ENMAX Power Corporation

Network Customer Built Transformer Vault Specifications

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Projects and Engineering
ENMAX Power Corporation
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Important - Please note the following:

This document is intended to supplement all relevant legislation including the Electric Utility Act, Alberta Electric Utility Code, Canadian Electric Code and EPC Distribution Tariff Term's and Condition's. If there is any inconsistency between this document and any of the above, the terms of that tariff, agreement or legislation will prevail.

The information contained within this document can be modified by EPC without notice.
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1. INTRODUCTION

1.1 Purpose of this Specification

Customers within the Calgary network service area with large electrical loads may require an indoor transformer vault to supply their electrical needs. To ensure that the integrity and quality of service of the network system is maintained, ENMAX Power Corporation (EPC) has written this specification that lists the basic procedural and technical requirements that must be met in the construction of a customer built transformer vault and associated infrastructure.

The term ‘Network’, as used in this publication, refers to the area of EPC’s electrical distribution system that is located in Calgary’s downtown core and portions of the adjacent communities (see Figure 1.1).

Figure 1.1 EPC Network boundary map.
Please note the following:

- The transformer vault, lift out well and Emergency Disconnect Device (EDD) room all fall under the Alberta Building Code definition of an ‘Electrical Equipment Vault’ and must adhere to those requirements. All customer installations must pass City of Calgary building code inspection.

- The design of all customer owned transformer vaults, EDD rooms and lift out wells must be reviewed and accepted by EPC Engineering prior to construction.

- Prior to any construction that will affect EPC’s Network system, EPC requires a site coordination meeting. At the meeting an EPC representative will review any outstanding conflicts that will need to be corrected prior to the beginning of the construction of the transformer vault, EDD room or lift out well. The EPC Project Manager will then establish a tentative schedule for construction that will commence when the customer meets all the requirements in the Network specifications.

- For all other aspects of Network servicing, please refer to the Network Servicing Policies and Guidelines at www.enmax.com.

1.2 Customer Checklists (Construction & Energization)

A checklist for the construction of the transformer vault, EDD room and lift out well is provided by EPC Engineering and must be signed off before work commences. See Appendix A for a copy of the checklist.

1.3 Types of Transformers to Be Used

The transformers that are used in the transformer vault are filled with an insulating fluid that is approved for indoor application. EPC will supply and install the transformers at the customer’s expense.

1.4 Utility Right-of-Way

EPC requires the customer to grant a strata Utility Right-of-Way to EPC for transformer vaults, EDD rooms, lift out wells on private property and the associated conduit systems.

The conduit system includes the conduit connecting the transformer vault to the external EPC system, as well as the conduit between the transformer vault and the customer’s main incoming disconnect.
2. DESIGN SPECIFICATIONS FOR STRUCTURES AND FACILITIES

2.1 Transformer Vault Location Requirements

The transformer vault must be located in a manner to meet the following EPC requirements:

i. There are two (2) access points. EPC personnel must have 24 hour direct access from outside the building via one of the access points. Direct 24 hour access is necessary so that EPC personnel can perform emergency and/or routine switching and maintenance on the ENMAX system without delays.

ii. The installation of equipment access doors must meet all of the conditions outlined in Section 3 ‘Equipment and Personnel Access Requirements’ and/or the installation of a standard EPC vault steel hatch and slab assembly.

iii. Sufficient space must exist in the area immediately outside of the transformer vault to allow EPC work vehicles to maneuver.

iv. The transformer vault must be located on the customer’s property and cannot be located above the +15 level of the building.

v. The customer must advise EPC if the floor of the transformer vault is not constructed flush with the grade directly outside of the building (i.e. ground level) by the equipment access doors to allow ease of installation/removal of EPC transformers.

2.2 Transformer Vault Dimensions

Details regarding the vault are as follows:

i. The transformer vault must be large enough to house a minimum of four (4) network style transformers with protectors

ii. The interior of the transformer vault must be completely free of any obstacles or protrusions (posts, pillars, bulkheads, supporting beams, etc.)

iii. There must be enough room to permit safe operation of the equipment by EPC Network staff and allow for safe removal of the equipment if required
The minimum internal dimensions for a transformer vault are shown in Table 2.2.

### Table 2.2 Typical Internal Vault Dimensions

<table>
<thead>
<tr>
<th>(L x W x H)</th>
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<tr>
<td>11m x 5m x 4.5m (120/208 volts)*</td>
</tr>
<tr>
<td>11m x 5m x 4.5m (277/480 volts)*</td>
</tr>
<tr>
<td>12m x 11m x 4.5m (347/600 volts)*</td>
</tr>
</tbody>
</table>

* Dimensions exclude the space requirement for the mechanical ventilation equipment.

See attachment ‘Typical Customer Built Vault Dimensions (600 Volt) and (208 Volt or 480 Volt)’ for further details.

