NASHVILLE ELECTRIC SERVICE
VAULT DESIGN GUIDE
(NON-NETWORK)

JULY 2021

NON-NETWORK VAULT DESIGN GUIDE

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NON-NETWORK VAULT DESIGN GUIDE

1. Purpose

1.1. The purpose of this guide is to ensure the furnishing of an electrical vault for utility equipment. Once designed and constructed by the Customer and accepted by NES, the electrical vault will house utility transformers, and other equipment required to serve the Customer's electrical needs.

1.2. It is intended that this document serve as a guide to the Customer in preparing a vault design rather than as a detailed specification. The Customer shall furnish complete descriptive information and specifications of the proposed vault.

1.3. This guide is intended for non-network vaults. Refer to Appendix B for map of network and non-network areas. If a location borders the red line, contact NES Energy Services or the Design Engineer to confirm whether to use the network or non-network vault design guide.

2. Customer Responsibility

2.1. The word "Customer" in this document refers to the property owner or developer. Many steps will actually be completed by consultants or contractors (Customer's Architectural Team), but the ultimate responsibility rests with the Customer.

2.2. Doors, vents, removable vault tops, and grating shall be designed, constructed, and maintained by the Customer per NES requirements.

2.3. The Customer shall reimburse NES for the cost of any maintenance or cleanup performed in the vault by NES once equipment in the vault is energized.

2.4. The Customer shall have an "Application for New Commercial Service" turned into NES Energy Services. The owner does need a reasonable estimation of the square footage of the building. At a minimum, the Customer shall provide a site plan, power distribution diagram, and service load calculations when signing up for service. The load calculation can be different than the calculation used to determine the vault size outlined in this guideline.

2.5. The vault shall pass final inspection by the NES Engineer including, but not limited to: Vault top removal and replacement before NES equipment can be installed.

2.6. Damage to existing NES facilities by the Customer shall be repaired by NES at the expense of the Customer. Damage to any NES equipment shall be at the expense of the customer.

2.7. Customer shall not locate vault below footprint of the street.

2.8. Customer shall obtain permit with Metro Public Works for Customer-owned vaults and vault tops located in sidewalks. Contact the Permit Office at 615-862-8762; NES Engineer can provide contact names if necessary. Customer shall provide easements indicated on property documents.

3. Drawings

3.1. Preliminary Design Drawings

3.1.1. Customer's Architectural Team shall provide preliminary vault layout drawings for NES review and comment. It is recommended that the preliminary design drawings be included in the design development package.

3.2. Construction/Approval Drawings

3.2.1. The Customer's Architectural Team shall submit copies of the Vault Design Guide with the sheet numbers, note numbers, and details line by line where each item as applicable is addressed. The drawings that are indicated in the marked-up Vault Design Guide shall be submitted for approval. The submittal shall illustrate compliance with ALL applicable requirements listed in this design guide. Architectural, Civil, Structural, Mechanical, Plumbing and Electrical shall review, not just Electrical. Application will be rejected without marked up Design Guide. Work with the Design Engineer for the submittal requirements (quantity, size, format, etc.).

3.2.2. Re-submittal shall be required if the construction drawings lack enough detail for the NES Engineer to confirm that all requirements are being satisfied.

3.2.3. It is recommended that the Customer submit construction drawings for review four (4) weeks before scheduled issue date of contract documents.

3.2.4. Structural, mechanical, architectural, civil, and electrical drawings shall be sealed and signed by a Tennessee licensed engineer for each area of responsibility.

3.2.5. The Customer shall submit the construction drawings to NES Energy Services and the Design Engineer for final approval before construction. Work with the Design Engineer for the submittal requirements (quantity, size, format, etc.).

3.2.6. The Customer shall notify the NES Engineer immediately of any proposed changes to the vault design after construction drawings have been approved. Any changes to the vault design after the initial design approval will require additional NES review and approval.

3.2.7. Customer shall submit an existing site plan and a final site plan to help coordinate lighting, recognizing existing underground lighting pull boxes, and underground electrical lines indicated on civil plans.

3.3. As-Built Record Drawings

3.3.1. A printed copy and electronic copy (AutoCAD .dwg format) of the record drawings showing all as-built revisions shall be provided to the NES Engineer before the permanent electric service will be energized.

3.3.2. As-Built drawings with significant revisions from the original construction/approval drawings shall be sealed and signed by a Tennessee licensed engineer for each area of responsibility.

3.3.3. The Customer's Architectural Team shall provide as-built surveys in AutoCAD format and in plan view for infrastructure (ductbank and manholes) installed.

4. Architectural Requirements

4.1. Vault Inspection and Acceptance (Architect shall note 4.1.1. - 4.1.10. on Architectural drawings)

4.1.1. The Customer shall notify the NES Engineer at least five (5) working days before the grounding inspection. This must be done before the vault walls and floors are poured.

4.1.2. The Customer shall notify the NES Engineer at least five (5) working days before the proposed final vault inspection date.

4.1.3. The vault must be complete, secure, clean, and accessible for inspection to take place.

4.1.4. The Customer shall connect a temporary feed (a generator is acceptable) to the panelboard so NES can confirm that the light and receptacle circuits are operational.

4.1.5. The Customer shall remove and replace the vault tops (Functionality Test) in the presence of NES to obtain the acceptance of NES (vault shall be cleaned after lift-out test before handing over to electrical contractor). Rigging hardware and lifting means shall be provided by the customer.

4.1.6. All applicable components of this guide shall be satisfied before the vault can pass inspection and be accepted for use by NES. Vault shall be sprayed down to get rid of dust after electrical contractor completes work, before transition to NES. Installation of NES equipment is contingent on acceptance of the vault by NES.

4.1.7. Contractor to protect lift off slabs and gratings with a layer of plywood. Contractor to coordinate with NES how many sections of grating to leave unprotected for ventilation. Contractor to clean debris from grates prior to turning building over to the owner. Contractors are not to enter the vault after turning over vault to NES. (Omit if no lift off slabs).

4.1.8. Route Vault Miscellaneous Steel Shop Drawings as well as Switchboard Shop Drawings through NES Energy Services and the Design Engineer for approval.

4.1.9. Vault floor is to be clean and smooth without any irregularities in the finish (slick machine/trowel finish required). Any expansion joints shall be saw cut.

4.1.10. Architect shall be responsible to share this NES Vault Design Guide to all design teams and applicable parties (general contractors, etc).

4.1.11. Architect to provide codes sheet or sheet index that indicate square footage of each level of structure and total square footage of occupied or unoccupied space.

4.1.12. Refer to Drawing #UGS-00036 for building setback for in sidewalk type vaults.

4.2. General Requirements

4.2.1. Transformer Size

(a) Transformer sizing and quantity shall be determined by NES Energy Services and the Design Engineer. Customer to submit total building square footage (conditioned and non-conditioned), along with the break down for specific occupancy type (parking, office, retail, residential, hotel, restaurant, etc.) in order for NES to provide the size and quantity of transformers for vault design.

4.2.2. Working Clearance Around Transformers

(a) See Table 2 (Appendix A) for the maximum standard transformer dimensions. See Table 3 (Appendix A) for the minimum working clearance required for one transformer.

(b) The transformers shall be arranged in a vault such that three feet (3') of working clearance is maintained around each unit once they are installed in the operating position. Two units can share common working space. There shall be no fixed objects located within the working space.

(c) Twenty feet (20') horizontal clearance shall be provided between electrical utility vault and any above ground or underground generator vent exhausts, storage or fuel oil tank, fill valve, vent valve, or air intake in case of vault fires.

4.2.3. Installation Provisions for Equipment

(a) The vault shall be designed in such a way as to allow replacement of any one unit without disturbing the other units in service.

(b) Approval drawings shall illustrate the equipment can maneuver into the operating position around any obstacle while maintaining minimum clearances through the path of travel.

(c) Transformer will likely be moved into position by NES using roller skids or roller dollies. Therefore, the vault floor shall be clean and smooth without any irregularities in the finish (slick machine/trowel finish required). Any expansion joints shall be saw cut.

(d) Customer installed hoists will not be allowed.

(e) Vault floors shall all be one level. Multi-height vaults are not allowed.

4.2.4. Working Clearances around Equipment Access Requirement

(a) The equipment access should be located in the sidewalk or building wall along a main street. Alleys less than thirty feet (30') wide will not be used for equipment access due to the limited space for trucks and cranes to set equipment. NES may consider equipment access locations other than main streets when an easement is recorded to provide the thirty feet (30') wide corridor for truck and crane access.

(b) The equipment access shall not be located within an area that, if blocked for an extended period of time, would negatively affect operations of the Customer's facility or other surrounding facilities. An example would be a parking area entry ramp.

(c) Provide six feet (6') horizontal working space on each side of the access door for Street Level Vaults or on at least three sides of the vault lid for Below Grade Vaults.

(d) Working space shall extend vertically from the surface of the sidewalk to forty feet (40') above the surface for all vaults.

(e) Working space shall extend from the back edge (building side) of the vault access to the street/curb (or other area where the truck or crane will be positioned).

(f) Fixed objects of any kind (fire hydrants, trees, planters, street light poles, building signs etc.) shall not be located within the working space detailed above.

(g) NES will not approve an overhang inside the working space unless it is fully retractable. Fixed awnings, signs, or balconies within the working space are not acceptable.

(h) Provide a 12" separation between any building face and the edge of the lift off slab for "swing room" for the lift off slab and gratings.

(i) Grating locations should be kept as far as possible from doors, windows, fire escapes, and combustible materials.

4.2.5. Street Level Vaults Equipment Access Requirements

(a) Provide a roll-up door or a set of hinged doors for equipment installation.

1. Roll-Up Door Requirements:

(i) Roll-up door "Drum Assembly" to be installed on the inside of the vault. Manual operation of the roll-up door is required in power outage situations.

(ii) The width of a roll-up door shall be a minimum of ten feet (10') wide

(iii) The height of a roll-up door shall be fourteen feet (14').

2. Hinged Door Requirements:

(i) All hinged doors shall meet the requirements of a personnel access door. See Section 4.2.8 for details.

(ii) Each hinged door shall be a minimum five feet (5') wide x minimum fourteen feet (14') high and open outward. If doors can only open 90°, the minimum clearance between set of door's panic hardware shall be minimum ten feet (10').

(b) Approximately ten feet (10') x ten feet (10') reinforced flat concrete pad will need to be installed outside the roll-up door or hinged door frame at the same height as the vault floor. The concrete pad shall be clean and smooth without any irregularities in the finish (slick machine/trowel finish required). If a lift out slab and grating combination is designed to sit above this area to bring area to final grade, civil or plumbing engineer to drain area to prevent water retention.

(c) Transformers shall not be installed through any access other than the roll-up or hinged door mentioned above.

(d) Fixed removable wall panels shall not be accepted.

(e) Area outside of vault dedicated for setting and moving transformers shall not have more than 1% slope.

4.2.6. Below Grade Vaults Equipment Access Requirements

(a) Vault depth should not be greater than twenty feet (20') from the elevation of the sidewalk at the sidewalk personnel access.

(b) Vault can be located entirely under the sidewalk or on the first level of a basement. Basement vaults shall extend under the sidewalk for equipment access.

(c) Vault tops can be located within a public right-of-way or any other area subject to occasional non-deliberate vehicular traffic.

(d) Vault tops shall be poured in place. Pre-cast tops are not allowed.

(e) Vaults located in public right-of-ways must be approved by Metro and/or TDOT.

4.2.7. Personnel Access General Requirements

(a) Vaults require at least two personnel entrances, one at each end of the vault.

(b) Access for personnel shall be located such that the path of egress leads to an exit that does not open into an unsafe condition such as a driveway. Personnel doors typically lead to the exterior of the facility, electrical room, basement, parking garage, or other common space.

(c) Each door (if provided) shall open in the direction of egress (doors open to outside of vault room) and be equipped with a flat bar exit device (panic door) with door closer on the vault side of the door. See Appendix E for required door hardware. 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 trim kit. Details should be discussed with manufacturer's representative. Lock cylinder and core shall be provided and installed by NES. The Customer shall not have access to the vault after equipment has been energized. This hardware is mandatory, no substitutions accepted. All outswing doors shall be equipped with a steel security latch guard plate to protect from tampering and latch prying.

(d) Each doorway (if provided) leading into a vault from the building interior shall be provided with a tight-fitting UL listed door that has a minimum fire rating of 3 hours (Type A).

(e) 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 4' by 8' landing between the vault door and stairs.

(f) Each doorway (if provided) leading into a vault shall have OSHA approved permanent and conspicuous safety signs installed outside the door (min. 8.5" x 11") reading: DANGER – HIGH VOLTAGE – KEEP OUT. For roll up doors, the sign shall be placed on both left and right sides of the door opening.

(g) An additional safety sign (min. 8.5" x 11") shall be posted below (h) at each doorway, outside the door, reading: WARNING – EMERGENCY EXIT – DO NOT BLOCK.

(h) All access locations and details shall be subject to NES approval.

4.2.8. Street Level Vaults Personnel Access

(a) Street level vaults require at least two personnel doors. The doors shall be on opposite ends of the vault.

