

**Transmission & Distribution
Material & Installation Specification**

Padmount Switch

I. Quantity

The base bid shall include the indicated number of 600A Padmount Switches as required for a complete and operational system.

II. Material

DESCRIPTION

- A. The padmount switch shall be equal in quality, design, performance, and appearance to the items specified on drawing TDMIS-1406. The basis of design is G&W type RPF1, SF6 insulated, 630A rotary puffer switches, manually operated, electronically controlled fault interrupters.

QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** The chosen manufacturer shall have at least 20 years' experience in manufacturing SF6 insulated medium voltage switchgear. The manufacturer of the switches shall be completely and solely responsible for the performance of the load break switch and fault interrupter as well as the complete integrated assembly as rated over a period of 5 years from the date of shipment of the switch.
- B. The manufacturer shall furnish certification of ratings of the load break switch, fault interrupter and the integrated switch assembly upon request.
- C. The switch shall comply with requirements of the latest revisions of applicable industry standards, including:
IEEE C57.12.28, IEEE C37.72, IEEE C37.74, IEEE C37.60, IEEE 386
- D. The switch manufacturer shall be ISO 9001:2008 and ISO 14001:2004 certified.

DELIVERY, STORAGE, AND HANDLING

- A. Padmount switches, including load break switches and fault interrupters, shall be shipped preassembled from the factory. No field assembly shall be required.
- B. The contractor, if applicable, shall handle, transfer, store prior to installation, and move the switches in accordance with manufacturer's recommendations.

SWITCH CONFIGURATION

- A. Switch shall be equipped with 3-phase load break switch ways and 3-phase fault interrupter way(s), as indicated on the one-line diagram.
- B. Switch shall be designed for front access to cables and operators.

SWITCH CONSTRUCTION

- A. Switch contacts and cable entrance terminations shall be contained in a single welded mild steel tank with entrances internally connected by copper conductors. Construction shall be a dead front design. Switches shall be shipped factory filled with SF6 gas conforming to ASTM D-2472. Switch tanks shall be painted ASA70 light gray using a corrosion-resistant epoxy paint.
- B. Each switching way is to be equipped with an internally-mounted operating mechanism capable of providing quick-make, quick-break operation in either switching direction. The mechanism shall be capable of delivering sufficient torque and shall be provided with latches for each position to assure load interrupting, fault closing and momentary ratings. All switch positions are to be clearly identified, padlockable and adaptable to keylock schemes. The operating mechanism shall be actuated from the outside of the switch tank with an operating handle. The operating shaft shall be made of stainless steel providing maximum corrosion resistance. A double "O" ring type operating shaft seal shall be used for a leak resistant, long life seal. Switch contacts shall be of a rotary puffer design made with copper alloy contacts with silver plating to assure permanent, low contact resistance. Each rotating contact simultaneously disengages from two fixed contacts, thus providing two break points per phase giving improved interrupting capability compared to single break contact systems. Contact travel shall be 90 degrees to assure efficient arc extinction and a wide open contact gap. Arcing is confined away from the main contact surfaces. The stationary contacts shall be supported independent of the

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cable entrance bushings, eliminating possible misalignment. Auxiliary blades used for load interruption are not acceptable.

- C. The fault interrupter shall consist of vacuum bottles and a spring-assisted operating mechanism. The mechanism used shall be designated "Model FI" for three phase operations. The mechanism shall consist of three vacuum bottles mechanically linked to a single spring-assisted operating mechanism. The vacuum interrupter operating mechanism shall consist of the support assembly, linkage, spring latch mechanism, and solenoid utilized for electronic tripping. Maximum interrupting time shall be three cycles (50 msec). The movable contact shaft shall be flagged to indicate the contact position, open or closed. This contact position indicator shall be fully visible through viewing windows supplied in the switch tank. Each tap phase is to be equipped with an individual 630A vacuum interrupter fully enclosed in an SF6 insulated switch tank. Electrical opening shall be by a solenoid that is activated from sources external to the switch tank. Manual reset or closing of the fault interrupter shall be mechanical with the use of an external operating handle. The mechanical linkage assembly shall provide for a "trip-free" operation which allows the fault interrupter to interrupt independent of the operating handle.