### 2.3 Location of Emergency Disconnect Device (EDD) Room

i. EPC requires an emergency disconnect device room inside the building that contains the equipment to electrically disconnect the incoming EPC high voltage cables from the transformers in the event of an emergency.

ii. To facilitate access to a building during an emergency, it is essential the emergency disconnect devices be installed at a location that is always readily accessible to EPC crews.

iii. The EDD room must be located in a manner so that EPC is provided with 24-hour direct access from outside the building.

iv. The interior of the EDD room must be completely free of any obstacles or protrusions (posts, pillars, bulkheads, supporting beams, etc.)

v. Room dimensions should be as shown in attachment ‘Network EDD Switch Placement Template’

Access door dimensions are to be a minimum of 0.91 meters (W) x 2.1 meters (H)

vi. EPC will supply and install the emergency disconnect devices for which the customer is accountable for the cost.
Note that the EDD room may also be incorporated as part of a transformer vault lift out well if applicable. Please contact EPC Engineering for details.

2.4 Electrical Load Criteria for Transformer Vaults

Table 2.4 outlines the maximum aggregate service panel size that can be connected to a transformer vault at the given voltages.

<table>
<thead>
<tr>
<th>Secondary Voltage (volts)</th>
<th>Transformer Size (kVA)</th>
<th>Maximum Aggregate Service Panel Size (amps)*</th>
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<tr>
<td>120 / 208</td>
<td>500</td>
<td>4,400</td>
</tr>
<tr>
<td>120 / 208</td>
<td>750</td>
<td>6,400</td>
</tr>
<tr>
<td>120 / 208</td>
<td>1000</td>
<td>8,800</td>
</tr>
<tr>
<td>277 / 480</td>
<td>750</td>
<td>2,800</td>
</tr>
<tr>
<td>277 / 480</td>
<td>1000</td>
<td>3,600</td>
</tr>
<tr>
<td>277 / 480</td>
<td>1500</td>
<td>5,600</td>
</tr>
<tr>
<td>277 / 480</td>
<td>2000</td>
<td>7,600</td>
</tr>
<tr>
<td>347 / 600</td>
<td>2500</td>
<td>7,600</td>
</tr>
</tbody>
</table>

* Note that for services with more than one (1) service disconnect, the largest single disconnect is restricted to 4000 amps.

2.5 Grounding of Transformer Vaults

The customer must contact EPC Engineering for details on ground grid installation either within the concrete floor or in the substrate below the floor.

i. For the protection of EPC staff, a ground grid is required for all transformer vaults, EDD rooms and lift out wells. This ground grid is designated the ‘EPC ground grid’.

ii. The EPC ground grid must be located within the floor or in the substrate immediately below the floor of the transformer vault, EDD room or lift out well.
iii. The customer is responsible for the supply and installation of the EPC ground grid for transformer vaults, EDD rooms and lift out wells located inside of the building.

iv. The customer is also responsible for the supply and installation of the EPC ground grid for EDD rooms and lift out wells located outside of the building. EPC Engineering will obtain approval from the City of Calgary for construction of these facilities outside of the building on public land.

See attachment ‘Ground Grid Layout For Civil Structures’ for grounding details.

2.6 Customer Equipment Bonding

i. It is the customer’s responsibility to bond any metallic hardware that extends into public space. Examples are door frames, sprinkler systems, lighting, etc.

ii. The customer must install their own ground plate in the indoor transformer vault room and connect it to the building’s grounding system. The customer ground plate is indirectly electrically bonded to the supply authority (EPC) ground plate via the building electrical system.

See attachment ‘Customer Ground Plate’ for grounding details.

2.7 Painting

i. The customer is responsible for painting all of the interior transformer vault surfaces, EDD room and lift out wells. This includes the ceiling, walls and floor.

ii. All floors must be smooth and free of irregularities to permit the use of air-pallet equipment.

iii. Non-slip surfaces are NOT to be installed or applied on any floor surfaces.

iv. The color of the paint must be white and be latex based.

2.8 Transformer Vault and Emergency Disconnect Device Room Wall Construction

The transformer vault, EDD room and lift out well must be a “cast in place” concrete with a fire-resistant rating of not less than 3 hours.

All walls must be smooth and free of any protrusions.
2.9 Floor/Ceiling Loading Weights

The customer is responsible for ensuring that the floor and/or ceiling load ratings are capable of supporting the EPC installed equipment. Table 2.9 outlines the approximate weights for transformers and the associated secondary buss work and cables.

<table>
<thead>
<tr>
<th>Service Voltage (volts)</th>
<th>Base Footprint* (W x L)</th>
<th>Unit Weight (kg)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 / 208</td>
<td>1.3m x 1.6m</td>
<td>6,500</td>
</tr>
<tr>
<td>277 / 480</td>
<td>1.5m x 1.6m</td>
<td>9,000</td>
</tr>
<tr>
<td>347 / 600</td>
<td>1.4m x 2.1m</td>
<td>10,000</td>
</tr>
<tr>
<td>Secondary Buss Work and Cables</td>
<td>N/A</td>
<td>2,000</td>
</tr>
</tbody>
</table>

* The base footprint is not the same as the transformer dimensions
** The secondary buss work and cables are supported via I-beams mounted to the walls

2.10 Customer Service Duct Locations

The permitted locations for customer service duct entering the transformer vault are as shown in attachment ‘Cable Entrance Duct Zone’. The customer service duct location must be approved by EPC Engineering prior to construction.

