DIVISION 13 00 60 - HIGH VOLTAGE VAULT DESIGN

Contents

13 00 60 - HIGH VOLTAGE VAULT DESIGN

1. General Requirements

1.1. The term “electric vaults” or “high voltage vaults” shall be defined as any room containing electrical equipment operating above 600 volts.

1.2. Vaults shall be designed to comply with NEC 450, Part III, as a 3 hour rated structure and shall not be constructed with any flammable material.

1.3. 15 kV switching vaults shall not be installed in a building penthouse or any other floor above grade level because of the difficulty of pulling 500 kcmil, 15 kV cable up through a building. Transformer vaults are allowed in the penthouse provided that a 2 hour rated chase is installed vertically between the lower switching vault and the upper transformer vault.

1.4. Once energized, access to electrical vaults shall be by University Electric Utility employees only. If access to a vault by others is needed, a University Electric Utilities employee shall be present.

2. Architectural Requirements

2.1. **PROHIBITED:** Gypsum board – for any application

2.2. **PROHIBITED:** Construction materials that require spray-on fireproofing.

2.2.A. Where an exception is granted, spray applied fireproofing shall include a hardener additive.

2.3. **PROHIBITED:** Standby generators, transfer switches, small secondary transformers and related panelboards, and fire alarm panels in electric vaults.

2.4. **PROHIBITED:** Use of pre-stressed or post stressed concrete walls, floors or ceilings.

2.5. **PROHIBITED:** Penetrations in the high voltage vault ceiling or deck.

2.6. Vault walls, floor, and ceiling shall be capable of supporting a 5,000 lb. point load.

Installation of 15kV cables requires the use of specialized pulling equipment. The equipment must be anchored to the vault wall, floor or ceiling, as field conditions require. The vault structure must be capable of supporting this equipment. Cable pulling can exert as much as 5,000 lbs. of pressure on this equipment. The use of stressed concrete in vaults is prohibited to allow the mounting of cable pulling equipment as required.

2.7. Shall not contain any foreign utilities that pass through the vault.

No ductwork that does not directly serve the space shall be permitted in the vault. No electrical conduit may pass through the vault. No sanitary, water, or gas piping may pass through the vault. All equipment entering the vault must directly serve the space.

2.8. Shall have two means of egress on opposite ends of the space.

2.9. Vault doors shall be designed with the following features:

2.9.A. One of the two doors to the vault must be large enough to move the electrical equipment upright through the door. Removable transoms are acceptable. Alternate means of removing equipment from the vault must be submitted to the University electrical engineering staff for review and approval.

2.9.B. Entrance to the vault shall be possible through both doors.

2.9.C. Both vault doors must be provided with an 'ST-1' core lock.

2.9.D. Both doors must be self-locking. Once the key is removed, the door stays locked.

2.9.E. Include panic style hardware on all vault exits.

2.9.F. Include door sweeps and gaskets (seals) in architectural door schedules.

2.10. Walls of the vault shall be painted white.

2.11. The high voltage vault shall have a minimum 12' clear from the finished floor. No architectural supports or appurtenances may occupy this space. Any exceptions must be approved by University of Minnesota Energy Management Electrical Engineering.

3. Fire Protection Systems

3.1. **PROHIBITED:** Fire protection sprinkler systems in electric vaults. The A/E shall design electric vault(s) to eliminate the need for a fire protection sprinkler system per the latest edition of NFPA 13 and/or any other applicable codes.

3.2. Vault smoke detection shall be an incipient detection system to avoid entrance of non-electrical personnel into the vault for periodic smoke detector maintenance.

4. Mechanical Systems

4.1. Design space conditioning for a nominal 80 degrees Fahrenheit ambient.

4.2. Chilled water-cooling is preferred.

4.3. Design heat load for a peak summer loading. Do NOT design for maximum transformer heat rejection. It is acceptable to allow the vault to get above 80 degrees ambient on the few hot and humid days of the year.