DESIGN RATINGS

- A. The switch shall be rated:

Maximum Design Voltage, kV	15.5
Impulse Level (BIL) Voltage, kV	110
Continuous Current, Amperes	630
Load break Current, Amperes	630
One Minute Withstand (dry), AC kV	35
Production Test Rating	34
15 Minute Withstand, DC kV	53
Momentary Current, kA, ASYM	25
Fault-Close Current, kA, ASYM	25
One Second Current, kA, SYM	16
Fault Interrupting Rating, kA, SYM	12.5
Mechanical Endurance, Operations	2000
Load Break Operations at 600 Amperes	500

- B. Interrupters shall be tested to IEEE C37.60 Fault Interrupter Duty per the table below.

Percent of Maximum Interrupting Rating	Approx. Interrupting Current Amps	No. of Fault: Interruptions
15-20%	2000	44
45-55%	6000	56
90-100%	12000	16
Total Number of Fault Interruptions: 116		

CABLE ENTRANCES

- A. Load Break Switches - Cable entrances shall be tested to IEEE 386 and be, as indicated on the switch drawing:
- ___ 600 amp G&W Quik-Change disconnectable apparatus bushing,
 - ___ 200 amp Deepwell bushing.
- B. Fault Interrupters - Cable entrances shall be tested to IEEE 386 and be, as indicated on the switch drawing:
- ___ 600 amp G&W Quik-Change disconnectable apparatus bushing,
 - ___ 200 amp Deepwell bushing.

ELECTRONIC CONTROL

- A. An electronic control shall be provided to monitor load and fault current on all three phases of the fault interrupter. Each phase shall have a current transformer mounted inside the switch tank to provide control power and current sensing. No external power source shall be required for overcurrent protection. Operational temperature range of the control shall be -40°C to +65°C. Maximum time for power up and ready-to-trip when closing on a circuit shall be ten percent of the trip time or 1/2 cycle, whichever is greater. Trip selection may be made with the fault interrupter energized. The range of Phase Overcurrent minimum trip settings shall be 15-300A (500:1 CT).
- B. The control shall include 30 Time Current Characteristic (TCC) curves, which shall be field selectable using dip switches. The control shall be equipped with multiple TCC curve modification options, including Instantaneous Trip, Inrush Restraint, and Phase Time Delay. In addition, the control shall include a Phase Imbalance (Ground Fault) setting. All settings shall be inputted via selector knobs located on the faceplate of the control. The control shall include a last cause of trip indicator. Trip

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modules shall not require a computer or other external device for inputting trip settings or other operational parameters.

- C. The control cable shall be connectorized, allowing the electronic control to be removed from the interrupter for repair or replacement while the interrupter is energized. The interrupter shall include protection circuitry to allow this while preventing any damage to the current transformers.
- D. The control shall be powered via a 24VDC source. Control shall be mounted in a NEMA4X rated fiberglass enclosure.

PAD MOUNT ENCLOSURE

- A. The enclosure shall be fabricated of 12 gauge galvanized steel and manufactured to ANSI C37.72 and C57.12.28 standards. The enclosure shall be tamper resistant incorporating hinged access doors with pentahead locking bolts and provisions for padlocking. The enclosure shall be provided with lifting provisions and painted with a Munsell 7.0GY3.29/1.5 green finish.

FACTORY PRODUCTION TESTS

- A. Each switch shall undergo the following production testing. Test reports must be available upon request.
 - Each switch shall be factory filled with SF6 gas. The gas shall be checked for moisture content per IEEE std. 1125-1993.
 - Each switch shall undergo an SF6 leak check per IEEE C37.122.3-2011 to verify the integrity of the tank, seals, and gaskets.
 - A mechanical operation check of each switching mechanism.
 - AC hi-pot tested one minute phase-to-phase, phase-to-ground and across the open contacts.
 - Circuit resistance shall be checked.
 - Primary current injection test to test CTs, trip mechanism, and electronic control.
- B. Failure of any test above shall result in rejection and replacement of switch from project.

