



**NASHVILLE ELECTRIC SERVICE  
DRY VAULT DESIGN GUIDE**

**EFFECTIVE JULY 31, 2009**

# DRY VAULT DESIGN GUIDE

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## 1. Customer Responsibility

- 1.1. Customer should carefully consider the cost of the dry vault versus the real estate given up by a pad mount. The cost for the dry vault transformer is over 2 times higher not including the design fee and construction cost.
- 1.2. Vaults shall be designed, constructed, and maintained by the customer per NES requirements.
- 1.3. The vault must pass a final inspection by NES before NES equipment can be installed. A vault shall not pass final inspection until all the applicable requirements detailed in this specification have been satisfied.
- 1.4. These are only guidelines and each vault design is unique. All vault designs must be approved by NES prior to construction.
- 1.5. The customer shall notify and schedule an inspection before the vault floor is poured for grounding inspection and shall schedule a final inspection.

## 2. Drawing Submittal Requirements

### 2.1. Preliminary Design Drawings

- 2.1.1. Customer shall provide preliminary vault layout drawings for NES review and comment.
- 2.1.2. Ventilation of the vault should be discussed early – the vault may require a 4-hour shaft or have 4-hour horizontal supply or exhaust that will affect the design of the space and budget. NES will require a 4-hour solid wall protecting the shaft/chase.

### 2.2. Construction/Approval Drawings

- 2.2.1. Construction drawings submitted for approval shall illustrate compliance with all NES requirements and we recommend the customer do this at least four weeks prior to release for bid. This shall not be considered the same as the submission of information to NES Energy Services. That submission was to determine the size of the transformer – this is to determine if or vault guidelines have been followed. It is a different package to different people within NES.
- 2.2.2. Customer shall have structural, mechanical, and electrical drawings sealed and signed by a Tennessee licensed engineer for each area of responsibility. Customer may submit a complete set of signed sealed PDF's of construction drawings with specifications or a paper set. Drawings may be delivered to NES addressed to NES Standards – Rm 340, 1214 Church Street, Nashville, TN 37246 – or emailed to CESTandards@NESpower.com.
- 2.2.3. Customer shall submit two printed copies and an electronic copy (AutoCAD .dwg format) of the construction drawings to the NES Engineer for final approval before construction.
- 2.2.4. Customer shall notify the NES Engineer immediately of any proposed changes to the vault design after construction drawings have been approved.

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## 2.3. *As-Built Record Drawings*

- 2.3.1. Customer shall provide to the NES Engineer a printed copy and an electronic copy (AutoCAD .dwg format) of the record drawing showing all as-built revisions before the permanent electric service will be energized.
- 2.3.2. Customer shall ensure any as-built drawings with significant revisions from the original construction/approval drawings be sealed and signed by a Tennessee licensed engineer for each area of responsibility.

## 3. Transformer Quantity and Rating

- 3.1. The NES Engineer shall select the appropriate quantity and rating of transformers for vault design based on the size of the customer's main switchgear.
- 3.2. Due to initial estimated demand, NES may elect to install a lesser quantity and/or smaller rating of transformers in the vault. Through experience, NES has found it necessary to base the vault design on the size of the customer's main switchgear. Vaults sized on initial estimated demand may not be large enough to serve future electrical demands on the premise.

## 4. Fire Rating

- 4.1. Vault shall be four-hour fire rated and constructed of concrete or masonry with adequate structural strength for the conditions.
- 4.2. Thermal insulation or other fireproofing materials shall not be installed on ceiling or wall of vault.

## 5. Personnel Access

### 5.1. *General Requirements*

- 5.1.1. Vault shall **only** be accessible to qualified NES personnel. Vaults shall not be used for customer's storage. Mechanical equipment shall be located such that it can be maintained by the customer from outside the vault. Mechanical equipment shall not be located within the vault structure. Duct work, filters, fans, etc. shall not be located within the vault. Ventilation shafts shall not be located over electric equipment. Duct smoke detectors shall not shut down the fans. Fire dampers in the ducts are not allowed.
- 5.1.2. The vault shall have at least two means of egress, one at each extreme of the area, not necessarily in opposite walls. A sign shall be posted by each door stating

**WARNING: EMERGENCY EXIT DO NOT BLOCK**



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- 5.1.3. Access for personnel shall be located such that the path of egress is clearly marked and leads to a safe exit that does not open into an unsafe condition such as a driveway. Provide battery backup LED exit lights with spot lights shall be provide adjacent personnel doors 18” AFF with buzzer and the ability to flash the green exit sign. This fixture shall be equal to a Cooper Sure-lite CCXH70-30GWH-DHMRT-SD-VS2WP (weatherproof vandal shield). Egress must not be through the building’s electrical room.
- 5.1.4. All access locations and details shall be subject to NES approval.

## 5.2. Personnel Doors

- 5.2.1. Personnel doors shall open in the direction of egress and be equipped with Yale brand 2100 series flat bar exit device with door closer on the vault side of the door. Outside trim should be specified as Augusta outside trim lever with Type 262F wide escutcheon trim. The lock set shall be set up to operate as “storeroom” (ANSI 09) function. Hardware manufacturer notes that an easy field change is required to achieve the “storeroom” function with this trip kit. Details should be discussed with manufacturer’s representative. Lock core shall be provided and installed by NES. The Customer shall not have access to the vault after equipment has been energized.
- 5.2.2. Each doorway leading into a vault from the building interior shall be provided with a tight-fitting door that has a minimum fire rating of three hours.
- 5.2.3. Stairs shall not be permitted inside a vault. If stairs are required in the path of egress, they must be located outside the vault with no less than a four foot by eight foot (4’ x 8’) landing between the vault door and stairs.
- 5.2.4. Each doorway leading into a vault shall have OSHA approved permanent and conspicuous warning signs reading as follows:

**DANGER – HIGH VOLTAGE – KEEP OUT**



- 5.2.5. If hinged doors are utilized for equipment installation/removal, one of the personnel doors may be deleted as long as the hinged doors meet all requirements of the personnel access door as described above.