(b) If hinged doors are utilized for equipment installation/removal, one of the required personnel doors may be deleted.

(c) At least one of the doors shall provide unrestricted access to NES personnel 24 hours a day/7 days a week. Access shall not be restricted by doors or gates locked with a key other than NES vault key.

4.2.9. Below Grade Vaults Personnel Grating Access

(a) Below grade vaults shall have at least one sidewalk personnel access as described below. NES Engineer may require additional points of access for multiple transformer vaults.

(b) Access for personnel shall be located such that it is not above electric equipment or conductors in the vault.

(c) Customer must obtain Metro approval and Metro ADA Compliance Division approval for gratings installed in a public sidewalk.

(d) Clear opening for personnel access shall be 30" x 48". Refer to Appendix E for hatch access panel.

(e) Refer to NES Drawings #UGS-00034 and #UGS-00036.

(f) If gratings have elongated openings, then they shall be placed such that the long dimension of the opening is perpendicular to the dominant direction of travel. There shall be no gaps greater than half inch (½") on all sides of the grating.

(g) Detailed design/shop drawings shall be submitted to NES Energy Services and the Design Engineer for approval. Drawings shall include grating dimensions, weights, and lifting provisions.

(h) A corrosion resistant fixed ship ladder meeting all current OSHA requirements shall be installed at a personnel access through the sidewalk. The ladder shall be installed with a 4:1 slope. Refer to OSHA Standard 1926.1053, for "fixed ladders." Any deviation from the ship ladder requirement shall require approval from NES.

(i) Fixed ship ladder shall have an OSHA approved telescoping ladder extension post that locks in place to guide and provide stability to the user, see Appendix E for NES approved ladder extension. Customer shall make certain that the extension post is installed in such a way as to satisfy the applicable OSHA requirements.

(j) Fixed ship ladder to include a glide rail.

(k) The ladder shall not interfere with clearances required to move transformers into operating position or working clearances around transformers once they are placed into the operating position.

(l) Provide three feet (3') clear working space around all sides of personnel access through a sidewalk.

(m) Protect all exposed steel items from corrosion by hot dipped galvanizing.

5. Structural Engineer and Architectural Requirements

5.1. Fire Rating

5.1.1. The vault shall be designed and constructed in such a manner as to provide a 4-hour separation between the vault and the building (this includes the fan room if required). Two permitted exceptions to this 4-hour separation are listed below.

(a) One UL listed (Type A) 3-hour rated door is permitted into the interior of the building.

(b) Electric service entrance may be permitted to pass through the 4-hour wall, provided a UL listed firestop system with a 3-hour rating is installed by the Customer. Detailed drawings and specifications shall be submitted to NES for approval of system selected to maintain 3-hour fire rating.

5.1.2. The vault shall be constructed of solidly poured concrete wall meeting 4-hour fire rating. **Filled-Block or pre-cast wall vault room will not be accepted**.

5.1.3. Thermal insulation or fireproofing materials shall not be installed on the ceiling or wall of a vault.

5.1.4. Contractor to include fire caulking on both sides of seams between walls and structural beams, and around both sides of door frames.

5.2. Weights and sizes of equipment are listed in Appendix A.

6. Structural Requirements

6.1. Vault Inspection and Acceptance (Structural Engineer shall include notes 6.1.1. - 6.1.7. on Structural drawings)

6.1.1. The Customer shall notify the NES Engineer at least five (5) working days before the underground grounding inspection. This must be done before the vault walls and floors are poured.

6.1.2. The Customer shall remove and replace the vault tops (Functionality Test) in the presence of NES to obtain the acceptance of NES (vault shall be cleaned after lift-out test and demonstration before handing over to the electrical contractor for equipment installation). (Omit if no lift off slabs).

6.1.3. All applicable components of this guide shall be satisfied before the vault can pass inspection and be accepted for use by NES. Installation of NES equipment is contingent on acceptance of the vault by NES.

6.1.4. It is recommended that the contractor orders inserts for the lift off slabs as early as possible. NES will not provide the required inserts. See Appendix E for the required inserts. (Omit if no lift off slabs).

6.1.5. Vault Floor is to be clean and smooth without any irregularities in the finish (slick machine/trowel finish required). Any expansion joints shall be saw cut.

6.1.6. Route Vault Miscellaneous Steel Shop Drawings through NES Energy Services and the Design Engineer for approval.

6.1.7. Protect all exposed steel items from corrosion by hot dipped galvanizing.

6.2. Street Level Vaults

6.2.1. Floor shall be sloped 1.0% to liquid containment pit. Containment pit shall have a 1% slope towards a sump pit on one end that is 18" long x 18" wide x 6" deep for liquid extraction. The 1% slope elevations shall be constant. There shall be no need for steps in vault.

6.2.2. Containment pit shall be covered with grating of sufficient strength to support expected loads. Each section of grating shall weigh less than 150 pounds. There may be multiple pits connected by 4" PVC below slab if required.

6.2.3. Liquid containment capacity shall be greater than or equal to 110% of the volume of liquid in the largest transformer (Refer to Appendix A Table 5).

6.2.4. Where 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 of the sill or curb be less than four inches (4") or greater than eight inches (8"). Door sill or curb (shall be painted yellow) shall be removable if the doorway is used for equipment installation or removal. Angled iron is suggested for removable curb. Sealant shall be installed between the door sill and the vault floor.

6.2.5. The liquid containment pit shall be within the footprint of the vault and not be on a different floor/level.

6.3. Pulling Irons (All Vaults)

6.3.1. Structural Engineer shall show details and sections for compliance

6.3.2. Pulling irons used to position transformers shall be located on each wall, one foot (1') above finished floor, recessed and centered on each transformer.

6.3.3. Additional pulling irons may be required by NES Engineer.

6.3.4. Pulling irons shall be designed and installed to withstand 12,000 pound load and have a minimum eye opening of 6".

6.3.5. The pulling irons are typically cast into a concrete wall. Other pulling iron designs shall be subject to approval by NES. Embedded plates are allowed.

6.3.6. Pulling irons shall be recessed into the face of the wall. Pulling irons shall not extend into clear working space around each transformer.

6.3.7. Pulling irons shall be protected from corrosion by hot dipped galvanizing.

6.3.8. For any conduits that enter through the floor, a pulling iron insert shall be provided above on the wall four feet (4') above the top of the conduit. Coordinate with Electrical Engineer.

6.3.9. Pulling irons are required to be placed at 9' above finished floor across from any wall "Bayouts" of conduit entrances (opposite wall or near column for cable pull leverage). Coordinate with Electrical Engineer. Location shall be in line with center bayout pipes. These are not required to be recessed.

6.3.10. See Appendix E for recessed pulling iron example.

6.4. Concrete Support Beams

6.4.1. Once transformers are in position, they shall be placed on portable concrete support beams.

6.4.2. The customer shall provide two (2) portable concrete support beams per transformer. Provide three (3) beams for 1500kVA or larger transformers. The final location of these support beams shall be determined by NES when the transformers are set inside the vault(s).

6.4.3. Support beam details are shown in NES drawing #UN-22304. Recommended part is provided in Appendix E.

6.5. Lift Off Slabs and Grating (Below Grade Vaults)

6.5.1. A typical single-transformer vault is illustrated in NES drawing #UGS-00034 (provided by NES Engineer).

6.5.2. NES requires cast in place concrete slabs. Equipment must not be directly under gratings. Coordinate this with Electrical Engineer or NES Engineer.

6.5.3. Gratings may be accepted for equipment access if they are required for ventilation and site conditions will not allow for ventilation separate from the vault equipment access.

(a) Customer must obtain Metro and/or TDOT approval and Metro ADA Compliance Division approval for ventilation gratings installed in a public sidewalk.

(b) See Appendix E for required gratings.

(c) Gratings shall not be located above cable racking or other NES equipment to be installed in the vault.

(d) "Electric" Identification plate required on hatch if access is for ladder. Identification plate shall be installed flush with top of hatch, centered on opening edge (non-hinge side).

(e) Grating lifting provisions shall be provided in section of grating.

(f) Detailed design and shop drawings shall be submitted to NES Energy Services and the Design Engineer for approval. These drawings shall include all grating dimensions, weights, and lifting provisions.

6.5.4. Vault tops located within a public right-of-way or any other area subject to occasional non-deliberate vehicular traffic.

(a) Designs created by use of Allowable Stress Design (structural steel) or Working Stress Design (concrete) shall use AASHTO H-20 or HS-20 Design Loading (Engineer shall indicate on contract documents).

(b) Designs created by use of Load and Resistance Factor Design (structural steel) or Ultimate Strength Design (concrete) shall use HL-93 (Engineer shall indicate on contract documents).

6.5.5. Removable concrete slabs should be provided for equipment installation and removal. Slabs should be poured in place. Pre-casted slabs shall not be accepted.

6.5.6. Maximum weight of lift-off slab shall be 14,000 pounds. Maximum length of lift-off slab shall be fourteen feet (14') (Engineer shall indicate on contract documents).

6.5.7. Four (4) embed inserts (with brass plugs with hex socket) shall be installed in each slab for lifting, see Appendix E for required inserts.

6.5.8. Indicate to contractor to provide half inch (½") max expansion around slabs for tight gaps.

6.6. Sidewalk Access for Under Building Vault

6.6.1. Where ventilation is required using the access space for below building vaults, grating of equal type as shown on NES drawing #UGS-00036 may be used in equal size segments. Four picks per transformer is desired or less if practical. If a structural beam is required, an acceptable method for removing the beam is required.

6.6.2. If lift off slabs are designed for this area, max weight shall be 14,000 lbs per section. Provide a 1-foot (1') gap between the building and lift off slab for swing space. Provide inserts per section 6.5.7.

6.7. Electrical Bayout Wall Structural Details

6.7.1. Structural Engineer shall coordinate with Electrical Engineer for location of primary and secondary conduit/cable entrances. If expected to be in the wall, a bayout shall be required. If secondary conduit/cable entrances are from the ceiling, it must be near a wall and not in the middle of the room over electrical equipment.

6.7.2. Bottom of bayout should be 7' above finished floor or as approved by NES.

6.7.3. Bottom row of conduits should be 8' above finished floor or as approved by NES.

6.7.4. Refer to NES drawing #UN-41535 (provided by NES Engineer).

6.8. Below Grade Vaults

6.8.1. Floor shall be sloped 1.0% to sump pit for removal of water that may enter the vault through the ventilation gratings. The preferred location of sump is behind the access ladder and not in the work space or path of ingress or egress to the vault. Refer to NES drawings #UGS-00034 and #UGS-00036.

6.8.2. 1% slope elevation shall be constant. There shall be no need for steps in vault.

6.8.3. Sump pit shall be 18" long x 18" wide x 18" deep with a grating cover of sufficient strength to support expected loads. Contractor to cut notch into grating for piping to pass through. Pit can be shallower, but a bigger notch will have to be cut into the grating.

6.8.4. NES requires the installation of a sump pump in the vault to pump water to the nearest storm structure. NES required pump will be equipped with an oil sensing switch to prevent oil from being pumped into public storm water system. NES shall provide the required sump pump(s) for plumbing contractor to install.

6.8.5. The plumbing contract documents to indicate size of PVC drain from the sump location up and out through the vault wall to outside the vault. The Plumbing and the Civil design professionals shall coordinate to show the sump drain routed to nearest storm drainage structure for sump pump discharge. The route taken to the storm drainage structure shall be chosen to minimize the amount of bends and elbows. The civil contract documents shall show the drain to the storm structure from the vault. Refer to Appendix E for sump pump details.

6.8.6. Note for contractor to coordinate storm structure connection with Metro Water Services prior to connection. Needs to be routed outside of building.

6.8.7. The plumbing contract documents to indicate a shut off Valve, a PVC to rubber union, check valve, and adequate piping up the wall to the storm drainage structure or building storm system all to be supplied and installed by customer.

6.8.8. The sump pump controller location shall not be located under gratings. Final location of controller shall be subject to NES approval.

6.8.9. Refer to Section 4.2.9. and Appendix E for ship ladder and hatch access information.

7. Mechanical Engineer Requirements

7.1. Ventilation and Equipment Cooling

7.1.1. Vaults shall be located where they can be ventilated to the outside environment without using flues or ducts wherever such an arrangement is practical.

7.1.2. Ventilation adequate to dispose of the transformer full-load losses (heat output) without creating a temperature rise that is in excess of the transformer rating shall be provided.

7.1.3. Ventilation outlets shall be located as far as possible from doors, windows, fire escapes, and combustible materials.

7.1.4. Ventilation inlet and outlet shall be at opposite ends of the vault room so ventilation system directs airflow across the vault to ensure uniform temperature and no hot spots.

7.1.5. Louvers utilized for ventilation shall include bird screens. Detailed drawings shall be submitted for approval. Louvers shall be fixed in the open position and shall not be controlled by fire or smoke detectors. Steel hot dipped galvanized bars will be required behind the louvers to prevent access to vault.

7.1.6. Mechanical to refer to Sections 6.5 and 6.6 for grating design. Coordinate with Structural and Electrical design professionals.

