DIAMOND PLASTICS®
CORPORATION

# Recommendations for Installation of AWWA C900 4” thru 60” PVC Pipe Products

Sales Office

**DIAMOND PLASTICS CORPORATION**
P.O. Box 1608
Grand Island, NE 68802-1608

**MANUFACTURING PLANTS:**

Grand Island, Nebraska
Golconda, Nevada
Lubbock, Texas
Macon, Georgia
Muncie, Indiana
Plaquemine, Louisiana
Casa Grande, Arizona

7/2016

# INDEX

## DIAMOND C900 PVC PIPE

Diamond Plastics Corporation supplies PVC pipe manufactured to AWWA C-900 dimensions with integral coupling which utilizes an elastomeric gasket for an assembled seal. In this guide we will attempt to outline the basic handling, storage, assembly, and installation procedures for these products.

### -Installation Guide Disclaimer-

**TECHNICAL DATA CONTAINED IN THIS INSTALLATION GUIDE IS FURNISHED WITHOUT CHARGE AND IS ACCEPTED BY RECIPIENT AT RECIPIENT'S SOLE RISK. EVERY EFFORT HAS BEEN MADE TO VERIFY THE INFORMATION CONTAINED IN THIS INSTALLATION GUIDE, HOWEVER, DIAMOND PLASTICS CORPORATION MAKES NO REPRESENTATION REGARDING ITS ACCURACY DIAMOND PLASTICS CORPORATION ASSUMES NO RESPONSIBILITY FOR, AND IS NOT LIABLE FOR, ANY USE OF THE INFORMATION CONTAINED IN THIS INSTALLATION GUIDE OR ANY USE MADE OF THIS INSTALLATION GUIDE FOR WHICH IT WAS NOT INTENDED. IN NO EVENT SHALL DIAMOND PLASTICS CORPORATION BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES CLAIMED ATTRIBUTABLE TO USE OF THIS INSTALLATION GUIDE. IF THIS INSTALLATION GUIDE IS UTILIZED AS A SUBMITTAL APPURTENANCE, THE USER ASSUMES ALL RESPONSIBILITY TO VERIFY THE ACCURACY OF INFORMATION CONTAINED IN THIS INSTALLATION GUIDE AND TO CONFIRM THAT THIS GUIDE IS OF CURRENT PUBLICATION.**

### -Receiving and Handling-

**Inspection:** Each pipe shipment should be inspected carefully upon arrival. The carrier is responsible for delivering the pipe. Make certain all material listed on the bill-of-lading has arrived. The receiver must make certain there has been no loss or damage. Should there be any errors or damage, make proper note on the delivery receipt. Make claim in accordance with the carrier's instruction. Do not dispose of any damaged material. Carrier will advise you of the procedure to follow for freight damage.

**Unloading –** Pipe should be lowered, not dropped, from trucks to the ground or into a trench. DO NOT ATTEMPT TO HANDLE PIPE BUNDLES BY PULLING ON STRAPPING OR PACKAGING MATERIAL. The forklift truck, boom and sling, or other material handling equipment should be equipped to avoid excessive swinging. DO NOT USE CHAINS AS A SLING. Avoid all impact blows, gouging, or abrasions caused by metal surfaces, rocks, material handling equipment, or any other source.

When prolonged exposure to direct sunlight is anticipated, PVC pipe should be covered with a light colored breathable material which will permit adquate air circulation to prevent heat accumulation.

**Cold Weather Handling:** Extra care should be used in handling during cold weather.

**WARNING: Carelessly unloading pipe can be hazardous. Use appropriate equipment and stay clear when removing tie-downs, banding, and dunnage material.**

