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## 2. Purpose

The purpose of this document is to define the design requirements for Steel Sleeve Encased Boring in cases where it is not possible or practical to utilize traditional trenching methods for installation of conduit. This type of installation method utilizes a steel sleeve to encase a conduit bank in which the individual conduits are installed using appropriate spacers. The steel sleeve is filled with grout for strength and to stabilize and protect the conduits within. The size and number of conduits for any particular bore may vary, and a wide variety of both predesigned as well as custom made spacers are available to accommodate any desired configuration of conduits. This specification addresses the general requirements applicable to all installations. All spacers shall be designed to accommodate Schedule 80 PCV conduit.


## 3. Sleeve Requirements

**Steel** sleeves used to encase conduits may be 18", 24", 30", or 36" in diameter. Sleeves having a diameter of 18" to 24" must have a minimum wall thickness of 0.375". Sleeves having a diameter of 30" must have a minimum wall thickness of 0.500". Sleeves having a diameter of 36" must have a minimum wall thickness of 0.532".

## 4. Conduit Spacer Material and Design Requirements

Conduit spacers shall conform to the requirements below and **BIDDER** shall verify that spacers meet the following specifications:

1. **MATERIAL:** 0.750"  $\pm$  0.075" thick high-density polyethylene (HDPE) stress relieved sheets.
2. **COLOR:** Natural white.
3. **TENSILE STRENGTH:** 4600 PSI.
4. **ELONGATION:** 900%
5. **COMPRESSIVE STRENGTH:** 2700 to 3600 PSI.
6. Factory installed polyolefin, compact wheel assemblies on conduit spacers sized according to Table 1 (2 required).
7. Opening for optional ½" cable to stabilize conduit bank during installation. (2 required)
8. Float stop (2 required).
9. A 0.875" clearance between the conduit spacer O.D. and casing I.D.
10. The perimeter of conduit spacer is scalloped for maximum grout flow area.

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11. The minimum distance between conduits shall be 3.0".
12. All conduits shall be a minimum of Schedule 40.
13. The minimum distance between spacers shall be **5 feet**. See RC-2 for maximum distance requirements.
14. The conduit spacers shall have maximum float measurements specific to each individual conduit spacer design. Maximum float is defined as the amount of space between the casing wall and the (float stop) top of the conduit spacer.
  - A. Figure 1 Conduit Spacer, **1.116"** maximum float.
  - B. Figure 2 Conduit Spacer, **1.292"** maximum float.
  - C. Figure 3 Conduit Spacer, **1.106"** maximum float.
  - D. Figure 4 Conduit Spacer, **1.261"** maximum float.
  - E. Figure 5 Conduit Spacer, **1.578"** maximum float.

### 5. Conduit Spacer Configurations

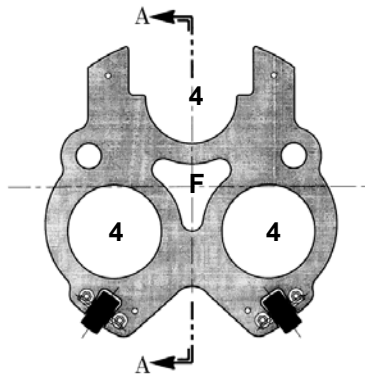
A list of typical casings and conduit spacers is shown in Table 1. The conduit spacers that are specified for any particular project will depend on the number and size of conduits that are required to be installed. Hence, spacers may be selected from the variety of predesigned and cataloged types (shown below) or custom designed and ordered if a predesigned spacer for the required conduit configuration is not available. **NVE T&D Standards must pre-approve all conduit spacer combinations and manufacturers that are not listed in Table 1 of this standard.** Details of the approved configurations are shown in Figures 1 thru 5.

Casing O.D. (inches)	Casing Wall Thickness (inches)	Number of Conduits and Size	Wheel Size (inches)	Underground Devices, Inc.
18 (Figure 1)	0.375	3 – 4"	2	BS3404W2
24 (Figure 2)	0.375	2 – 6" & 2 – 4"	2	BS3406W2
24 (Figure 3)	0.375	3 – 6" & 2 – 4"	2	BS3405W2
30 (Figure 4)	0.500	5 – 6" & 2 – 4"	2	BS3407W2
36 (Figure 5)	0.532	7 – 6" & 2 – 4"	3	BS3382W2

