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1. Purpose

1.1 This specification defines the minimum requirements for a customer-owned equipment room containing facilities and equipment owned, operated, and maintained by NV Energy (NVE).

1.2 These design requirements are intended to provide for satisfactory infrastructure to install and maintain NV Energy electrical service equipment. These are the minimum requirements to meet the operational and safety needs of NV Energy.

1.3 This specification is not a complete design or construction specification. Compliance with this specification is a requirement for service.

2. References, Codes and Standards

2.1 Terms in this document are defined in IEEE 100 as well as by the references cited below.

2.2 The equipment room shall be designed and constructed in compliance with the National Electric Code (NEC), Article 450 "Transformers and Transformer Vaults". Attention is particularly directed to Part "III", 450-41 through 450-48 or latest revision.

2.3 This specification does not relieve the Customer from complying with all applicable codes, ordinances, or other industry standards.

2.4 Where there is a conflict between this specification and any codes, ordinances, or industry standards, this specification shall supersede when the requirements of this document exceed those of applicable codes. When there is a question regarding a conflict, the Customer shall notify NVE in writing for resolution.

2.5 Exemptions from this specification must be obtained in writing from NVE.

2.6 The requirements in this standard may be in addition to and exceed the requirements in the National Electric Code (NEC) and other local codes. The requirements in this standard shall take precedence when they exceed the requirements of any applicable codes.

2.7 Applicable codes (may not be all inclusive):

- National Electric Code (NEC), Article 450, “Transformers and Transformer Vaults”
- Must meet all applicable OSHA standards as outlined in 29 CFR 1910
- ASTM A123, Standard Specification for Zinc-Coated Coating on Iron and Steel Products
- ASTM A153, Standard Specifications for Zinc Coating on Iron and Steel Hardware
- ASTM F512, Standard Specifications for Smooth-Wall Poly Conduit and Fittings for Underground Installation
- Metal Framing Standards Publication No. MFMA-1
- NEMA TC6, PVC and ABS Plastic Utilities Duct for Underground Installation
- NEMA GR-1, Ground Rods and Ground Rod Couplings
- Uniform Fire Codes and National Fire Protection Association Standards & Codes
- City of Las Vegas, City of North Las Vegas, City of Laughlin, City of Henderson, and/or Clark County of Nevada Construction Codes Requirements of Fire Extinguishing Systems
- IEEE 100, Standard Dictionary of Electrical and Electronic Terms

3. General Requirements

3.1 The construction and design of the equipment room shall meet the requirements of NEC Article 450, “Transformers and Transformer Vaults”.

3.2 NV Energy must approve the equipment room design before construction begins in accordance with Section 4 Customer Submittals. This will include a review of the fire protection and suppression components by an NV Energy Safety & Health Specialist or designee, and a general design review by our Engineer(s).

3.3 NV Energy will provide, install, and maintain the following:

- Primary switchgear and fusing
- Primary cables and terminations
- Primary junction boxes
- Transformers
- Service cable connections to the transformer

3.4 The Customer shall furnish all materials, labor, and incidentals, except as otherwise noted in this specification, necessary to complete construction of the equipment room including, but not limited to, the following:

- Ventilation
- Fire Suppression
- Ground Bus
- Oil Containment
- Duct and Cable Racking
- Lighting and Outlets
- Service Conductors

3.5 Only equipment, pipes, ducts, wires and other fixtures that are a necessary part of the electrical installation shall be allowed in an equipment room.

3.6 Foreign fixtures such as pipes, ducts, vents, or other objects which are not required for electric service shall not enter or pass through the equipment room.

3.7 NV Energy will provide and install transformer(s), switches, primary conductors, and connectors as required.

3.8 All metering equipment and customer equipment, other than service conductors or bus, shall be located outside of the equipment room.

3.9 Equipment rooms shall not be used as temporary or permanent storage spaces.

3.10 The design of the equipment room shall accommodate and the Customer shall ensure that NVE personnel have full, unimpeded 24 hour immediate access to the equipment room.

3.11 After NVE acceptance of the equipment room, the Customer and/or his representative or contractor(s) shall not enter the equipment room except in the presence of an authorized NVE employee. Access to the equipment room after equipment is energized will be restricted and entry into the equipment room by the Customer for maintenance of facilities is to be coordinated with NVE. A sign will be posted identifying the NVE contact for entry into the equipment room. At least seven days advance notice is required to schedule maintenance of NVE equipment room facilities. A qualified NVE employee must be present during Customer/contractor access into an energized equipment room. The Customer will be charged for this stand-by time.