7.1.7. Mechanical Engineer shall show calculations on the Contract Documents or coordinate with the Electrical Engineer to show. Mechanical Engineer to determine the area of gratings required and coordinate with the Structural Engineer.

7.2. Ventilation by Natural Circulation

7.2.1. 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.

7.2.2. 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 (3 sq-in) per kVA of transformer rating(s).

7.3. Ventilation by Forced Air

7.3.1. The full load heat loss (heat output) for each transformer is listed in Table 5 (Appendix A).

7.3.2. Total full load heat loss of a vault with one transformer installed equals the full load heat loss of that transformer. If multiple transformers are included in the vault design, the total heat loss for all transformers to be considered.

7.3.3. Vault Temperature

(a) 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).

7.3.4. Vault shall only be accessible to qualified NES personnel.

7.3.5. Mechanical equipment (filters, fans) shall not be located within the vault structure, they shall be located such that they can be maintained by the customer from outside the vault.

7.3.6. A transformer fan room (adjacent to the transformer vault) will need to be 4-hour rated with 3-hour doors unless the room opens to the exterior of the building. Steel hot dipped galvanized bars will be required to separate this fan from the transformer vault room.

7.3.7. Ventilation registers/grilles shall not be located over electric equipment.

7.3.8. Ventilation equipment shall be standalone. Building heat, smoke, or fire detectors shall not interfere with the operation of the ventilation system. Fire dampers in the ducts are not allowed.

7.3.9. Fans shall be controlled by one thermostat located within the vault. The thermostat shall be rated for installation in a damp environment. Mechanical Engineer to advise location of thermostat and set point to satisfy 7.3.3.

7.3.10. The exhaust should exit above grade in an area that does not interfere with pedestrian traffic. If the exhaust must exit through gratings in the sidewalk, care should be taken to ensure air velocities are low enough not to interfere with pedestrian traffic. It is recommended that these installations be approved by Metro Public Works.

7.3.11. If use of ventilation duct work cannot be avoided, the applicable requirements detailed below shall be satisfied.

(a) Ventilation duct shall be 4-hour rated construction.

(b) Ventilation ductwork that passes through the interior of the building (or parking garage) shall be routed through a 4-hour fire rated enclosure in order to maintain a 4-hour separation between the building and vault.

(c) Detailed drawings and specifications shall be submitted to NES for approval of system selected to maintain 4-hour fire rating.

(d) Customer shall provide drawings sealed and signed by a Tennessee licensed mechanical engineer as described in Section 3.

8. Plumbing Engineer, Fire Protection, Mechanical Requirements

8.1. Compliance Drawing(s). Provide drawing(s) to show compliance with following concerning the vault:

8.1.1. Piping unrelated to the functions of the electrical service shall <u>not</u> be routed through the vault.

8.1.2. Fire detection or suppression equipment shall <u>not</u> be located in the transformer vault.

8.1.3. Contract documents shall clearly indicate compliance with this section.

8.1.4. Plumbing contract documents to include documentation for Section 6.8.

8.1.5. Plumbing engineer shall determine appropriate sump discharge size. NES sump model included in Appendix E. Refer to section 6.8.

9. Electrical Engineer Requirements

9.1. Required General Notes (Electrical Engineer shall include notes 9.1.1. to 9.1.11 on Electrical contract documents)

9.1.1. The Customer shall notify the NES Engineer at least five (5) working days before the underground grounding inspection. This must be done before the vault walls and floors are poured.

9.1.2. The Customer shall connect a temporary feed (a generator is acceptable) to the vault disconnect switch so NES can confirm that the light and receptacle circuits are operational.

9.1.3. The location and quantities of light fixtures is for design intent and pricing only. Exact location of light fixtures and devices shall be spot located by NES personnel prior to installation. Contact NES C&M Supervisor five (5) working days prior to installation.

9.1.4. 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.

9.1.5. All components of vault electrical system shall be surface mounted. Components of the vault electrical system shall not extend into path of egress or clear working space.

9.1.6. For the purpose of electrical design, vaults shall be considered "Wet Location" for any vault below grade, and "Damp Locations" for vaults at grade unless otherwise specified.

9.1.7. The luminaires shall be arranged so that persons changing lamps or making repairs on the lighting system are not endangered by live parts or other equipment. Luminaires shall not be located directly above electrical equipment or conduit penetrations. Luminaires shall not be installed on removable access panels.

9.1.8. It is recommended that the contractor order grounding inserts as early as possible. NES will not supply these inserts. These must be procured prior to vault wall pour. See Appendix E for the required inserts. See section 9.8 for insert details.

9.1.9. Route Service Switchboard(s) Shop Drawings through NES Energy Services and the Design Engineer for approval.

9.1.10. Panelboard schedule should be completed (typed) before vault inspection is requested.

9.1.11. Once the vault is accepted by NES, no admittance into the vault is allowed without NES approval.

9.1.12. Coordinate with the Civil Engineer that the site plan and the electrical drawings have no gaps in scope between disciplines from the primary duct banks to the entrance into the electrical vault.

9.2. Disconnect Switch / Panelboard

9.2.1. A Square D 120/240V, 60A/2P branch circuit panel with Square D type QOB breakers shall be installed in the vault to be operated by utility personnel.

9.2.2. Panel board shall be fed from the Emergency Power Supply circuit of the building.

9.2.3. All receptacle circuits shall be provided and shall have ground fault circuit interrupting (GFCI) outlets for personnel protection.

9.2.4. Two spare 20A/1P breakers shall be installed for future use by NES personnel.

9.3. Illumination

9.3.1. Illumination shall be provided for all paths of egress and working spaces around electrical equipment. Illumination level shall be 60 foot-candles or greater.

9.3.2. Electrical engineer shall fill out foot-candle calculation sheet attached showing all calculations and determine number of light fixtures required (Appendix C).

9.3.3. At least two (2) lighting circuits shall be provided. Lights shall be wired in alternating fashion so that the vault is still evenly lit with one switch in the off position.

9.3.4. Two (2) light switches shall be located adjacent to each personnel access. When a personnel access is provided through the sidewalk grating, two (2) light switches shall be accessible from the top of each ladder.

9.3.5. The lighting circuits shall be wired around the vault, with a junction box near each fixture location. A flex conduit shall connect each junction box to each fixture. See Appendix E for approved lighting fixtures.

9.3.6. Vault lighting/receptacle circuits shall be designed, provided, and installed by the Customer.

9.3.7. Installation shall comply with the latest edition of the National Electrical Code in effect.

9.3.8. Locations of all vault electrical equipment shall be subject to NES approval.

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 duplex type, 20A/125V, NEMA 5-20R.

9.4.2. One duplex type, 20A/125V NEMA 5-20R receptacle and one single 15A/250V NEMA 6-15R 2P/3W receptacle from dedicated circuits shall be provided on the wall adjacent to the sump. Sump receptacles not required for Street Level Vaults unless otherwise specified by NES Engineer.

9.4.3. Receptacles shall be installed at a height of sixty inches (60”) above finished floor in Below Grade Vaults, and thirty six inches (36”) above finished floor in Street Level Vaults.

9.4.4. One general use receptacle shall be no more than fifteen feet (15’) away from the sump.

9.5. Conduit Entrance

9.5.1. Customer should be mindful of vault/building structural members when laying out primary or secondary entrance.

9.5.2. Conduit entrance penetrating the floor shall not be located within a path of egress or clear working space. Conduit shall not be directly in front of ventilation louvers.

9.5.3. For conduit entrance penetrating a wall, see section 6.3.9 regarding pulling iron location.

9.5.4. Provide bayouts for all conduit penetrations in the wall.

9.5.5. See NES drawing #UN-41535 (provided by NES Engineer) for typical conduit bayout details.

9.5.6. Bayout shall not be located under ventilation gratings. Concrete encasement is permissible to extend bayout so no conductor is exposed under a grating. Conduit sleeves shall be permitted under grating if concrete encasement is an obstacle.

9.5.7. Locate bayouts to minimize the amount of cable that passes under ventilation gratings.

9.5.8. Electrical service conduits shall not be located within ten feet (10') of any above ground or underground storage tank, fill valve, or vent valve.

9.5.9. (Below Grade Vaults) Unused conduits shall be filled with duct seal.

9.5.10. (Above Grade Vaults) Unused conduits shall be filled with fire stop.

9.6. Primary Entrance

9.6.1. When manholes are involved, primary ducts shall extend from the vault to within ten feet (10') of the manhole (existing or energized) specified by NES Engineer. Customer shall be responsible for excavation from the vault to the manhole. Customer shall complete the duct run to the manhole coordinating with NES (NES may have manhole work to complete to make the manhole ready to accept the duct run).

9.6.2. Primary ducts shall be encased in red dye concrete. See NES drawing #UN-40716 (provide by NES Engineer) for additional duct run requirements.

9.6.3. Primary ducts entering a vault through the floor shall be 8" - 10" from vault wall and extend six to eight feet above finished floor and shall be galvanized rigid steel conduit. Tops of conduits shall be threaded with ground bushing. Conduits shall be straight and square with the walls.

9.6.4. Additional ducts may be required. Verify final arrangement and quantity of ducts with NES Engineer.

9.6.5. The primary conductors are to be supported by a four inch (4") "Angle Iron or Aluminum Angle" support supported from the walls of the room and ceiling if required. "Angle Iron or Aluminum Angle" support shall be positioned so it is one foot (1') in front of the transformer and nine feet (9') above finished floor. The "Angle Iron or Aluminum Angle" support shall be installed after the transformer is installed if the transformer is placed with the front facing the door. Refer to Appendix E for part number.

9.6.6. Where Primary conduits enter the floor, Elbows (90°) and turn ups shall be galvanized rigid steel conduit as well as 10' back from the elbow.

9.7. Secondary Entrance

9.7.1. One bank of conduits shall be provided for secondary service entrance cables unless otherwise approved by NES Engineer in writing.

9.7.2. Secondary ducts entering a vault through the floor shall extend eight inches (8") above finished floor in Street Level Vaults. Secondary ducts should not enter through the vault floor in Below Grade Vaults.

9.7.3. The number of secondary ducts, the location of the entrance, and the arrangement of the ducts shall be subject to NES approval. The maximum number of conduits, including fire pump shall be eighteen (18). "Compacted" (aka Compact Strand) secondary cable will not be accepted. Consulting engineer shall consider providing all eighteen (18) conduits and terminate spare conduits in terminating cabinets so they may be used in the future if needed. Refer to the Metering section of the NES "Electric Service Guidelines". This can be found online at www.nespower.com under Builders & Contractors / Guidelines & Manuals.

9.7.4. The electrical construction drawings shall indicate cable racking from the secondary conduits to the transformer. Layout shall be coordinated and approved by the NES Engineer. Refer to Appendix E for part numbers, photos, and method suggestions.

9.7.5. The consulting engineer shall specify the service cable be provided with color insulation per Table 6 (see Appendix A).

9.8. Grounding Provisions

9.8.1. NEMA Std 4-hole ground inserts shall be provided and cast into the concrete structure by the Customer, see Appendix E for required inserts.

9.8.2. At a minimum, ground inserts shall be installed to within 12" of where the primary electrical conduits enter the vault and in the floor centered 1-ft out on each end of the transformer.

9.8.3. Additional ground inserts may be required by NES Engineer.

9.8.4. Install 4/0 AWG – 19 STR bare soft drawn copper just inside the vault wall to form a ring inside the vault walls.

9.8.5. Provide grounding ring per NES drawing #UGS-00035.

9.8.6. Customer shall coordinate grounding inspection per Section 4.1.

9.9. NES Meter Information

9.9.1. Meter locations, room/space requirements, bases, and general information shall be coordinated with NES Meter Department at 615-415-6770.

9.9.2. Meter information is available on the NES website at www.nespower.com under the Builders & Contractors pulldown menu. Download the "Electrical Service Guidelines" under the Guidelines & Manuals pull down. Refer to the Meter section of this manual. For more detailed meter information contact the NES engineer.

9.9.3. NES recommends that businesses who have unknown retail spaces with separate meter type loads, to install an adequately sized fused disconnect and a NES approved terminating cabinet with adequate space for meter installations around this equipment. Coordinating space requirements with NES Meter Department.

9.9.4. Coordinate with NES Metering Department for meter base types (All single phase services will require fifth terminal).

9.10. Electrical Switchboard Room Plan Submission

9.10.1. Shall include a ¼ scale drawing or isometric of the switchboard room. This drawing shall indicate transition sections of the gear if the gear is fed overhead from the vault, the fire pump sections if hot sequenced, and the meter equipment space to satisfy the meter requirements of section 9.9.

