzer	SEL-501 (0501003X5613XB)
	2	0	Line relay, current differential, 125VDC	Schweitzer	SEL-311L (0311L1JDD325422XX)
	Owner Furnished	0	Multi function meter, 4 wire, 3 element, 125VDC, DNP3.0	Novatech (Bitronics)	M650B3U511
	1	0	Circuit Switcher control switch relay, w/ nameplate "CIRCUIT SWITCHER"	Electroswitch	Series 2457D
	1	0	Circuit Switcher control switch relay, w/ nameplate "MOAB"	Electroswitch	Series 2457D
	2	1 lamp only	Indicating light, Red, 125 VDC 2000 ohm, with LED lamp	G.E. ET-16	#116B6708G43R73R4
	2	1 lamp only	Indicating light, Green, 125 VDC 2000 ohm, with LED lamp	G.E. ET-16	#116B6708G43G73G4
	1	0	LTC Auto/Man control switch, electrically operated, 125VDC, 3 deck, w/ nameplate "AUTO-MAN"	Electroswitch	Series 31LSR (9303DD)
	1	0	LTC Raise/Lower control switch, w/ nameplate "RAISE-LOWER"	Electroswitch	Series 2457D
	1	0	Transformer LTC Rotary Position Indicator, W RS232 OUTPUT	INCON	1250-LTC-0-I-S-120
	2	0	Local-Remote selector switch, 2 N.O., 2 N.C. contacts, face plate inscribed "REMOTE-LOCAL", standard handle.	G.E	CR104PSG21B92
	1	0	Multi function relay, overcurrent, ground, reclosing, event recording, metering, 125VDC, DNP3.0, Load Profiling, additional I/O	Schweitzer	SEL-351S (0351S6X3D3E5421)
	1	0	Transformer Tripping Relay , 125 VDC, Hand Reset	Electroswitch	Series LOR 7808D
	1	1 lamp only	Indicating light, Amber, 125 VDC 2000 ohm, with LED lamp	G.E. ET-16	#116B6708G43A73A4
	1	0	Test switch (2TS1 THRU 2TS3) for SEL587, FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=183, POS C=036	ABB FT-19R	FR3G183183036
	1	0	Test switch (2TS4 THRU 2TS6) for SEL501, FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=209, POS C=036	ABB FT-19R	FR3G183209036
	1	0	Test switch (2TS7 THRU 2TS9) for SEL351S, FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=036, POS C=183	ABB FT-19R	FR3G183036183
	3	0	SEL Communication Cable 15'	Schweitzer	SEL C273A
	1	0	RS232 Cable 15'		
	14	1	12 pt Terminal blocks, Slide-Link, #10-32 studs terminals, with white marking strip	States	Series NT M-25012
	6	1	4pt Terminal block, Shorting type, #10/32 stud terminals, with white marking strip	States	Series NT M-25104G
	2	0	3-pole Fuse Block, Class K, 30A, 250V, Class R	Bussman	R25030-3
	2	1 lamp only	Indicating light, White, 120 VAC, with LED lamp	G.E. ET-16	#116B6708G4-5-W73-N4
	6	6	Fuse, 6A, 250V. Class K-1, Limitron, Potential circuit	Bussman	FRN-R-6