For installations where the customer’s main service panel is in close proximity to or above the transformer vault, the customer may have to supply cable strain relief grips to support the weight of the EPC secondary cable and reduce the tension on the cable terminations within the customer service panel. The customer must contact EPC Engineering to determine the requirement for and obtain approval of the cable strain relief system.

3. EQUIPMENT AND PERSONNEL ACCESS REQUIREMENTS

i. EPC personnel must have 24-hour access via one of the access points.

ii. This access must be directly from the outside of the building and not require the permission or assistance of a third party such as building security or the fire department.
iii. A minimum of two (2) access points at the floor grade of the transformer vault are required and one (1) access point at floor grade for the EDD room (if applicable). The number of doors required will be dependent upon their location in the transformer vault room. If equipment access doors (i.e. double doors) are located on the side walls (11m side) then EPC will require 1 personnel access door (i.e. single door) on each of the end walls (5m side). If equipment access doors are located on the end wall, then EPC will require 1 personnel access door on the opposite end wall.

Notes:
- A drawing of the transformer vault and both equipment and personnel access doors must be submitted to EPC Engineering for review and acceptance prior to construction.
- EPC will be installing signage on the customer side of the doors to the transformer vault and EDD room.

3.1 Equipment Access

Either a ceiling or wall access design may be used to provide the entrance to install the EPC electrical equipment in an above grade transformer vault.

An outdoor ceiling access to the transformer vault room must be constructed by installing a standard EPC vault steel hatch and slab assembly. This ceiling access must be integrated within the building roof structure. Please contact EPC Engineering for design details.

- The steel hatch and slab assembly is installed in the ceiling of portion of the transformer vault room with outdoor access. There are to be NO obstructions (e.g. structural members, signage, portions of the building such as overhangs, trees, etc.) above the hatch and slab assembly. Clear vertical space is required for EPC to utilize a crane to safely install/remove transformers and other associated equipment.
- EPC will supply the steel hatch and slabs at the customer’s expense.
- The ceiling access can be combined with the EDD room for equipment access.

Wall access to the transformer vault room must be constructed via a door assembly. Equipment access doors must meet the following requirements:

- The minimum internal dimension for the wall access equipment doors is 2.1 meters wide x 2.9 meters high. Typically this is a double door without a center
support. Doors must open outwards from the transformer vault room and the EDD room (if applicable).

- The equipment access doors must either be equipped with removable door hinge pins so the doors can be taken off of their hinges or the doors must be able to open a full 180 degrees.

- The customer will supply and fit the door hardware as shown in attachment ‘Customer Built Vault Door Hardware’.

3.2 Lift Out Well Equipment Access

i. When a transformer vault is constructed below grade, a lift out well is required for the removal of EPC equipment.

   - The minimum size for the lift out well is shown in attachment ‘Typical Customer Built Vault Lift Out Well/EDD Combo’.

   - The preferred location of the lift out well is the outside of an exterior wall of the building and adjacent to the transformer vault.

   - The bottom of the equipment access doors must be located at the same level as the floor of the transformer vault.

ii. The lift out well must be equipped with a sump pit (please see Section 4.3 - Sump Pits and Covers). The sump pit must have a perforated cover and a removable hatch with a minimum diameter of 0.3 meters to allow for pumping out any liquid.

   - The location of the sump pit must be approved by EPC Engineering prior to construction.

iii. There are to be NO obstructions (e.g. structural members, signage, portions of the building such as overhangs, trees, etc.) above the removable concrete slabs. Clear vertical space is required for EPC to utilize a crane to safely install/remove transformers and other associated equipment from the lift out well.

3.3 Personnel Access Doors

i. EPC personnel must have 24 hour access via one of the access points.

ii. This access must be from outside of the building and lead directly into the transformer vault when the vault is not equipped with a lift out well.
iii. For locations where the emergency disconnect device is in a separate room, the access must be from outside of the building and lead directly to the emergency disconnect device room.

iv. For all locations where the exit is not via the ceiling, the bottom of the personal access door is to be at the same level as the floor of the transformer vault.

v. If the access to the personnel doors of the transformer vault is via the ceiling, a fixed in place EPC ladder is required to permit access via the grates.
   - EPC will supply and install the ladder at the customer’s expense.

vi. Wall located personnel access doors (i.e. single doors) must adhere to the following:
   - The personnel access doors shall have dimensions of 0.91 meters wide x 2.1 meters high.
   - The customer will supply and fit the door hardware as shown in attachment ‘Customer Built Vault Door Hardware’.
   - Doorway must have a concrete sill with a minimum height of 100mm and comply with Section 3.6.2.7 ‘Electrical Equipment Vaults’ of the Alberta Building Code. EPC Engineering will supply the oil capacity of each liquid filled piece of equipment as required. See Detail 2 in attachment ‘Typical Customer Built Vault Door Sill’. See also section ‘4.1 Liquid Containment – Door Sill’.
   - The door may be alarmed if required by the customer. The supply and installation of any building security related equipment is the responsibility of the customer. Note that EPC will not be responsible for notifying the building security staff when EPC staff are on-site and accessing our equipment via alarmed doorways.
   - If the personnel access door does not open into public space, the next door must open into public space and be equipped with a panic bar.
   - Personnel access doors must open outward from the transformer vault.