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## 6. Equipment Installation Provisions and Weight

### 6.1. General Requirements

- 6.1.1. Locate vault at ground level with truck and crane access.
- 6.1.2. Provide a roll-up door or a set of hinged doors for equipment installation. Fixed removable panels shall not be accepted.
- 6.1.3. Equipment doors shall have a means of latching the door in the open position.
- 6.1.4. Transformer may be moved into position by NES using rollers (skates). Therefore, the vault floor shall be clean and smooth without any irregularities in the finish. The structural construction drawings shall indicate this.
- 6.1.5. Maximum equipment weights are shown in Table 4 on page 16.

### 6.2. Clearances and Working Space

- 6.2.1. Minimum clear opening for equipment installation and removal shall be as listed in Table 2 on page 15.
- 6.2.2. Those same clearances shall be required to move the equipment into operating position.
- 6.2.3. The architectural construction drawings as described in Section 2 on page 3 shall illustrate that the equipment can make any turns and still maintain clearances while being moved into position.
- 6.2.4. Vault shall be designed in such a way as to allow replacement of any one unit without disturbing any of the other units in service.
- 6.2.5. Customer shall provide adequate working clearances around electrical equipment installed in its operating position. Working space requirements are shown in Table 3 on page 16 and in Figure 1 on page 11. Architectural Construction drawings shall be submitted indicating the kVA size of the transformer and the clearances.
- 6.2.6. Working Clearances Around Equipment Access
  - (a) Customer shall provide six feet (6') horizontal working space from the vault access to the street or curb on each side of the equipment access.
  - (b) Customer shall provide forty feet (40') vertical working space from the elevation of the vault floor throughout the entire horizontal working space.
  - (c) Fixed objects of any kind shall not be located within the working space. NES will not approve an overhang inside the working space unless it is fully retractable. Fixed awnings within the working space are not acceptable.
  - (d) Twenty feet (20') horizontal clearance shall be provided between electric utility vault and any above ground or underground storage tank, fill valve, or vent valve.

## 7. Vault Accessories

### 7.1. General Requirements

- 7.1.1. Piping unrelated to the functions of the electrical service shall not be routed through the vault.

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- 7.1.2. Piping containing liquids, sewerage, chemicals, corrosive or hazardous gases shall not be routed through the vault.
- 7.1.3. Customer shall protect all exposed steel items in the vault from corrosion by hot dipped galvanizing.
- 7.1.4. Fire detection or suppression equipment shall not be located in the transformer vault.
- 7.1.5. Plumbing and Fire Protection construction drawings shall be submitted to NES to verify that these conditions have been met.

## **7.2. Liquid Containment and Sump Pump Provisions**

- 7.2.1. Liquid containment capacity shall be greater than or equal to 110% of the volume of liquid in the largest transformer. Liquid capacity is shown in Table 4 on page 16.
- 7.2.2. When a doorway leads into the vault, a door sill or curb that is of sufficient height to confine the liquid from the largest transformer within the vault shall be provided. In no case shall the height be less than four inches (4") or greater than eight inches (8"). Door sill or curb shall be removable if the doorway is used for equipment installation or removal.
- 7.2.3. Floor shall be sloped one percent (1.0%) to the liquid containment pit.
- 7.2.4. Containment pit shall be covered with a minimum of two grating sections that must weigh less than 150-lbs.
- 7.2.5. The structural construction drawings shall indicate the calculation of the size of the containment pit.

## **7.3. Pulling Irons**

- 7.3.1. Pulling irons shall be located on each wall, one foot (1') above finished floor, centered on each transformer.
- 7.3.2. Additional pulling irons may be required.
- 7.3.3. Quantity and location of pulling irons are subject to NES approval.
- 7.3.4. Pulling irons shall be installed to withstand twice the expected load. The expected load is 6,000-lbs.
- 7.3.5. Typical pulling iron details are shown in Figure 2 on page 12. Other pulling iron shapes shall be approved by the NES Engineer.
- 7.3.6. Pulling irons shall be required in the ceiling above the primary and secondary conduit entry.
- 7.3.7. The structural construction drawings shall indicate the location of the pulling irons.

## **7.4. Cable Racking**

- 7.4.1. The electrical construction drawings shall indicated cable racking from the secondary conduits to the transformer. Layout shall be approved by the NES Engineer.

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## **7.5. Grounding Provisions**

- 7.5.1. Ground inserts equal to Dossert PGU30-4 shall be cast into vault walls at the top and bottom of the conduit where conductor enters the vault, and on the floor near each transformer, as shown in Figure 3 on page 13.
- 7.5.2. All ground inserts shall inter-connected with 4/0 AWG-7STR bare hard drawn copper conductor conforming to the latest revision of ASTM B8.
- 7.5.3. Ground inserts shall be noted on the electrical construction drawings.
- 7.5.4. Grounding conductor shall be bonded to structural steel in the vault floor and wall.
- 7.5.5. Customer shall contact NES Engineer to coordinate inspection of grounding system before vault concrete is poured.

