

MaxiForce™ Round Removable and Fixed Steel Bollard Installation Schedule

Various Design Loads at 18" Impact Height

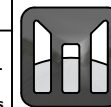
Engineered Anchorage System for Round Steel Bollard

Bollard Size / Model	Soil Lateral Bearing / Bearing Pressure	Design Load (lbs.)	Concrete Pier Diameter (in.)	Concrete Pier Height (in.)	Concrete Pier Reinforcing	Bollard Sleeve / Embedment at Concrete Pier	Concrete Grade Beam Depth (In.)	Concrete Grade Beam Width (In.)	Concrete Grade Beam Reinforcing		
									Longitudinal	Stirrups	
<i>Individual Footing Option</i>											
<i>Continuous Footing Option</i>											
3"	225 psf/f / 2,000 psf	3,000	18	38	4 - #4 vert.	18" Sleeve / 18" Embedment	24	12	4 - #4 cont.	#3 at 11" o.c.	
	225 psf/f / 2,000 psf	3,750	18	40	4 - #4 vert.	18" Sleeve / 18" Embedment	26	12	4 - #4 cont.	#3 at 11" o.c.	
4"	418 psf/f / 3,500 psf	6,000	18	38	4 - #4 vert.	18" Sleeve / 18" Embedment	26	12	4 - #4 cont.	#3 at 11" o.c.	
	200 psf/f / 2,000 psf	6,000	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	32	12	4 - #4 cont.	#3 at 14" o.c.	
	525 psf/f / 3,300 psf	7,500	18	38	4 - #4 vert.	18" Sleeve / 18" Embedment	26	12	4 - #4 cont.	#3 at 11" o.c.	
	250 psf/f / 2,000 psf	7,500	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	32	12	4 - #4 cont.	#3 at 14" o.c.	
	175 psf/f / 1,600 psf	7,500	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	36	12	4 - #4 cont.	#3 at 14" o.c.	
5"	418 psf/f / 3,500 psf	6,000	18	38	4 - #4 vert.	18" Sleeve / 18" Embedment	22	16	4 - #4 cont.	#3 at 9" o.c.	
	200 psf/f / 2,000 psf	6,000	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	28	16	4 - #4 cont.	#3 at 11" o.c.	
	525 psf/f / 3,300 psf	7,500	18	38	4 - #4 vert.	18" Sleeve / 18" Embedment	22	16	4 - #4 cont.	#3 at 9" o.c.	
	250 psf/f / 2,000 psf	7,500	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	28	16	4 - #4 cont.	#3 at 11" o.c.	
	175 psf/f / 1,600 psf	7,500	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.	
	335 psf/f / 2,700 psf	10,000	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	28	16	4 - #4 cont.	#3 at 11" o.c.	
	234 psf/f / 2,100 psf	10,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.	
	171 psf/f / 2,000 psf	10,000	18	60	4 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.	
	206 psf/f / 2,300 psf	15,000	18	64	8 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.	
	210 psf/f / 2,000 psf	15,000	30	54	8 - #4 vert.	18" Sleeve / 18" Embedment	38	16	4 - #4 cont.	#3 at 11" o.c.	
	250 psf/f / 2,000 psf	15,000	36	48	8 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.	
	6"	418 psf/f / 3,500 psf	6,000	18	38	4 - #4 vert.	18" Sleeve / 18" Embedment	22	16	4 - #4 cont.	#3 at 9" o.c.
		200 psf/f / 2,000 psf	6,000	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	28	16	4 - #4 cont.	#3 at 11" o.c.
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335 psf/f / 2,700 psf		10,000	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	28	16	4 - #4 cont.	#3 at 11" o.c.	
234 psf/f / 2,100 psf		10,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.	
171 psf/f / 2,000 psf		10,000	18	60	4 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.	
206 psf/f / 2,300 psf		15,000	18	64	8 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.	
210 psf/f / 2,000 psf		15,000	30	54	8 - #4 vert.	18" Sleeve / 18" Embedment	38	16	4 - #4 cont.	#3 at 11" o.c.	
250 psf/f / 2,000 psf		15,000	36	48	8 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.	
8"		418 psf/f / 3,500 psf	6,000	18	38	4 - #4 vert.	18" Sleeve / 18" Embedment	22	16	4 - #4 cont.	#3 at 9" o.c.
		200 psf/f / 2,000 psf	6,000	18	48	4 - #4 vert.	18" Sleeve / 18" Embedment	28	16	4 - #4 cont.	#3 at 11" o.c.
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	206 psf/f / 2,300 psf	15,000	18	64	8 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.	
	210 psf/f / 2,000 psf	15,000	30	54	8 - #4 vert.	18" Sleeve / 18" Embedment	38	16	4 - #4 cont.	#3 at 11" o.c.	
	250 psf/f / 2,000 psf	15,000	36	48	8 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.	