4.4. If the A/E chooses to ventilate the vault with 100 percent outside air instead of chilled water, the design concept must be reviewed and approved by the University electrical and mechanical engineering staff.

4.4.A. If use of outside air is approved by the University, install an "OFF-AUTO" switch mounted in the vault to allow personnel to shut the ventilation off during maintenance of the vault. In addition, if the switch is left in the "OFF" position for more than 4 hours, the ventilation system shall automatically restart.

This is intended to allow University electricians to turn off vault ventilation during maintenance activities in which the direct outside airflow from fans can be problematic.

4.5. Supplemental heating must be provided, if necessary, for the vault to maintain a minimum ambient of 65 degrees Fahrenheit.

4.6. Maintain slightly positive room pressurization.

4.7. Exhaust only ventilation of high voltage vaults is prohibited.

Supply air must be provided to the vault. Simply conditioning recirculated room air will not provide a positively pressurized space.

Designers should note that the incipient smoke detection system would not function properly if the vault were at a lower pressure than the room containing the smoke detection equipment.

4.8. **PROHIBITED:** The vault shall not contain any mechanical equipment that requires access by unauthorized personnel for maintenance (e.g. motor starters, fans, louver operators, etc.). Ductwork and incipient smoke detection piping is acceptable.

4.9. Supply air to a vault must be filtered.

5. Electrical Requirements

5.1. Vault lighting shall be switched with illuminated 3-way switches, and shall be on an emergency circuit.

5.2. Provide at least one vault duplex receptacle on an emergency circuit. Receptacle shall be colored red.

5.3. Contract documents shall note that housekeeping pads must be sealed prior to equipment being placed on them.

5.4. A 36"x36"x12" spare fuse cabinet shall be provided and mounted on the wall of the vault.

5.5. A minimum of 72 inches of clearance shall be maintained in front of 15 kV switchgear and in front of the primary termination compartment of the transformers.

5.6. To provide safe operating clearance for hot stick operation, a minimum of 6 feet of clearance is required in front of all electrical equipment doors. In addition, a minimum of 6 feet of clearance is required in front of any removable panels where grounding clusters may be applied or an exposed live part may exist. A minimum of 60 inches shall be maintained in the rear of the 15 kV switchgear for cable pulling purposes.

5.7. Minimum duct bank size into a building shall be 2 x 2 (total of 4 barrels).

5.7.A. Where required by field conditions, duct bank may be constructed as 1 x 4 (total of 4 barrels).

5.8. If the elevation of the manhole serving the building is higher than the elevation of the vault, and there is a risk of a flooded manhole draining in to the vault, the vault shall be provided with a sump drain (not sanitary drain) to avoid flooding from the outside manhole.

5.9. If the 15 kV duct bank enters the vault through a wall, a water break must be used (e.g. a pullbox or cable tray) to avoid water from running into the switchgear.