## **7.6. Support Beams**

- 7.6.1. Once transformers are in position, they shall be placed on concrete support beams.
- 7.6.2. The customer shall provide three movable concrete support beams per transformer. Beam details are shown in Figure 4.
- 7.6.3. Structural construction drawings shall indicate the support beams.

## **8. Ventilation and Equipment Cooling**

### **8.1. General Requirements**

- 8.1.1. Provide ventilation adequate to dispose of the transformer full-load losses without creating a temperature rise that is in excess of the transformer rating.
- 8.1.2. Locate ventilation openings as far as possible from doors, windows, fire escapes, and combustible materials.
- 8.1.3. Louvers utilized for ventilation shall include bird screens. Customer shall submit detailed drawings for approval as part of the approval drawings described in Section 2 on page 3.
- 8.1.4. Protect all exposed steel items from corrosion by hot dipped galvanizing.
- 8.1.5. Ventilation must be installed and functional before NES will energize the transformers.
- 8.1.6. The mechanical construction drawings shall indicate the ventilation calculations for the vault.

### **8.2. Ventilation by Natural Circulation**

- 8.2.1. A vault ventilated by natural circulation of air shall be permitted to have roughly half of the total area of openings required for ventilation in one or more openings near the floor and the remainder in one or more openings in or near the roof, or all of the area required for ventilation shall be permitted in one or more openings in or near the roof.
- 8.2.2. The combined net area of all ventilating openings, after deducting the area occupied by screens, gratings, or louvers, shall not be less than three square inches per kVA of transformer capacity of the vault.

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## **8.3. Ventilation by Forced Air**

- 8.3.1. The full load heat loss for each transformer is listed in Table 4 on page 16.
- 8.3.2. The temperature of the cooling air (ambient vault temperature) shall not exceed 122°F (50°C), and the average temperature of the cooling air for any 24-hour period shall not exceed 104°F (40°C).
- 8.3.3. Fans shall be controlled by a thermostat rated for installation in a damp environment.
- 8.3.4. Ventilation ducts shall be constructed in 4-hour walls – preferably a 4-hour vertical shaft to the roof with an exhaust fan on top. A grate or protection bars shall be provided to prevent intruders from entering the shaft and getting into the vault room.
- 8.3.5. The customer’s mechanical engineer shall design the ventilation system to the above requirements.
- 8.3.6. Customer shall provide drawings sealed and signed by a Tennessee licensed mechanical engineer as described in Section 2 on page 3.

## **9. Vault Electrical**

### **9.1. General Requirements**

- 9.1.1. Vault lighting/receptacle circuits shall be designed, provided, and installed by the customer.
- 9.1.2. Installation shall comply with the current edition of the National Electrical Code (NEC).
- 9.1.3. UL listed rigid non-metallic conduit, fittings, and boxes shall be used throughout the installation. The entire conduit system shall be installed and equipped so as to prevent water from entering the conduit system. All supports, bolts, straps, screws, and so forth, shall be of corrosion-resistant materials or be protected against corrosion by approved corrosion-resistant materials.
- 9.1.4. For the purpose of electrical design, vaults shall be considered “Damp Locations” unless otherwise specified.
- 9.1.5. Locations of equipment shall be subject to review by NES.
- 9.1.6. Customer shall provide drawings sealed and signed by a Tennessee licensed electrical engineer as described in Section 2 on page 3.

### **9.2. Disconnect Switch / Panelboard**

- 9.2.1. A 120/240 volt single phase 60 ampere NEMA type 4X distribution panel with breakers Square D Type QOB or approved equal shall be installed in the vault to be operated by utility personnel. Panel shall be furnished with a main breaker.
- 9.2.2. At least two lighting circuits shall be provided if the lighting load is over 800-Watts.
- 9.2.3. At least two receptacle circuits shall be provided and shall have ground fault circuit interrupting breakers for personnel protection.
- 9.2.4. One dedicated 20A receptacle circuit shall be provided adjacent the oil containment pit.
- 9.2.5. Two spare 20A breakers shall be installed for future use by NES personnel.

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- 9.2.6. Power/lighting circuits, lighting, panelboard, ect – shall be surface mounted.
- 9.2.7. All circuits with-in vault shall be dedicated to the vault and shall not feed other items outside the 4-hour rating. They may feed a mechanical room that ventilates the vault.
- 9.2.8. The panel directory shall be typed.

## **9.3. Illumination**

- 9.3.1. Illumination shall be provided for all working spaces about electrical equipment. Illumination level shall be 50 foot-candles or greater. A fluorescent light source consisting of 48 inch T8 lamps is required. Provide electronic ballast with cold start (zero degree) capabilities. Fixtures must be equal to Lithonia DMW232120GEB10IS.
- 9.3.2. The luminaires (fixtures) shall be arranged so that persons changing lamps or making repairs on the lighting system are not endangered by live parts or other equipment. Lighting equipment shall not be located directly above electrical equipment or conduit penetrations.
- 9.3.3. Light switch shall be located adjacent to each personnel access.
- 9.3.4. Exit lights with battery backup shall be installed above personnel doors.

## **9.4. Receptacles**

- 9.4.1. At least one receptacle shall be provided on each interior wall. Additional receptacles may be required by the NES Engineer. Receptacles shall be rated 120V, 20A, of the duplex type.
- 9.4.2. Receptacles shall be installed at a height of thirty-six inches (36”) above the floor.