4. Design Considerations

4.1 NV Energy's preferred design is to use standard pad mounted outdoor equipment. The customer is responsible for the equipment premium, installation, operation, and maintenance costs beyond those of NV Energy's outdoor pad mounted design standards.

4.2 Equipment shall not be installed in an equipment room which, in the event of equipment failure, is likely to cause other customers outside the facility to experience an extended interruption of service until repairs can be made to the failed equipment.

4.3 The minimum floor space required for an equipment room shall be determined by the number of transformers and switches required to serve the facility.

4.4 Dry type transformers will be required in equipment rooms at or above grade when transformers are necessary for service.

4.5 Oil filled transformers will be required in equipment rooms below grade when transformers are necessary for service.

4.6 NVE will make the determination as to whether an equipment room is above, at, or below grade, and what type of transformer(s) will be required based in part on information submitted by the customer.

4.7 The equipment shall have the ability to be de-energized from outside the equipment room. The intent of this is to be able to de-energize the equipment room in case of failure, a fire or other hazardous circumstance.

4.8 After receipt of the detailed design and construction submittals, NVE will work with the Customer to determine the best layout and size of the equipment room.

5. Customer Submittals

5.1 The customer shall submit to NVE a design of the equipment room and a construction schedule for approval. The schedule shall provide adequate time for NVE to review the design.

5.2 **A minimum of 10 business days** is typically required for review (and approval if acceptable) by NVE. Any revisions or changes of the schedule must be submitted to NVE for approval, and approval must be granted in writing prior to the start of construction.

5.3 The design and construction schedule shall include:

- The date on which construction of the equipment room is to begin.
- The date on which construction of the equipment room will essentially be complete, no significant Customer work remains, and NVE may have access to the equipment room for installation of NV Energy's electric service equipment.
- A timeline indicating when all items of this specification will be completed in order for NVE to plan for energizing the equipment.
- The date on which the Customer desires electrical service.

5.4 The customer shall submit three (3) complete sets of detailed design plans, drawings, and other documentation which demonstrates compliance with this specification to NV Energy for approval.

5.5 Design and construction drawings should be approved by NVE prior to application for permit with the city or county of jurisdiction. The purpose of this requirement is to allow the Customer to provide the city or county of jurisdiction with NVE approved documentation. Required NVE changes made to the design after city or county approval may require re-submittal to the city or county of jurisdiction.

5.6 The submittal shall include the following:

- One Line Diagram showing primary type, size, and number of required conductors (as developed with the NVE designer); service conductor type, size, and number of conductors; and main panel(s) sizes and quantity.
- The Customers bus duct locations and/or electrical service conduit entrance(s) into the equipment room.
- For equipment rooms located outside of the building floor plan - a site plan showing the location of the equipment room and adjacent streets, personnel and vehicular access, ventilation, wall penetrations, and fire protection equipment along with any other necessary details as required.
- For equipment rooms located within a building floor plan - a drawing showing adjacent rooms, ventilation, fire protection, personnel and vehicular access, equipment access, penetration details, and exterior and interior access routes along with any other necessary details as required.
- Where electrical service equipment rooms are part of a building or structure - the location of the building's inlet air ducts, vents, doors and windows. No building inlet air ducts, vents, windows or doors shall be located immediately above or adjacent to an equipment room or the equipment room's ventilation.
- The equipment room HVAC balance diagram showing inlet air flow (CFM), inlet air maximum temperature, any significant heat loads, and the duct vent sizes.
- Electrical conduit ducts from the electrical source to the equipment room (reference Section 5.6.15)
- Construction drawings, specifications, vendor information, etc. showing compliance with this specification.
- Fire protection drawings, system design calculations and technical specification sheets on fire protection system components for the equipment room including fire/smoke dampers and actuators, sealants, doors, etc.

5.7 NVE will review the submittals and return one complete set of documentation to the Customer with NVE comments. **A minimum of 10 business days** shall be required for NVE engineering review of submittals.

5.8 Delays in submission of or failure to submit the required design and schedule information will result in delays in obtaining or failure to obtain electrical service.

5.9 Submittals returned "NOT APPROVED" shall be revised by the Customer as appropriate and resubmitted to NVE.

5.10 NV Energy approval is limited to those areas occupied by NV Energy equipment. Approval is for the purpose of assuring the safe and efficient operation and maintenance of NVE equipment. NVE assumes no responsibility for the correct application or safety of Customer installed/owned equipment or designs.

6. Equipment Room Location

6.1 The location of the equipment room shall comply with NVE Standard RPI-015 “Commercial Meter and Service Equipment Location”.