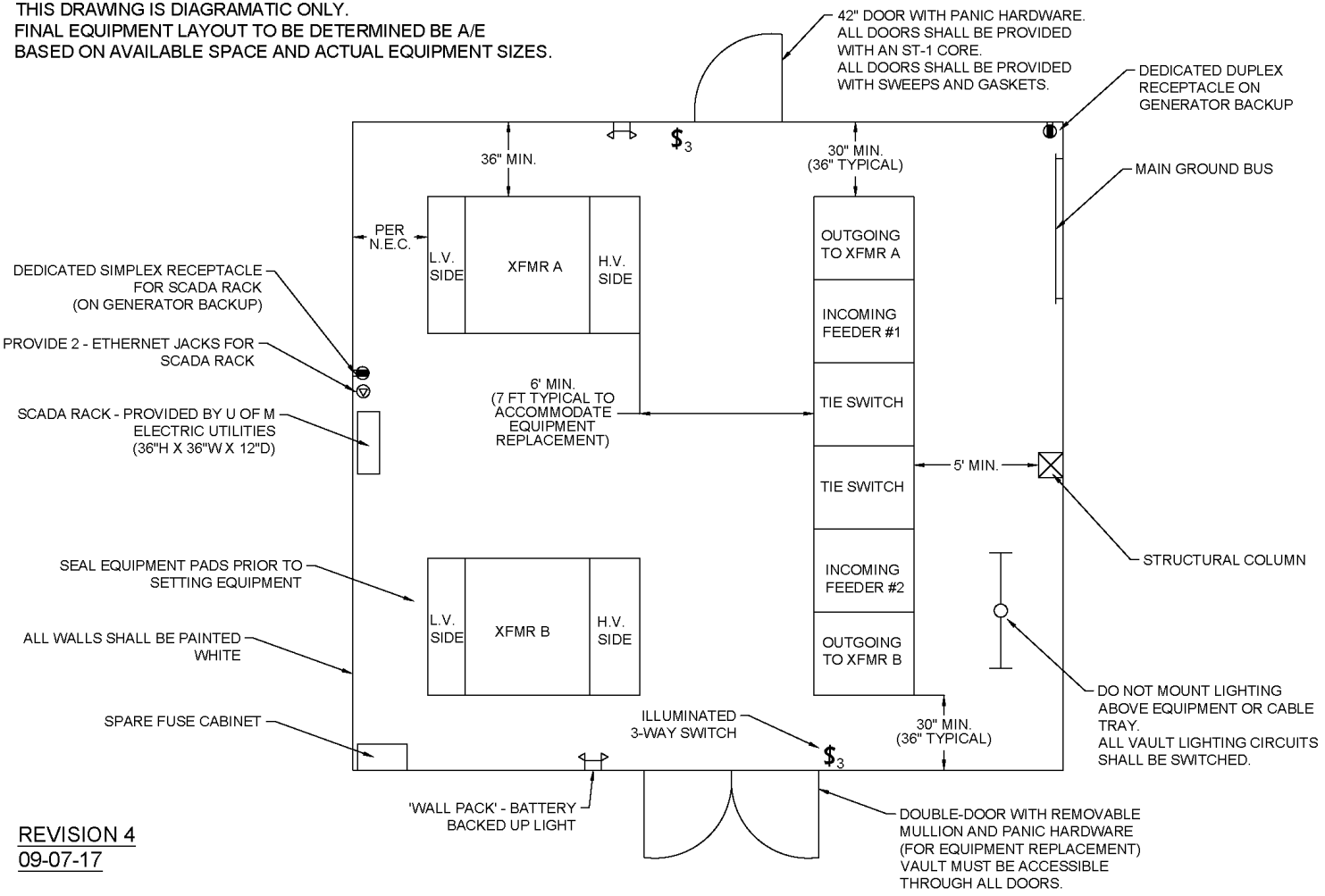
6. Grounding Requirements

6.1. Reference 26 05 26 for grounding requirements.

END OF SECTION

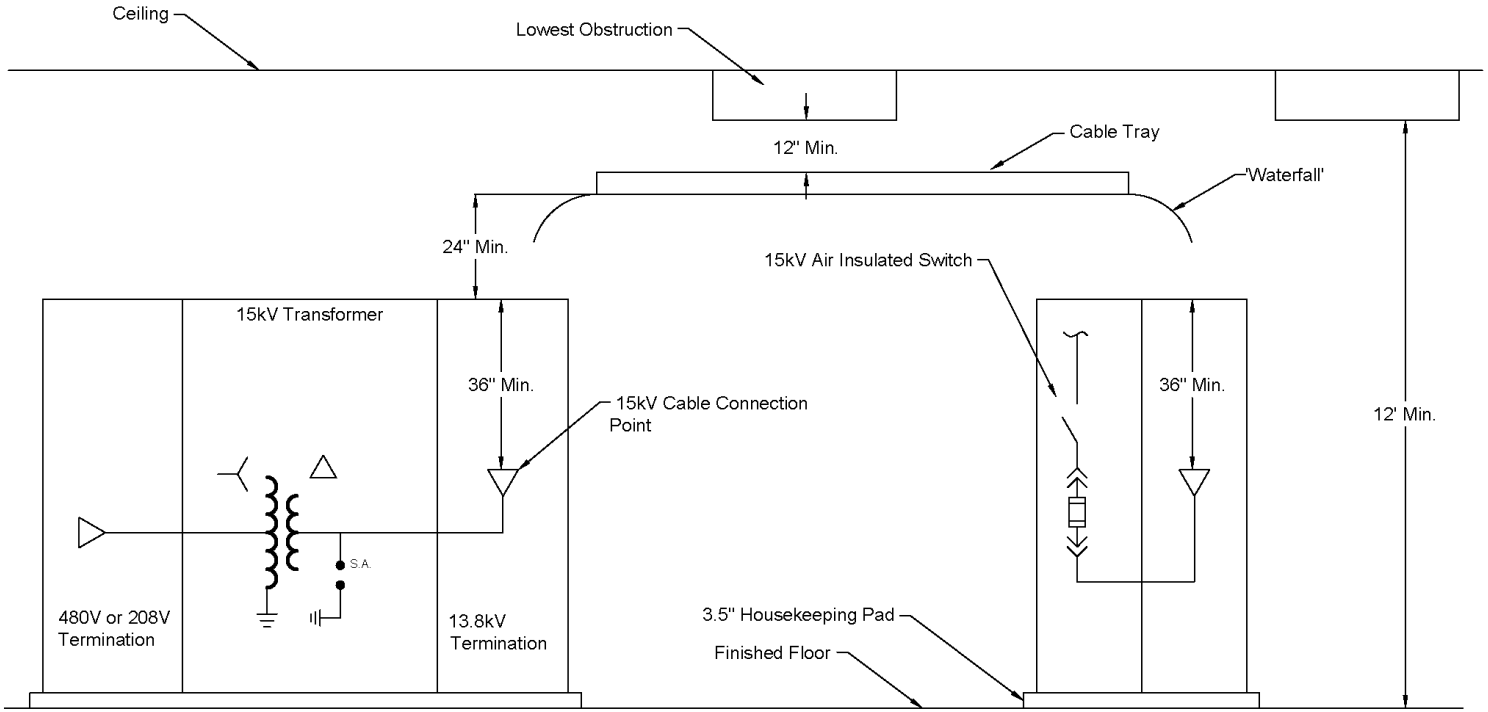
DIVISION 13 00 60 – LIST OF FIGURES

DIVISION 13 00 60 - FIGURE 1
TYPICAL ELECTRIC VAULT LAYOUT DETAIL



DIVISION 13 00 60 - FIGURE 2A
TYPICAL ELECTRIC VAULT ELEVATION DETAIL 1

NOTE:
THIS DRAWING IS DIAGRAMATIC ONLY.
FINAL EQUIPMENT LAYOUT TO BE DETERMINED BE A/E
BASED ON AVAILABLE SPACE AND ACTUAL EQUIPMENT SIZES.