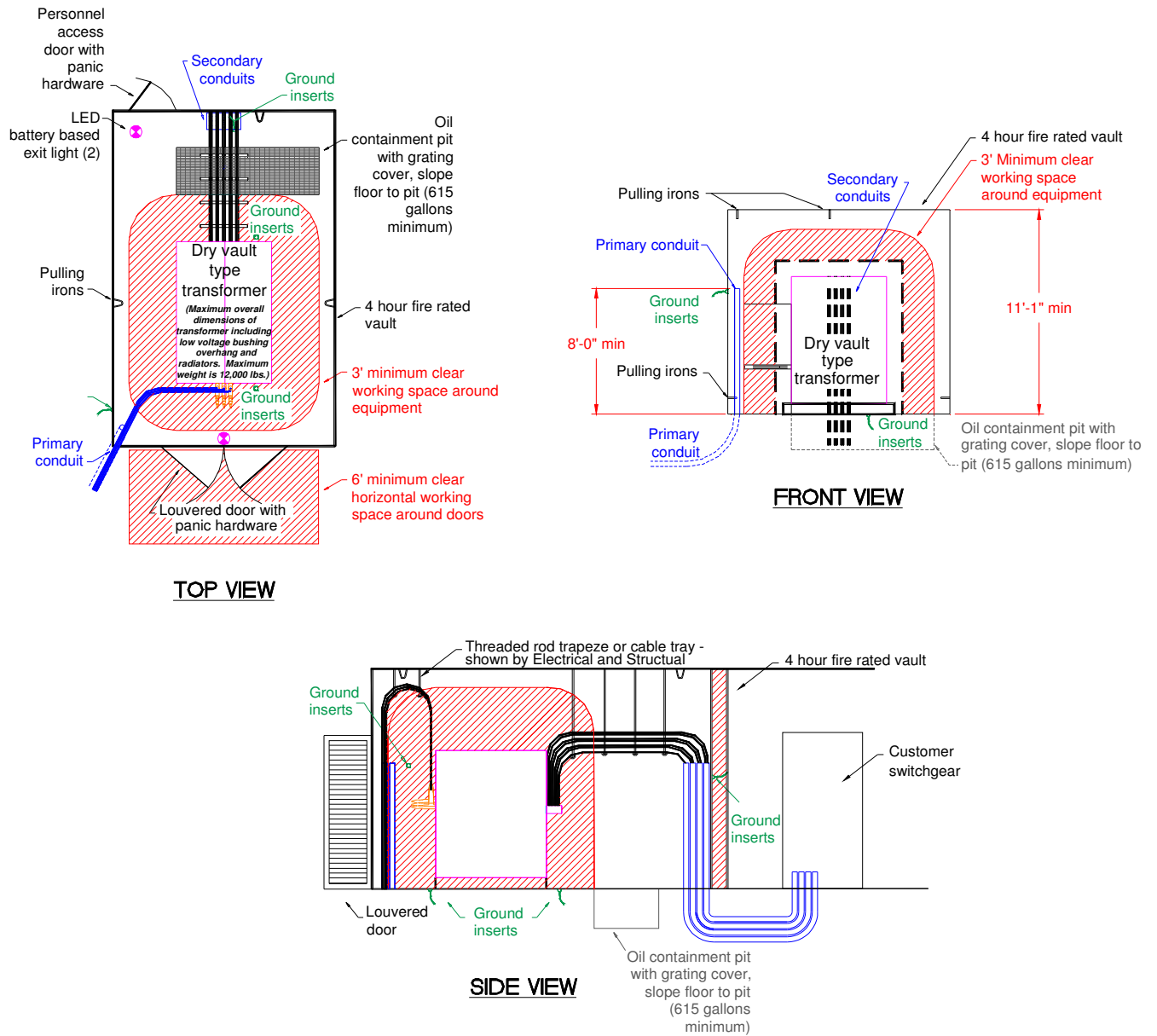
## **9.5. Conduit Terminations**

- 9.5.1. Conduits shall enter through the floor shall be against a wall and protected by rigid galvanized conduit to a height of not less than eight feet (8’) from the finished floor.
- 9.5.2. Conduits shall not be within the working space around equipment.