Design and Construction Notes:

- Design load location at 18" above finished grade.
- The soil pressure value is shown at design load condition and should be verified that the site soil is adequate for the listed value.
- See supplemental concrete pier / beam details for additional information.
- Material Specifications: Concrete = 3,000 psi (28-day min.); Reinforcing ASTM A615 (60 ksi for all bars #5 and larger/ 40 ksi for all bars #4 and smaller).

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Model	HD/HDH & MFR Inst Sched (18")		
Size	File Name	Scale	Sheet
C	HD_HDH & MFR Inst Sched (18)	NA	DO NOT SCALE DRAWING
			Sheet 1 Of 1

MaxiForce™ Round Removable and Fixed Steel Bollard Installation Schedule

Various Design Loads at 27" Impact Height

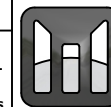
Engineered Anchorage System for Round Steel Bollard

Bollard Size / Model	Soil Lateral Bearing / Bearing Pressure	Design Load (lbs.)	Concrete Pier Diameter (in.)	Concrete Pier Height (in.)	Concrete Pier Reinforcing	Bollard Sleeve / Embedment at Concrete Pier	Concrete Grade Beam Depth (In.)	Concrete Grade Beam Width (In.)	Concrete Grade Beam Reinforcing	
									Longitudinal	Stirrups
<i>Individual Footing Option</i>						<i>Continuous Footing Option</i>				
3"	225 psf/f / 2,000 psf	3,000	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	28	12	4 - #4 cont.	#3 at 12" o.c.
	N/A	3,750	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4"	450 psf/f / 3,500 psf	6,000	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	28	12	4 - #4 cont.	#3 at 12" o.c.
	210 psf/f / 2,000 psf	6,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	36	12	4 - #4 cont.	#3 at 14" o.c.
	N/A	7,500	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5"	450 psf/f / 3,500 psf	6,000	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	26	16	4 - #4 cont.	#3 at 11" o.c.
	210 psf/f / 2,000 psf	6,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
	558 psf/f / 5,000 psf	7,500	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	26	16	4 - #4 cont.	#3 at 11" o.c.
	263 psf/f / 3,500 psf	7,500	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
	192 psf/f / 2,000 psf	7,500	18	60	4 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.
	350 psf/f / 3,200 psf	10,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
	256 psf/f / 2,600 psf	10,000	18	60	4 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.
	192 psf/f / 2,100 psf	10,000	18	66	4 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.
	N/A	15,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6"	450 psf/f / 3,500 psf	6,000	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	26	16	4 - #4 cont.	#3 at 11" o.c.
	210 psf/f / 2,000 psf	6,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
	558 psf/f / 5,000 psf	7,500	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	26	16	4 - #4 cont.	#3 at 11" o.c.
	263 psf/f / 3,500 psf	7,500	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
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	192 psf/f / 2,100 psf	10,000	18	66	4 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.
	236 psf/f / 2,800 psf	15,000	18	70	8 - #4 vert.	18" Sleeve / 18" Embedment	42	16	4 - #4 cont.	#3 at 11" o.c.
	248 psf/f / 2,500 psf	15,000	30	58	8 - #4 vert.	18" Sleeve / 18" Embedment	42	16	4 - #4 cont.	#3 at 11" o.c.
	286 psf/f / 2,500 psf	15,000	36	52	8 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.
	8"	450 psf/f / 3,500 psf	6,000	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	26	16	4 - #4 cont.
210 psf/f / 2,000 psf		6,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
558 psf/f / 5,000 psf		7,500	18	42	4 - #4 vert.	18" Sleeve / 18" Embedment	26	16	4 - #4 cont.	#3 at 11" o.c.
263 psf/f / 3,500 psf		7,500	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
192 psf/f / 2,000 psf		7,500	18	60	4 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.
350 psf/f / 3,200 psf		10,000	18	54	4 - #4 vert.	18" Sleeve / 18" Embedment	34	16	4 - #4 cont.	#3 at 11" o.c.
256 psf/f / 2,600 psf		10,000	18	60	4 - #4 vert.	18" Sleeve / 18" Embedment	36	16	4 - #4 cont.	#3 at 11" o.c.
192 psf/f / 2,100 psf		10,000	18	66	4 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.
236 psf/f / 2,800 psf		15,000	18	70	8 - #4 vert.	18" Sleeve / 18" Embedment	42	16	4 - #4 cont.	#3 at 11" o.c.
248 psf/f / 2,500 psf		15,000	30	58	8 - #4 vert.	18" Sleeve / 18" Embedment	42	16	4 - #4 cont.	#3 at 11" o.c.
286 psf/f / 2,500 psf		15,000	36	52	8 - #4 vert.	18" Sleeve / 18" Embedment	40	16	4 - #4 cont.	#3 at 11" o.c.