3.4 Vehicle Access

i. Equipment rooms and lift out wells must be designed and located to provide sufficient unrestricted space exterior to the building for EPC large construction vehicles to safely install/remove/maintain EPC electrical equipment.
ii. Typical equipment used is a mobile crane and flatbed tractor trailer.

iii. Minimum dimensions for equipment setup are shown in attachment ‘Customer Equipment Access Requirements’.

## 4. LIQUID CONTAINMENT

### 4.1 Door Sill

i. All personnel access points (i.e. single doors) to the transformer vault must be equipped with a concrete sill. See Detail 1 in attachment ‘Typical Customer Built Vault Door Sill’.

ii. Locations with equipment access doors (i.e. double doors) must be equipped with a removable oil containment sill. This sill will be supplied and installed by EPC. See Detail 2 in attachment ‘Typical Customer Built Vault Door Sill’.

### 4.2 Drainage System

#### 4.2.1 Lift Out Well

The floor of the lift out well must incorporate a drainage system.

The drainage system must be as follows:

- A dry sump pit located at the ladder end of the lift out well, directly beneath the fixed portion of the access/ventilation grates. Dimensions of the dry sump are to be 0.6 x 0.6 x 0.6 meters (L x W x H).

#### 4.2.2 Emergency Disconnect Device Room (EDD)

Floor drains are not allowed in the EDD room.

#### 4.2.3 Transformer Vault

Floor drains are not allowed in the transformer vault.
4.3 Sump Pits and Covers

i. To maintain safety and ensure ease of entrance into the sump pit, the sump pit must be equipped with a removable cover with a minimum thickness of 6.35mm. This cover must be constructed from galvanized steel, stainless steel or aluminum. For stand-alone systems (no storm water connection), the cover must be hinged or removable and 0.3 meter in diameter to facilitate the insertion of a pump hose for liquid removal. See attachment ‘Typical Customer Built Vault Lift Out Well/EDD Combo’ for sump pit location.

ii. All covers must be installed flush with the surrounding floor surface.

iii. The sump pit cover must be perforated to permit liquid to enter the sump pit.

5. FIRE PROTECTION AND DETECTION

5.1 Alarms

EPC does not require alarms within the transformer vault, EDD rooms or lift out wells.

- If an alarm is required by the customer to accommodate building code requirements, only silent strobe-style alarms are permitted. Audible alarms are not permitted within an enclosure containing EPC equipment.

- Any alarms installed by the customer must adhere to the Alberta Building Code.

- The location and type of alarms deemed necessary by the customer must be approved in advance by EPC Engineering.

5.2 Smoke and Heat Detectors

i. The transformer vault must be equipped with two (2) ceiling mounted heat detectors and two (2) ceiling mounted smoke detectors. These devices will provide detection of overheating or potential hot spots.

   - The detectors must be located so that there is a smoke detector positioned between each pair of Network transformers.

   - The specific location for each detector must be approved by EPC Engineering in advance.
ii. If the EDD room is inside the building but not part of the lift out well, the room must be equipped with the following:
- One (1) ceiling mounted heat detector
- One (1) ceiling mounted smoke detector

iii. All smoke and heat detectors must be connected to the building alarm system and actuate the main building alarm if fire or overheating occurs in the transformer vault room or EDD room.

iv. Smoke detectors must be configured to disable the ventilation system when activated.

v. Smoke and heat detectors installed in transformer vaults and EDD rooms must be tested regularly in accordance with the testing of all other building security/alarm systems. Access to these rooms for testing must be arranged 5 business days prior to testing by contacting EPC Customer Intake. Any EPC costs associated with this testing will be the accountability of the customer.

5.3 Sprinkler Systems

If the current building code stipulates that the customer must install a sprinkler system, then the following is required:

- Sprinkler system must be a non-pressurized, dry type (non-liquid).
- Location of the sprinkler heads must be approved by EPC Engineering.
- A by-pass system must be installed to enable EPC to disable the sprinkler system when EPC performs work activities in the room.

5.4 Fire Ratings

i. The floors, ceiling and walls of the transformer vault, EDD room and lift out well must be ‘cast in place’ concrete that has a fire-resistant rating of not less than three (3) hours.

ii. The customer must not affix any sheathing, coverings or panels (wood, metal, foam, fiberboard, masonry, etc.) to the interior surfaces (walls, floors, ceilings) of the transformer vault, EDD room or lift out well to achieve an increase in the fire-resistance rating.
5.5 Fire Rated Doors

In those locations where the transformer vault, EDD room and lift out well have wall access style personnel and equipment access doors, the doors must have a fire-resistant rating of not less than two (2) hours. All doors must be constructed of metal with no composite or glass sections.