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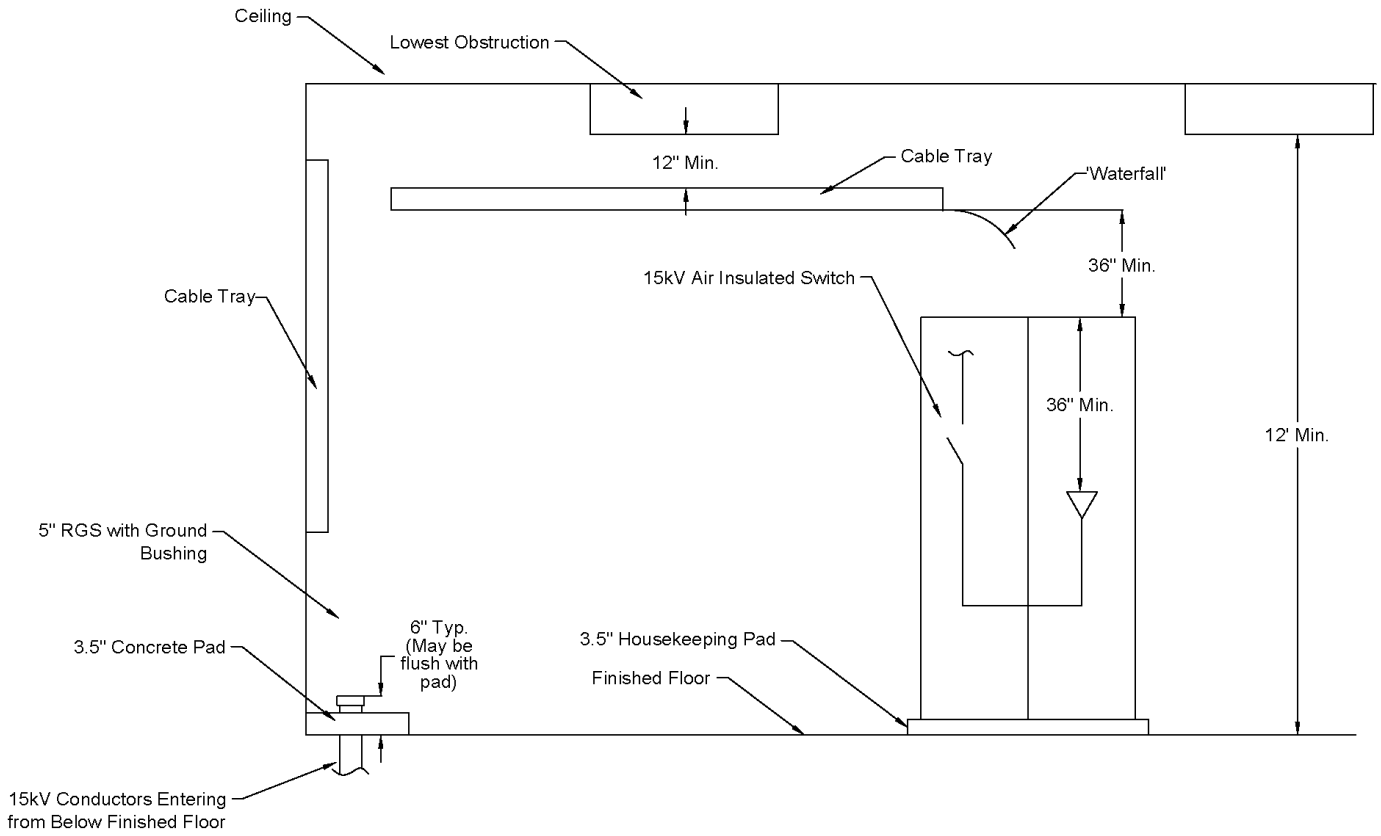
6-5-17

DIVISION 13 00 60 - FIGURE 2B
TYPICAL ELECTRIC VAULT ELEVATION DETAIL 2

NOTE:
THIS DRAWING IS DIAGRAMATIC ONLY.
FINAL EQUIPMENT LAYOUT TO BE DETERMINED BE A/E
BASED ON AVAILABLE SPACE AND ACTUAL EQUIPMENT SIZES.