STANDARD COMPONENTS

- A. The following shall be included as standard:
 - Mild steel tank

- One (1) removable operating handle to operate each load break switch or fault interrupter
- Gas pressure gauge and fill valve.
- ½-13 nuts to provide sufficient grounding provisions for all cable entrances
- Stainless steel three line diagram and corrosion-resistant nameplates.
- Switch operating handles with padlock provision.
- Parking stands for each bushing
- Viewing window per load break switch to view open contact position
- Viewing window per fault interrupter to view vacuum bottle position
- Provision to mount future low pressure alarm
- #4/0 brass ground lug
- NEMA 4X rated junction box for wiring SF6 alarms, remote switch position contacts, or external power source for Electronic Control

LABELING

- A. Hazard Alerting Signs - The exterior of the pad mount enclosure (if furnished) shall be provided with “Warning--Keep Out--Hazardous Voltage Inside--Can Shock, Burn, or Cause Death” signs. Each padmount switch shall be provided with a “Danger--Hazardous Voltage--Failure to Follow These Instructions Will Likely Cause Shock, Burns, or Death” sign. The text shall further indicate that operating personnel must know and obey the employer’s work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.
- B. Nameplates, Ratings Labels, and Connection Diagram - Each padmount switch shall be provided with a nameplate indicating the manufacturer’s name, catalog number, model number, date of manufacture, and serial number. Each padmount switch shall be provided with a ratings label indicating the following: voltage rating; main bus continuous rating; short-circuit rating; fault interrupter ratings including interrupting and duty-cycle fault-closing; and load break switch ratings including duty-cycle fault-closing and short-time.

III. Installation

- A. The installation shall be as appropriate on drawing TDMIS-1406 as related to and called out on TDMIS unit assembly drawings or as needed to complete the circuit or circuit extension and/or circuit taps.

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- B. Size and type hardware shall not be substituted without express approval of engineer.
- C. Only qualified personnel with at least 5 years' experience with medium voltage or certificate from a certified training school as approved by COC-DOP may be assigned to terminate MV cables and / or switching operations. A resume of personnel's experience shall be submitted to DOP for approval 30 days prior to beginning terminations and / or switching.
- D. Padmount switch shall be installed level, plumb and square on a concrete pad and coordinated with conduit entries from below.
- E. A circle type ground shall be installed within padmount switch as specified in TDMIS-1213.