6.2 An “Access to Equipment Agreement” is required for equipment room installations.

6.3 The equipment room shall be located on the Customer’s property. It is recommended that transformers be placed in separate rooms to prevent an equipment failure from damaging or preventing access to other equipment.

6.4 The preferred location for an equipment room is at grade level adjacent to the exterior wall that is closest to NVE’s existing distribution system.

6.5 In all cases, the location shall be accessible by a door or removable wall to an outside location where a movable lift can reach the transformers, switchgear and related equipment for installation, maintenance and replacement.

6.6 Location of the equipment room may dictate what type of equipment is required for service. (See Sections 4.4 and 4.5)

6.7 The customer shall provide NVE crews with immediate, unimpeded 24-hour access to the equipment room. Future expansion plans by the customer must not affect accessibility.

6.8 The equipment room shall be located where it can be ventilated to the outside air.

7. Permits and Licenses

7.1 The Customer, at their expense, shall secure all permits and licenses necessary for the execution of the work.

7.2 The Customer shall give all notices, necessary and incidental, for the due and lawful execution of the work.

7.3 Design and construction drawings per Section 4 should be approved by NVE prior to application for permit with the city or county of jurisdiction. The purpose of this requirement is to allow the Customer to provide the city or county of jurisdiction with NVE approved documentation. Required NVE changes made to the design after city or county approval may require re-submittal to the city or county of jurisdiction.

8. Personnel Access

8.1 The equipment room shall have **at least** two personnel access ways. These access ways shall be located at opposite ends of the equipment room. A personnel access way can be either:

- 2'-8" W x 6'-8" H doorways at curb level in the equipment room wall. The installation shall be such that the outside knob is fixed with entry by key only, while the inside of the door shall be equipped with a panic bar or pressure plate device that shall always remain unlocked and open under simple pressure as per Section 8.4.
- A doorway equipment access may also serve as one of the personnel accesses.

8.2 Both egresses must allow 24 hour exit from the equipment room and building.

8.3 Personnel doors shall swing out and be equipped with panic bars, pressure plates, or other devices that are normally latched but open under simple pressure.

8.4 All doors shall meet the following requirements:

- All doors shall have auto closers.

- All doors shall have warning placards/signs, such as “Danger High Voltage”
- Locksets shall be Best Heavy Duty Cylinder Lockset, Cat. #85K7D4AS3-626. Locksets shall be such that the outside knob is fixed with entry by key only, and the inside knob is always unlocked. NVE will provide and install lock cylinders.
- Doors shall swing out and be equipped with locks and hinges/latches that permit opening by easy pressure or torque on the operating components.
- Doors shall be 3-hour fire rated and smoke sealed.
- Door hardware, hinges, and latches shall be designed to withstand the pressures associated with fire protection discharges.
- Doors and openings shall be air tight so as to encapsulate the gaseous fire suppression agent.

8.5 A minimum 7’-6” clearance must be maintained in front of all switchgear bays.

9. Equipment Access

9.1 The equipment room design shall provide for and the Customer shall maintain a clear access route for delivery and installation of NV Energy equipment. NVE will work with the customer to plan for the most efficient maintenance and emergency restoration procedures.

9.1 An “Access to Equipment Agreement” is required for all equipment room or equipment area installations.

9.2 The preferred method of installing and removing equipment is by use of a movable lift (mobile crane). Therefore, the equipment room shall have a minimum of one of the following access features:

- A 10 ft. wide access aisle-way running the length of the equipment room. The access aisle-way shall provide a minimum 10'-0” wide x 14'-0” high clear path running the length of the equipment room for installation and/or removal of NVE equipment. Road access to equipment rooms is to be considered as part of the access aisle-way.
- One doorway at curb level opening into a 10 ft. wide clear access aisle-way running the length of the equipment room. Equipment access doors shall be double doors (hinged or roll-up), each door shall be a minimum of 8'-0" wide x 12'-0" high. The doors shall open out of the equipment room with auto-closers, and shall be set to curb level. The doors shall also be 3-hour fire rated, smoke sealed, and equipped with flush bolts. Locksets shall per Section 8.
- The installation shall be such that the outside knob is fixed with entry by key only, while the inside doors shall always remain unlocked. One such equipment door may double as a personnel access provided Section 8.4 is adhered to such that doors will open under simple pressure.

9.4 Equipment access openings shall not be located directly under or adjacent to building fresh air intakes or open windows due to hazards associated with fire, smoke, or fumes.

9.5 Customer shall provide an NVE approved movable lift capable of lifting 12,000 lb. equipment to a vertical height of 4’ in order to clear the conductors and which is capable of being rolled through the adjacent doors to the outside where NVE’s lifting equipment is located.