Design and Construction Notes:

- Design load location at 27" above finished grade.
- The soil pressure value is shown at design load condition and should be verified that the site soil is adequate for the listed value.
- See supplemental concrete pier / beam details for additional information.
- Material Specifications: Concrete = 3,000 psi (28-day min.); Reinforcing ASTM A615 (60 ksi for all bars #5 and larger/ 40 ksi for all bars #4 and smaller).

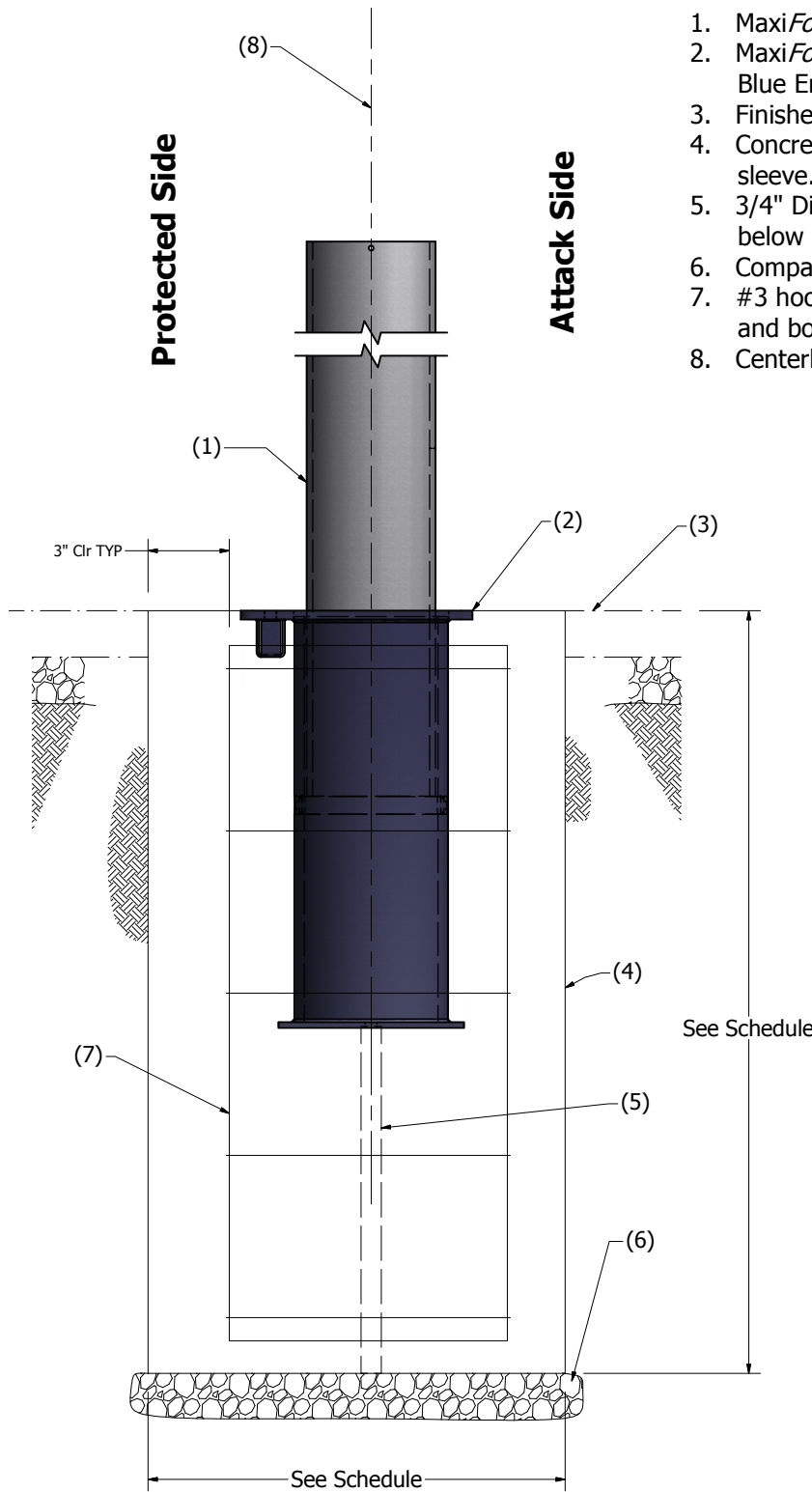
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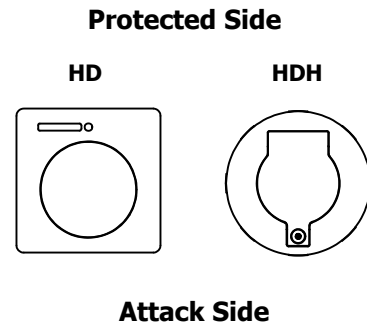
Model	HD/HDH & MFR Inst Sched (27")		
Size	File Name	Scale	Sheet
C	HD_HDH & MFR Inst Sched (27)	NA	1 Of 1
		DO NOT SCALE DRAWING	