## TABLE 1

| Approximate Joint Weights (Lbs) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Size | DR 14 | DR 18 | DR 21 | DR 25 | DR 32.5 | DR 41 | DR 51 |
| 4” | 65 | 51 | | 38 | | | |
| 6” | 133 | 105 | | 77 | | | |
| 8” | 227 | 180 | | 132 | | | |
| 10” | 343 | 271 | | 199 | | | |
| 12” | 487 | 385 | | 282 | | | |
| 14” | 662 | 520 | 445 | 380 | 294 | 234 | |
| 16” | 846 | 669 | 579 | 490 | 380 | 304 | 245 |
| 18” | 1062 | 843 | 721 | 618 | 480 | 383 | 309 |
| 20” | 1313 | 1051 | 892 | 769 | 598 | 477 | 386 |
| 24” | 1885 | 1511 | 1268 | 1106 | 860 | 686 | 554 |
| 30” | | 2538 | 2200 | 1872 | 1431 | 1158 | 936 |
| 36” | | 3639 | 3145 | 2654 | 2080 | 1649 | 1333 |
| 42” | | | 4092 | 3645 | 2852 | 2275 | 1823 |
| 48” | | | | 4744 | 3658 | 2966 | 2396 |
| 54” | | | | 5854 | 4547 | 3628 | 2927 |
| 60” | | | | 6706 | 5209 | 4157 | 3358 |

***4” - 24” weights based on 20 foot lengths***
***30” and above weights based on 22 foot lengths.***

**Trench Preparation-**

Proper installation procedures and trench preparation are essential to successful PVC pipe performance. Trench preparation procedures for PVC pipe do not vary substantially from procedures used with other piping products. There should be no more trench prepared than the footage of pipe which can be laid in a day. A typical trench cross section and terminology are given in figure 1.

**TRENCH CROSS-SECTION SHOWING TERMINOLOGY**

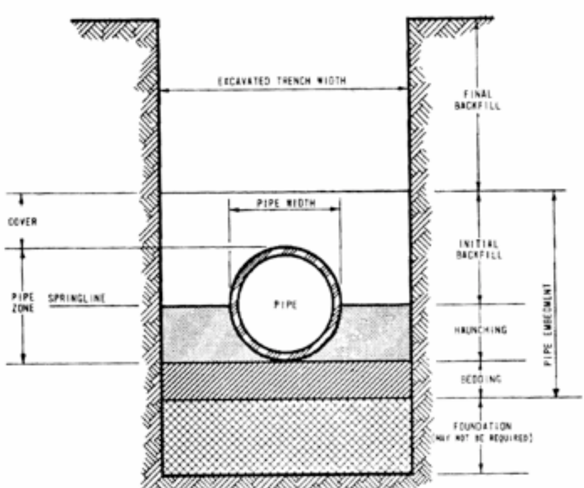



Figure 1

**Stringing Pipe:** Pipe should be placed near the trench on the opposite side of the excavated earth. The coupling should be pointed in the direction of work progress.

**Trench width:** Working space is the primary consideration in determining the trench width to be used. Trench width at the ground surface may vary with and depend upon depth, type of soils, and position of surface structures. The minimum clear width of the trench, sheeted or unsheeted, measured at the springline of the pipe is generally specified at least one foot (300 mm) greater than the outside diameter of the pipe to enable backfill material to be installed in the haunching area. Refer to Figure 1 for the location of the haunch area. Where embedment compaction is required, the trench shall be wide enough to accommodate the compaction equipment. If minimum trench width is exceeded, and embedment compaction is required, pipe zone haunching should be compacted at least one pipe diameter from the pipe on both sides of the pipe.

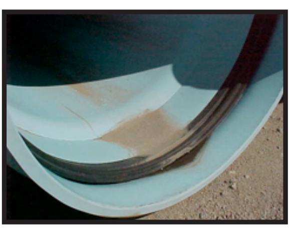
**Dewatering:** Where conditions are such that running or standing water occurs in the trench bottom or the soil in the trench bottom displays a "quick" tendency, the water should be removed by pumps and suitable means such as well points or pervious underdrain bedding until the pipe has been installed and the backfill has been placed to a sufficient height to prevent pipe flotation.


**Foundation:** An adequate or stable foundation should be present (or provided) to uniformly support the full length of the pipe. Bell holes should be provided at each joint to permit proper assembly and support of the pipe. Unstable trench bottoms shall be stabilized by methods and with materials required, by the specifying engineer, to provide adequate and permanent support for the conditions encountered.