**TRAVERSE CITY LIGHT & POWER DEPARTMENT  
GRAND TRAVERSE SUBSTATION  
CONTROL PANELS - BILL OF MATERIAL**

**CONTROL PANEL NO.3**

ITEM NO.	EST. QUANTITY	SPARE QUANTITY	ITEM DESCRIPTION	MANUFACTURER	PART #
	1	0	SEL GPS Clock, Antenna, and C953 COAX Cable	Schweitzer	SEL-2407 (240700013)
	Owner Furnished	0	Multi function meter, 4 wire, 3 element, 125VDC, DNP3.0	Novatech (Bitronics)	M650B3U511
	1	1 lamp only	Indicating light, White, 120 VAC, with LED lamp	G.E. ET-16	#116B6708G4-5-W73-N4
	6	1 lamp only	Indicating light, White, 70 VAC, with LED lamp	G.E. ET-16	#116B6708G4-7-W73-N4
	1	0	Multi function relay, overcurrent, ground, reclosing, event recording, metering, 125VDC, DNP3.0, Load Profiling, additional I/O	Schweitzer	SEL-311C (Primary) (0311C113R3E54X1)
	1	0	Multi function relay, overcurrent, ground, reclosing, event recording, metering, 125VDC, DNP3.0, Load Profiling	Schweitzer	SEL-311C (Backup) (0311C113H4E54X1)
	1	0	Test switch (3TS1 THRU 3TS3) for SEL311C (PRI), FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=036, POS C=183	ABB FT-19R	FR3G183036183
	1	0	Test switch (3TS4 THRU 3TS6) for SEL311C (BU), FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=036, POS C=036	ABB FT-19R	FR3G183036036
	10	1	12 pt Terminal blocks, Slide-Link, #10-32 studs terminals, with white marking strip	States	Series NT M-25012
	4	1	4pt Terminal block, Shorting type, #10/32 stud terminals, with white marking strip	States	Series NT M-25104G
	2	0	SEL Communication Cable 25'	Schweitzer	SEL C273A
	5	0	3-pole Fuse Block, Class K, 30A, 250V, Class R	Bussman	R25030-3
	1	0	1-pole Fuse block, Class K, 30A, 250V, Class R	Bussman	R25030-1
	16	16	Fuse, 6A, 250V. Class K-1, Limitron, Potential circuit	Bussman	FRN-R-6

**TRAVERSE CITY LIGHT & POWER DEPARTMENT  
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CONTROL PANELS - BILL OF MATERIAL**

**CONTROL PANEL NO.4**

ITEM NO.	EST. QUANTITY	SPARE QUANTITY	ITEM DESCRIPTION	MANUFACTURER	PART #
	Owner Furnished	0	Multi function meter, 4 wire, 3 element, 125VDC, DNP3.0	Novatech (Bitronics)	M650B3U511
	1	1 lamp only	Indicating light, White, 120 VAC, with LED lamp	G.E. ET-16	#116B6708G4-5-W73-N4
	6	1 lamp only	Indicating light, White, 70 VAC, with LED lamp	G.E. ET-16	#116B6708G4-7-W73-N4
	1	0	Multi function relay, overcurrent, ground, reclosing, event recording, metering, 125VDC, DNP3.0, Load Profiling , additional I/O	Schweitzer	SEL-311C (Primary) (0311C113R3E54X1)
	1	0	Multi function relay, overcurrent, ground, reclosing, event recording, metering, 125VDC, DNP3.0, Load Profiling , additional I/O	Schweitzer	SEL-311C (Backup) (0311C113H4E54X1)
	1	0	Test switch (4TS1 THRU 4TS3) for SEL311C (PRI), FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=036, POS C=183	ABB FT-19R	FR3G183036183
	1	0	Test switch (4TS4 THRU 4TS6) for SEL311C (BU), FT-19, 30 pole, Full Length Clear Covers Pos A = 183, POS B=036, POS C=036	ABB FT-19R	FR3G183036036
	10	1	12 pt Terminal blocks, Slide-Link, #10-32 studs terminals, with white marking strip	States	Series NT M-25012
	4	1	4pt Terminal block, Shorting type, #10/32 stud terminals, with white marking strip	States	Series NT M-25104G
	2	0	SEL Communication Cable 30'	Schweitzer	SEL C273A
	5	0	3-pole Fuse Block, Class K, 30A, 250V, Class R	Bussman	R25030-3
	1	0	1-pole Fuse block, Class K, 30A, 250V, Class R	Bussman	R25030-1
	16	16	Fuse, 6A, 250V. Class K-1, Limitron, Potential circuit	Bussman	FRN-R-6