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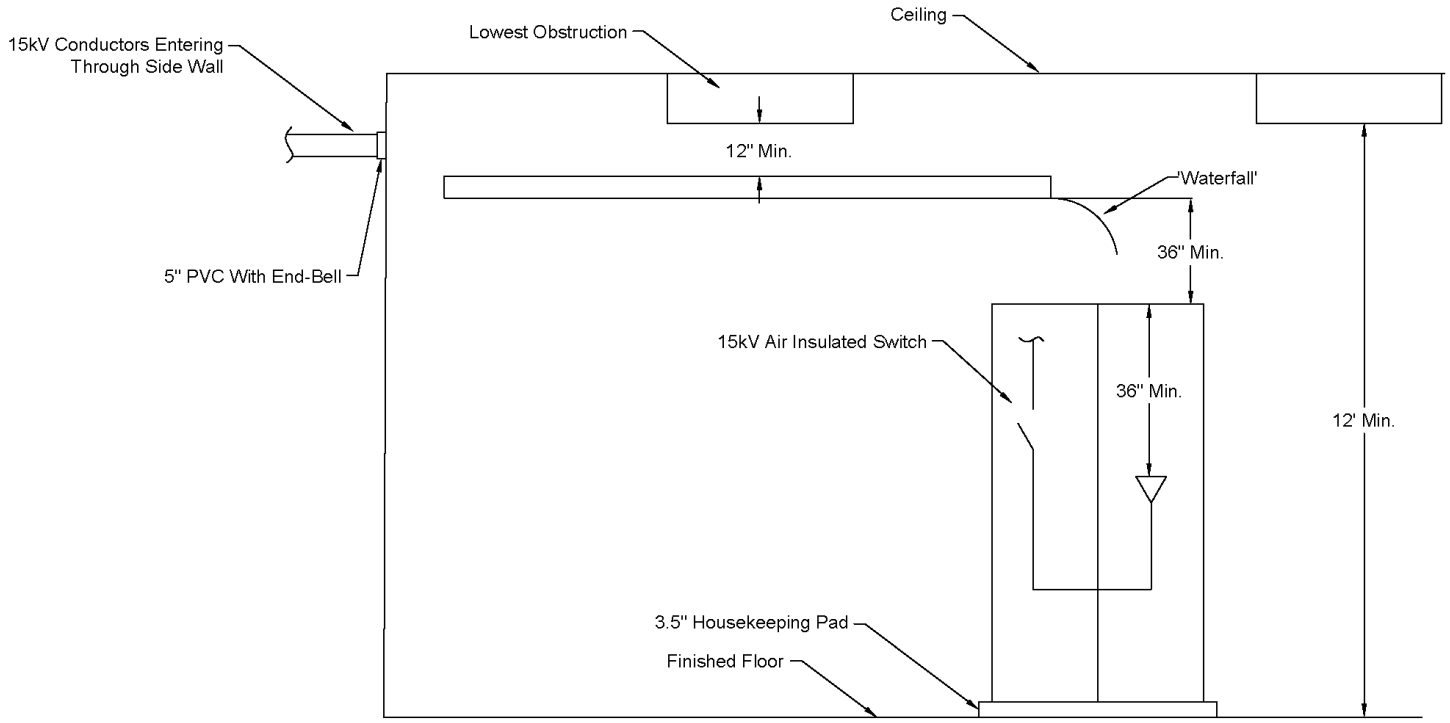
6-19-17

DIVISION 13 00 60 - FIGURE 2C
TYPICAL ELECTRIC VAULT ELEVATION DETAIL 3

NOTE:
THIS DRAWING IS DIAGRAMATIC ONLY.
FINAL EQUIPMENT LAYOUT TO BE DETERMINED BE A/E
BASED ON AVAILABLE SPACE AND ACTUAL EQUIPMENT SIZES.



