

1. SCOPE

This specification covers the requirements for outdoor, group operated vertical break “V” switches and controls that will be mounted on 3-pole structures. Vertical break “V” switches shall be differentiated from vertical break switches by the utilization of a reduced base length. The District will be the sole authority in the determination of whether a manufacturer’s switch qualifies as a vertical “V” switch.

1.1. STANDARDS REQUIREMENTS:

All materials and equipment furnished under these specifications shall be new and conform to the latest applicable standards of the following authorities:

- American National Standards Institute (ANSI)
- Institute of Electrical and Electronics Engineers (IEEE)
- American Society of Mechanical Engineers (ASME)
- National Electrical Manufacturers Association (NEMA)
- American Society for Testing and Materials (ASTM)

1.2. CONFLICTS

In the event of conflicts, standards shall take precedence over other standards in accordance with the above list with the topmost taking priority. In addition, the equipment shall comply with all applicable Federal and State of Washington laws and standards.

1.3. ELECTRICAL RATINGS

1.3.1. Basic Ratings

- Rated Voltage 115 kV
- Rated Maximum Voltage 121 kV
- Rated Frequency 60 Hz
- Rated Continuous Current 1200 A
- Related Short-Time Current (mom.) 61,000 A
- Rated Withstand Voltage (BIL) 550 kV

1.3.2. This specification covers vertical break switches as listed in Table 1, ANSI C37.32.

1.3.3. Temperature rise of the switch shall be as per Table 3 ANSI C37.30 and will not exceed 53°C over 40°C ambient for any part of the switch.



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1.4. MISCELLANEOUS

1.4.1. All switches shall be of the latest general design of the manufacturer.

1.4.2. Except where noted, all voltages and current values shall be root mean square (RMS) values.

2. MATERIAL

2.1. CONTACTS

- 2.1.1. Exposed contacts shall be self-wiping, silver to silver and shall be of the reverse loop type designed to increase contact pressure under fault conditions. All other current carrying contacts, including hinged end contacts, shall be silver to silver unless sealed and insulated from contamination and corrosion. Internal sealed contacts may be either silver to silver or silver to copper.
- 2.1.2. Contacts shall have a sufficient mass of high-thermal conductivity metal immediately adjacent to the contact surfaces to preclude the possibility of contact welding or damage at currents within the momentary rating of the switches.
- 2.1.3. External silver to silver contact surfaces that are applied to copper must be brazed silver alloy inlay to brazed silver alloy inlay. Minimum silver thickness shall be .010 inches.
- 2.1.4. Provisions are required to prevent loss of contact pressure during fault conditions. These must be described in the contractor's proposal.
- 2.1.5. All exposed contacts, both fixed and moveable, shall be replaceable in the field.
- 2.1.6. Springs must not be part of the main current path. All contact backup springs shall be stainless steel.
- 2.1.7. Flexible braided leads or shunts at the switch hinge are not acceptable for a conducting mechanical joint.

2.2. TERMINALS

- 2.2.1. Switch terminals shall be 4-hole NEMA pads (9/16" round holes drilled on 1 3/4" centers), suitable for connection with aluminum, copper, or bronze conductor terminals. All terminals shall be sized to accept a connector that has a minimum width of three inches.
- 2.2.2. Switch terminal pads shall be designed to act as supports for the weight of the conductor line jumpers to the switch.

2.2.3. Cast aluminum terminal pads shall be machined on the top surface.

2.2.4. Terminals shall be in the same plane and parallel to the mounting surface for the base.

2.3. INSULATORS

2.3.1. Insulators for V switches shall be of the station post type meeting the requirements of ANSI C29.9 for a Technical Reference Number 286 insulator. The insulator glaze color shall be ANSI No. 70 (sky gray).

2.3.2. The District's approved suppliers are Lapp and NGK-Locke. The manufacturer shall identify the proposed insulator supplier in the proposal.

2.3.3. The manufacturer shall supply all necessary data, including test reports for any proposed alternative insulator. The District approval of proposed insulator alternatives is required.