APPENDIX A

NON-NETWORK TRANSFORMER SPECIFICATIONS

TABLE 1: Non-Network Transformer Requirements for Standard Service Ratings

Secondary Voltage	Total From 4.2.2		Rated Power	Maximum Available Fault Current
	Size (min)	Size (max)		
(V)	(kVA)	(kVA)	(kVA)	(A)
208Y/120	min	1000	1000	52187
208Y/120	1001	1500	1500	78281
480Y/277	min	1000	1000	22615
480Y/277	1001	1500	1500	33922
480Y/277	1501	2500	2500	56536
480Y/277	2501	3000	3000	67844

TABLE 2: Maximum Non-Network Transformer Dimensions

Rated Power	Secondary Voltage	Rated Current	Width		Length (including connections)		Height (floor to cover)	
(kVA)	(V)	(A)	(In)	(Ft-In)	(In)	(Ft-In)	(In)	(Ft-In)
1000	208Y/120	2776	72	6-0	120	10-0	93	7-9
1500	208Y/120	4164	72	6-0	120	10-0	97	8-1
1000	480Y/277	1203	72	6-0	120	10-0	93	7-9
1500	480Y/277	1804	72	6-0	120	10-0	97	8-1
2500	480Y/277	3007	84	7-0	120	10-0	117	9-9
3000	480Y/277	3608	96	8-0	144	12-0	120	10-0

TABLE 3: Minimum Working Clearance Required for a Non-Network Transformer

Rated Power	Secondary Voltage	Rated Current	Width		Length (including connections)		Height (floor to cover)	
(kVA)	(V)	(A)	(In)	(Ft-In)	(In)	(Ft-In)	(In)	(Ft-In)
1000	208Y/120	2776	144	12-0	192	16-0	165	13-9
1500	208Y/120	4164	144	12-0	192	16-0	169	14-1
1000	480Y/277	1203	144	12-0	192	16-0	165	13-9
1500	480Y/277	1804	144	12-0	192	16-0	169	14-1
2500	480Y/277	3007	156	13-0	192	16-0	189	15-9
3000	480Y/277	3608	168	14-0	216	18-0	192	16-0

TABLE 4: Minimum Clearance Required for Moving a Non-Network Transformer

Rated Power	Secondary Voltage	Rated Current	Width		Length (including connections)		Height (floor to cover)	
(kVA)	(V)	(A)	(In.)	(Ft-In)	(In.)	(Ft-In)	(In.)	(Ft-In)
1000	208Y/120	2776	96	8-0	132	11-0	119	9-11
1500	208Y/120	4164	96	8-0	132	11-0	123	10-3
1000	480Y/277	1203	96	8-0	132	11-0	119	9-11
1500	480Y/277	1804	96	8-0	132	11-0	123	10-3
2500	480Y/277	3007	108	9-0	144	12-0	143	11-11
3000	480Y/277	3608	120	10-0	144	12-0	146	12-2

TABLE 5: Miscellaneous Non-Network Transformer Information

Rated Power	Secondary Voltage	Rated Current	Approx. Max Unit Weight	Approx. Max Liquid Capacity of One Unit	Full Load Heat Loss
(kVA)	(V)	(A)	(lbs.)	(gal)	(kW)
1000	208Y/120	2776	14500	750	11
1500	208Y/120	4164	17125	1000	17
1000	480Y/277	1203	14500	1000	11
1500	480Y/277	1804	17125	1000	17
2500	480Y/277	3007	22375	1200	28
3000	480Y/277	3608	25000	1200	33

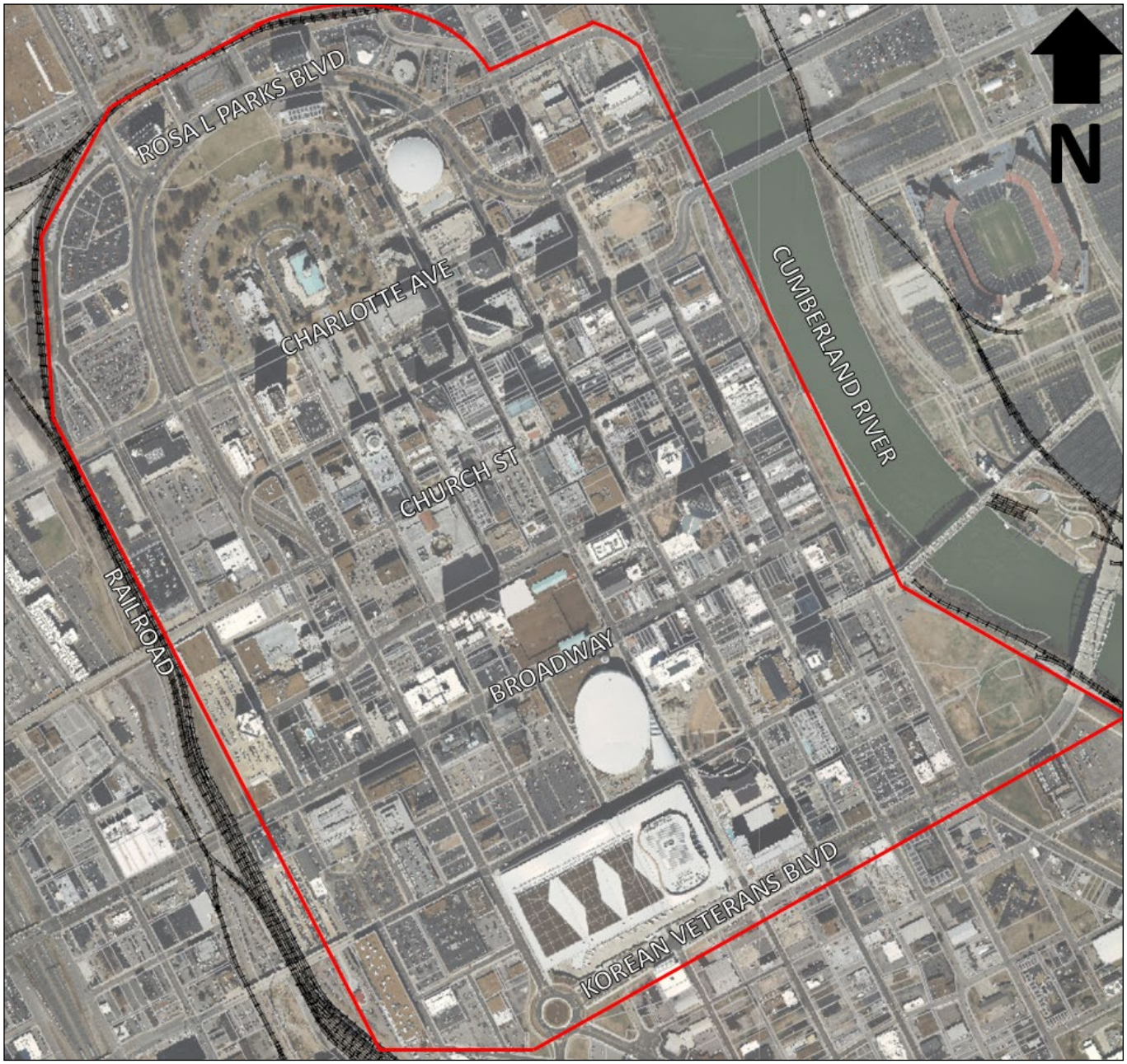
TABLE 6: Secondary Cable Color Code

PHASE	VOLTAGE	
	208Y/120V	**480Y/277V**
Neutral	White	Gray
A	Black	Brown
B	Red	Orange
C	Blue	Yellow

NON-NETWORK VAULT DESIGN GUIDE

APPENDIX B

NON-NETWORK MAP (EVERYTHING OUTSIDE OF CIRCLED RED AREA)



APPENDIX C

STANDARD LIGHTING CALCULATION

ROOM NAME: TRANSFORMER VAULT

DATA REQUIRED:

ROOM LENGTH (RL): _____
ROOM WIDTH (RW): _____
ROOM AREA (RL X RW): _____
CEILING HEIGHT: _____
FIXTURE HEIGHT ABOVE WORK PLACE (HAWP): 7'
MAINTENANCE FACTOR (MF): .85
LAMP LUMENS (LL) (OBSTAINED FROM CATALOG): _____

$$\text{ROOM CAVITY RATIO (RCR)} = \frac{(5)\,(7)\,(RL+RW)}{(RL)\,(RW)}$$

COEFFICIENT OF UTILIZATION (CU) (OBTAINED FROM CATALOG): _____

$$\#\text{FIXTURES} = \frac{60\,(RL)\,(RW)}{(2)\,(LL)\,(CU)\,(.85)}$$

APPENDIX D

STANDARD DRAWINGS (Provided by NES Engineer)

NES Drawing #UN-22304 - Concrete Support Beams for Vault Transformer

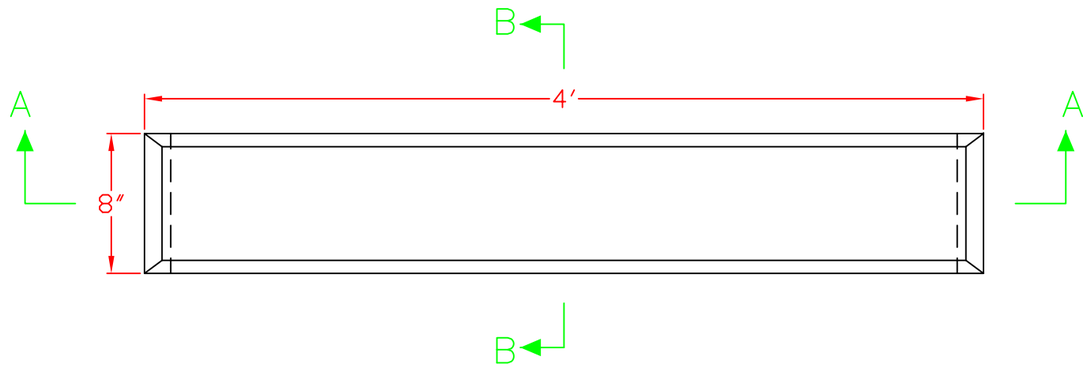
NES Drawing #UN-40716 - Trench Requirements

NES Drawing #UGS-00034 - Standard Non-Network Vault Layout

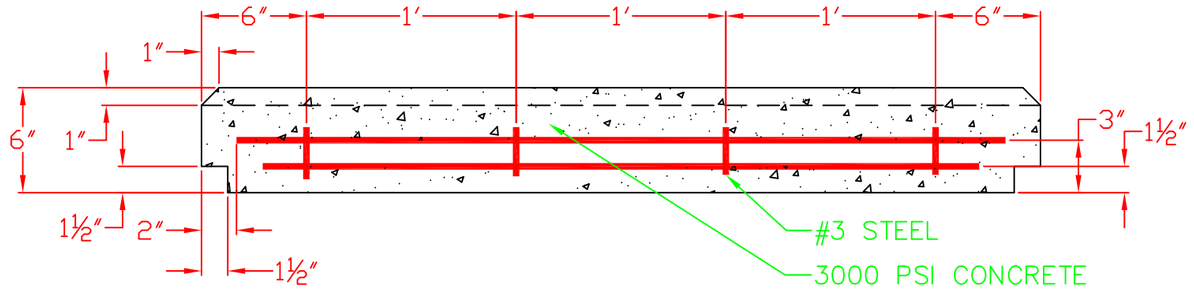
NES Drawing #UN-41535 - Standard Vault Bayout Detail

NES Drawing #UGS-00035 – Non-Network Vault Grounding Detail

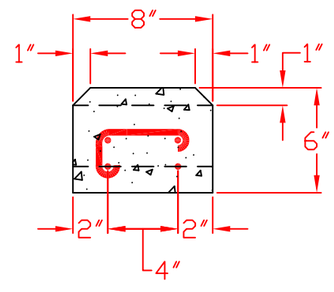
NES Drawing #UGS-00036 – Non-Network Below Sidewalk Vault Top Details



TOP VIEW



SECTION A–A



SECTION B–B

ISSUES :	A ORIGINAL	B REVISION	C REVISION
PREPARED BY :	JPB 6-3-80	JC 9-2-83	HITCHCOCK 2-18-02
CHECKED BY :	LDC 6-4-80	LDC 9-6-83	LDC 2-20-02
SUBMITTED BY :	WHR		
APPROVALS :	John M. Bryant	John M. Bryant	Ron S. Davidson
APPROVED FOR CONSTRUCTION			