10. Ceiling, Walls, and Floors

10.1 The ceiling height above the equipment shall not be less than 14 feet from the floor to the bottom of the lowest overhead obstruction unless otherwise approved in writing by NVE. A minimum of 4 feet clearance above the equipment to the lowest obstruction or ceiling shall be provided. Overhead cable racks should have a minimum 2 foot clearance from the ceiling. In addition to a 4 foot clearance above the equipment, a minimum 2 foot horizontal clearance must be maintained above all switchgear bays.

10.2 If the floor of the equipment room is below ground level, the portion of the walls and ceiling of the equipment room below ground level shall be painted with not fewer than two coats of white vinyl acrylic concrete paint.

10.3 Requirements for fire protection applications shall be considered when designing ceilings, walls, and floors. These considerations shall include structural requirements due to pressure during discharge of the fire suppression gases, and porosity for containment of suppression gases.

10.4 For equipment rooms containing oil-filled equipment, a six (6) inch (minimum) high curb shall be constructed and sealed along the wall and doorway openings for oil containment. See Section 22 Equipment Data for transformer oil volume.

10.5 The equipment room shall be designed to stop the intrusion of water through all walls, floors, ceilings, and joints.

10.6 Sumps (For Equipment Rooms With Floors Below Grade)

10.6.1 The Customer shall provide a minimum of two drainage sumps in the floor of the equipment room.

10.6.2 The sumps shall have minimum dimensions of 12" x 12" x 12", or 12" in diameter by 12" deep. The sumps shall have removable grates installed flush with the floor.

10.6.3 The sumps discharge piping shall be connected together with one and one half (1-1/2) inch PVC Class 120 water pipe.

10.6.4 The floor shall be sloped (pitched) toward each sump. The slope shall provide a maximum one (1) inch drop from the highest point of the floor to the sump.

10.6.5 The sumps shall be located in the corners of the equipment room next to a door and six (6) inches from the walls.

10.6.6 The Customer shall provide a means for discharging any accumulated water from the equipment room. Typically this requires a sump pump of sufficient head and capacity to discharge the water to or near a gutter or Drop Inlet. The pump shall be manually controlled, with the switch located such that entrance into standing water in the equipment room is not necessary to operate the pump.

10.6.7 In the case where the equipment room is divided into separate rooms (for fire suppression reasons), these sump requirements apply individually to each room.

10.7 There shall be no floor drains in the equipment room due to the potential of oil discharge from the transformers.

10.8 The Customer shall provide a minimum of eight (8) pulling irons for the primary conduit entrance. These pulling irons shall be located with two (2) in each corner of the room, one of which is near the ceiling and one near the floor. The pulling irons shall be located such that they are at least 18" away from the floor, ceiling, or adjacent wall. Pulling Irons shall be Joslyn #J1142 or NVE approved equivalent. Each pulling iron shall have a minimum installed working strength of 10,000 pounds.

11. Fire Protection and Detection

11.1 The building and/or fire agencies having jurisdiction may require fire protection and detection to be installed. NVE assumes no responsibility for the permitting or operation of the system.

11.2 When a fire protection system is required in the equipment room, the design of the fire suppression and detection system is the responsibility of the Customer. Automatic gaseous suppression systems may be required on equipment rooms built inside a building or within the foundation structure.

11.3 Automatic water sprinkler systems or water suppression systems shall not be utilized.

11.4 Note: Automatic water suppression systems are not allowed within the equipment room due to the hazards associated with the operation of such systems while working on electrical equipment in the area. The clean-up effort after the operation of a water suppression system in an electrical equipment room is significantly more hazardous, costly, and time consuming than with gaseous protection systems. In

addition, accidental discharges and leaks of water suppression systems may cause electrical equipment failures thereby reducing the reliability of electrical service and causing additional hazards.

11.5 Automatic fire suppression cylinders, containers, agent, and control panels when required shall be installed outside of the equipment room.

11.6 The owner shall be responsible for the monitoring, servicing, maintenance, and repair of the fire systems.

11.7 Pre-alarm audible devices, and supervised maintenance/isolation switches shall be permitted to be inside the equipment room.

11.8 Smoke detectors shall not be used inside electrical equipment rooms due to the potential for inadvertent operation with electrical equipment. Heat detectors are required. Automatic suppression systems when installed shall be cross-zoned with heat detection. Detectors shall have a minimum temperature rating of 205 degrees F.

