

# Engineering Requirements

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### 1. General Guidelines

- 1.1 In order to minimize the pulling tension, the cable should be pulled from the manhole or pole riser nearest
- 1.2 This standard is intended as a guideline for the installation of NVE conduits in or on bridges and overpasses. The final conduit support system design will be the responsibility of the Project Engineer (Engineer).

### 2. Process


- 2.1 It is imperative the NVE coordinate with the regulating body of the bridge or overpass throughout the project to secure occupancy rights on the structure, to assure that proper load limits are designed for, and to meet the project construction time table.
- 2.2 NVE Distribution Planning shall specify system requirements, e.g. number of conduits.
- 2.3 Design should conform to NVE ESR RT-5 “Criteria for Emergency Spare Conduit Installations”.
- 2.4 Design should have no sharp bends or “snaking” of conduits. Design should minimize cable pulling tension.
- 2.5 Final design shall be stamped by a professional engineer registered in the State of Nevada.
- 2.6 NVE Design Acceptance should include review by but not limited to the following: District Underground Inspector, District Design Facilitator, District Designer, District Engineer, District Coordinator, and District Supervisor.

### 3. Galvanized Rigid Steel (GRS) Conduit Specification

- 3.1 Conduit material shall be steel on the bridge and continuing through bridge abutments.
- 3.2 The specified size shall be nominal trade size 6”.
- 3.3 All surfaces, including threads, except field cut threads shall be zinc coated by a hot dip galvanizing process.
- 3.4 Field cut threads shall be painted with galvanized repair paint acceptable to the Engineer.
- 3.5 Each conduit stick, factory elbow and couplings shall bear the Underwriters Laboratories, Inc. label.

### 4. Expansion/Deflection Fitting

- 4.1 Expansion/deflection fittings shall be installed in/at all structural expansion joints or at 200’ maximum spacing, whichever is the lesser distance, and on the bridge side of the abutments. The expansion setting and deflection setting shall be determined by the Engineer. Fittings shall be O.Z./ Gedney Type EXDX-600 or approved equal.

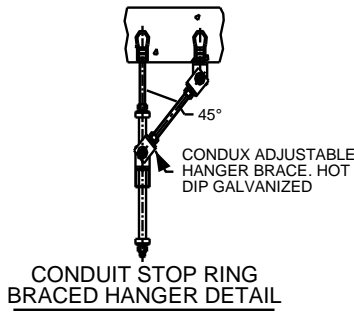
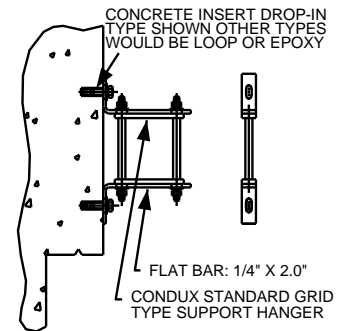
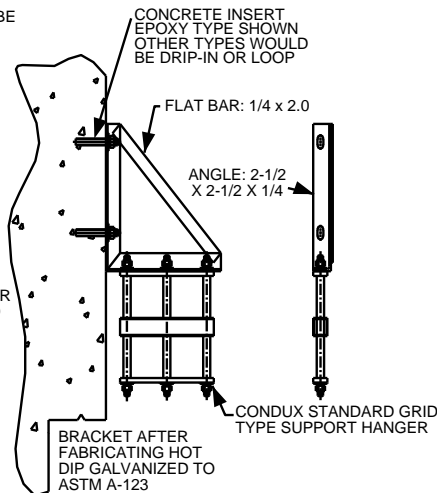
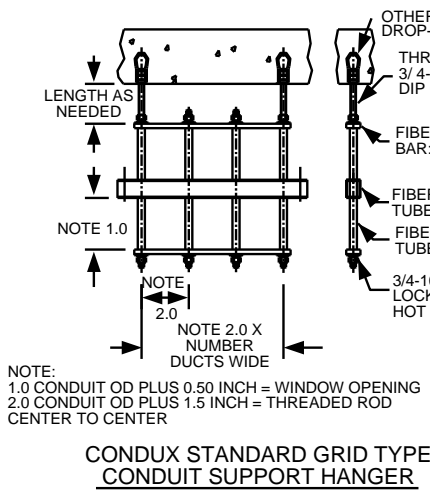
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4.2 Expansion/deflection fittings shall only be installed on straight portions of conduit runs.

