

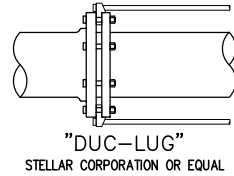
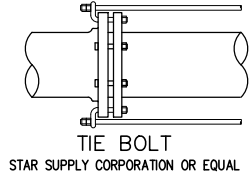
**TIE ROD SELECTION TABLES**

ASTM A242 (COR-TEN® OR EQUAL) STEEL									ROD DIAMETER: 5/8" OR (3/4")	
PIPE DIAMETER	NUMBER OF TIE RODS PER JOINT				MAXIMUM TIE ROD LENGTH, FEET					
	TEE DEAD END 90° BEND VALVE	45° BEND	22.5° BEND	11.25° BEND	TEE DEAD END 90° BEND VALVE	45° BEND	22.5° BEND	11.25° BEND		
3	2 -	2 -	2 -	2 -	100 --	100 --	100 --	100 --		
4	2 (2)	2 (2)	2 (2)	2 (2)	100 (100)	100 (100)	100 (100)	100 (100)		
6	2 (2)	2 (2)	2 (2)	2 (2)	60 (90)	80 (100)	100 (100)	100 (100)		
8	3 (2)	2 (2)	2 (2)	2 (2)	50 (50)	50 (70)	90 (100)	100 (100)		
10	4 (4)	4 (2)	2 (2)	2 (2)	40 (60)	60 (50)	60 (80)	100 (100)		
12	6 (4)	4 (4)	2 (2)	2 (2)	60 (60)	60 (80)	50 (80)	100 (100)		
14	8 (6)	6 (4)	4 (2)	2 (2)	60 (70)	60 (60)	80 (60)	80 (100)		
16	10 (6)	8 (6)	4 (3)	2 (2)	60 (50)	60 (70)	60 (70)	60 (90)		
18	12 (8)	8 (6)	6 (3)	3 (2)	50 (50)	50 (60)	70 (50)	70 (70)		

ASTM A36 STEEL									ROD DIAMETER: 5/8" OR (3/4")	
PIPE DIAMETER	NUMBER OF TIE RODS PER JOINT				MAXIMUM TIE ROD LENGTH, FEET					
	TEE DEAD END 90° BEND VALVE	45° BEND	22.5° BEND	11.25° BEND	TEE DEAD END 90° BEND VALVE	45° BEND	22.5° BEND	11.25° BEND		
3	2 -	2 -	2 -	2 -	100 --	100 --	100 --	100 --		
4	2 (2)	2 (2)	2 (2)	2 (2)	100 (100)	100 (100)	100 (100)	100 (100)		
6	2 (2)	2 (2)	2 (2)	2 (2)	60 (90)	80 (100)	100 (100)	100 (100)		
8	3 (2)	3 (2)	2 (2)	2 (2)	50 (50)	70 (70)	90 (100)	100 (100)		
10	6 (4)	4 (4)	2 (2)	2 (2)	70 (60)	60 (90)	60 (80)	100 (100)		
12	8 (6)	6 (4)	4 (2)	2 (2)	80 (90)	80 (80)	100 (80)	100 (100)		
14	10 (8)	8 (6)	4 (4)	2 (2)	70 (90)	80 (90)	80 (100)	80 (100)		
16	12 (10)	10 (6)	4 (4)	3 (2)	70 (80)	80 (70)	90 (90)	90 (90)		
18	- (12)	12 (8)	6 (4)	3 (2)	-- (80)	80 (80)	70 (70)	70 (70)		

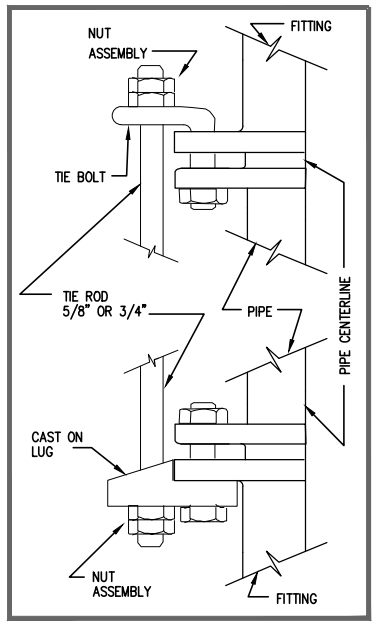
**APPROVED ATTACHMENTS**



**GENERAL NOTES**

- 1) TIE RODS SHALL BE GALVANIZED "ALL THREAD" ROD OF EITHER ASTM A242 OR A36 STEEL.
- 2) TIE RODS SHALL HAVE "NATIONAL-COARSE" THREAD WITH EITHER TWO NUTS OR ONE SELF-LOCKING NUT AT EACH END. (ALL NUTS SHALL BE GALVANIZED)
- 3) NUMBER OF TIE RODS PER JOINT SHALL BE IN ACCORDANCE WITH TIE ROD SELECTION TABLES ABOVE UNLESS OTHERWISE SHOWN ON APPROVED DESIGN PLANS.
- 4) TIE ROD ASSEMBLY SHALL BE COATED WITH 2 COATS OF COAL TAR EPOXY (16 MIL MINIMUM DRY FILM THICKNESS).
- 5) TIE RODS SHALL BE ASSEMBLED SYMMETRICALLY ABOUT EACH JOINT (IF AN EVEN NUMBER OF RODS ARE USED THEN EACH ROD SHALL HAVE A ROD LOCATED ON THE DIRECT OPPOSITE SIDE OF JOINT. IF 3 OR 6 RODS ARE USED THEN AN EQUAL NUMBER OF UNSHACKLED BOLT HOLES SHALL BE LEFT BETWEEN ANY TWO TIE RODS.)
- 6) TIE ROD NUTS SHALL BE TIGHTENED UNIFORMLY AT EACH JOINT PRIOR TO COATING.
- 7) TIE ROD LENGTHS SHALL NOT EXCEED THOSE LISTED IN ABOVE TABLES, UNLESS SPECIFICALLY SHOWN ON APPROVED PLANS.
- 8) TIE ROD COUPLINGS SHALL BE GALVANIZED "STAR NATIONAL PRODUCTS TIECOUPLING" OR EQUAL.
- 9) TIE RODS SHALL BE ATTACHED TO JOINTS WITH TIE BOLTS, EXCEPT FOR FIRE HYDRANT INSTALLATIONS WHICH SHALL USE EITHER TIE BOLTS OR GALVANIZED CAST ON LUGS. TIE BOLTS SHALL BE GALVANIZED "STAR NATIONAL PRODUCTS TIEBOLT" OR EQUAL.
- 10) 20" FITTINGS AND LARGER SHALL HAVE TIE ROD DESIGN INCLUDED ON DESIGN PLANS.

**ATTACHMENT DETAIL**



**SHACKLE/TIE RODS**

**UNION HILL  
WATER ASSOCIATION**

**WATER STANDARD DETAIL  
W-11**

SCALE: NTS    DATE: OCT 11, 2018  
R:\CAD\DETAIL\AUTOCAD\UHWA\W-11 TIE-RODS