

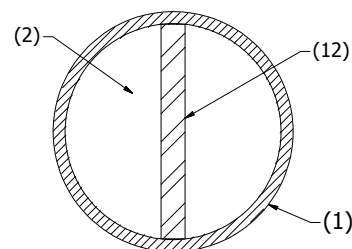
**DS22R Engineered Equivalent (meets SD-STD-02.01 K12/L3.0 and ASTM F2656-07 M50/P1)**



1. MaxiForce™ model MRR-DS22R fixed steel pipe bollard.
2. Concrete fill inside pipe bollard.
3. Finished grade or pavement.
4. Continuous concrete grade beam type footing.
5. #5 stirrups at 8" O.C. - closed at bottom corner with 135 degree hooks.
6. Centerline of bollard and concrete grade beam.
7. 10-#8 cont. longitudinal reinf. at bottom 5 layers.
8. 4" min. hooks with 180 degree bend at each end - TYP. UNO.
9. 7-pairs of #5 cross ties at both sides of each bollard.
10. 4-#10 cont. longitudinal reinf. at top 2 layers.
11. Tamped, undisturbed in-place soil or granular fill or lean concrete.
12. Locate steel plate parallel to vehicle travel direction.
13. 3/4" Dia. PVC pipe as needed for drainage below pipe sleeve.

## Installation Orientation

### Protected Side



## Attack Side

### Bollard Detail Plan

X

Drawing Rev. 1	Created 11/1/2010
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## MaxiForce™ Traffic Control Bollards

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Model

## MaxiForce MRR-DS22R Beam Footing

Size

File Name MaxiForce MRR-DS22R Beam Footing

Scale

NA

DO NOT SCALE DRAWING

Sheet 1 Of 3

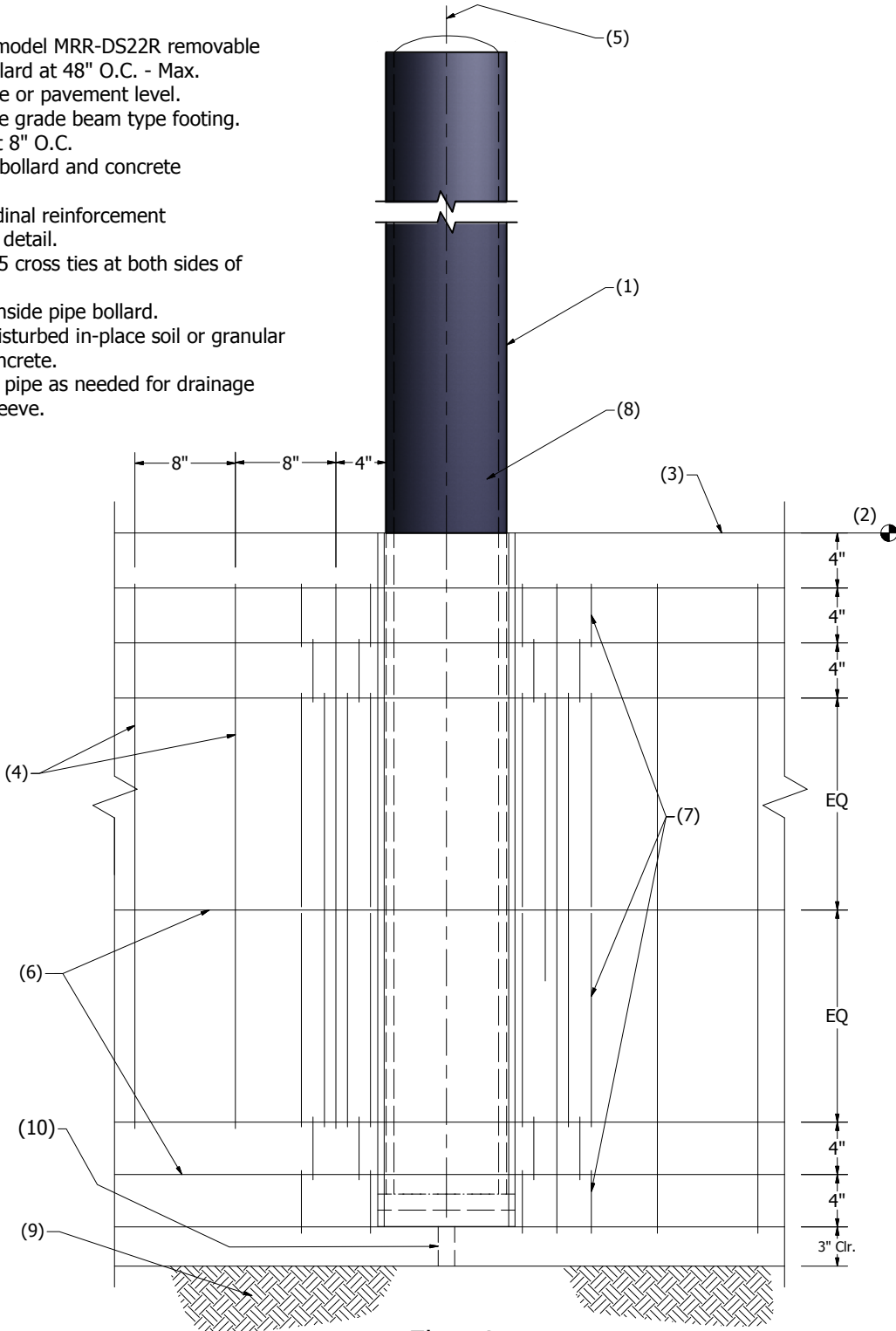
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# Engineered Anchorage System for the MaxiForce™ MRR-DS22R Removable Steel Bollard