## **9.6. Secondary Entrance**

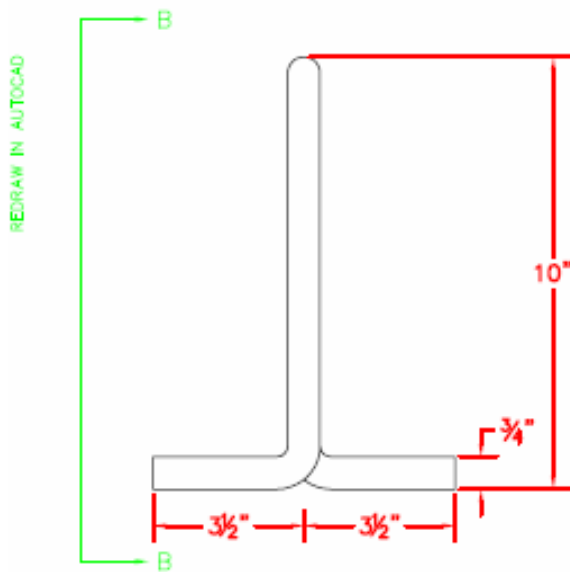
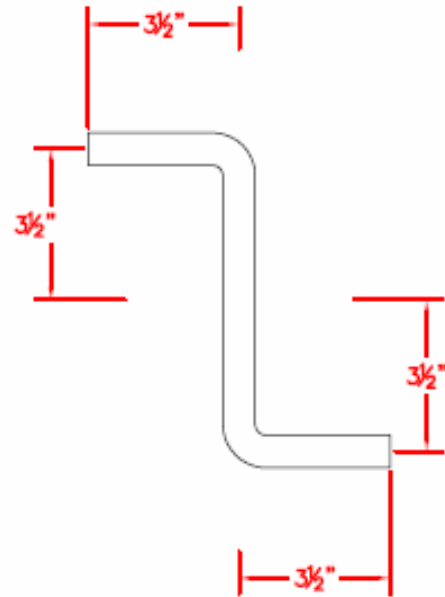
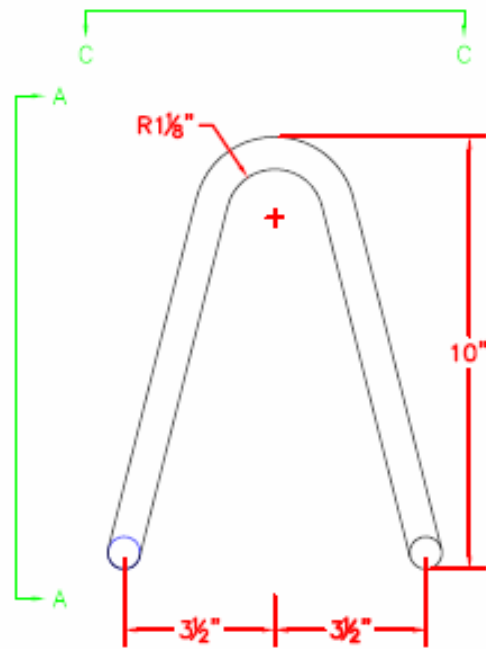
- 9.6.1. Customer shall provide one bank of conduits for secondary service cables unless otherwise approved by the NES Engineer in writing.
- 9.6.2. Secondary ducts entering a vault through the floor shall extend eight inches (8”) above finished floor in dry vaults, and the arrangement of the ducts shall be subject to NES approval.
- 9.6.3. The specific number of conduits shall be determined and approved by the NES Engineer.
- 9.6.4. When entering through the walls, the number of secondary ducts, the elevation of the entrance, and the arrangement of the ducts shall be subject to NES approval.

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**Figure 1: Typical Vault Layout (From NES Drawings UGS 00026)**

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STOCK # 060440000  
CU CODE: NPIRON

MADE FROM 3/4" DIA. IRON  
BAR, GALV.  
APPROX. WEIGHT 3 1/2  
LBS.

**Figure 2: Pulling Irons (from NES Drawing UN 10386)**

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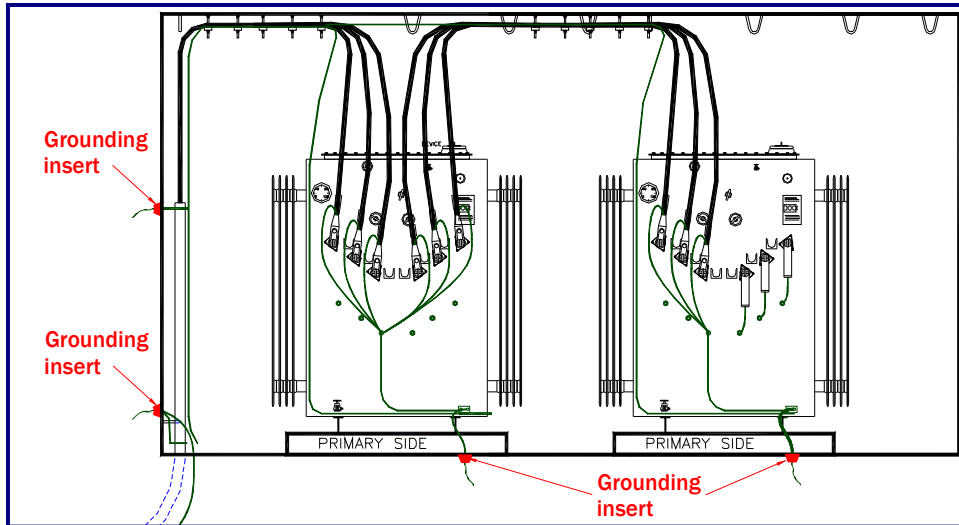


Figure 3: Ground Insert Locations (from NES Drawing USK 41495)