# SECTION 16292

# RELAY CONTROL PANEL

## PART 1. GENERAL

### 1.01 SUMMARY

- A. This specification is for design, manufacture, testing and delivery of Eight (8) Control Panels with all instruments and devices as shown in the Bidding Documents to the project site per the design criteria and ratings listed in this specification. Specific standards referenced, but not limited to:
  - 1. American National Standards Institute (ANSI):
  - 2. Institute of Electrical and Electronics Engineers (IEEE):
  - 3. National Electrical Manufacturers Association (NEMA):
  - 4. National Fire Protection Association (NFPA):
  - 5. American Society for Testing and Materials (ASTM):
  - 6. Occupational Safety and Health Act (OSHA)
- B. This specification covers the minimum acceptable quality, materials, inspection, drawings, and delivery of the required relay control panels.
- C. Reference Drawings
  - a. AC Schematics
  - b. DC Schematics
  - c. Panel Wiring Prints
  - d. Panel Front Elevations
  - e. Panel Steel Construction
  - f. Bill of Materials
  - g. Panel Tag List
- D. In the event of conflict between the Specification and the referenced documents, the requirements of this specification shall take precedence. In the case of conflict between several referenced documents, the more stringent requirement shall be followed. If clarification is necessary, contact the Engineer.

### 1.02 SECTION INCLUDES

- A. Relay Control Panels.

### 1.03 SUBMITTALS

- A. Qualification Data: Furnish a list of all performed tests and test results on the relay control panels prior to shipment.

### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Integrate with control house on open deck trailer with access allowing unloading with a fork lift.
- B. Store equipment in spaces with environments controlled within manufacturer's ambient temperature and humidity tolerances for non-operating equipment.
- C. Indicate if/what equipment requires assembly by Owner.
- D. Vendor to unload relay panels and set inside of control house.

PART 2. PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers and models are as follows
1. Electrical Power Products
  2. Electric Power Systems
  3. Keystone
  4. Systems Control

2.02 MECHANICAL CONSTRUCTION

- A. Fabrication and Assembly
1. Each panel section shall be interconnected with framing members so as to form a rigid self-supporting structure. Sections shall have provisions to be bolted together to existing panels to form panel lineups as indicated
  2. Panel shall be fabricated from members and sheets as indicated on drawings and/or data sheets.
  3. Provide interior side sheets for mounting auxiliary equipment and terminal blocks as required.
  4. Overall dimensions of panel are indicated. Modifications will be permitted only by approval of the Owner and Engineer.
  5. Make provisions for anchoring the panels to the floor.
- B. Finish
1. Clean and treat surfaces with a phosphate treatment, or equal, before application of finish.
  2. The exterior and interior finish paint color shall be as indicated in Part 4.
- C. Arrangement
1. Arrange panel assembly and equipment as indicated.
  2. Any modification in arrangement from that indicated shall be subject to approval by the Owner and Engineer.
  3. Component equipment on boards shall be arranged, wired and connected in a neat and orderly manner, allowing access to all devices for operation and maintenance.
  4. All component equipment specified for installation in panel shall be factory installed unless specified to be field installed. Provide cutouts, drilling, and blank cover plates for future equipment as indicated.

2.03 ELECTRICAL CONSTRUCTION

- A. Internal Control Wiring
1. Completely install all internal panel wiring at the factory.
  2. Make all connections at equipment studs or terminal blocks. Terminate all CT leads on short circuiting type terminal blocks. Install all internal wiring with no splices.
  3. Terminate all points requiring external wiring connections at numbered points on terminal blocks conveniently grouped to receive external (field) cables. The arrangement of external cable terminations will be by means indicated on the control panel drawings.
  4. Each terminal block will be identified as indicated. Individual terminals will be identified numerically from top to bottom starting with the number "1" on each block.
  5. Use extra flexible hinge wire in areas subject to flexing, such as where hinged brackets or swing panel doors are used.