REFERENCE DRAWINGS

DRAWING NO.	TITLE	DRAWING NO.	TITLE

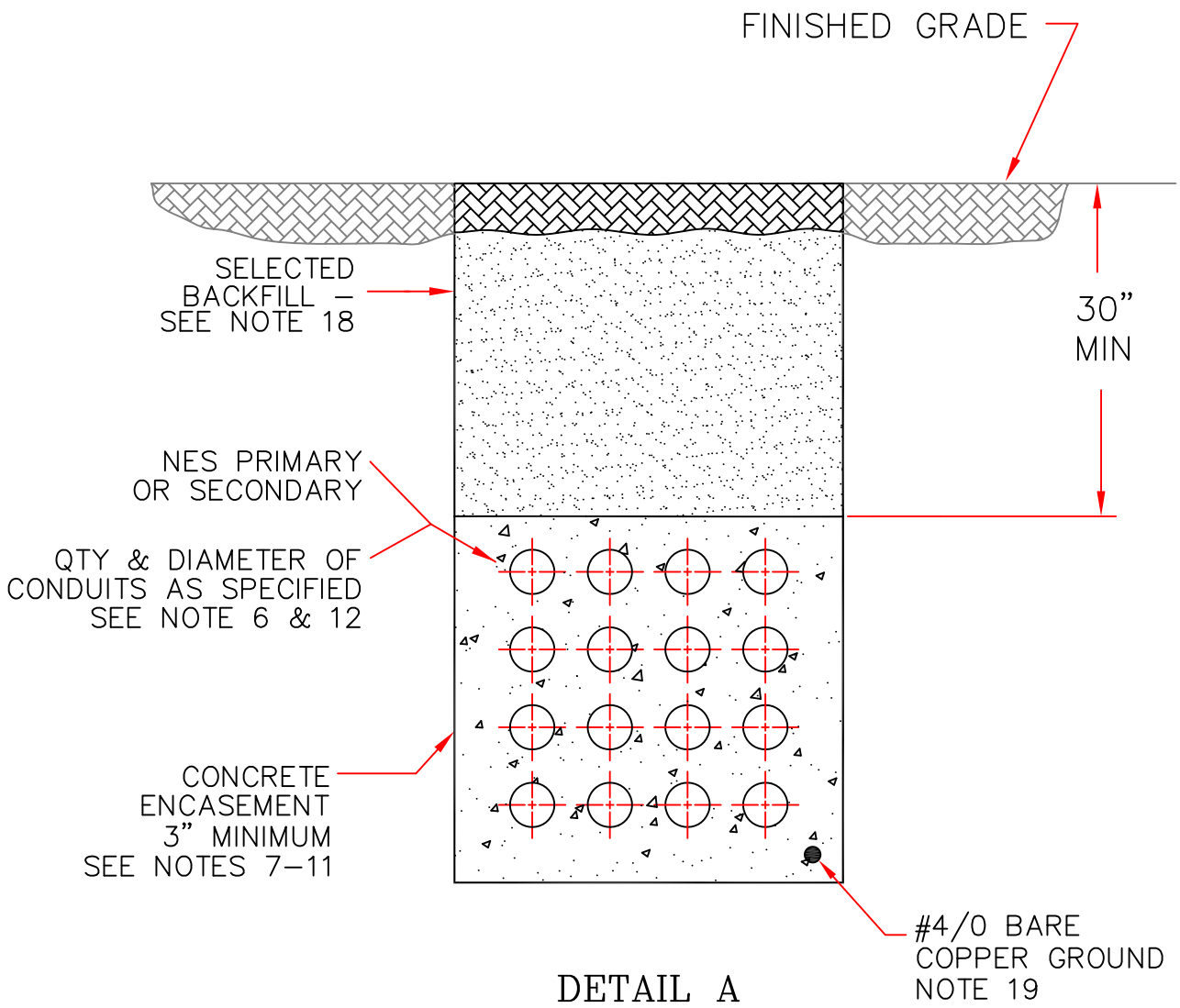
NASHVILLE ELECTRIC SERVICE
NASHVILLE, TENNESSEE

CONCRETE SUPPORT BEAMS FOR NETWORK TRANSFORMERS

SCALE : *2" = 1'-0"*

DRAWING NUMBER *UN-22304*

ISSUE *C*



DETAIL A

NES ONLY

REV FOR NETWORK ADD GROUND DETAIL

ISSUE:	A ORIGINAL		B REVISION		C REVISION															
PREPARED BY:	HITCHCOCK	09/16/02	HITCHCOCK	03/10/04	SIPES	05/17/10														
CHECK BY:					PMA	05/17/10														
SUBMITTED BY:																				
APPROVALS:																				
APPROVED FOR CONSTRUCTION:	Ronald D. Davidson		Ronald D. Davidson		Ronald D. Davidson															

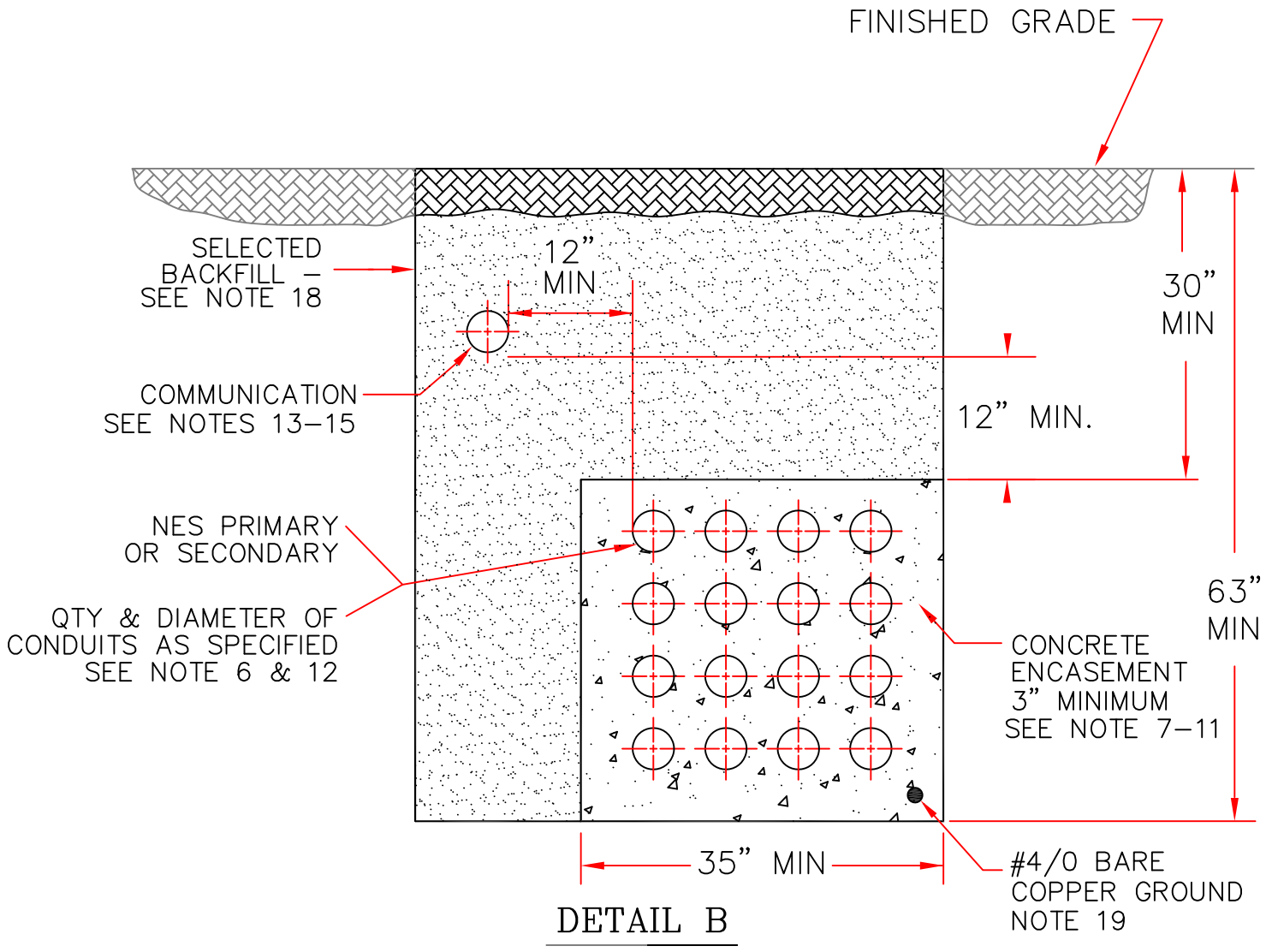
Nashville Electric Service

1214 Church St.
Nashville, Tennessee
37246

TRENCH REQUIREMENTS
NETWORK

SCALE: NONE

STANDARD	ISSUE
UN-40716	C



DETAIL B

NES AND COMMUNICATIONS

REV FOR NETWORK ADD GROUND DETAIL

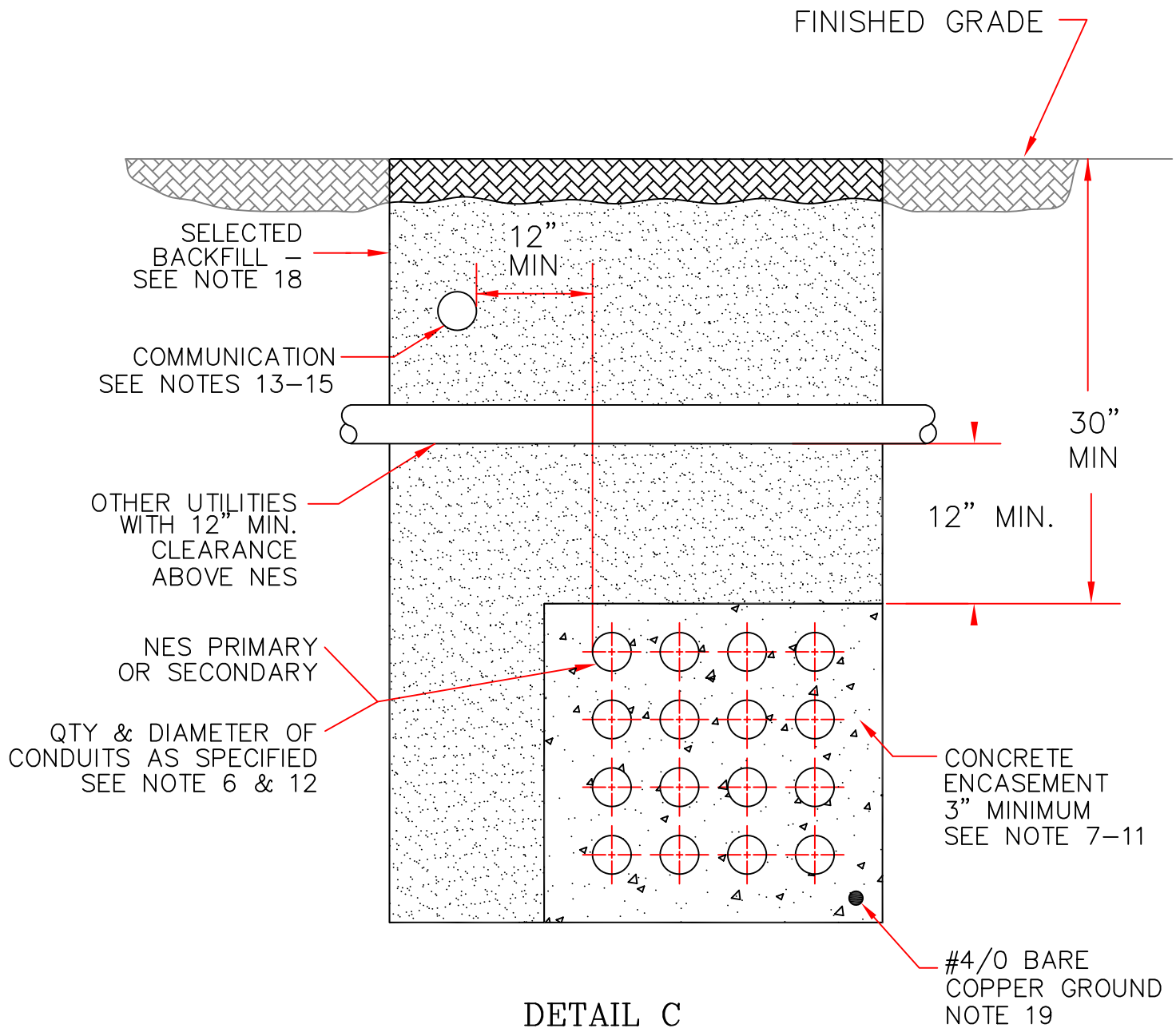
ISSUE:	A ORIGINAL		B REVISION		C REVISION	
PREPARED BY:	HITCHCOCK	09/16/02	HITCHCOCK	03/10/04	SIPES	05/17/10
CHECK BY:					PMA	05/17/10
SUBMITTED BY:						
APPROVALS:						
APPROVED FOR CONSTRUCTION:	Ronald D. Davidson		Ronald D. Davidson		Ronald D. Davidson	

Nashville Electric Service
1214 Church St.
Nashville, Tennessee
37246

TRENCH REQUIREMENTS
NETWORK

SCALE: NONE

STANDARD	ISSUE
UN-40716	C



DETAIL C

NES AND COMMUNICATIONS WITH OTHER UTILITIES

REV FOR NETWORK ADD GROUND DETAIL

ISSUE:	A ORIGINAL		B REVISION		C REVISION	
PREPARED BY:	HITCHCOCK	09/16/02	HITCHCOCK	03/10/04	SIPES	05/17/10
CHECK BY:					PMA	05/17/10
SUBMITTED BY:						
APPROVALS:						
APPROVED FOR CONSTRUCTION:	Ronald D. Davidson		Ronald D. Davidson		Ronald D. Davidson	