2.4. MAIN BEARINGS

The rotating insulators are to have stainless steel ball bearings in stainless steel races. Bearings are to be lubricated and sealed from contaminants with a breathable, dust proof seal and designed to operate without lubrications or maintenance during the life of the switch.

2.5. BASES

2.5.1. Bases shall be rigid tubular steel and fully galvanized after fabrication.

2.5.2. The switch base shall be adequate to support the full cantilever strength rating of the insulators and the weight of the connections to adjacent strain insulators. The base shall have 11/16-inch bolt holes. The bolt holes shall be positioned so that sufficient clearance exists between the bolt holes and the vertical side wall of the base. This shall be defined so that an ASTM standard washer can be installed under the head of the mounting bolts and the bolts can be tightened as required.

2.6. AIR BREAK

2.6.1. Each switch shall also be equipped with a fully adjustable quick break operating mechanism capable of interrupting at least 12 amperes of line charging current, unless stated otherwise in the purchasing document. Certified test reports are required to document this ability.

2.6.2. Each vertical break "V" switch shall be equipped with permanent stud arcing horns. These shall be designed to protect the switch contacts during opening and closing of the switch. All arcing horn hardware shall be ½ inch, 300 series stainless steel.



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2.6.3. All switches shall be capable of vacuum interrupter retrofit. Switches that require complete disassembly during this procedure will not be allowed.

2.7. OPERATING MECHANISM

- 2.7.1. The operating mechanism and brackets shall be designed to fit the 3-pole switch structure as shown on drawings at the end of this specification.
- 2.7.2. A worm gear operator to be manually operated from ground level shall be furnished unless stated otherwise in the purchasing document. A maximum operating effort of 35 lbs is required. A certified test report, showing operating force, will be required with the bid proposal.
- 2.7.3. The control rod shall rotate to open the switch and be adaptable for a motor operating mechanism.
- 2.7.4. Galvanized steel control and interphase pipes shall be of sufficient size to eliminate twist in the torsional operating pipes and significant sag in push-pull interphase pipes.
- 2.7.5. Intermediate guide bearings and pipe slices shall be furnished at vertical intervals not to exceed 10 feet. All openings at the upper ends of pipes shall be permanently plugged. The lower ends of all vertical pipes shall have provisions for drainage and protection from insect intrusion.
- 2.7.6. No bell type pipe couplers are acceptable in the drive train.
- 2.7.7. Two (2) sky gray (ANSI No. 70), 15 kV, insulators shall be installed in the vertical-operating rod.
- 2.7.8. The operating handle shall be equipped with position indicators and with provisions for padlocking in both open and closed positions. All connections to the operating rods shall be equipped with self-piercing setscrews. The centerline of the operating handle shall be located 3.5 feet above operating ground level, unless otherwise specified.
- 2.7.9. A minimum of 2 feet of 4/0 flat copper braid with appropriate connections and/or terminals shall be provided for ground connection. Braid shall be clamped to the operating rod just above the worm gear.
- 2.7.10. Whenever possible, the vertical rod shall be positioned so that the horizontal forces associated with the operation of the switch are balanced on both sides of the vertical operating rod.



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2.7.11. All switches shall include provisions for the adjustment of each individual switch pole. These provisions shall be of a continuously adjustable threaded type for correction of any misalignment in the switch insulators, bases and operating pipes. It shall be mechanically impossible, after final adjustment has been made, for any switch to remain in a partially open or closed position at the completion of an operator cycle. All threaded connections shall be equipped with mechanical locking devices to prevent the threaded connection from working loose. Switch linkage connections that attach to the ends of the pipes with no means of adjustment shall not be permitted.

2.7.12. Switch levers must be wrought steel. Cast levers are not allowed.

2.7.13. Levers shall have bushings in the holes that connect to the interphase pipe fittings.

2.8. HARDWARE

All nuts and bolts shall be hex head unless otherwise specified. Any hardware used in the drive train shall be 1/2" diameter or larger.