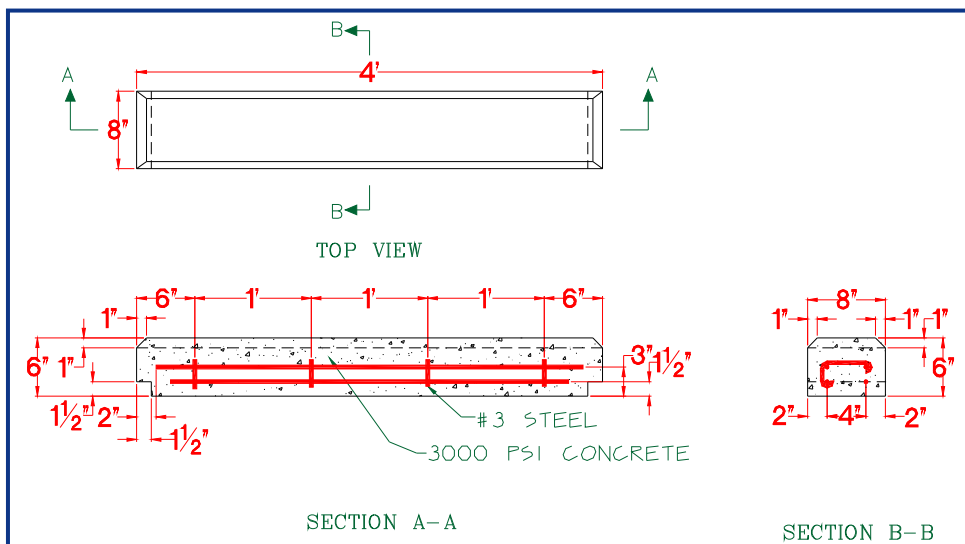
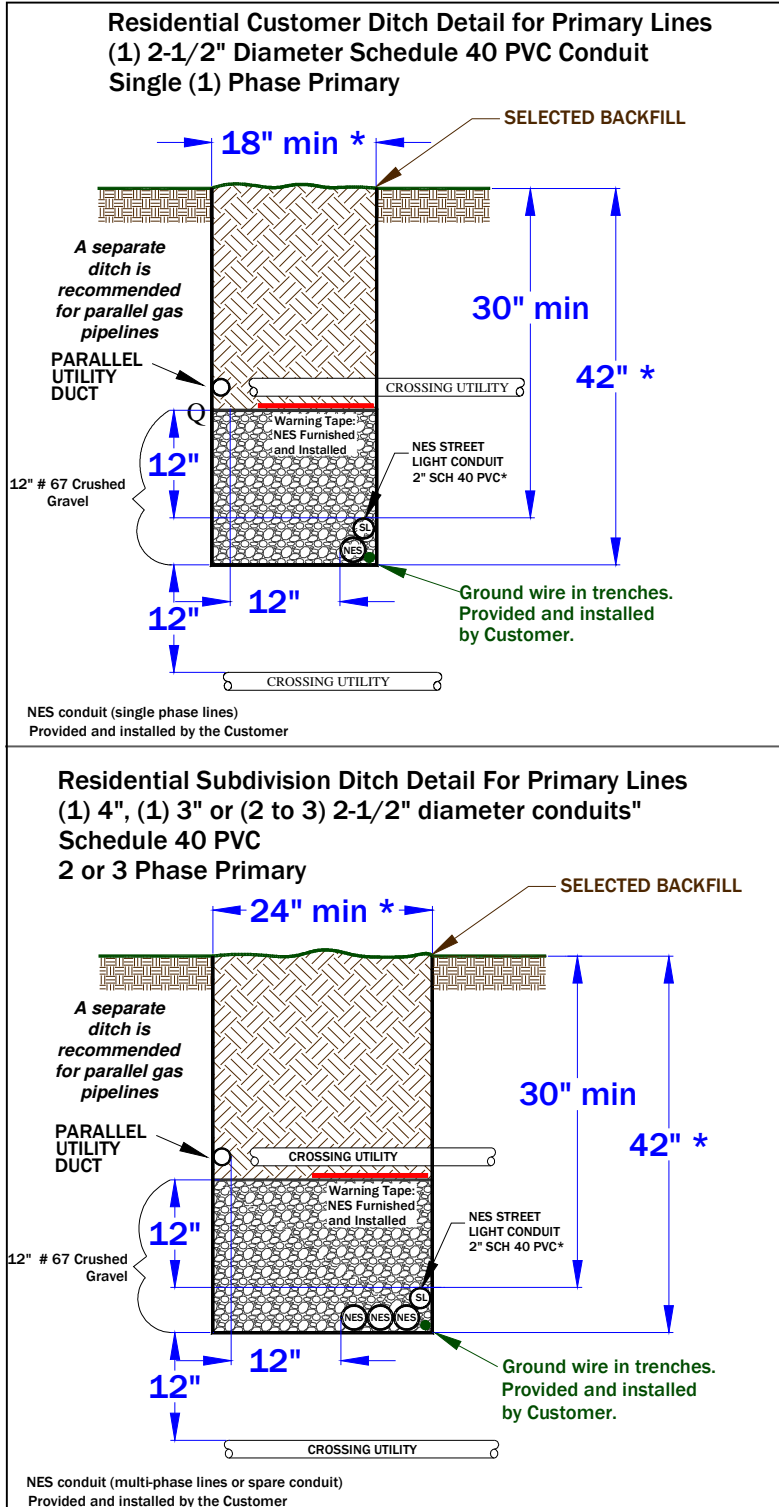


Figure 4: Concrete Support Beams (from NES Drawing UN-22304)

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\* - For individual residences, if NES is the only utility, and the conduit is installed such that the written schedule of the conduit is visible, the dimensions may be reduced to six inches (6") wide by thirty-six inches (36") deep, enabling Customer to use a Ditch Witch. For solid rock conditions see Appendix for reduced depth dimensions and instructions.

Figure 5: Trench Details (from NES Drawing Customer Guidelines)

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## 9.7. Maximum Fault Current

9.7.1. See Table 1 for available fault current of each transformer. Fault current is calculated on 5.75% impedance base with the ANSI tolerance of 7.5% below.