11.9 All fire suppression piping, nozzles and equipment shall be located so as not to interfere with electrical cables, transformers or other electrical equipment. A minimum clearance of 4' (four feet) shall be maintained from all electrical equipment so as not to interfere with overhead cabling, raceways, open buses and other electrical equipment.

11.10 Doorways and corridors shall remain clear and unobstructed. A minimum clearance of 13 feet shall be maintained from the finished floor to the bottom of fire suppression equipment in addition to the 4' vertical clearance requirement and 2 foot horizontal clearance requirement for electrical equipment in Section 10.1.

11.11 When carbon dioxide gas is used as the extinguishing agent, the owner shall take precautions so that the discharged gaseous agent will not settle into occupied areas where it may cause asphyxiation. It is recommended the odorant wintergreen be added to the carbon dioxide.

11.12 Forced air ventilation systems shall be equipped with a damper system that shuts down all fans and closes all openings in the event of a fire.

11.13 Dampers and fans shall be shut down upon activation of two fire detectors or upon activation of a pressure/flow switch resulting from the fire suppression agent being discharged.

11.14 Dampers and other openings shall be equipped with fusible links. Dampers shall be self-closing upon loss of power, fusible link, or activation of fire suppression or detection systems. Damper assemblies equipped with actuators employing a "stall" motor design are not allowed.

11.15 Dampers shall be combination fire/smoke with a 3-hour fire rating.

11.16 When automatic fire suppression systems are installed, a supervised isolation switch which deactivates the system shall be provided for NVE personnel so that maintenance or other activities in the equipment room may be performed. The switch shall be clearly marked, located inside the equipment room, adjacent to the entrance and easily accessible.

11.17 Fire Protection submittals shall be sent to the proper jurisdiction authority:

Las Vegas Fire and Rescue, 500 N. Casino Center Blvd. Las Vegas, NV

Clark County Fire, 575 E. Flamingo Rd. Las Vegas, NV

NLV Fire Administration, 2626 E Carey Ave, NLV, NV 89030

Henderson Fire Administration, 240 Water Street, Henderson, NV 89015

12. Fire Ratings

12.1 All walls, the floor, and the ceiling shall have a minimum three (3) hour fire rating. All doors shall have a three (3) hour fire & smoke rating. All penetrations (floor/wall/ceiling) including the doors shall be sealed per UFC & NFPA codes. Sealing designs shall consider pressures expected during fire protection suppression discharges.

12.2 Sealant used inside the equipment room shall be UL or FM approved and have the appropriate fire rating for the enclosure. All sealant materials and methods are subject to NVE approval through the submittal process.

12.3 Dampers shall be combination fire/smoke with a 3-hour fire rating.

13. Ventilation

13.1 General

13.1.1 Ventilation is required and can be by either natural circulation of air, forced ventilation, or a combination of both. The ventilation design shall be approved by NVE.

13.1.2 The equipment room shall be ventilated directly to an outdoor area. The equipment room ventilation shall not be mixed with the building ventilation/cooling system.

13.1.3 Ventilation openings shall be covered with durable gratings, screens, or louvers.

13.1.4 When gaseous fire suppression systems are used, ventilation requirements shall comply with the code requirements, including the ability to vent and maintain design limit pressures of the equipment room during fire suppression discharge and to minimize exposure of suppression gases to adjacent areas. Reference NFPA 12 Section 2.6.

13.1.5 Note: For fire suppression systems utilizing CO2, it is recommended that the ventilation exhaust duct be located at a high elevation point near or on the ceiling to allow lighter gases to discharge while heavy CO2 is being released. The fire/smoke damper for this ventilation duct should remain open during CO2 discharge and automatically close after CO2 release is complete.

13.1.6 All openings in the equipment room shall have fire/smoke combination louver/dampers in accordance with Section 5.6.9c and 5.6.8m.

13.2 Natural Circulation

13.2.1 The net area of ventilation opening, after reduction for the area occupied by screens, grates, and/or louvers, shall not be less than three square inches per installed transformer kVA. (Reference NEC 450). Example: With a quantity of four 1000kVA transformers installed, the ventilation area is calculated as 4 x 1000 kVA x 3 square inches/kVA = 12,000 square inches.

13.3 Forced Ventilation

13.3.1 The forced air ventilation capacity shall be designed and installed to maintain a 50 degree C (122 degrees F) maximum equipment room air temperature with an assumed outside air temperature of 40 degrees C (104 degrees F) with the assumed heat load per the table below:

Transformer Size	Heat Load per Transformer
2500 kVA (OIL)	18.4 kW
1500 kVA and below (OIL)	14.4 kW
2500 kVA (DRY)	30.0 kW
1500 kVA and below (DRY)	20.0 kW

13.3.2 The ventilation design capacity shall take into consideration all other heat loads including lighting, etc. In no case shall the ventilation capacity be less than 1300 CFM per transformer.