## Continuous Concrete Beam Footing (Elevation)

### DS22R Engineered Equivalent (meets SD-STD-02.01 K12/L3.0 and ASTM F2656-07 M50/P1)

1. MaxiForce™ model MRR-DS22R removable steel pipe bollard at 48" O.C. - Max.
2. Finished grade or pavement level.
3. Cont. concrete grade beam type footing.
4. #5 Sturups at 8" O.C.
5. Centerline of bollard and concrete grade beam.
6. Cont. longitudinal reinforcement per "Section" detail.
7. 7 - pairs of #5 cross ties at both sides of each bollard.
8. Concrete fill inside pipe bollard.
9. Tamped, undisturbed in-place soil or granular fill or lean concrete.
10. 3/4" Dia. PVC pipe as needed for drainage below pipe sleeve.



- Elevation -

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Model	<b>MaxiForce MRR-DS22R Beam Footing</b>		
Size	File Name	MaxiForce MRR-DS22R Beam Footing	
C	Scale	NA	DO NOT SCALE DRAWING
		Sheet 2	Of 3

# Engineered Anchorage System for the MaxiForce™ MRR-DS22R Removable Steel Bollard

## Continuous Concrete Beam Footing (Detail)

### DS22R Engineered Equivalent (meets SD-STD-02.01 K12/L3.0 and ASTM F2656-07 M50/P1)

#### Design and Construction Notes:

1. All backfill shall be in compliance with the requirements of SD-STD-02.01, section 7.2.2 (see below). If the lateral capacity of the existing soils is not in conformance with section 7.2.2, then the existing soil shall be replaced.
2. The recommended soil foundation material should be low-cohesive, well graded crushed or broken gravel of a particle size distribution per table 2 of SD-STD-02.01 (see below). Soil depth should be at least the foundation depth and 1.5 times embedment depth behind the installation or 2 feet, whichever is greater up to a maximum of 6 feet. Soil should be compacted to a density of not less than 90 percent maximum dry density.
3. All cast-in-place concrete construction shall conform to the latest edition of the ACI. Mechanically vibrate all concrete when placed unless noted otherwise.
4. Reinforcing steel lap splices, unless noted otherwise, shall be class 'B' tension lap splices per latest edition of ACI 318. Stagger splices a minimum of one lap length. Provide 58" min. lap splice length for #8 bars and 74" min. for #10 bars.
5. Material Properties: Pipe Steel shall be ASTM A500, Grade B or C,  $F_y = 42,000$  PSI. Steel Plate shall be ASTM A36,  $F_y = 36,000$  PSI. Concrete shall be per ASTM C31, C39 and C470,  $F'_c = 4,500$  PSI. Reinforcing Steel shall be deformed bars per ASTM A615,  $F_y = 60,000$  PSI / Grade 60.
6. See Section Detail for additional information.

#### Excerpt from:

SD-STD-02.01, Revision A, March 2003  
CERTIFICATION STANDARD - "Test Method for Vehicle Crash Testing of Perimeter Barriers and Gates"

#### As published by:

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Office of Physical Security Programs  
Bureau of Diplomatic Security  
U.S. Department of State  
Washington, D.C. 20520-1403

#### 7.2.2

For test articles embedded in soil, including concrete footings, the soil should be low-cohesive, well-graded crushed stone or broken gravel of particle size distribution comparable to Table 2. Soil depth should be at least the foundation depth and 1.5 times embedment depth behind the installation or 0.6 meters (2 feet), whichever is greater up to a maximum of 6 feet. Soil should be compacted to a density of not less than 90 percent maximum dry density.

**Table 2. Recommended soil foundation material**

Sieve Size	Mass Percent Passing
50.0 mm (2 in.)	100
25.0 mm (1 in.)	75-95
9.5 mm (3/8 in.)	40-75
4.75 mm (No. 4)	30-60
2.00 mm (No. 10)	20-45
0.425 mm (No. 40)	15-30
0.075 mm (No. 200)	5-20

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#### Model MaxiForce MRR-DS22R Beam Footing

Size C	File Name MaxiForce MRR-DS22R Beam Footing
Scale NA	DO NOT SCALE DRAWING
Sheet 3	Of 3