5.6 Fire Dampers

When an intake or exhaust outlet is not on an exterior building wall, the outlet must have a fire damper rated for a minimum of two (2) hours.

6. LIGHTING AND DUPLEX RECEPTACLES

6.1 General Room Lighting and Duplex Receptacle Requirements

The customer is responsible for the supply and installation of room lighting and duplex receptacles for the transformer vault and EDD room.

All lighting and duplex receptacles must meet the following requirements:

- Power to lighting and receptacles must be connected to circuits backed up by on-site generation or an uninterrupted power supply (UPS).
- Lighting must be rated to operate at temperatures down to 0 degrees Celsius.

See attachments:

- ‘Typical Customer Built Vault Lighting Standard (208 Volt or 480 Volt)’ for transformer vault requirements.
- ‘Typical Customer Built EDD Chamber Lighting Standard’ for emergency disconnect device room requirements.

Note that lighting and receptacle designs for 600 volt transformer vaults must be submitted to EPC Engineering for approval.

6.2 Emergency Lighting

The customer is responsible for the supply and installation of the emergency lighting for the transformer vault and the EDD room.

Emergency lighting must meet the following requirements:
i. An emergency exit sign and emergency light (with backup battery power) must be located directly above each point of exit.

ii. In locations where the emergency exit from the indoor vault/room leads into a second room, the customer must install lighting in the second room. This lighting must be continuously on, 24 hours a day.

iii. Emergency lighting installed in transformer vaults and EDD rooms must be tested regularly in accordance with the testing of all other building security/alarm systems. Access to these rooms for testing must be arranged 5 business days prior to testing by contacting EPC Customer Intake.

See attachments:

- ‘Typical Customer Built Vault Lighting Standard (208 Volt or 480 Volt)’ for transformer vault requirements.

- ‘Typical Customer Built EDD Chamber Lighting Standard’ for EDD room requirements.

7. VENTILATION SYSTEM

7.1 Indoor Transformer Vaults

i. The customer is responsible to install an air handling (ventilation) system which provides adequate heating and cooling of the transformer vault.

ii. The transformer vault must have both sufficient heat and cooling to prevent the ambient air temperature from falling below freezing (0 degrees Celsius) or exceeding +40 degrees Celsius. Typical transformer heat losses for EPC equipment (on a per transformer basis) are listed in Table 7.1.
### Table 7.1 Standard Heat Loss (per network transformer)

<table>
<thead>
<tr>
<th>Service Voltage (volts)</th>
<th>Transformer Size (kVA)</th>
<th>Transformer Loss (watts)</th>
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</thead>
<tbody>
<tr>
<td>120 / 208</td>
<td>500</td>
<td>7,000</td>
</tr>
<tr>
<td>120 / 208</td>
<td>750</td>
<td>8,000</td>
</tr>
<tr>
<td>120 / 208</td>
<td>1000</td>
<td>12,000</td>
</tr>
<tr>
<td>277 / 480</td>
<td>750</td>
<td>8,000</td>
</tr>
<tr>
<td>277 / 480</td>
<td>1000</td>
<td>11,000</td>
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<tr>
<td>277 / 480</td>
<td>1500</td>
<td>12,000</td>
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<tr>
<td>277 / 480</td>
<td>2000</td>
<td>14,000</td>
</tr>
<tr>
<td>347 / 600</td>
<td>2500</td>
<td>19,000</td>
</tr>
</tbody>
</table>

iii. A typical ventilation system will be comprised of either a passive air intake or conditioned air intake, an exhaust fan, and exhaust opening. The system must provide cool/hot air as required.

iv. The location of the air intake and exhaust system inlet must maximize the air flow across the EPC transformers. Allowable locations for the ventilation grate openings are shown in attachment ‘Cable Entrance Duct Zone’.
   - The ventilation system must be controlled by an adjustable thermostat within the transformer vault and accessible to EPC personnel at all times.
   - The ventilation system shall be separate from the system for the remainder of the building and shall be designed so that it is automatically shut off in the event of a fire in the vault.
   - Location of all ventilation equipment requiring routine maintenance must be located external to the room to facilitate the maintenance activity. The annual testing and maintenance of the ventilation system and components (louvers, motors, etc.) is the responsibility of the building owner.

v. The air intake must provide fresh outside air and be covered by louvers, a bird screen, and include an air filter(s). Air intake must not be drawn from a parkade.
   - The air filter(s) must be a common standard size, disposable and available locally. The customer is responsible to provide the first set of filters.
vi. To ensure a safe and efficient outlet for the exhaust air, the exhaust outlet must be installed in a place that will not allow the room exhaust to be drawn into the vault air intake.

- The exhaust outlet cannot be located in a lift out well.
- The exhaust system outlet must be covered by louvers and a bird screen.
- A two hour fire rated damper may be required for both the intake and exhaust openings as per current building codes.

vii. It is the customer’s responsibility to supply and install the control panel and supply the energy to power all the ventilation related equipment within the transformer vault.