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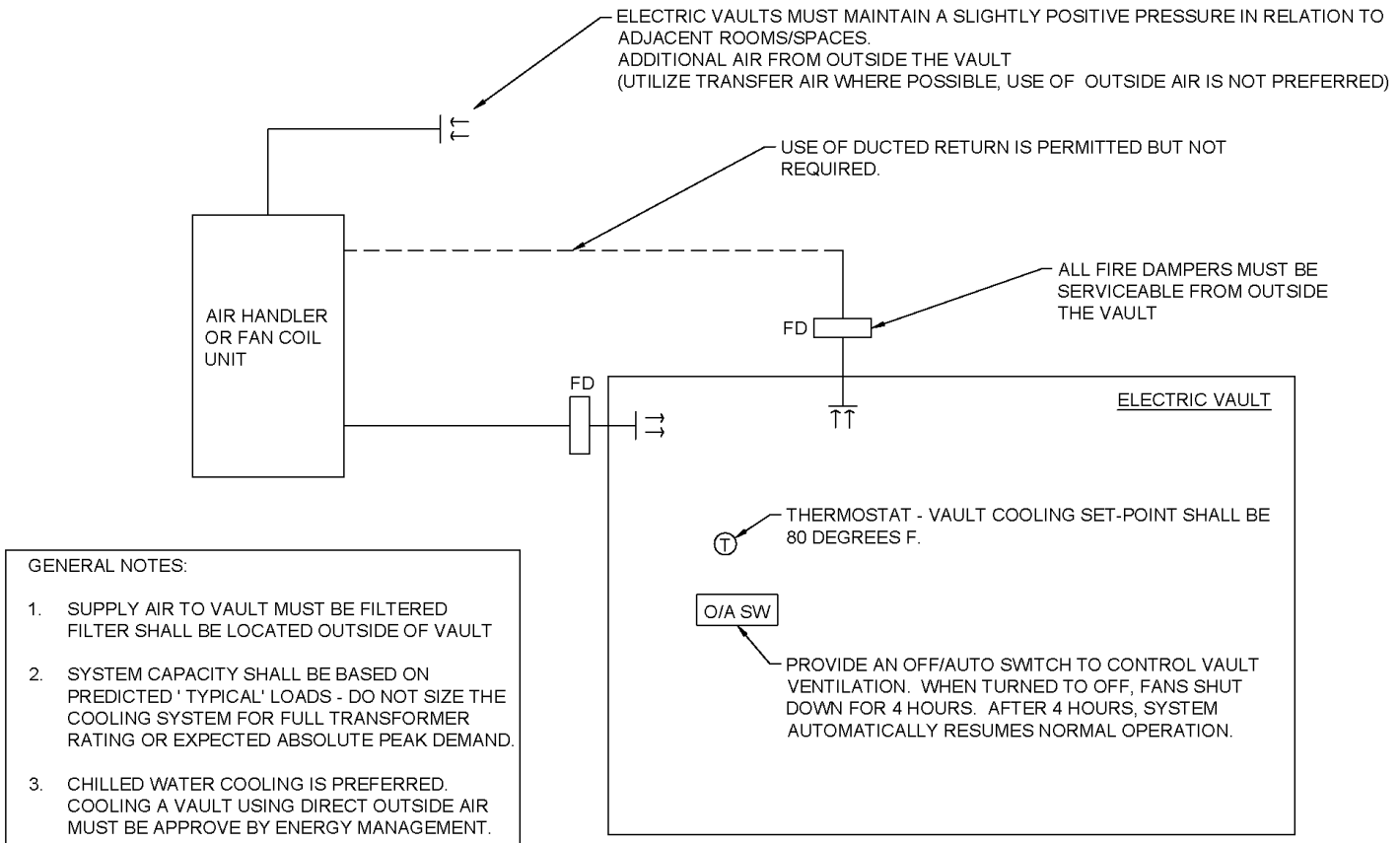
DIVISION 13 00 60- FIGURE 3
TYPICAL ELECTRIC VAULT VENTILATION DETAILS



GENERAL NOTES:

1. SUPPLY AIR TO VAULT MUST BE FILTERED FILTER SHALL BE LOCATED OUTSIDE OF VAULT
2. SYSTEM CAPACITY SHALL BE BASED ON PREDICTED ' TYPICAL' LOADS - DO NOT SIZE THE COOLING SYSTEM FOR FULL TRANSFORMER RATING OR EXPECTED ABSOLUTE PEAK DEMAND.
3. CHILLED WATER COOLING IS PREFERRED. COOLING A VAULT USING DIRECT OUTSIDE AIR MUST BE APPROVE BY ENERGY MANAGEMENT.
4. THE ENGINEER SHALL DESIGN A SYSTEM THAT PREVENTS WATER FROM A BROKEN COIL FROM ENTERING THE VAULT. IF NECESSARY, SPECIFY A WATER-BREAK IN THE DUCT WORK

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END OF SECTION