Nashville Electric Service
1214 Church St.
Nashville, Tennessee
37246

TRENCH REQUIREMENTS
NETWORK

SCALE: NONE

STANDARD	ISSUE
UN-40716	C

NOTES

1. ALL TRENCHES SHALL MEET OSHA STANDARDS.
2. TRENCH DEPTHS & WIDTHS GIVEN ARE THE MINIMUM FOR WORKING REQUIREMENTS.
3. ALL EXCAVATED AND OTHER MATERIALS SHALL BE PLACED AT LEAST 2' FROM TRENCH.
4. (REQUIREMENT NOT APPLICABLE TO NETWORK.)
5. (REQUIREMENT NOT APPLICABLE TO NETWORK.)
6. CONDUIT TO BE 4" TYPE EB NEMA TC-6 PVC DUCT CONCRETE ENCASED.
7. SUFFICIENT DUCT SPACERS SHALL BE USED TO PREVENT DIPS AND SAGS BETWEEN SUPPORTS. THERE IS TO BE A MINIMUM OF 4 DUCT SPACERS PER 20' LENGTH OF DUCT RUN.
8. IT IS VERY IMPORTANT THAT THIS DUCT RUN BE STRAIGHT AND IN LINE BETWEEN MANHOLES. A SLIGHT GRADE OF 1/2% SHOULD BE MAINTAINED FROM ONE MANHOLE TO THE OTHER TO ALLOW ANY GROUND WATER SEEPAGE TO FLOW INTO THE MANHOLE.
9. THERE IS TO BE NO METAL, METALIC STRAPS, OR REBAR OF ANY KIND BETWEEN THE DUCTS OR BANDED AROUND THE OUTSIDE OF THE DUCT RUN. FIBERGLASS BANDING IS ACCEPTABLE.
10. IF SHORING IS REQUIRED DUE TO DEPTH OF THE TRENCH, THE DUCT BANK IS TO BE FORMED TO THE MINIMUM DIMENSIONS SHOWN IN THE DRAWING.
11. THE CONCRETE FOR THE DUCT BANK IS TO BE POURED IN NO MORE THAN 1/3 OF THE DEPTH AT A TIME AND VIBRATED IN TO INSURE COMPLETE AND UNIFORM COVERAGE AROUND AND UNDER ALL DUCTS.
12. A PULL STRING (200# BREAKING STRENGTH, GREENLEE POLYLINE OR APPROVED EQUAL) SHALL BE INSTALLED IN EACH DUCT BY THE CONTRACTOR.
13. A MINIMUM OF 12" VERTICAL & HORIZONTAL CLEARANCE IS REQUIRED BETWEEN NES AND FACILITIES OF OTHER UTILITIES, UNLESS THE SAID UTILITY HAS A GREATER CLEARANCE REQUIREMENT.
14. NO UTILITY SHALL BE ALLOWED DIRECTLY ABOVE NES.
15. ADJACENT STRUCTURES OR CONCRETE ENCASED DUCT RUNS SHALL BE SEPERATED BY AN EXPANSION JOINT OF PLYWOOD, BLACKBOARD, OR OTHER SIMILAR MATERIAL.
16. DUCT RUN SHALL BE INSPECTED BY NES BEFORE AND AFTER CONCRETE ENCASEMENT PRIOR TO BACKFILL.
17. (REQUIREMENT NOT APPLICABLE TO NETWORK.)
18. ALL BACKFILL SHALL BE FREE FROM STONES, ROCK, OR OTHER MATERIAL WHICH MIGHT DAMAGE THE CONDUIT SYSTEM.
19. PROVIDE #4/0 AWG COPPER, 7 STRAND, BARE GROUND WIRE IN ACCORDANCE WITH NES SPECIFICATIONS. GROUND WIRES MUST CONFORM TO ANSI B8-04, LATEST VERSION.

REV FOR NETWORK ADD GROUND DETAIL

ISSUE:	A ORIGINAL		B REVISION		C REVISION	
PREPARED BY:	HITCHCOCK	09/16/02	HITCHCOCK	03/10/04	SIPES	05/17/10
CHECK BY:					PMA	05/17/10
SUBMITTED BY:						
APPROVALS:						
APPROVED FOR CONSTRUCTION:	Ronald D. Davidson		Ronald D. Davidson		Ronald D. Davidson	

Nashville Electric Service
1214 Church St.
Nashville, Tennessee
37246

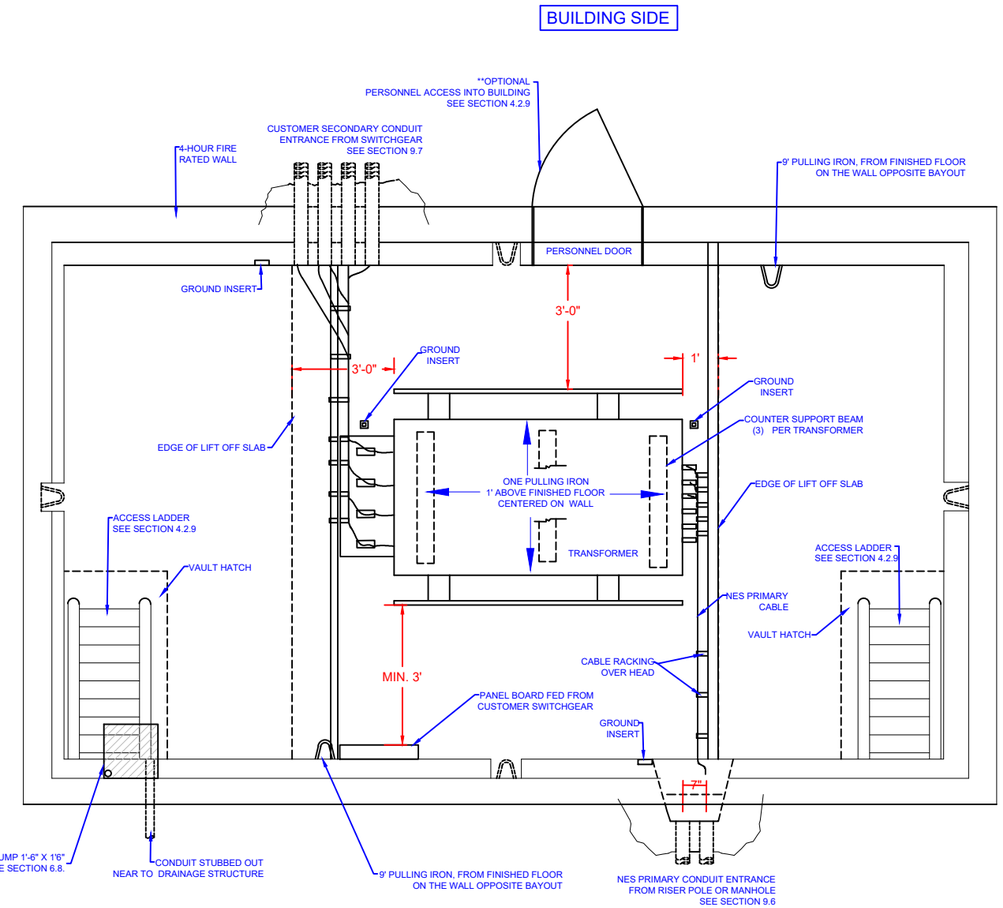
TRENCH REQUIREMENTS
NETWORK

SCALE: NONE

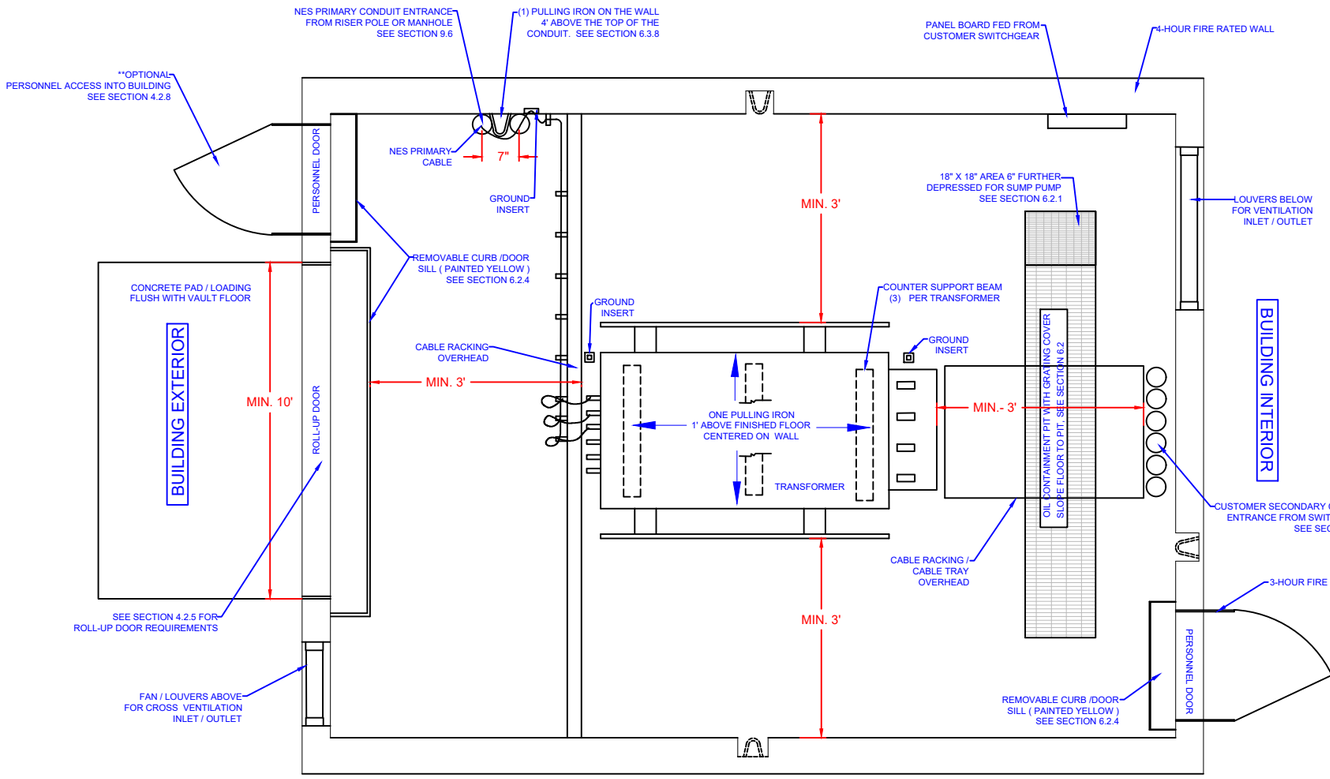
STANDARD	ISSUE
UN-40716	C

CONCEPTUAL DRAWING – NOT FOR CONSTRUCTION

REFER TO NES VAULT DESIGN GUIDE FOR DETAILS



BELOW GRADE VAULT PLAN VIEW



STREET LEVEL VAULT PLAN VIEW

ISSUES:	A ORIGINAL	B REVISION
Drawn by:	MT	H. PATEL
CHECKED BY:	MT	RDR
SUBMITTED BY:	MT	
APPROVALS	Ron D. Davidson	Ronald D. Rasmussen
APPROVED FOR CONSTRUCTION	Detailed description of changes.	Miscellaneous changes.
ISSUE NOTES:	10-3-16	07/2021
	10-4-16	07/2021
	10-27-16	