6. Connections to agree with schematics and wiring diagrams.
  7. Install internal wiring in horizontal and vertical wiring troughs or channels with removable covers for easy accessibility.
  8. Provide all wiring necessary for all equipment specified for installation on the panel.
  9. Use compression connectors as indicated in Part 4 Design Criteria and Ratings section.
  10. Label all wires with opposite end point.
  11. Terminate no more than two wires at any one terminal point.
  12. Wire all unused relay and auxiliary switch contacts to terminal block points, when indicated.
  13. Furnish spare terminal block points in each unit as indicated.
  14. Wiring between sections shall be accomplished as indicated.
- B. External Control Wiring (Intra-panel Wiring)
1. All Intra-panel wiring to be provided and installed by panel Vendor. Prior to shipment one end of intra panel wiring is to be disconnected and pulled back into panel. Upon arrival at the job site, un-terminated end of intra panel wiring will be terminated and landed by Others.
- C. Terminal Blocks
1. Provide heavy-duty terminal blocks as indicated.
  2. Mount terminal blocks on one or more vertical rows on back or sides of the board, or on interior divider panels, brackets, or wireways, with means for supporting exterior control cables.
  3. Location of terminal blocks shall be subject to approval by the Owner and Engineer.
- D. Point-to-Point panel wiring diagrams will be provided by Engineer.

## 2.04 WARRANTY

- A. The Vendor shall warranty all equipment and work contained in the panel for at minimum one year from the date of placing in service or eighteen months from the date of delivery, whichever is longer.

## PART 3. TESTING

### 3.01 FACTORY TEST

- A. Standard tests normally performed by the Vendor and as specified.
- B. Visual inspection of relay control panels upon completion follows
1. Verify that all relays or other devices are installed in locations as shown on Drawing #915 "CONTROL PANELS – FRONT ELEVATION (PANELS 1-4)".
  2. To confirm nameplate data of all relays and devices is in agreement with the bill of materials. Verify engraved nameplates correlate with relay functions.
  3. Inspect all instruments and relays for damaged covers (including glass), scratches, missing hardware, loose terminal connections, internal or concealed shipping damage, etc.
- C. Dielectric Megger test of 1000V to ground to confirm integrity of all wiring insulation.
- D. Continuity test "Ring Out" of completed circuits. Circuit polarities, diode direction, and shorting means shall be observed to ensure proper continuity.



PART 4. DESIGN CRITERIA AND RATINGS

4.01 MECHANICAL CONSTRUCTION

- A. Arrangement drawings will be provided to vendor.
- B. Number of lineups: (1) One
- C. Number of shipped assemblies: (4) Four
- D. Total number of panels: (4) Four
- E. Finish color
  - 1. Interior: White
  - 2. Exterior: ANSI 61 Light Grey
- F. Doors required.
  - 1. Front: No
  - 2. Rear: No
- G. Door open limit or stops required: No
- H. Hinged side of door: N/A
- I. Panel material: Steel
- J. Removable end sheet required: No
- K. Floor sill framing and anchoring channel required: Yes
- L. Number of anchor bolts holes per panel: (4) Four
- M. Diameter of anchor bolt holes: 0.625"
- N. Each panel physically separable from lineup: Yes
- O. External control cable entrances: From above
- P. Nameplates
  - 1. Laminated Phenolic: Yes
  - 2. Adhesive mounted: Yes
  - 3. Screw-on: No
- Q. Dimensions
  - 1. Nominal height of panel: 90"
  - 2. Nominal depth of panel: 30"
  - 3. Nominal width of panel: 30"
  - 4. Thickness of panel: 0.12"
  - 5. Interior partition thickness: Manufacturers Standard
  - 6. Minimum distance from floor to lowest device: 8"