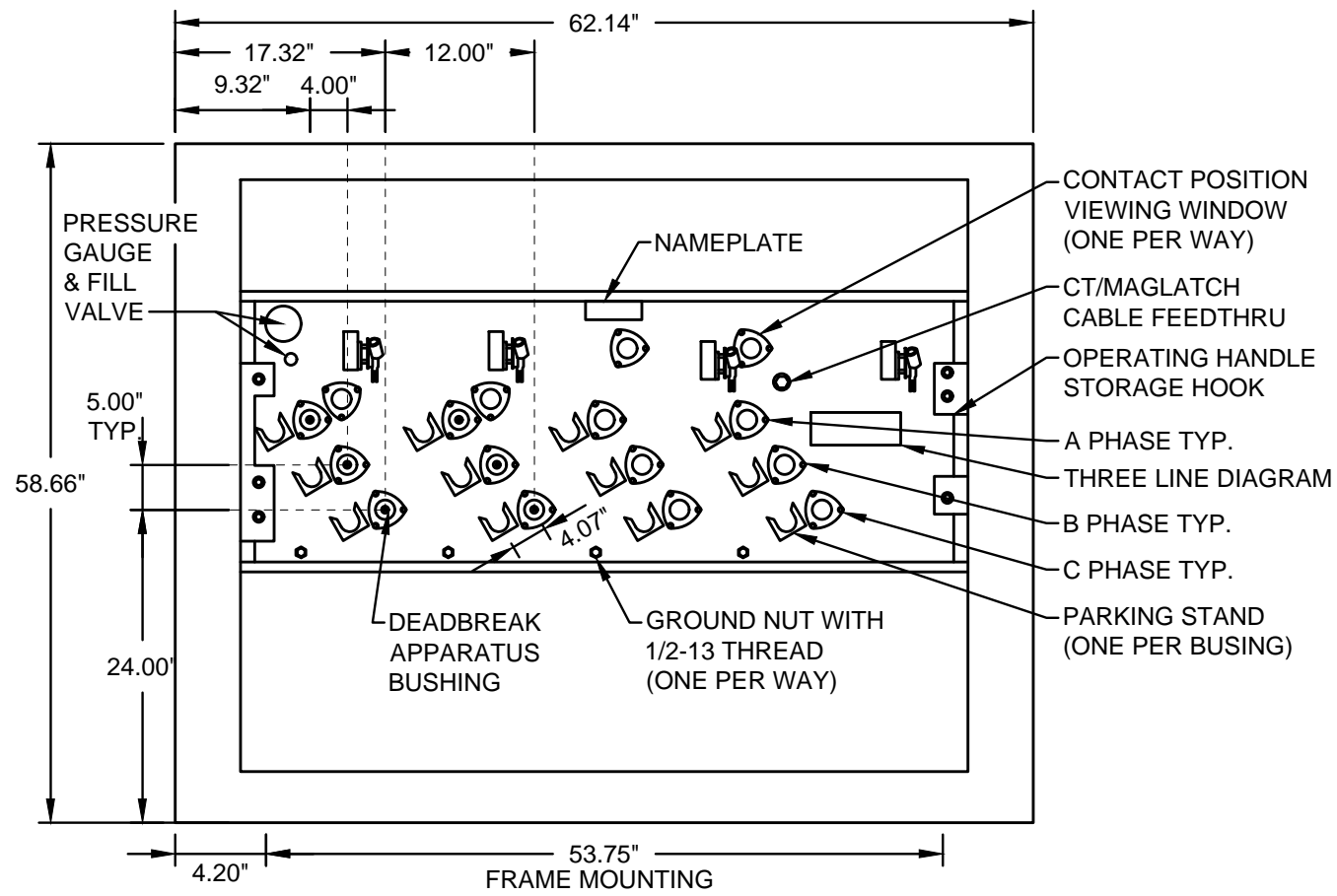
IV. Method of measurement

Shall be per each padmount switch and components and shall include all materials, accessories, lubricants, abrasives, touch up paint, adapters, tools, labor, equipment, testing, and supervision required for a complete and operational module.

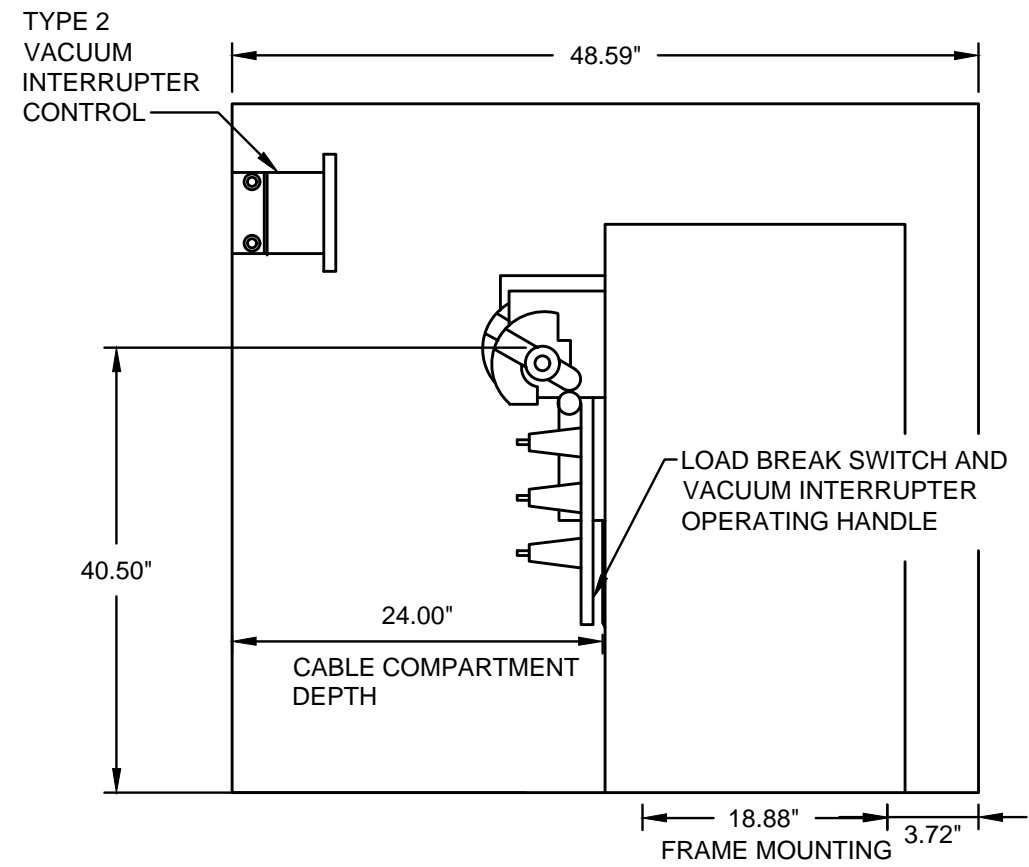
V. Basis of payment

Items	Unit	Description
TDMIS-1406	Each	[Number of ways]-Way padmount switch with [Number of ways] 600A loadbreak ways and [Number of ways] [Amps]A fault interrupter ways