Engineered Anchorage System for the MaxiForce™ HD and HDH Base Circular Concrete Pier Footing



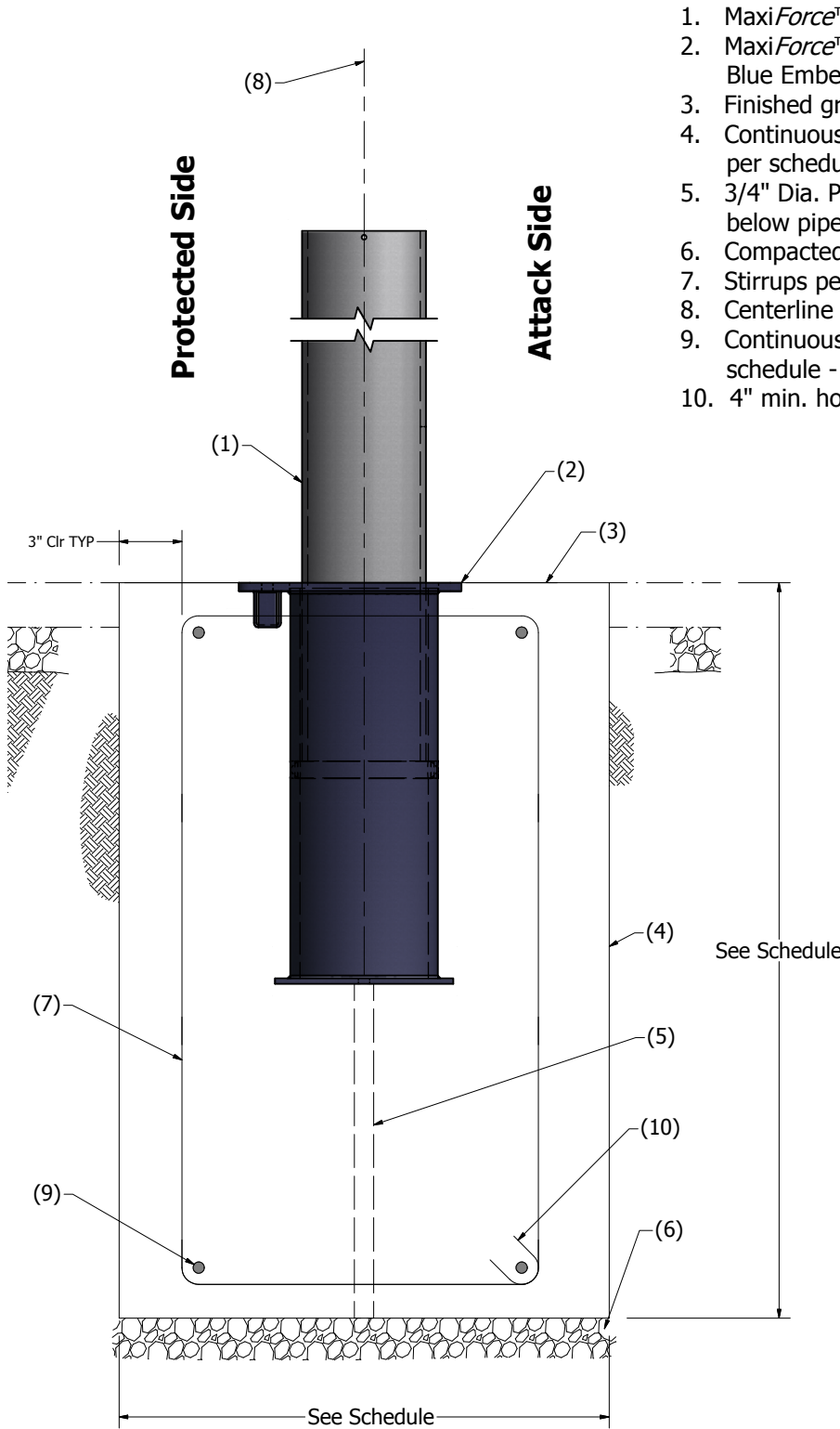
1. MaxiForce™ Steel pipe bollard per specification.
2. MaxiForce™ HD or HDH Base assembly per Blue Ember Technologies.
3. Finished grade or pavement.
4. Concrete base pier per schedule at each pipe sleeve.
5. 3/4" Dia. PVC pipe as needed for drainage below pipe sleeve.
6. Compacted gravel bed (3" minimum).
7. #3 hoop ties at 12" O.C. and 2 - #3 ties at top and bottom of concrete pier.
8. Centerline of bollard and concrete base pier.

Installation Orientation



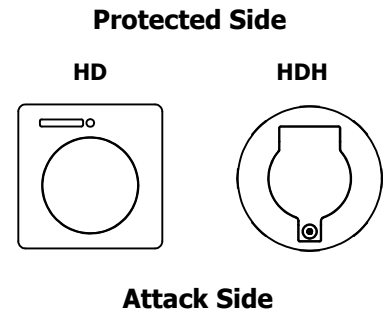
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Model	HD/HDH Base Pier Footing	
Size C	File Name HD_HDH Base Pier Footing	
Scale NA	DO NOT SCALE DRAWING	Sheet 1 Of 1


Engineered Anchorage System for the MaxiForce™ HD and HDH Base Continuous Concrete Beam Footing



1. MaxiForce™ Steel pipe bollard per specification.
2. MaxiForce™ HD or HDH Base assembly per Blue Ember Technologies.
3. Finished grade or pavement.
4. Continuous concrete grade beam per schedule.
5. 3/4" Dia. PVC pipe as needed for drainage below pipe sleeve.
6. Compacted gravel bed (3" minimum).
7. Stirrups per schedule.
8. Centerline of bollard and concrete grade beam.
9. Continuous longitudinal reinforcement per schedule - lap splice 32" min. for #4 rebar.
10. 4" min. hooks with 135 degree bend - TYP. UNO.

Installation Orientation



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Model HD/HDH Base Beam Footing		Size C	File Name HD_HDH Base Beam Footing
		Scale NA	DO NOT SCALE DRAWING Sheet 1 Of 1