REFERENCED DOCUMENTS AND WEB LINKS

NES VAULT DESIGN GUIDE

NASHVILLE ELECTRIC SERVICE
1214 CHURCH ST
NASHVILLE, TN 37246

NASHVILLE ELECTRIC SERVICE
CUSTOMER ENGINEERING STANDARDS

T:\CE STANDARDS DRAWINGS\UGS\UGS-00034B

NON-NETWORK VAULTS – PLAN VIEW
BELOW GRADE VAULT AND STREET LEVEL VAULT

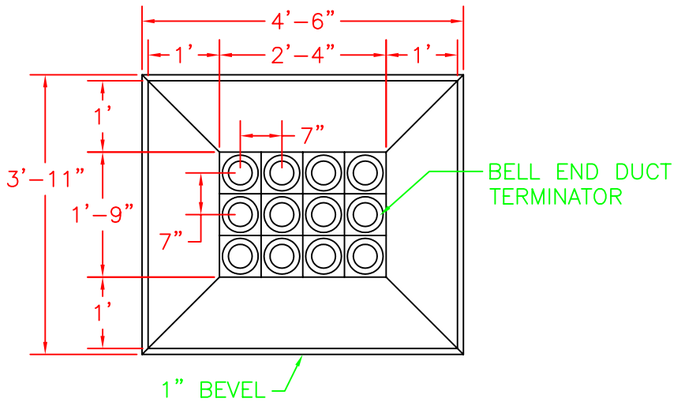
SCALE: NTS

Sheet 1 of 1

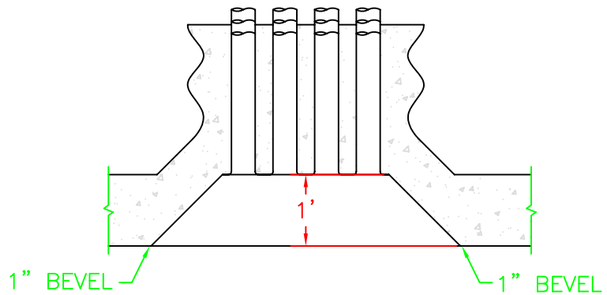
DRAWING NUMBER: UGS-00034

ISSUE: B

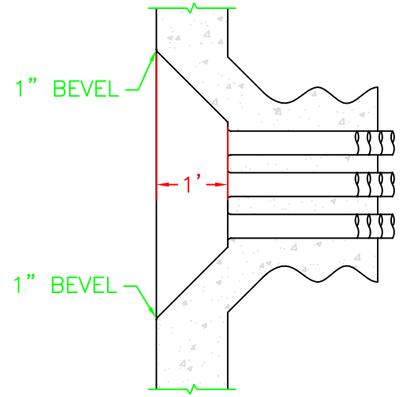
TYPICAL STRAIGHT BAYOUT



FRONT VIEW

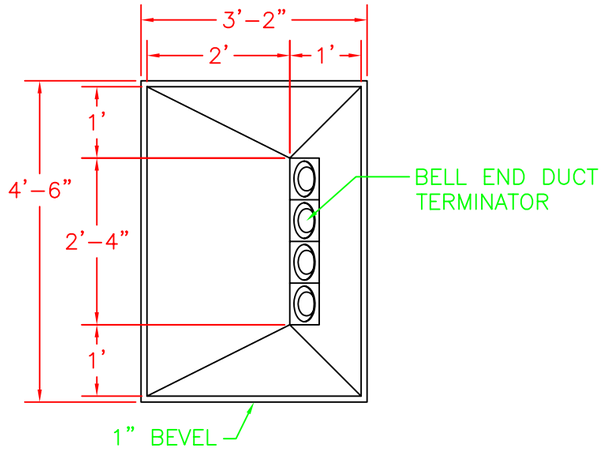


TOP VIEW

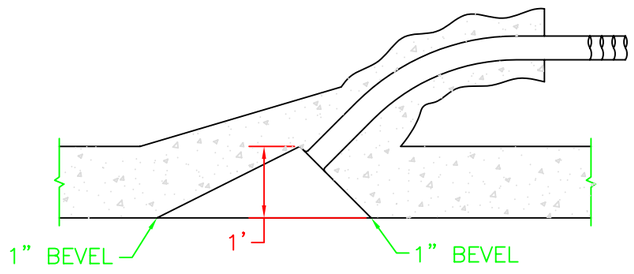


SIDE VIEW

TYPICAL ANGLED BAYOUT



FRONT VIEW



TOP VIEW

NOTES

1. BAYOUT SHALL NOT BE LOCATED BELOW VENTILATION GRATING.
2. ALL CONDUITS SHALL BE TERMINATED IN BAYOUT WITH BELL END DUCT TERMINATORS.
3. 1" BEVEL SHALL BE PROVIDED ON ALL EDGES OF BAYOUT TO PREVENT DAMAGE TO CABLE.

ISSUES:			
A	ORIGINAL	HITCHCOCK	04/27/06
PREPARED BY:		HITCHCOCK	04/27/06
SUBMITTED BY:			
PRINCIPAL APPROVAL:			
PLANNING APPROVALS AS REQUIRED BY CONSTRUCTION			Ronald D. Davidson

REFERENCE DRAWINGS		EQUIPMENT INFORMATION	
DRAWING NO.	TITLE	EQUIPMENT NO.	DESCRIPTION
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NASHVILLE ELECTRIC SERVICE

1214 CHURCH STREET
NASHVILLE, TENNESSEE 37246

ESTIMATE NO.	WO NO.	DESCRIPTION
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STANDARD VAULT BAYOUT DETAIL

Sheet 1 of 1

SCALE: N.T.S.

DRAWING NUMBER: UN-41535

ISSUE: A

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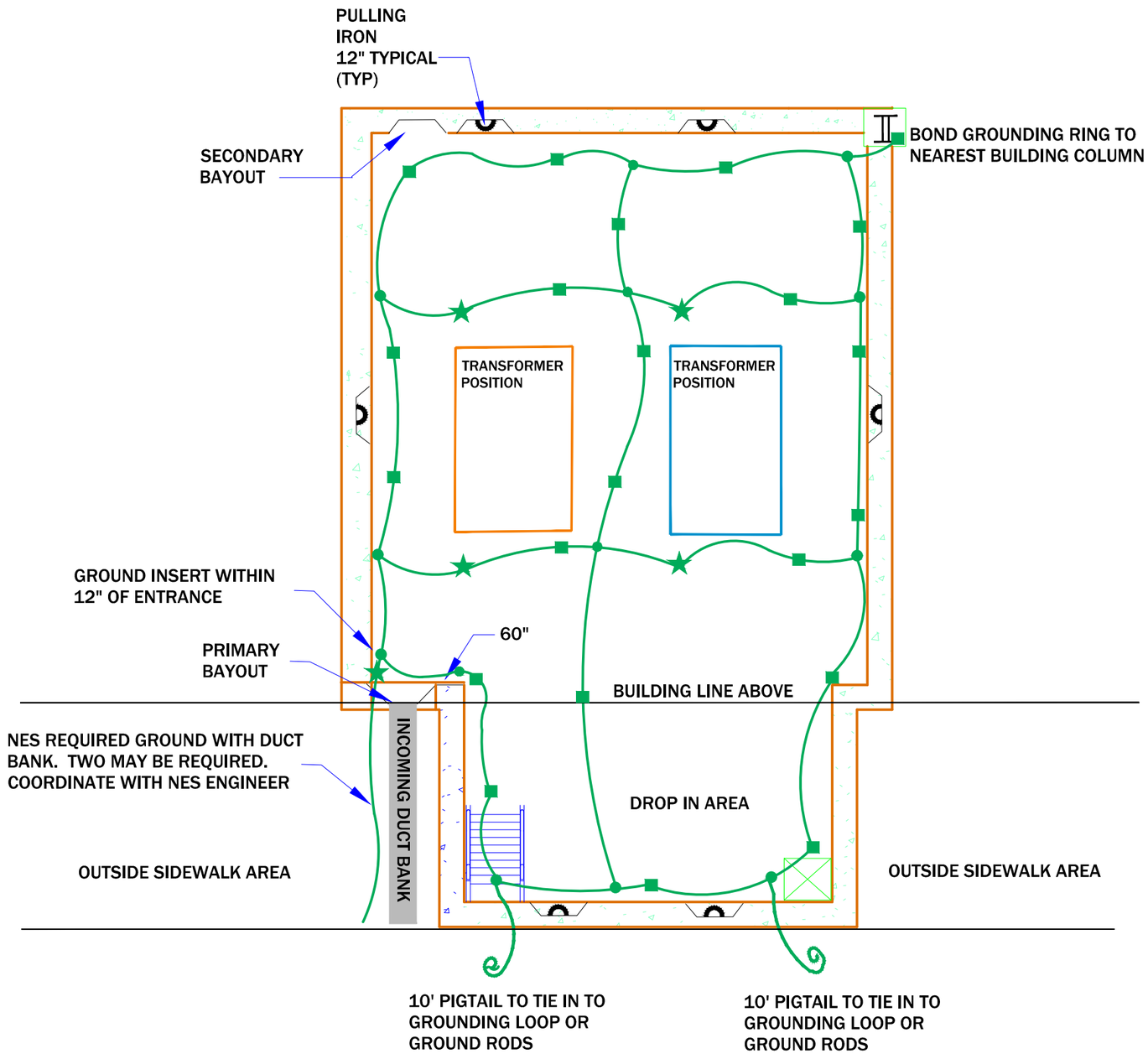

LEGEND

	4/0 AWG 19-STR BARE SOFT DRAWN COPPER IN FLOOR OR WALL
●	CABLE TO CABLE BOND BRUNDY KS39
■	CABLE TO REBAR BRUNDY GAR6429. SPACED 8 TO 10-FT INTERVALS
★	GROUND INSERT (IN FLOOR OR WALL) FOR NON NETWORK VAULTS (OTHERS MAY BE REQUIRED, COORDINATE WITH NES ENGINEER)

NOTE TO CONTRACTORS:
- ONCE VAULT ACCEPTED BY NES, NO ADMITTANCE INTO THE VAULT WITHOUT NES APPROVAL

ISSUES: A ORIGINAL
Drawn by: CJM 05-14-21
CHECKED BY: RDR 05-14-21
SUBMITTED BY:
APPROVALS: Ronald D. Rasmussen
APPROVED FOR CONSTRUCTION
ISSUE NOTES: ORIGINAL

REFERENCED DOCUMENTS AND WEB LINKS

NES VAULT DESIGN GUIDE

NES
NASHVILLE ELECTRIC SERVICE
1214 CHURCH ST
NASHVILLE, TN 37246

NASHVILLE ELECTRIC SERVICE
CUSTOMER ENGINEERING STANDARDS

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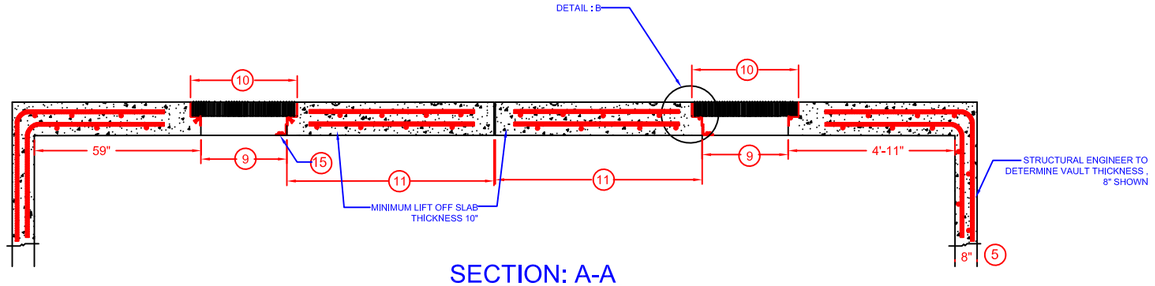
NON-NETWORK VAULT GROUNDING

SCALE: NTS

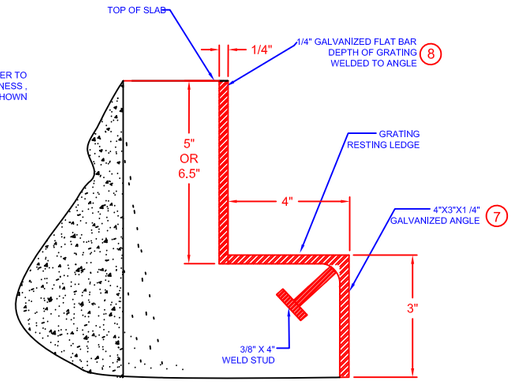
Sheet 1 of 1

DRAWING NUMBER: UGS-00035

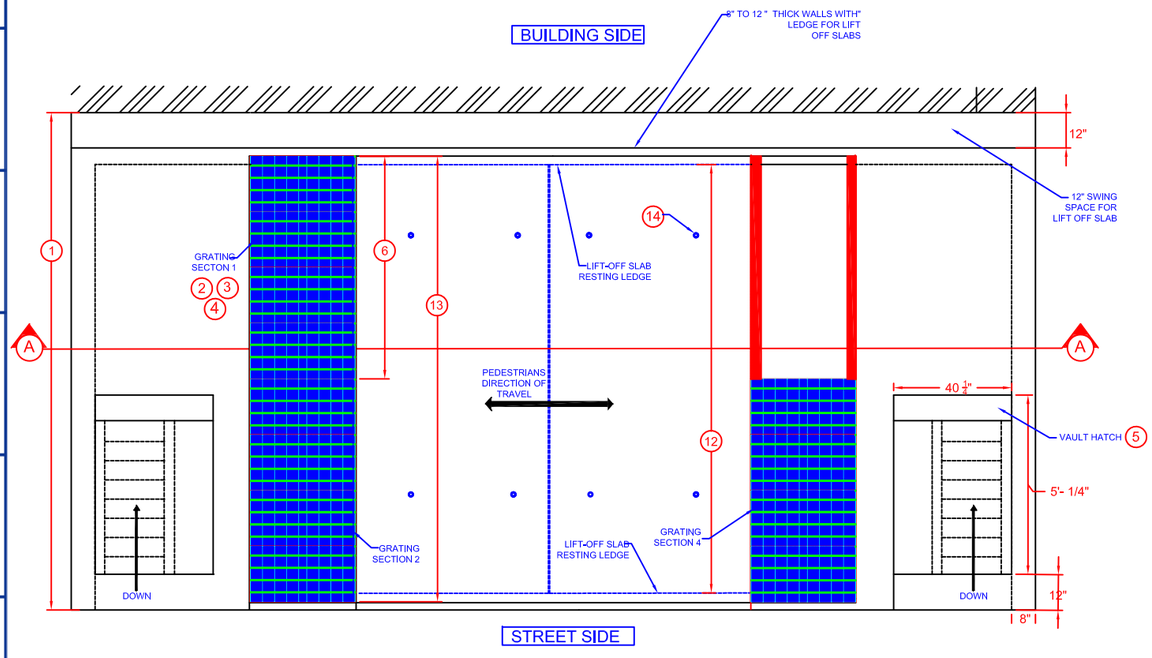
ISSUE: A



SECTION: A-A



DETAIL : B SCALE: *NTS*



NON NETWORK VAULT TOP VIEW

NOT FOR CONSTRUCTION. EXAMPLE ONLY TO SHOW COMPONENTS AND GRATING SIZES AND CRITICAL VAULT DIMENSIONS. ACTUAL VAULTS MAY VARY PER STRUCTURAL ENGINEER FOR H-20 HEAVY DUTY AASHTO LOAD.