2.9. BOLT HOLES

All switch parts that require bolting to the pole, except for the 13/16-inch holes in the base plates, shall be 11/16-inch diameter.

2.10. STOPS

Each single pole switch shall have two adjustable stops at the base of each rotating insulator stack. One is to control the fully closed position and the other is to control the fully open position.

3. FINISH

All ferrous parts unless stainless steel shall be hot-dip galvanized in accordance with ASTM A123 or ASTM A153.

4. NAMEPLATE

Each switch shall have a nameplate permanently attached to the base plate of each pole and to the base of the operating handle. Information on the nameplate shall include the information required by ANSI C37.30 plus manufacturer's order or serial number.



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5. FINAL DRAWINGS

The Supplier shall furnish three (3) sets of final drawings per order (including installation and instruction drawing).

6. DELIVERY

- 6.1. The switches shall be shipped F.O.B. destination to 1150 Hawley Street, Wenatchee, WA, 98801. The delivery will be accepted Monday through Friday between the hours of 9:00 AM and 3:30 PM. Please call Terry McFadden (509) 663-8121, Ext. 4730, 24 hours prior to delivery.
- 6.2. Each “V” switch pole shall be packaged in wooden crate(s) strong enough to withstand shipping, handling, and stacking by forklift. Crates shall be wide enough to prevent tipping on uneven surfaces. All crates shall be designed for forklift handling on all four sides.
- 6.3. Each switch pole shall be completely assembled with base, insulators, and conductive parts.
- 6.4. Brackets and all accessories are to be assembled to the maximum degree possible for shipment. Hardware that fastens the control brackets to the structure is to be shipped attached to the brackets.
- 6.5. Switches shall be crated so that a three pole switch with controls and pipe can be clearly identified and sent to a jobsite as a complete unit without having to re-package any parts. Operating rods may be bundled separately but shall be grouped so that each group contains the rods for a single switch.
- 6.6. Quick break mechanism, except for rod, shall be mounted on switch ready for use.
- 6.7. One (1) complete set of installation drawings for switch, quick break, and/or vacuum interrupters shall be furnished in a waterproof and ultraviolet light-resistant plastic envelope, which shall be securely attached to each switch.
- 6.8. Crates shall be marked with the manufacturers name or symbol, catalog number, and purchase order number.
- 6.9. A packing slip shall be enclosed with each shipment.
- 6.10. Shipment shall be FOB District with freight prepaid and allowed.

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7. PROPOSAL SUBMITTALS

7.1. Approval and Final drawings along with the certified reports shall be submitted to the following address:

Randall B. Kono
Distribution Engineer
Public Utility District No. 1 of Chelan County
PO Box 1231
Wenatchee, WA. 98807-1231

7.2. Vendor shall furnish recommended maintenance procedure.

7.3. Vendor shall make available copies of design test reports as set forth and conducted in accordance with ANSI C37.34 Sections 4, 5, 6, & 7. Reports of the following additional testing shall be available upon request.

7.4. Each switch design shall be subjected to 1500 cycle (open-close) operations test. Contact wear shall be recorded.

7.5. Certified test reports showing how the switch operating forces were measured and that the force required to operate the switch conforms to these specifications.

7.6. A users list showing a minimum of five years of successful installations shall be provided.. This list shall only reference installations that are the same as the installation that the District proposes. The companies name, address, phone number, and a current contact name shall be included for each reference. A photograph of the final installation should be included if possible.