13.3.3 The maximum air velocity shall not exceed 900 feet per minute.

13.3.4 The combined net area of all ventilation openings, after deducting the area occupied by screens, gratings, and louvers shall not be less than fifteen hundred (1500) square inches per transformer position.

13.3.5 The fans shall be controlled by a thermostat. The fans shall operate at 90 degrees F equipment room temperature and shut off at 70 degrees F equipment room temperature.

13.3.6 The Customer shall provide and maintain electric service to all ventilation fans.

13.3.7 A means of disconnecting the power to the fans shall be provided in the equipment room.

13.3.8 Fans shall be interlocked to be shutdown during automatic fire protection system actuation. Reference UFC and NFPA.

13.3.9 Fire dampers on vents used to minimize pressure of the room during discharge of carbon dioxide fire suppression systems should close after discharge of the carbon dioxide. These vents should be located near or at the top of the room.

13.3.10 The ventilation system balance diagram showing the designed inlet capacity (CFM), maximum inlet temperatures and duct sizes shall be supplied as part of the submittals defined in Section 4.5.

14. Grounding

14.1 Grounding for the equipment room must meet NFPA 70 - NEC Article 250 requirements.

14.2 The customer is responsible for installing a continuous ground bus along the inside walls of the room a minimum of 12” and a maximum of 36” above the floor. The ground bus must not cross or obstruct any access doors.

14.3 The ground bus shall be a copper bar or wire and must have minimum cross-sectional area equal to 4/0 AWG conductor.

14.4 The ground bus shall be tied to a minimum number of ground points as specified in 14.6 to create an equal potential zone in the room. The ground bus shall be tied once to each piece of equipment in the room.

14.5 Connections of the ground points to the grounding electrode conductors that tie to the ground bus shall be made with an NEC approved and listed connector. Connections of the grounding electrode conductors to the ground bus shall be made using Cadweld or equivalent exothermic welding process. Connections of equipment grounding conductors between the ground bus and equipment shall be made with an NEC approved and listed connector. A Cadweld or equivalent exothermic welding process is acceptable for connecting the equipment grounding conductors to the ground bus.

14.6 One ground rod shall be installed in each of the corners of the equipment room as grounding points. Additional ground rods shall be installed as required and determined by NVE, up to twelve (12) in each room. In any event, grounding will conform to or exceed the requirements of NEC Article 250.

14.7 Each ground point shall consist of a ground rod or NVE approved alternative.

14.8 All ground rods shall be driven vertically such that the top end shall be ten (10) inches above the floor. The Customer shall exercise reasonable care to avoid damaging the threads on the ground rods. **Ground rods shall only be driven in the presence of an NVE inspector**.

15. Cable and Cable Racking

15.1 Customer is responsible for furnishing all conduit and racking inside the building required to bring the primary and service conductors to the switchgear and/or transformer.

15.2 Customer is responsible for furnishing, installing, and maintaining service cables, unless otherwise agreed. NVE will terminate the customer’s service cables on the transformer.

15.3 NV Energy will furnish, install, and maintain the primary voltage cables.

15.4 The equipment room shall provide adequate space for entry/exit and training of primary and secondary cables to equipment.

15.5 Switches

15.5.1 Underground primary feeder cables entering the equipment room shall run through precast concrete structures installed underneath switchgear bays as needed.

15.5.2 Primary cables exiting switchgear shall run through precast concrete structures installed underneath fuse bays as needed.

15.6 Transformers

15.6.1 Underground primary cables shall run through precast concrete structures installed underneath the floor.

16. Ducts for Primary Cable and Control

16.1 The Customer shall furnish and install a conduit duct for NVE's primary cable from the equipment room to a NVE designated location on Customer's property line.

16.2 The design shall call for an RS-82 (NVE Standard) precast box (30” x 84” x 48”) placed a maximum of 150’ outside the equipment room to facilitate the installation of feeder cable to the entrance switch bay.

16.3 The Customer must contact the NVE Designer to confirm type, size, location, and number of conduits for each equipment room.

16.4 All ducts shall be concrete encased. A minimum of 1 1/2" of concrete shall separate each duct. A minimum of 3" of concrete shall encase the complete duct bank.

16.5 The sum of the angles of all bends in the duct from the property line to the equipment room shall not exceed 135 degrees.