- The design of the ventilation equipment/system is the responsibility of the customer and must meet current building codes and be approved by the City of Calgary.
- The control panel must be installed at the designated 24 hour access point which has been reviewed by EPC Engineering.
- The control panel must have a manual off, manual on, and an automatic position. The switch must have a light that indicates the status of the ventilation equipment.
- Prior to construction, a copy of the plans of the physical layout for the ventilation equipment must be submitted to EPC Engineering for approval.

### 7.2 Emergency Disconnect Device Room (EDD)

Ventilation is not allowed in the EDD room.
Fig 1. GROUND GRID LAYOUT FOR TYPICAL TRANSFORMER VAULTS AND ENMAX MARK VII VAULT.

Fig 2. GROUND GRID LAYOUT FOR LIFT OUT WELL

Fig 3. GROUND GRID LAYOUT FOR MANHOLES/EDD

<table>
<thead>
<tr>
<th>ITEM</th>
<th>STOCK NUMBER</th>
<th>UI</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>DESCRIPTION</th>
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<tr>
<td>1</td>
<td>61458300518</td>
<td>M</td>
<td>80</td>
<td>65</td>
<td>48</td>
<td>BARE 4/0 AWG STRANDED COPPER</td>
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PERMIT NUMBER: P6756
The Association of Professional Engineers,
and Geoscientists of Alberta

ALL DIMENSIONS ARE IN MILLIMETERS EXCEPT AS INDICATED.


FILE: 536-GGR-001
AVAILABLE EQUIPMENT ACCESS DOOR Zone
(NOTE: DOOR MUST BE CENTERED ON THE TRANSFORMER VAULT)

REMOVABLE CONCRETE SLAB (3.2x2.20)

EDD SWITCH

630

EDD SWITCH

630

EDD SWITCH

630

EDD SWITCH

630

WALL

2500

GRATES

920

480

100

1380

920

80

630

1080

630

80

3200

8000

3400

PERMIT NUMBER: P6756
The Association of Professional Engineers, and Geoscientists of Alberta

ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT AS INDICATED.


FILE: 536-NCBV-003

SCALE: N.T.S.
BUILDING SIDE

LIFT OUT SLAB

27m

13m

6.0m (MIN)

40m

BUILDING SIDE

STREET LEVEL
VAULT DOORS

27m

13m

6.0m (MIN)

40m

MINIMUM EQUIPMENT SETUP REQUIREMENTS

PERMIT NUMBER: P6756

The Association of Professional Engineers, and Geoscientists of Alberta


FILE: 536-NCBV-004

CUSTOMER EQUIPMENT ACCESS REQUIREMENTS

DSGN APPr.

PROFESSIONAL LICENSEE (ENGINEERING) ALBERTA

2017/10/23 REVISED DRAWING

TITLE

DATE

DSGN

APPR.

REVISION

SCALE: N.T.S.
NOTES:
1) ACCESS DOOR LOCATION TO BE APPROVED BY ENGINEER.
NOTE:
1-ALL ENTRANCE CONDUIT TO BE EQUIPPED WITH BELL ENDS.
2-LOCATION & ELEVATION OF ALL ENTRANCE CONDUIT TO BE APPROVED BY ENGINEERING.

WALL ENTRY OPTION
PVC DUCT ENCASED IN CONCRETE BASE
SEE DETAILS

BUILDING OUTSIDE WALL

FLOOR ENTRY OPTION
PVC DUCT ENCASED IN CONCRETE BASE
SEE DETAILS

GROUND LEVEL

BASEMENT LEVEL

CABLE ENTRANCE INTO VAULT CONDUIT DETAILS
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<th>ITEM</th>
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<th>DESCRIPTION</th>
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<td>Parallel Arm (Puch side) Mounting Closure (Left &amp; Right)</td>
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<td>2</td>
<td>2</td>
<td>9827-F/9927-F</td>
<td>Surface Mounted Vertical Rod Fire Touch Bar Exit Device</td>
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<td>3</td>
<td>2</td>
<td>930NL</td>
<td>Outside &quot;D&quot; Handle Style with Night Latch</td>
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<td>4</td>
<td>1</td>
<td>1E-74</td>
<td>Best 7-pin Rim Cylinder (Mortise) - Personnel Access Doors</td>
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<td>5</td>
<td>1</td>
<td>12E-72</td>
<td>Best 7-pin Rim Cylinder - Equipment Access Doors</td>
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<tr>
<td>6</td>
<td>1</td>
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<td>Removeable Center Post - Equipment Access Doors</td>
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<tr>
<td>7</td>
<td>1</td>
<td>9875-F/9975-F</td>
<td>Mortise Lock Fire Exit Device - Personnel Access Door</td>
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**PERMIT NUMBER:** P13425

**DATE:** 2017/10/17

**TITLE:** CUSTOMER BUILT VAULT (DOOR HARDWARE)

**FILE:** 536-NCBV-014
- LED LIGHTING
  (4 UNITS)

- UNINTERRUPTIBLE 40W
  24hr LIGHTING

- EMERGENCY EXIT
  LIGHTED SIGN

- LIGHT SWITCH

- SMOKE DETECTOR

- HEAT DETECTOR

- RECEPTACLE
  (2 UNITS)

- EMERGENCY BATTERY
  POWER LIGHT

NOTE 1:
- ALL CONDUIT TO BE PVC
- ALL RECEPTACLES AND FITTINGS
  TO BE WEATHERPROOF

NOTE 2:
3-PHASE
UTILITY 120/208V SUPPLY TO
BE PROVIDED FOR FUTURE TESTING
Customer Supplied Room Wiring:

The customer is responsible for the cost of supplying and installing the general room lighting and duplex power receptacles within the ENMAX Emergency Disconnect Device room.