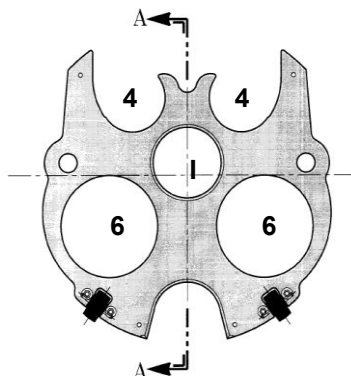
**Table 1. Typical Casings and Conduit Spacers**

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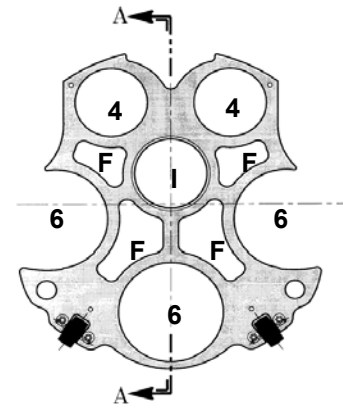
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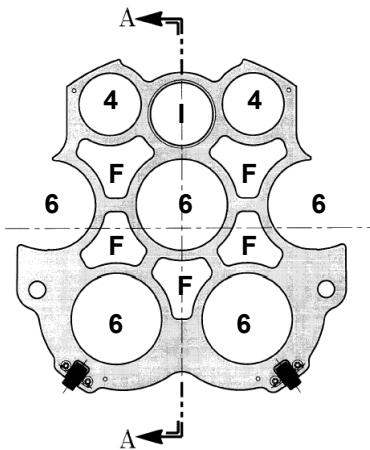
**3-4" Conduits**  
**Figure 1**



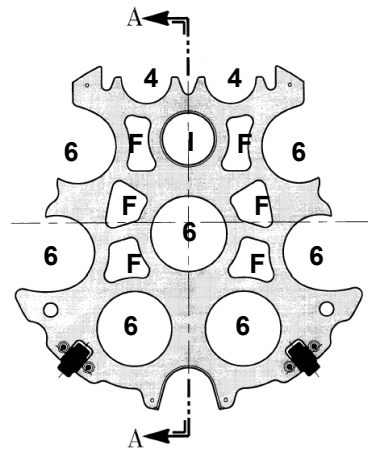
**2-6" & 2-4" Conduits**  
**Figure 2**



**3-6" & 2-4" Conduits**  
**Figure 3**



**5-6" & 2-4" Conduits**  
**Figure 4**



**7-6" & 2-4" Conduits**  
**Figure 5**

### NOTE:


4 = A 4" conduit

6 = A 6" conduit

F = Flow hole for grout

I = Grout Injection pipe hole

Minimum distance between conduits is 3.0 inches.

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### 6. Thermal Grout Mix

The grout mix used to fill the steel casing must have an adequately high fluidity (low viscosity) to be pumped into the casing without leaving voids, have an adequately low thermal resistivity, and must support the conduits within the conduit bank once hardened. Tables 2 and 3 show two acceptable grout mix formulas that meet NV Energy requirements. Due to variability in materials from different sources, it is the responsibility of the contractor to test and verify that the mix has adequate fluidity, thermal resistivity, and strength.

It is the responsibility of the contractor performing the work to verify that the total volume of grout pumped into the casing equals the calculated volume to ensure the casing is completely filled. Additionally, after filling the casing, some settlement of the grout will occur and water will bleed out causing a reduction of the total volume. After a 24 hour period, an additional amount of grout should be pumped in to fill the void caused by shrinkage of the grout. The contractor shall keep a record of the total volume of grout installed.


Once filled with grout, the open ends of the casing shall be capped (plugged) with high strength non-shrinking concrete to prevent moisture loss over time. Once capped, the percent moisture content and the thermal resistivity should remain constant. **An NV Energy Inspector shall review and approve all grout mixes.**

Component Material	Amount
Bag House Fines	1475 lb/yd3
Cement	100 lb/yd3
Flyash	545 lb/yd3
Water	860 lb/yd3
Slurry Density	78 lb/ft3
Time of Efflux	30 sec.
Thermal Resistivity (set/hardened condition)	71 °C-cm/W

**Table 2. Grout Mix Option 1**

Component Material	Amount
Bag House Fines	1630 lb/yd3
Cement	75 lb/yd3
Flyash	400 lb/yd3
Water	875 lb/yd3
Slurry Density	78 lb/ft3
Time of Efflux	30 sec.
Thermal Resistivity (set/hardened condition)	71 °C-cm/W

**Table 3. Grout Mix Option 2**

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