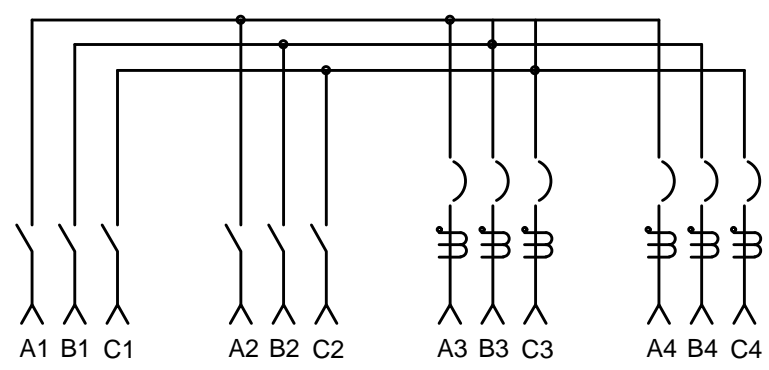
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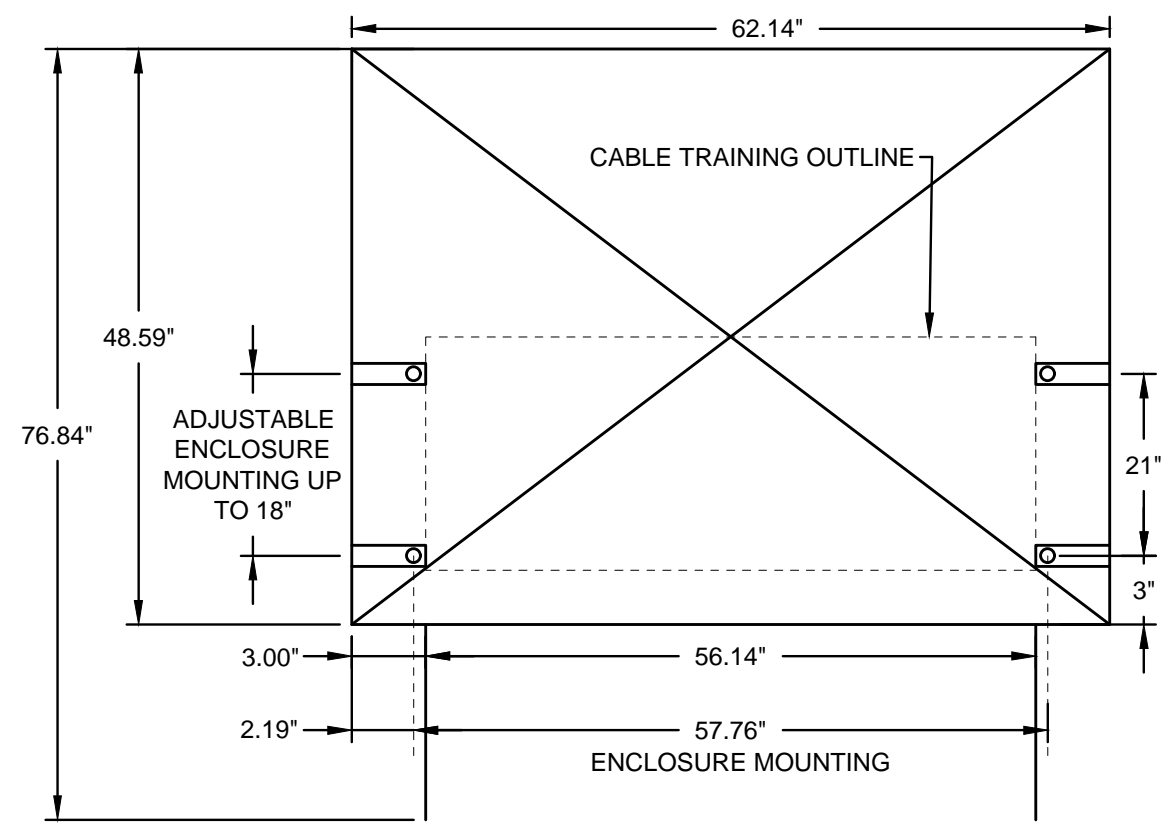
**DETAIL 1
FRONT VIEW**