The general room lighting and duplex power receptacles should only be installed once the Disconnect Switches have been placed in their final positions and all ENMAX wiring has been completed.

**Note:**
- The customer is to contact EPC Engineering to arrange a site meeting to confirm all fixture and ground plate locations.
- Location of supply panel and breaker number to be clearly marked at the designated primary entrance.

**Circuits Required:**

Two (2) 15-amp circuits will be required inside the ENMAX EDD room.
One (1) 15-amp circuit to be used for lighting, and one (1) 15-amp circuit to be used for the split duplex power receptacles. Both (2) circuits inside the ENMAX room are to be supplied 120 volts AC. All circuits are to be connected to a generator-equipped or UPS-equipped source.

**Conduits and Fittings:**

- All customer conductors are to be contained within rigid PVC conduit.
- Weatherproof PVC fittings and connectors are to be used for the conduit.
- All conduit runs are to be vertical or horizontal.
- All conduit runs should be securely fastened to the wall with an appropriate clamp or insert.

**Customer Ground Plate:**

- All conductive customer equipment within the transformer EDD room is to be bonded to the customer ground plate.
- Ground plate to be wall mounted using isolators at a height of 0.3m above finished floor.

**Customer Bonding Conductors:**

- Customer is required to install a minimum of 1/0 AWG Cu green jacketed conductor from their building ground to their ground plate within the EDD room.
- Customer is required to install a minimum of 8 AWG Cu green jacketed conductor to bond their equipment inside the EDD room.
- Bonding conductor will be placed horizontally at a minimum height of 0.6m from the floor and no closer than 0.3m from any energized conductors or terminations.
- Bonding conductor is not to be fastened to ENMAX uni-strut but may cross providing the cable is inside rigid PVC.
- All customer bond conductors are to be installed in rigid PVC.
General EDD Room Lighting:
- Lighting fixtures to be a minimum of two 40W, weatherproof, spec grade, low temperature LED equipped with a protective wire cage.
- 24hr Un-switched lighting is to be placed above each EDD room doorway and supplied by a separate 15 Amp circuit.
- General Room Lighting should be horizontally mounted along the perimeter of the chamber, set over each disconnect switches' centre line. Final lighting locations are to be determined by EPC Engineering.

Exit Signs:
- Emergency lighting and illuminated exit signs should be located directly above each point of exit.

Note:
In locations where the emergency exit from the EDD room leads into a second room, a 24-hour light in the second room is required.

Emergency Battery Powered Light:
- The Customer is to install a Battery Light located beside each Exit Sign. This Light is to sense an outage on the general lighting circuits and activate once the outage occurs. Prior to installation, the Battery Light design is first required to be sent to and accepted by EPC Engineering.

Light Switches:
- Weatherproof, spec grade switches are required inside the room.
- Light switches are to be located at a height of 1.25m from the floor at each room exit.
- Each light switch should control all switched customer lighting within the room.

Receptacles:
- Weatherproof, spec grade duplex power receptacles are required inside the room.
- Each receptacle is to be located at a uniform height from the floor of 0.75m.

Heat and Smoke Detectors:
- Customer to install heat and smoke detectors on the ceiling as outlined on the first page.
- Smoke and heat detectors require dry contacts for ENMAX use.
DETAIL 1 - PERSONNEL ACCESS DOORWAY SILL

EQUIPMENT ACCESS DOOR

323.9 (1' - 3"")

6.4 (1⁄4"") CHECKER PLATE STEEL

15.9 (5⁄8") HOLES @ 609.6 (24") SPACING

SILICONE BEAD

15.9 (5⁄8") HOLES @ 304.8 (12") SPACING

3.2 (1⁄8") NITRILE GASKET

SILICONE BEAD

57.2 (21⁄8")

DETAIL 2 - REMOVABLE OIL CONTAINMENT SILL
LEGEND

$ - LIGHT SWITCH (2 Units)

- 40W LED LIGHTS (6 Units)

- RECEPTACLE (4 Units)

- UNINTERRUPTABLE 40W 24hr LIGHTING (2 Units)

- EMERGENCY EXIT LIGHTED SIGN (2 Units)

- HEAT DETECTOR (2 Units)

- SMOKE DETECTOR (2 Units)

- EMERGENCY BATTERY POWERED LIGHT (2 Units)

NOTE 1
- ALL CONDUIT TO BE PVC
- ALL RECEPTACLES AND FITTINGS TO BE WEATHER PROOF

NOTE 2
THE LOCATIONS OF THE FOLLOWING ARE TO BE FIELD DETERMINED:
- CUSTOMER GROUND PLATE
- FAN CONTROL DEVICE
- GENERAL LIGHTING

DSGN APPr.