**Bedding:** The trench bottom should be over excavated to permit placement of bedding materials when encountering rock, hard pan, boulders, or other materials that could damage the pipe due to point loading on the bell. Over excavate and place a minimum of 4” of bedding for pipe nominal diameters 4”-16”, a minimum of 6” of over excavation and bedding for 20”-42” nominal diameter pipe and a minimum of 8” of over excavation and bedding for 48” -60” nominal diameter pipes. The bedding should consist of an evenly graded, free flowing, granular material which is free of large stones or frozen material and with particle size of up to approximately 10% of the pipe size and no larger than 1 ½” in size. Bell holes should be utilized to reduce axial deflection and support the barrel of the pipe.

**- Lubricant -**

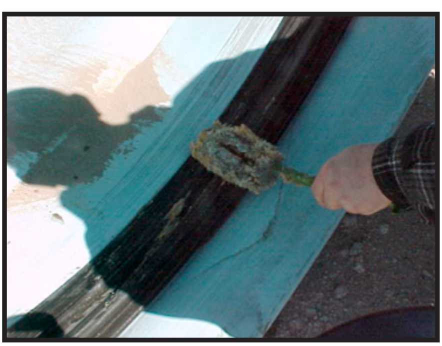
Clean any dirt or foreign matter from the gasket and spigot. An even, uniform application of gasket lubricant must be applied to the bevel of the spigot as well as the contact surface of the gasket. Gasket lubricant may be applied with a swab, brush, or roller. Gasket lube is furnished with each truckload of pipe. Additional lubricant may be purchased from your distributor



**In open storage.**

**Remove debris.**

**Clean annular.**



**Lubricate gasket.**

**Lubricate spigot.**

## - Assembly -

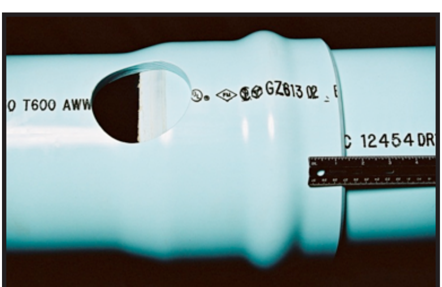
Assembly is made by sliding the lubricated spigot end into the gasketed bell end. The gasket seals the joint against leaks, into or out of the pipeline.

Insert the spigot end into the socket so that it is near contact with the gasket. Keep the pipe lengths in proper alignment. Brace the bell while the spigot end is pushed through the gasket so that previously completed joints in the line will not be "stacked," "over belled," or inserted past the second reference mark. (refer to Encasements.) Push the spigot end in until the lip of the bell is between the reference marks on the spigot end. If the spigot is inserted beyond the first insert reference mark, laying length will be lost. Loss of laying length can be significant on long footage projects. Also, joint flexibility is reduced when the spigot is inserted beyond the second insert reference mark. Some joints may require barring to seat the joint. If so, use a wood block to protect the end of the pipe. A come-a-long may be preferred to the bar and block, but a swinging stab is not recommended. Where the physical weight or trench conditions make the recommended methods unsafe, joints may be assembled using mechanical equipment provided that the pipe is properly lubed and aligned. The end must be protected from damage, and the joint must not be "over belled" or inserted beyond the second insert reference mark. If the second insertion mark is not visible after assembly, the pipe was over-inserted. The joint needs to be disassembled and done correctly. Likewise, if the first mark falls short of the lip of the bell, the pipe needs to be pushed a little further until the lip is between the two reference marks. Here the cutaway shows that the joint has no flexibility, and cannot expand.

**Properly inserted spigot.**


**Properly inserted spigot.**

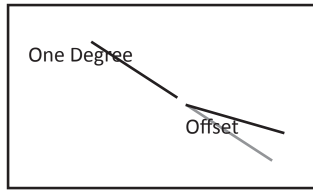
An "over-assembled" joint can be under substantial stress. In pressure pipe these stresses are additive to hydrostatic stresses and bells can fail directly due to over-insertion.