16.6 The typical number and size of conduits required in the duct for NVE's primary cable, control and communication is specified below – Customer must contact NV Energy for specific requirements:

15kv & 25kv: All Equipment Rooms	2 - 6" conduits per entrance/exit switch bay 1 - 2" conduit for communication
As required by commitment	1 - 6” conduit per switch for control 1 - 6” conduit spare

16.7 The minimum radius for conduit bends in the interior of a building shall be:

Duct Elbow Size	Radius (Minimum)
2”	18”
6”	48”

16.8 All underground primary ducts shall be 12 foot sweeps. Elbows shall not be used.

16.9 All primary ducts shall be installed in accordance with NEMA TCB2.

16.10 Any rigid steel conduit that is buried shall be wrapped with 30 mil plastic tape or factory coated.

16.11 A duct layout plan showing the specific route and duct material used shall be submitted for NVE approval as part of the submittals per Section 4.

17. Ducts for Secondary Cable

17.1 The Customer shall furnish and install a conduit duct for the Customer’s secondary cable from the equipment room to Customer's panel location when cable is used.

17.2 NV Energy will terminate the customer’s service cables on the transformer.

17.3 A duct layout plan showing the specific route and duct material used shall be submitted for NVE approval with the submittals per Section 4.

17.4 All secondary ducts shall be sealed by the Customer. Sealing shall be for the purposes of stopping water, smoke, and fire. The Customer shall take extra care in the design of bus duct systems so that this can be accomplished. All sealing material and methods shall be subject to the approval of NVE. Sealing materials shall be approved through the submittal process.

17.5 The service conductor conduit locations shall be approved by NVE. The size of the conductor and number of conductors shall also be approved by NVE. These plans shall be submitted to NVE in the submittals per Section 5.

17.6 The length of each Customer's furnished service entrance conductor after it enters the equipment room shall be as approved by NVE.

17.7 The Customer shall furnish the service conductors, or bus conductors from the Customer's switchgear to the equipment room. The Customer shall furnish 2-hole NEMA pad connectors for the termination of their cable to the transformers.

17.8 Customer supplied service conductors shall be 250 kcmil, 500 kcmil, or 750 kcmil. The conductors may be either copper or aluminum.

17.9 When Bus Conductors are utilized, the following conditions are required:

17.9.1 Bus conductor location and configuration in the equipment room shall be approved by NVE. These plans shall be submitted to NVE in the submittals per Section 4. The Customer shall provide and install the bus duct termination enclosures. Termination enclosures shall be located as close as practical to the transformers.

17.9.2 The termination enclosure shall be designed to terminate NVE's NEMA pad connectors. The spacing between phases shall provide sufficient room to terminate NVE's conductors.

17.9.3 NVE will furnish and install all cable and connectors required to connect the transformers to the Customer's bus conductor termination enclosure in the equipment room.

18. Conduit System Materials

18.1 All polyvinylchloride (PVC) conduits shall be Schedule 40 (minimum), gray color in accordance with the latest revision of ASTM F512 and NEMA TC6. Conduit may be supplied by any manufacturer meeting specifications.

18.2 All conduit fittings shall conform to ASTM F512 and NEMA TC9.

18.3 Elbows shall be schedule 40 polyvinylchloride (PVC), one piece gray in color with an integral bell end.

Size	2"	6"
Carlon No.	UA9CJB	UA9FRB
Condux No.	52781-20	52785-60

18.4 End bells shall be solid one-piece type, polyvinylchloride (PVC), Schedule 40, gray in color.

Size	2"	6"
Carlon No.	E997J	E997R
Condux No.	61019-20	61019-60

18.5 Conduit plugs shall be plastic tapered for appropriate conduit size.

Size	2"	6"
Carlon No.	P258JT	P258RT
Condux No.	80474-00	80478-00

18.6 Prefabricated multiple conduit terminators are acceptable. Please submit for approval.

18.7 A flat tape pull rope shall be left in each duct to facilitate conductor installation. The pull tape shall be tied to the removable conduit plug (MC-38).

18.8 Pull tape shall be made of polyester, be lubricated, and printed with footage markings and have a minimum strength of 2500 lbs. (MT-15).

19. Lighting and Receptacles

19.1 The Customer shall provide, install, and maintain lighting equipment and electrical outlets inside the equipment room. Lighting and outlets shall be designed and installed to meet all applicable codes.

19.2 NVE requires a minimum of two 120 VAC wall outlets consisting of duplex receptacles, minimum 20A rating, located such that no point on a wall is more than ten feet away from an outlet.

19.3 The height of the lights shall provide proper work clearance for electrical equipment installed in the equipment room.