## 5. Hanger Supports

- 5.1 Where applicable, "all supports, bolts, straps, screws and so forth shall be of corrosion-resistant materials or protected against corrosion by corrosion-resistant materials" per NEC 2005 344.10 (D), including bridge inserts. Stainless Steel or hot dip galvanizing after fabrication is acceptable.
- 5.2 Conduit hanger support shall be at 6'-8' maximum spacing.
- 5.3 Squares that enclose conduit in supports should be approximately 1/2" larger than the OD of the conduit.
- 5.4 Support shall permit conduit to expand and contract with temperature and bridge.
- 5.5 Peen, center punch or spot weld all bolts at thread line to lock nuts in place.
- 5.6 Mounting surface for hardware shall be cleaned by sandblasting or other equivalent methods.
- 5.7 Steel support hangers must be restrained for maximum cable pulling tension.
- 5.8 Hanger supports mounted on the exterior of the bridge shall be located on the downstream side of the bridge if over water, and no lower than the bridge structure.




**CONDUIT STANDARD GRID TYPE CONDUIT SUPPORT HANGER WITH ANGLE IRON SIDE MOUNT**

**CONDUIT STANDARD GRID TYPE CONDUIT SUPPORT HANGER WITH FLAT BAR "L" MOUNT BRACKET**

NOTE: ALL MEASUREMENTS ARE IN INCHES UNLESS NOTED OTHERWISE

NOTE: PVC CONDUIT PLACE DETAIL 100 FOOT MAX  
FIBERGLASS CONDUIT PLACE DETAIL 200 FOOT MAX  
GRC CONDUIT THIS DETAIL IS NOT NEEDED

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**6. Conduit Sleeves/Windows**


- 6.1 Windows, sleeves and casings should be designed to permit the conduit to pass through, for example, an abutment in the same alignment as the conduit on the hanger support. Such design will make rolling or bending the conduit unnecessary. The conduit pass through method will be determined by the Engineer.

**Figure 3 Typical Window (Intentionally Blank)**

**7. Conduit Bonding to Bridge**

- 7.1 A #2 AWG stranded copper conductor shall bond bridge steel or rebar to the NVE conduits near the bridge abutments.
- 7.2 The conduit bonding should be visible from the inspection doors or from the outside.
- 7.3 The bonding method to the bridge shall be by either exothermic welding or compression connector, as determined by the Engineer.
- 7.4 The bonding method to the conduit shall be by a mechanical bronze ground clamp, looped to each conduit.
- 7.5 For GRS conduit systems that are continuous between NVE manholes, grounding bushings shall be installed in pullboxes and manholes; then #2 AWG stranded copper conductor attached to the ground bus in the manhole, looping through the insulated grounding bushing on each galvanized rigid steel conduit. The insulated grounding bushing shall be O.Z. Gedney HBLG-6122 or SBLG-6122 or equivalent.
- 7.6 For GRS conduit system that are not continuous between NVE manholes, #2 AWG stranded copper conductor shall be installed from the conduit bonding point(s) to the ground bus in the manhole(s). Where subject to physical damage, a 1" PVC Schedule 80 or galvanized rigid steel conduit shall be installed for protection.


**Figure 5 Typical Bonding for Non Continuous GRS Conduit Systems (Intentionally Blank)**

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## 8. Inspection Door(s)

- 8.1 If necessary, install a 30" x 30" door that is located such that the expansion/deflection fittings and conduit bonding to the bridge at the abutment may be inspected by NVE.

Figure 6 Typical Inspection Door (Intentionally Blank)

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