7.7. Description of the method employed to prevent loss of contact pressure during fault conditions.

7.8. Pricing per line item.

7.9. Delivery lead time for each item.



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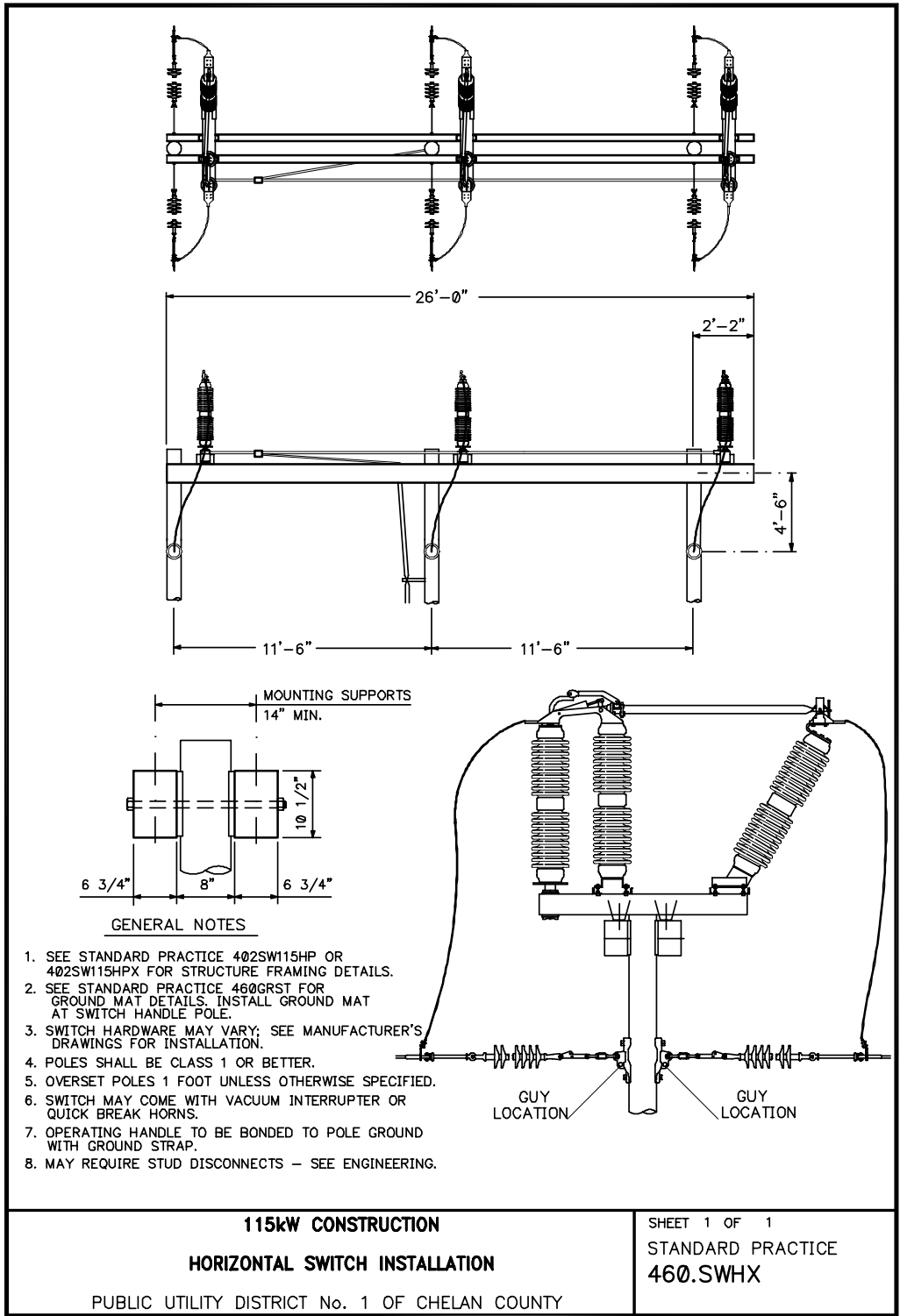


Figure 1: 115kV Vertical "V" Type Switch Installation

Engineer's Notes:

- The switch spacing is 11'-6".