### Appendix A: Tables

Power Rating	Sec Voltage	Rated Current	Maximum Available Fault Current	Width		Length		Height	
				(In.)	(Ft.-In.)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)
(kVA)	(V)	(A)	(A)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)
500	125/216	1,336	25,127	60	5 - 0	96	8 - 0	77	6 - 5
	277/480	601	11,307						
750	125/216	2,005	37,691	60	5 - 0	96	8 - 0	92	7 - 8
	277/480	902	16,961						
1000	125/216	2,673	50,255	72	6 - 0	108	9 - 0	93	7 - 9
	277/480	1,203	22,615						
1500	125/216	4,009	75,382	72	6 - 0	108	9 - 0	97	8 - 1
	277/480	1,804	33,922						
2000	277/480	2,406	45,229	84	7 - 0	120	10 - 0	113	9 - 5
2500	277/480	3,007	56,536	84	7 - 0	120	10 - 0	117	9 - 9
3000	277/480	3,608	67,844	96	8 - 0	120	10 - 0	120	10 - 0
3750	277/480	4,511	84,805	100	8 - 4	120	10 - 0	120	10 - 0

**Table 1: Dry Vault Transformer Ratings and Maximum Dimensions**

Rating	Width		Length		Height	
	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)
(kVA)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)
500	84	7 - 0	120	10 - 0	101	8 - 5
750	84	7 - 0	120	10 - 0	116	9 - 8
1000	96	8 - 0	132	11 - 0	117	9 - 9
1500	96	8 - 0	132	11 - 0	121	10 - 1
2000	108	9 - 0	144	12 - 0	137	11 - 5
2500	108	9 - 0	144	12 - 0	141	11 - 9
3000	120	10 - 0	144	12 - 0	144	12 - 0
3750	124	10 - 4	144	12 - 0	144	12 - 0

**Table 2: Minimum Clearance for Moving Transformer into Position**

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Rating	Width		Length		Height	
(kVA)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)	(In.)	(Ft.-In.)
500	132	11 - 0	186	15 - 6	133	11 - 1
750	132	11 - 0	186	15 - 6	148	12 - 4
1000	144	12 - 0	198	16 - 6	149	12 - 5
1500	144	12 - 0	198	16 - 6	153	12 - 9
2000	156	13 - 0	210	17 - 6	169	14 - 1
2500	156	13 - 0	210	17 - 6	173	14 - 5
3000	168	14 - 0	210	17 - 6	176	14 - 8
3750	172	14 - 4	210	17 - 6	176	14 - 8

**Table 3: Minimum Clear Working Space for a Single Transformer**

Size	Width	Length	Height	Weight	Oil Volume	Full Load Heat Losses *
(kVA)	(in)	(in)	(in)	(US Pounds) ±20%	(US Gallons) ±20%	(kW)
500	60	96	77	5,800	225	6
750	60	96	92	7,700	425	8
1,000	72	108	93	9,500	450	11
1,500	72	108	97	12,000	510	17
2,000	84	120	113	16,000	575	22
2,500	84	120	117	20,000	650	28
3,000	96	120	120	25,000	850	33
3,750	100	120	120	25,000	900	41

**Table 4: Miscellaneous Transformer Information**

\* Section 8.1.1

## Appendix B: Reference Drawings

Partial details are included in the figures listed below. The complete NES drawing is available upon request. Drawings can be e-mailed in AutoCAD or pdf format.

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## Appendix C: Revision History

Revision Date	Revision History	Approvals <small>(original signatures available in Room 340 of the NES Building)</small>
02/20/07	Original Issue	Created by: <u>Sally Dunn</u> Supervisor: <u>Ron Davidson</u> Manager: <u>Nick Thompson</u>
03/26/07	<ul style="list-style-type: none"> <li>• Pg 3: Corrected hatching of working space on Figure 1.</li> <li>• Pg 5: Added clarification that customer cannot use vault space in 5.1</li> <li>• Pg 5: Added egress warning sign to 5.2</li> <li>• Pg 5: Added requirement that egress cannot be into electric room (this may be where problem started that necessitates employee evacuation).</li> <li>• Pg 8: Deleted 7.5.3, 7.5.4, and Figure 4 (dry transformers are ordered with I-beams)</li> <li>• Pg 9: Corrected table number on 8.3.1.</li> <li>• Pg 9: Deleted 9.1.4. (applies to network not dry vaults)</li> <li>• Pg 10: deleted 9.2.1 and 9.2.2. (applies to network not dry vaults)</li> <li>• Pg 10: added "if required" to 9.2.6.</li> <li>• Pg 10: added 'with battery backup for lights' to 9.3.3.</li> <li>• Pg 11: added "if required by Engineer" to 10.1.2.</li> <li>• Pg 11: added "1ft bevel for primary, 6" bevel for secondary" to Figure 5.</li> <li>• Pg 11: changed 10.2.1.(a) to indicate 5" or 6" conduit may be required.</li> <li>• Pg 11: Deleted 10.2.2. (applies to network not dry vaults)</li> <li>• Pg 12: added "and the arrangement of the ducts shall be subject to NES approval" to 10.3.2.</li> <li>• Pg 12: added "When entering through the walls" to 10.3.3.</li> <li>• Pg 12: deleted 2<sup>nd</sup> sentence referencing fault current (applies to network vaults) from 11.1.</li> <li>• Pg 13: Corrected tables – dimensions and ratings to match Specification ET-560-3, deleted sidewalk vault table. Added footnotes to explain tables</li> </ul>	Created by: <u>Sally Dunn</u> Supervisor: <u>Ron Davidson</u> Manager: <u>Nick Thompson</u>
06/29/07	<ul style="list-style-type: none"> <li>• Pg 2: Added door clearance to vault layout drawing.</li> <li>• Pg 4: Changed 6.2.6 (a) to read "Customer shall provide six feet (6') horizontal working space from the vault access <u>to the street or curb</u> on each side of the equipment access." Removed 6.2.6 (b).</li> <li>• Pg 10: Deleted figure and all of section 10.2 (Primary Bayout), added 10.1.4.</li> <li>• Pg 11: Changed ditch detail to indicate schedule 40 PVC, corrected arrow to point to concrete and corrected backfill/gravel shading on the galvanized conduit detail.</li> <li>• Pg 13: Added table showing required working space.</li> <li>• Corrected cross-references throughout document based on new table and page numbers.</li> <li>• Changed "Customer" to "customer" throughout document, spelled out numbers less than ten, to be consistent with Corporate Communications' direction.</li> </ul>	<u>Ronald Reasonover</u> Created by:  <u>Ron Davidson</u> Supervisor:
3/18/08	<ul style="list-style-type: none"> <li>• Pg 1: Changed 1.1.2 "inspection by the NES Engineer" to "inspection by NES"</li> <li>• Pg 1: Added 1.1.3 disclaimer that each design was unique and each must be approved prior to construction.</li> <li>• Pg 8: Added 8.1.2 to define maximum temperature rise (taken from dry-vault transformer specification ET 560-3.) Corrected 8.3.2 to be consistent with IEEE C57.12.24-2000 (50 deg C cooling air, 40 deg C for a 24 hour period).</li> </ul>	<u>Nick Thompson</u> Manager:

# DRY VAULT DESIGN GUIDE

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07/14/09	<ul style="list-style-type: none"> <li>• Pg 3: Added cost warning in 1.1.</li> <li>• Pg 3: Added "designed" to 1.2.</li> <li>• Pg 3: Added note for inspection prior to floor pour in 1.5.</li> <li>• Pg 3: Added ventilation note in 2.1.2.</li> <li>• Pg 3: Added a note about when to get final drawing submittals and a statement that there are two submittals to NES and not just one in 2.2.1.</li> <li>• Pg 3: Revised the note on what format the drawings could be submitted in – in 2.2.2.</li> <li>• Pg 4: Added an illustration of the Warning sign in 5.1.2.</li> <li>• Pg 4: Moved Figure 1 to Pg. 11.</li> <li>• Pg 4: Added description of exit light to 5.1.3.</li> <li>• Pg 5: Revised description of Yale brand door hardware in 5.2.1.</li> <li>• Pg 5: Added description of sign to 5.2.4.</li> <li>• Pg 6: Added a note for the structural drawings to include a smooth floor in 6.1.4.</li> <li>• Pg 6: Added a note the architectural construction drawings shall illustrate the equipment can turn into place if needed in 6.2.3.</li> <li>• Pg 6: Added a note that the architectural construction drawings shall indicate the kva and the clearances in 6.2.5.</li> <li>• Pg 6: Added a note concerning distances of fuel oil storage distance from the vault in 6.2.6 (d).</li> <li>• Pg 7: Added note of what plumbing engineer should include with the submittal in 7.1.5.</li> <li>• Pg 7: Revised containment pit note two have at least two grating sections in 7.2.4.</li> <li>• Pg 7: Added note for structural engineer to show calculation of pit size in 7.2.5.</li> <li>• Pg 7: Added note to include pulling irons above in the ceiling above the primary and secondary conduits in 7.3.6.</li> <li>• Pg 7: Added a note for the structural engineer to show where the pulling irons are in 7.3.7.</li> <li>• Pg 7: Revised the wording of 7.4.1 from customer to electrical construction drawings and from secondary bayout to secondary conduits.</li> <li>• Pg 8: Moved the Pulling Iron Figure to Pg 12.</li> <li>• Pg 8: The contractor shall provide the ground inserts which is also listed in 7.5.1.</li> <li>• Pg 8: Added more specific instructions about the ground wire to use in 7.5.2-7.5.5.</li> <li>• Pg 8: Indicated the structural engineer shall show or indicate the support beams in 7.6.3.</li> <li>• Pg 8: Indicated the mechanical engineer shall show the ventilation calculations in 8.1.6.</li> <li>• Pg 9: Moved the Ground Insert Figure and Concrete Support Figure to Pg 13.</li> <li>• Pg 9: Made the requirement for any ventilation shaft more clear in 8.4.4.</li> <li>• Pg 9: Revised owner to customer in 9.1.1.</li> <li>• Pg 9: Added a recommended manufacturer and a main breaker in the panel in 9.2.1.</li> <li>• Pg 9: Revised the two circuit lighting rule to be if the circuit is over 800-W in 9.2.2.</li> <li>• Pg 9: Added a location for a dedicated receptacle in 9.2.4.</li> <li>• Pg 9: Added statements for surface mounted equipment and dedicated equipment circuits in 9.2.6 and 9.2.7.</li> <li>• Pg 10: Added statement for a typed panel directory in 9.2.8.</li> <li>• Pg 10: Indicated a lamp, ballast and fixture type in 9.3.1.</li> <li>• Pg 10: Deleted battery ballast requirement in 9.3.2.</li> <li>• Pg 10: Deleted statements about bayouts that was 10.1.1.</li> <li>• Pg 10: Revised "that" to "shall" in 10.1.1.</li> <li>• Pg 11: Revised Figure 1 – the secondary conduits enter thru the floor.</li> <li>• Pgs 11-16: Revised the NES standard drawings numbers the figures reference.</li> </ul>	<p><u>Ronald Reasonover</u> Created by:</p> <p><u>Ron Davidson</u> Supervisor:</p> <p><u>Nick Thompson</u> Manager:</p>