VAULT DIMENSION TABLE

		TRANSFORMER SIZE 1000-KVA, 1500-KVA	TRANSFORMER SIZE 2500-KVA, 3000-KVA
1	CRITICAL DIMENSION STREET TO BUILDING FACE	14'-4"	16'-4"
6	GRATING LENGTH	VARIES REFER TO STRUCTURAL DRAWINGS	VARIES REFER TO STRUCTURAL DRAWINGS
10	OPENING FOR GRATING	3'-1" (37")	4'-11" (59")
13	LIFT OFF SLAB LENGTH	VARIES REFER TO STRUCTURAL DRAWINGS	VARIES REFER TO STRUCTURAL DRAWINGS
9	CLEAR SPAN OF GRATING	2'-5" (29")	4'-3" (51")
11	LIFT OF SLAB WIDTH	5'-6"	6'-0"
12	WALL TO WALL DIMENSIONS	12'-0"	14'-0"

GENERAL NON NETWORK VAULT GRATING NOTES :

ALSO REFER TO VAULT DIMENSION TABLE

1. ARCHITECTURAL TEAM SHALL MEET THESE CRITICAL DIMENSIONS FOR SIDEWALK VAULTS. IF CRITICAL DIMENSIONS CANNOT BE MET, ARCHITECTURAL TEAM SHALL PROVIDE "AT GRADE" VAULT OR VAULT BELOW FINISHED GRADE WITH LIFT OFF ACCESS TO MEET TABLE 4 OF VAULT DESIGN GUIDE. SIMILAR GRATING AND LIFT OFF SLABS TO BE FURNISHED. AS WELL AS FORCED AIR VENTILATION.
2. GRATINGS ARE TO BE EQUAL TO OHIO-GRATING, WHEELS-N'HEELS INVENT 64-7-WH-63. 3/16".
3. GRATINGS TO BE H-20 HEAVY DUTY AASHTO LOAD RATED.
4. GRATING PANEL SECTIONS SHALL BE EQUAL LENGTHS . EACH SECTION WITH FOUR LIFTING DEVICES.
5. INWESO 30" X 48" ALUMINUM SHOCK ASSIST, SINGLE LEAF, 90 DEGREES WATER TIGHT, H-20 LOADING, CAST- IN. CAT # 3048AL-CWSH-020L, "ELECTRIC" LABEL ON TOP. SECURITY PENTA-HEAD BOLTS.
6. OVERALL LENGTHS MAY VARY DEPENDING ON STRUCTURAL ENGINEER DRAWINGS.
7. 4"X3"X1/4" GALVANIZED ANGLE INSERTS PART OF OWNERS MISCELLANEOUS STEEL PACKAGE. REFER DETAIL B. LIFT OFF SLAB SIDE STEEL PIECE WILL BE 1 INCH SHORTER THAN STATIONARY SIDE DUE TO 1/2 INCH GAPS ON EACH END.
8. 1/4" FLAT BAR TO BE WELDED TO THE GALVANIZED ANGLE. LENGTH OF ANGLE VARIES AS PER DEPTH IF GRATING AND SIZE OF TRANSFORMERS. REFER TO DETAIL B.
9. CLEAR SPAN DIMENSION OF GRATES REFER TO TABLE AS PER TRANSFORMER SIZE.
10. OUTSIDE TO OUTSIDE DIMENSIONS OF GRATES REFER TO TABLE AS PER TRANSFORMER SIZE.
11. VAULT LIP TO LIP MAY BE 8" LONGER DEPENDING ON STRUCTURAL ENGINEER. DRAWING USED 4" LEDGE.
12. LIFT OFF SLAB LENGTH VARIES AS PER TRANSFORMER SIZE , AS SHOWN IN THE TABLE.
13. OVERALL LENGTHS MAY VARY DEPENDING ON STRUCTURAL ENGINEER DRAWINGS.
14. DAYTON LIFTING INSERT F-54 (TYP), ROUGHLY 2' FROM OUTSIDE EDGE, 1' FROM INSIDE EDGE. CUSTOM ORDER TO DEPTH OF SLAB, REFER TO VAULT DESIGN GUIDE SECTION 6.5 . PROVIDE TWO MATS OF REBAR TO HOLD INSERT STRAIGHT WHEN POURING SLAB.
15. POSITION ANGLE FOR LIFT OFF SLAB BOLTED TO VAULT RIM. (TYP) FOR 4.

ISSUES:				
Drawn by:	A	ORIGINAL	H. PATEL	07/2021
CHECKED BY:			RDR	07/2021
SUBMITTED BY:			Ronald B. Rasmussen	
APPROVALS:	B	REVISION	H. PATEL	09/2021
CONSTRUCTION			RDR	09/2021
ISSUE NOTES:			Ronald B. Rasmussen	
		STANDARD GRATING ACCESS AND GRATING PANEL WITH PROFILE		TO MATCH OHIO GRATING CUT SHEET

REFERENCED DOCUMENTS AND WEB LINKS

NES NETWORK VAULT DESIGN GUIDE

NASHVILLE ELECTRIC SERVICE
1214 CHURCH ST
NASHVILLE, TN 37246

NASHVILLE ELECTRIC SERVICE
CUSTOMER ENGINEERING STANDARDS

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NON NETWORK BELOW SIDEWALK VAULT TOP DETAILS.

SCALE: *NTS*

Sheet 1 of 1

DRAWING NUMBER: *UGS-00036*

ISSUE: *B*

APPENDIX E

REQUIRED HARDWARE (not an exhaustive list)
CUSTOMER PROCURED AND INSTALLED

Grounding Provisions - Ground Inserts

Manufacturer: Dossert®

Product: PGU 30-4 NEMA Std. 4-hole or equal approved by NES

Cable Range: Min. 1/0 STR. - 373 D, MAX. 300 MCM - 630 D

Material: Copper Alloy 113-Dl, U-Bolts, Nuts and L.Washers-Everdur

Manufacturer: Burndy®

Product: YGF29-4N Drawing Number SD082518-01
Cable Range: Min. #2 STR. 292 D - MAX. 250 MCM - 575 D

Vault Lift Off Slab - Ductile Embed Insert

Manufacturer: Dayton Superior®

Product: 4 per slab - 1"-8NC Bolt dia., 1-1/8" Shaft dia., threaded F-54 hot-dipped galvanized (with brass plugs with hex sockets)
Made to length. Contractor to indicate length. Length = Slab thickness minus 2-inches.

Grating

Manufacturer: Ohio Gratings Inc.®

Product: Wheels n' Heels® InVent 64-7-WH-63 3/16" Galvanized

Vault Door - Panic Hardware

Manufacturer: Yale®

Product: 7100 Series flat bar exit device with door closer

Outside Trim: Augusta trim lever Type 626(F) Series wide escutcheon trim

Lock Set: Setup to operate as "Storeroom" (ANSI 09) function

Lock Rim Cylinder and Core: Shall be provided and installed by NES

Hatch Access Panel

Manufacturer: Inwesco

Product: 3048AL-CWSH-020L or equivalent with same opening size and operation. Hatch must use Penta head bolt and have "Electric" stamped on the lid.

Personnel Access - Ladder
Corrosion resistant, per OSHA Standard 1926.1053, for “Fixed Ladders”

Personnel Access - Ladder Safety Post

Manufacturer: Bilco®

Product: LadderUp® Safety Post model LU-2

Primary Cable Support – Fiberglass Bracket For Underground Cable Support

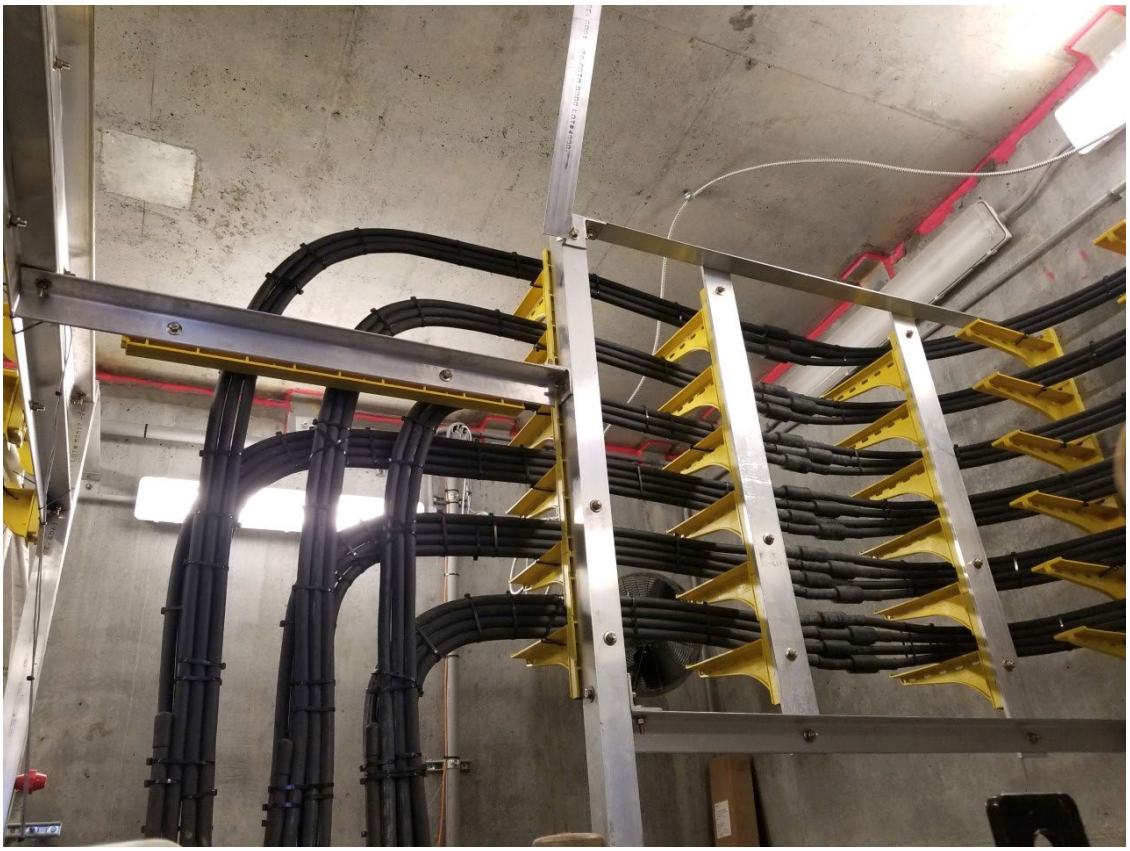
Manufacturer: Underground Devices®

Product: Part #MM10 – Mounts with 3/8” anchors and extends from walls 9-11”

Secondary Cable Racking

Manufacturer: Underground Devices®
Product: Heavy Duty Rack - Part #CR36-B

Manufacturer: Underground Devices®
Product: Cable Arms (14”) – Part #RA14



Manufacturer: Thomas & Betts®

Product: Cable Tray - Aluminum, H Beam, Series #1, 6” Side Rail, 36” Wide, 12” Rung Spacing

Lighting

Manufacturer: Lithonia Lighting®

Product: CSVT L48 5000LM MVOLT 40K 80CRI Wet Rated.

Manufacturer: Columbia Lighting
Product: LXEM-4-40ML-RFA-EDU

Manufacturer: Cooper
Product: 4VT3-LD5-6-G-UNV-L840-CD1-U

Typical Rigging Assembly

Mfg.	Part #	Description	Qty.
Actek	AK4621	1”-8 Swivel Hoist Ring w/1.29 Thread Projection, 10,000 lbs Capacity	4
Actek	AK46210SP17	1”-8 Swivel Hoist Ring w/17” Thread Projection, 10,000 lbs Capacity	4
Actek	AK46261	1”-8 Nut	4
Actek	AK46268	Washer	4

Concrete Support Beams

Manufacturer: Oldcastle Precast

Product: 8”x4’0x6” Precast NES Network Vault Support, Special #98617-1 Item #2500035

Sump Pump (provided by NES)

Manufacturer: Stancor

Product: Avenger Series – Model SE-50

Recessed Pulling Iron Example

NON-NETWORK VAULT DESIGN GUIDE

Revision Date	Revision History	Approvals
07/02/2015	Original issue – based on Network Vault Design Guide and Dry Vault Design Guide.	Wes Suddarth Created By Supervisor Manager
11/3/2016	Combined Non-Network & Network vault design guides.	Created By Supervisor Manager
07/19/2021	- Separation of Non-Network & Network design guides - Updated Sections - 1.3, 2.4, 2.6, 3.2, 4.1, 4.2, 6.3, 6.5, 6.6, 6.8, 7.1, 7.3, 8.1, 9.1, 9.2, 9.3, 9.5, 9.6, 9.7, 9.8, 9.9 - Appendix A – Updated Tables 2 & 3 - Appendix B – Added Non-Network Map. - Appendix D – Updated Standard Drawings - Appendix E – Updated hardware list and added photos	Created By Supervisor Manager