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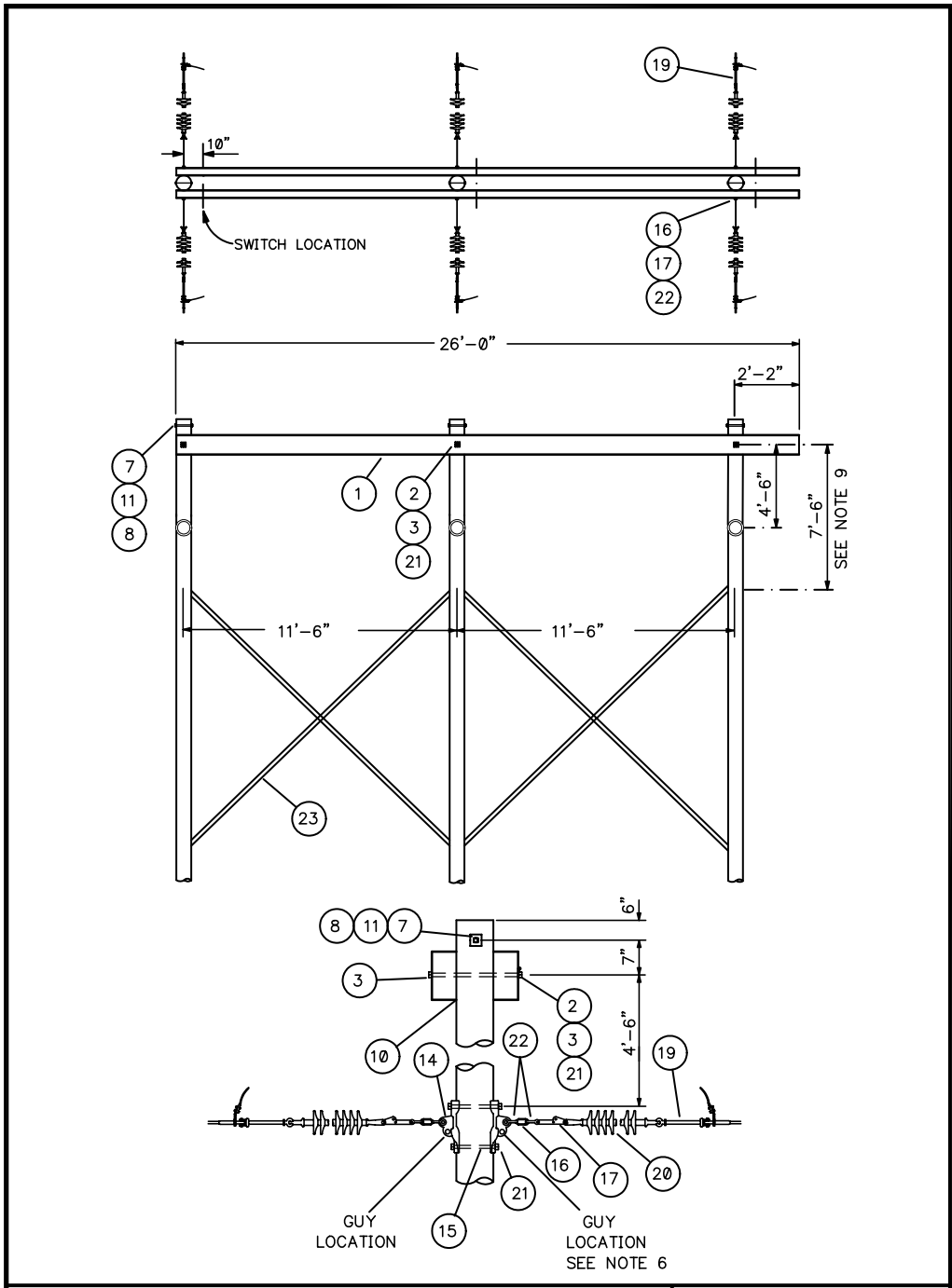
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115kV CONSTRUCTION
HORIZONTAL SWITCH STRUCTURE
WITH CROSS BRACES
 PUBLIC UTILITY DISTRICT No. 1 OF CHELAN COUNTY

SHEET 1 OF 2
 STANDARD PRACTICE
402.SW115HPX
 9/21/99

DATABASE: AMW-ID: 3ZT

Figure 2: Framing Illustration

Engineer's Notes:

- The crossarm dimension is 6-3/4" X 10-1/2" X 26'.
- Base of switch will be approximately 61' above the ground line.



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