**DETAIL 2
RIGHT VIEW**



**DETAIL 3
THREE LINE DIAGRAM**

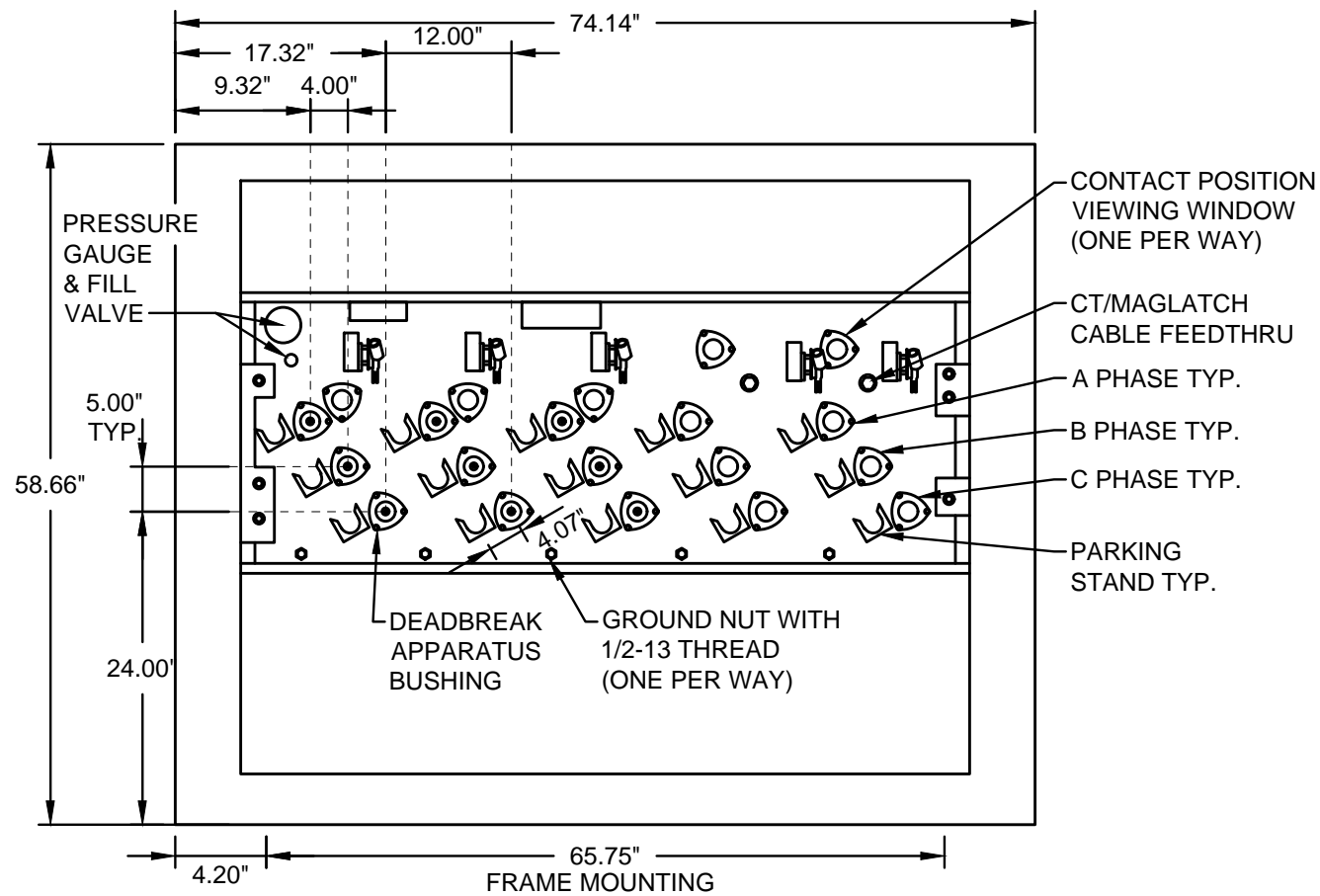


**DETAIL 4
PLAN VIEW**

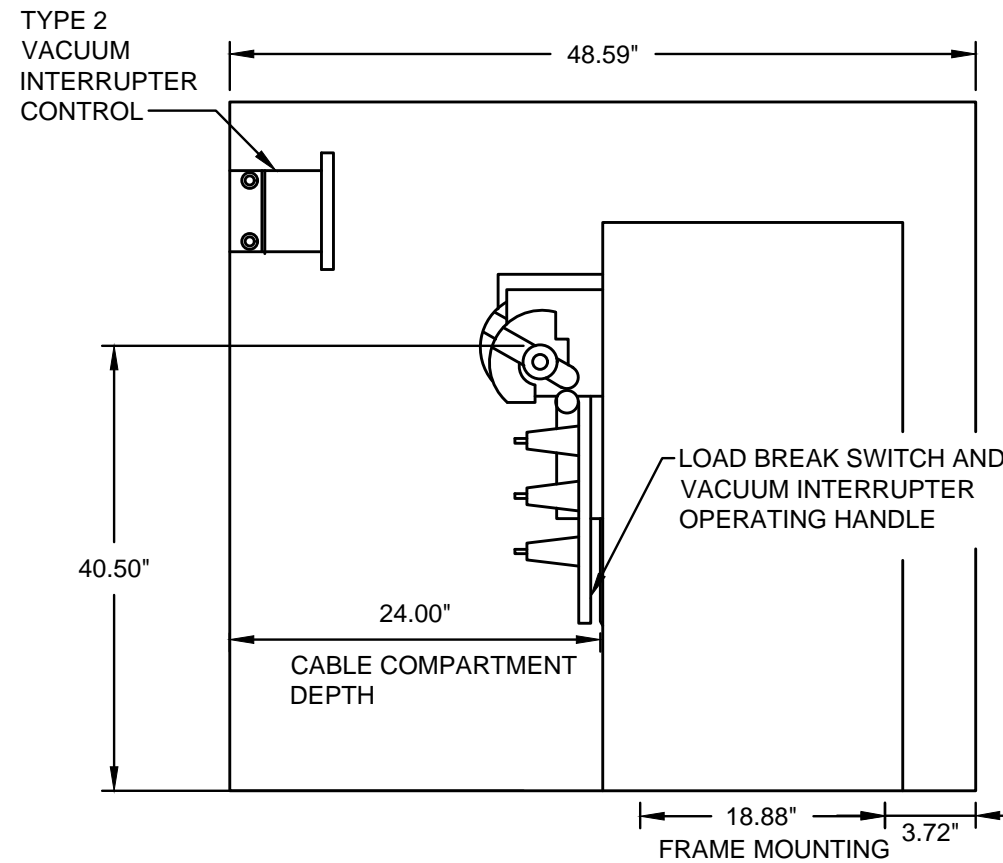
GENERAL NOTES:

1. ALL WAYS ARE EQUIPPED WITH INTERNAL SPRING OPERATORS AND EXTERNAL PROVISIONS FOR PADLOCKING IN ALL POSITIONS.
2. WHEN ELBOWS, INSERTS, AND ANY OTHER ACCESSORIES ARE CONNECTED TO THE SWITCH, THE RATINGS OF EACH CONNECTED ASSEMBLY WILL BE THAT OF THE LOWEST RATED COMPONENT OF THE ASSEMBLY.
3. ENCLOSURE IS REMOVABLE FROM SWITCH TANK.
4. MOUNTING INFORMATION: THE FRAME OF THE SWITCH MUST BE ANCHORED TO THE PAD. THE FRAME IS EQUIPPED WITH 4 SLOTTED ANCHORING HOLES. EACH MEASURING 9/16" X 1". THE LOCATIONS OF THESE HOLES, REFERRED TO AS "FRAME MOUNTING" ARE SHOWN IN THE FRONT VIEW AND RIGHT VIEW. THE PAD MOUNT ENCLOSURE SHOULD BE SECURED TO THE PAD TO PROVIDE IT WITH ADDITIONAL STABILITY. EACH PAD MOUNT ENCLOSURE IS SHIPPED WITH 4 SECURING BRACKETS THAT ARE TO BE USED FOR THIS PURPOSE. THE SECURING BRACKETS CAN BE INSTALLED ANYWHERE ALONG THE INNER EDGE OF THE ENCLOSURE.
5. ENCLOSURE IS DESIGNED PER APPLICABLE SECTIONS OF ANSI/IEEE C37.74 & C57.12.28. ENCLOSURE IS TYPICAL AND SHOWS THE OVERALL DIMENSIONS ONLY. CONSTRUCTION DETAIL MAY VARY FROM THOSE DEPICTED. ENCLOSURE DOORS EQUIPPED WITH THREE POINT LATCH WITH PENTA HEAD BOLT AND PROVISION FOR PADLOCK.