PERMIT NUMBER: P6756
The Association of Professional Engineers, and Geoscientists of Alberta

ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT AS INDICATED.

DATE REVISION DSGN APPr.
2015/05/27 ADDED APEGA BORDER GF GF

FILE: 536-VIG-005
Customer Supplied Vault Wiring:

The customer is responsible for the cost of supplying and installing the general room lighting and duplex power receptacles within the ENMAX vault.

The general room lighting and duplex power receptacles should only be installed once the vault's transformers have been placed in their final positions and all ENMAX vault wiring has been completed.

Note:
- The customer is to contact ENMAX EPC Engineering to arrange a site meeting to confirm all fixture and ground plate locations.
- Location of supply panel and breaker number to be clearly marked at the designated primary entrance.

Circuits Required:
Four (4) 15-amp circuits will be required inside the ENMAX vault. Two (2) 15-amp circuits for lighting, and two (2) 15-amp circuits for the split duplex power receptacles. All four (4) circuits inside the ENMAX vault are to be supplied 120 volts AC. All circuits are to be connected to a generator-equipped or UPS-equipped source.

Conduits and Fittings:
- All customer conductors are to be contained within rigid PVC conduit.
- Weatherproof PVC fittings and connectors are to be used for the conduit.
- All conduit runs are to be vertical or horizontal.
- All conduit runs should be securely fastened to the wall with an appropriate clamp or insert.

Customer Ground Plate:
- All conductive customer equipment within the transformer vault is to be bonded to the customer ground plate.
- Ground plate to be wall mounted using isolators at a height of 0.3m above finished floor.

Customer Bonding Conductors:
- Customer is required to install a minimum of 1/0 AWG Cu green jacketed conductor from their building ground to their ground plate within the vault.
- Customer is required to install a minimum of 8 AWG Cu green jacketed conductor to bond their equipment inside the vault.
- Bonding conductor will be placed horizontally at a minimum height of 0.6m from the floor and no closer than 0.3m from any energized conductors or terminations.
- Bonding conductor is not to be fastened to ENMAX uni-strut but may cross providing the cable is inside rigid PVC.
- All customer bond conductors are to be installed in rigid PVC.
General Vault Lighting:
- Lighting fixtures to be a minimum of two 40W, weatherproof, spec grade, low temperature LED equipped with a protective wire cage.
- 24hr Un-switched lighting is to be placed above each vault doorway and supplied by a separate 15 Amp circuit.
- General Room Lighting should be horizontally mounted along the perimeter of the vault, set over each transformer’s centre line. Final lighting locations are to be determined by ENMAX EPC Engineering.

Exit Signs:
- Emergency lighting and illuminated exit signs should be located directly above each point of exit.

Note:
In locations where the emergency exit from the indoor vault leads into a second room, a 24-hour light in the second room is required.

Emergency Battery Powered Light:
- The Customer is to install a Battery Light beside each Exit Sign. This Light is to sense an outage on the general lighting circuits and activate once the outage occurs. Prior to installation, the Battery Light design is first required to be sent to and accepted by ENMAX EPC Engineering.

Light Switches:
- Weatherproof, spec grade switches are required inside the vault.
- Light switches are to be located at a height of 1.25m from the floor at each vault exit.
- Each light switch should control all switched customer lighting within the vault.

Receptacles:
- Weatherproof, spec grade duplex power receptacles are required inside the vault.
- Each receptacle is to be located at a uniform height from the floor of 0.75m.
- The power supply circuit is to be a split circuit.

Heat and Smoke Detectors:
- Customer to install heat and smoke detectors on the vault ceiling between each pair of transformers as outlined in standard drawing 536-VIG-005.
- Smoke and heat detectors require dry contacts for ENMAX use.
## INDOOR VAULT COMMISSIONING CHECKLIST

### INSPECTION #1: GROUND GRID INSTALLATION

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<thead>
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<th>ITEM</th>
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<th>CUSTOMER INITIALS</th>
<th>ENMAX INITIALS</th>
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**ACKNOWLEDGEMENT**

PRINT: SIGN: PRINT: SIGN:
# INDOOR VAULT COMMISSIONING CHECKLIST

## INSPECTION #2: PRE-CONCRETE POUR

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<td>Transformer Vault and EDD Room Wall Construction</td>
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### INDOOR VAULT COMMISSIONING CHECKLIST

**INSPECTION #2: PRE-CONCRETE POUR (CONTINUED)**

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# INDOOR VAULT COMMISSIONING CHECKLIST

## INSPECTION #3: PRE-ACCEPTANCE / FINAL ACCEPTANCE

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<td>Section 4.3 Sump Pits and Covers</td>
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## INDOOR VAULT COMMISSIONING CHECKLIST

### INSPECTION #3: PRE-ACCEPTANCE / FINAL ACCEPTANCE (CONTINUED)

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**ACKNOWLEDGEMENT**

**Note:** Doors must be lockable before ENMAX can accept vault