20. Materials

20.1 Certain materials to be incorporated in the work may be designated in this specification under a trade name or the name of the manufacturer. Where materials are specified by a particular designation, or equal, the Customer may use an alternative material, which is of equal quality and of the required characteristics for the purpose intended, but only with prior NVE approval. These materials must be approved with the submittals, and no substitutions are allowed without specific approval from NVE.

20.2 The Customer shall request approval of a proposed substitution in writing accompanied by complete data as to the quality of the material proposed. Such request shall be made in ample time to permit due consideration for approval without delaying the work. At least ten (10) working days are required to review a material submittal. The burden of proof as to the equality or suitability of alternatives shall be upon the Customer. Samples may be required to determine equality. NVE shall be the sole judge as to the equality and suitability of alternative materials. The use of materials prior to written approval of their use by NVE shall be at the Customer's risk and may be rejected.

20.3 Certain required materials may not be stocked locally. The Customer should locate required material as early in the project schedule as possible. This will reduce the likelihood of delays or costly rebuilding of the equipment room to comply with these specifications.

21. Inspections

21.1 NVE will provide an Inspector who will be in the line of communication between the Customer and NVE during construction. The hours of work for the Inspector are from 7:30 A.M. to 3:00 P.M., Monday through Friday. All work requiring the presence of the Inspector shall be scheduled during these hours

21.2 The Customer shall, unless otherwise specified, give 48 hours advance notice, by telephone, to the NVE Inspector prior to placing concrete, installing ground rods, backfilling trench, or mandrelling conduit.

21.3 Ducts constructed for NVE installed cable shall be thoroughly cleaned and tested. The test shall involve drawing a mandrel through each duct. The customer will furnish the proper size mandrels. The mandrel test shall be pulled only in the presence of the Inspector.

21.4 Ducts which do not pass the mandrel test shall be repaired and re- tested. A steel brush shall not be used in any non-metallic duct.

21.5 NVE will not energize its equipment until all requirements of this specification are complete and the inspector has accepted the equipment room.

21.6 It shall be the Customer's responsibility to coordinate with the Inspector to ensure proper inspection is performed throughout the construction period. The name of the Inspector will be provided to the

Customer after the equipment room design and drawings are approved. Fire protection and suppression systems shall be inspected by NVE's Safety and Health Specialist or designee.

21.7 The Customer shall arrange for inspection at the number listed on the NVE design drawing.

21.8 NVE's inspectors shall inspect the equipment room during construction for compliance with the approved design. All material and work shall be subject to inspection, examination, and testing by NVE, at any time during manufacture, installation, or construction. The Customer shall provide and maintain proper facilities and safe access for such inspections or testing. The Customer will pay the costs of all tests required under this inspection.

21.9 NVE shall have the right to reject defective material and work. Rejected work shall be corrected and rejected material shall be replaced with proper material. The Customer shall promptly segregate and remove rejected material from the job site.

21.10 Failure of the Customer to adhere to the above provisions may result in the Customer being required, at his expense, to remove, uncover, or otherwise enable inspection of such work by the Inspector.

21.11 Rejected work will result in delaying electric service until the inadequacies are corrected. The costs of correcting rejected work shall be paid by the Customer.

21.12 The Customer shall submit letters from the applicable building and fire agencies detailing their inspection of the equipment room and stating their acceptance and approval. NVE will not provide electrical service or energize NVE equipment prior to acceptance of the equipment room by the required agencies.

21.13 The fire protection and detection system shall meet the requirements of NVE and of the local governing body (i.e., city, county Fire Department). Only after complete approval of all aspects of the inspection will NVE's equipment be energized.

22. Equipment Data

22.1 The dimensions below are approximate for the standard Arc-Resistant Stand-Up Switchgear that NVE requires for equipment rooms and should be used only as a general guide in determining the required size of an equipment room. The size of the equipment room shall be determined in coordination with NVE. Additionally, front, side, and overhead clearances must be added to the equipment dimensions below to determine minimum space required for the equipment room.

Equipment	Width (in)	Depth (in)	Height (in)	Weight (lbs)
Termination bay	44	44	129	2500
Fuse bay	44	44	129	2500
Capacitor bay	64	44	129	3300
Transition bay	44	44	129	2500
Tie switch bay	44	44	129	2500

22.2 12,470 Transformer Data

Size (kVA)	Width (in)	Depth (in)	Height (in)	Weight (lbs)	Oil Volume (gal)
500	68	65	65	5900	350
750	68	71	77	8200	400
1000	73	75	77	10,400	475
1500	73	77	77	12,200	600
2500	86	86	77	17,200	800
Dry-type (all sizes)	72	120	108	15,000	--