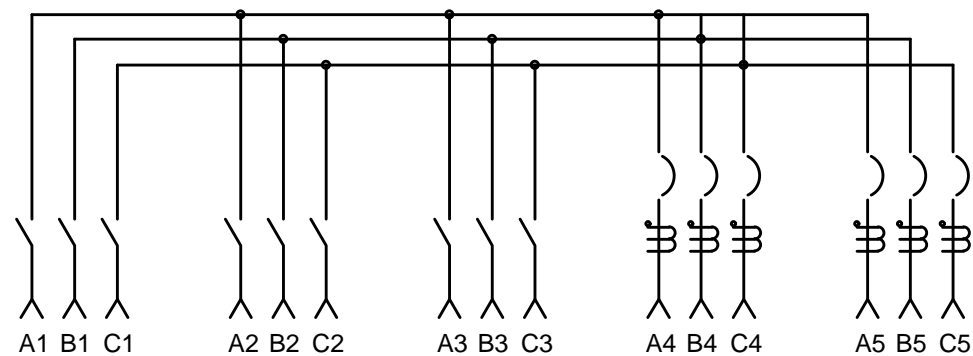
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PADMOUNT SWITCH 4-WAY SWITCH		
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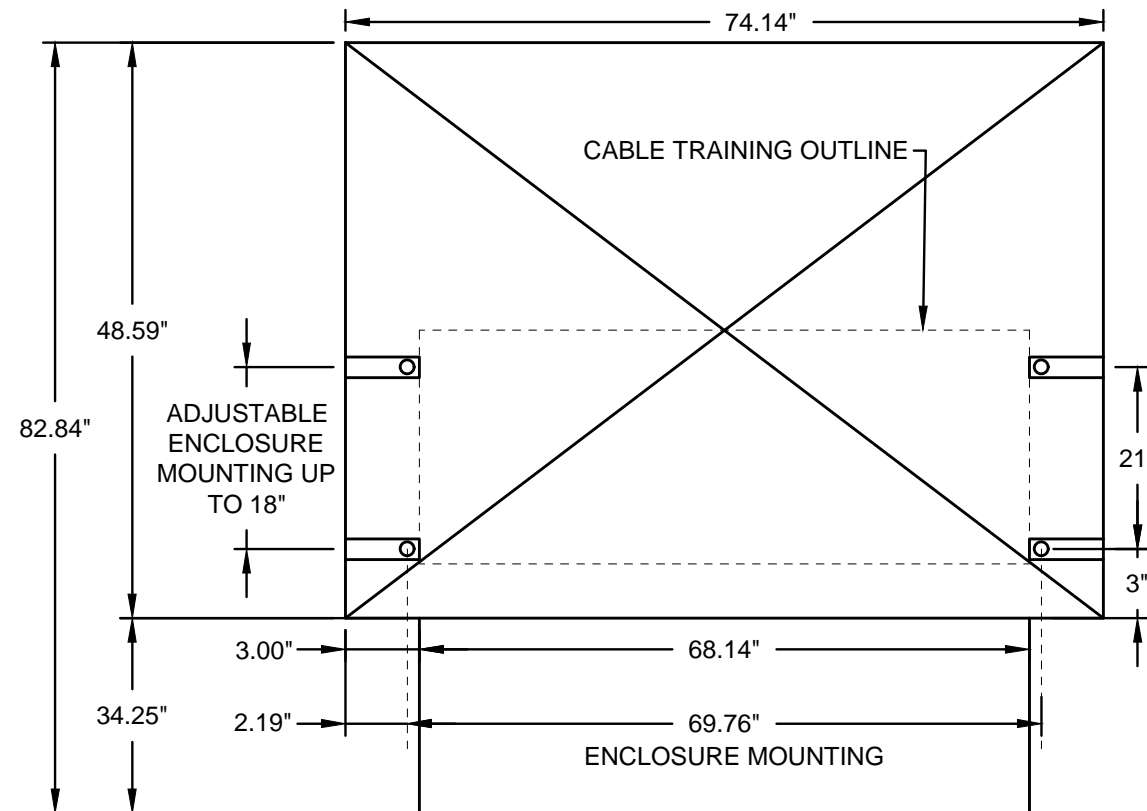
**DETAIL 5
FRONT VIEW**



**DETAIL 6
RIGHT VIEW**



**DETAIL 7
THREE LINE DIAGRAM**



**DETAIL 8
PLAN VIEW**

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PADMOUNT SWITCH 5-WAY SWITCH		
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