4.02 ELECTRICAL CONSTRUCTION

- A. Interior lighting
  - 1. Type of light: None
  - 2. Voltage: N/A

3. Light switch type: N/A
- B. Convenience outlets
1. Outlet type: N/A
  2. Voltage: N/A
  3. Number of circuits: N/A
  4. Number of outlets per panel: N/A
  5. Furnish with GFI breaker: N/A
- C. Ground bus bar
1. Size: 1/4" x 1" x 24"
  2. Orientation: Horizontal
  3. Location: Lower front of panel
  4. Tapped hole size: 10/32
  5. Tapped hole spacing: 1"
  6. Provisions for connecting (1) one #2/0 conductor to control building ground.
- D. Terminal Blocks
1. Slide Link type: States Series NT with 12 terminals and studs for making terminated wire connections.
  2. CT type: States Series NT with 4 shorting type terminals and studs for making terminated wire connections.
  3. Marking strip: Yes
  4. Block identifier: Letter
- E. Intra-panel wiring: #12 SIS
- F. Provide wire loops for complete relay/device removal from panels: Yes
- G. Shielded internal instrument wire required: Yes
- H. External field cables provided by: Others
- I. Internal panel wires
1. Control wiring: #12 SIS
  2. Current circuit wiring: #10 SIS
  3. Annunciator and alarm wiring: #14 SIS
- J. Wire terminals: Ring-tongue compression, un-insulated.
- K. Wire labels: Slip over heat shrink vinyl, machine printed.
- 4.03 SPARE PARTS
- A. See provided Bill of Material.
  - B. (1) one spare fuse for each fuse required.
  - C. (1) one Quart (spray cans) White Interior Panel Paint.
  - D. (1) one Quart (spray cans) Gray Exterior Panel Paint.

PART 5. FUNCTIONAL DESCRIPTION

5.01 RELAY CONTROL PANEL #1

- A. This panel will contain 69kV Bus Relaying and Communications. It shall consist of:
1. One (1) 3Ø digital multi-function meter (69kV Bus)
  2. One (1) SEL311C Multi-function relay (Differential & Sparing)
  3. One (1) SEL3530 RTAC
  4. One (1) SEL2523 36 Window annunciator panel
  5. One (1) Sync scope
  6. One (1) Tripping relay for 69kV bus differential with associated panel light
  7. One (1) Tripping relay for 69kV breaker failure with associated panel light
  8. Two (2) ABB FT-19 test switches
  9. Three (3) Indicating light for bus potential

5.02 RELAY CONTROL PANEL #2

- A. This panel will contain 138:69kV Transformer relaying. It shall consist of:
1. One (1) 3Ø digital multi-function meter (Transformer Secondary)
  2. Two (2) SEL311L Line Differential relay
  3. One (1) SEL587 Differential relay
  4. One (1) SEL501 Overcurrent relay
  5. One (1) SEL351S Secondary Overcurrent
  6. Three (3) ABB FT-19 test switches
  7. One (1) INCON LTC Position indication
  8. Controls to interface with transformer LTC controls with associated panel light
  9. Control switches for circuit switcher with associated panel lights
  10. One (1) Tripping relay for transformer differential with associated panel light
  11. One (1) Indicating light for LTC potential
  12. One (1) Indicating light for Sync potential

5.03 RELAY CONTROL PANEL #3

- A. This panel will contain 69kV Line relaying. It shall consist of:
1. One (1) SEL2407 Satellite clock
  2. One (1) 3Ø digital multi-function meter (69kV line)
  3. One (1) SEL311C Multi-function relay (primary)
  4. One (1) SEL311C Multi-function relay (back up)
  5. Two (2) ABB FT-19 test switches
  6. One (1) Indicating light for line sync potential
  7. Three (3) Indicating lights for Primary relaying potential
  8. Three (3) Indicating lights for Backup relaying potential

5.04 RELAY CONTROL PANEL #4

- A. This panel will contain 69kV Line relaying (GV522). It shall consist of:
1. One (1) 3Ø digital multi-function meter (69kV line)
  2. One (1) SEL311C Multi-function relay (primary)
  3. One (1) SEL311C Multi-function relay (back up)
  4. Two (2) ABB FT-19 test switches
  5. One (1) Indicating light for line sync potential
  6. Three (3) Indicating lights for Primary relaying potential
  7. Three (3) Indicating lights for Backup relaying potential

END OF SECTION 16292