**Over inserted spigot.**

## Curvilinear Alignment (Without Bending the Pipe.)

During construction, it may become necessary to make very slight changes of direction. When this situation is encountered, the clearance between the inside diameter of the socket and the outside diameter of the spigot may be utilized to accomplish curvilinear alignment without bending the pipe. Neither the pipe nor the joint should be axially deflected in any manner to cause stress at the joint. Diamond **C900** will accommodate a 1° change in direction, which is equivalent to a four inch offset per joint. The minimum radius of curvature for 20’ joints is 1,146 feet. This, minimum radius of curvature, assumes the spigot is not inserted beyond the second insert reference mark. Inserting the spigot beyond the second insert reference mark reduces allowable joint offset.




**- Thrust Restraint -**

Diamond’s gasketed C-900 PVC pipe utilizes an integral bell socket with an elastomeric sealing gasket and is not self restraining. Therefore, thrust restraint is required at certain points in the piping system such as at valves, change in horizontal or vertical direction, fittings, etc.

The following diagram illustrates typical locations where thrust restraint is required. While thrust blocking is depicted, thrust restraint devices meeting the requirements of ASTM F1674 may be utilized. Typical joint restraint devices are seen in the photo on page 4.

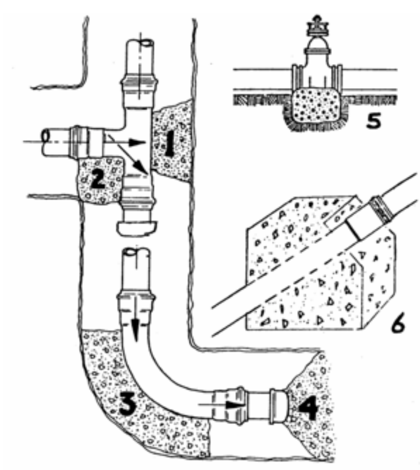



Figure No. 4

THRUST BLOCKS

1. Tees
1 & 2. Plugged End of Tee
3. 90° Elbow
4. End Caps or Plugs
5. Valve
6. Steep Incline

## Thrust at 90 degree elbow based on 100 psi internal pressure.

| Pipe Size* | Thrust |
|---|---|
| 4" (100) | 2,560 |
| 6" (150) | 5,290 |
| 8" (200) | 9,100 |
| 10" (250) | 13,700 |
| 12" (300) | 19,400 |
| 14" (350) | 26,000 |
| 16" (400) | 33,600 |
| 18" (450) | 42,200 |
| 20" (500) | 51,800 |
| 24" (600) | 73,900 |
| 30" (750) | 114,000 |
| 36" (900) | 163,000 |
| 42" (1050) | 220,000 |
| 48" (1200) | 287,000 |
| 54" (1350) | 339,000 |
| 60" (1500) | 389,000 |

As the chart above demonstrates, enormous thrust loads may be generated. Properly designed thrust restraint is a must. The specifying engineer should provide this information.

**- Service Connections -**

Service lines are connected to water mains by either:

1. Direct Tapping
2. Saddle Tapping
3. Tapping Sleeve & Valve

Direct tapping (1" or smaller tap) is restricted to C900 pipe sizes 6" through 16 inch with pipe walls at least 3/8" thick

Saddle tapping is restricted to a maximum corporation stop of 2 inches.

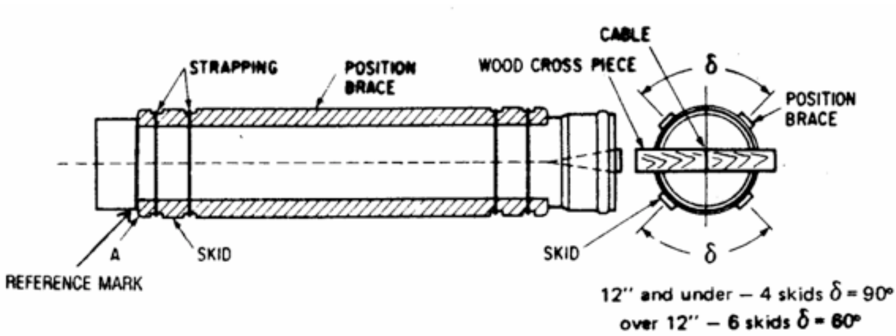
Tapping sleeves and valves are used when service connections larger than 2 inches are required.

A wide strap tapping saddle may be used for outlets less than two inches. For outlets larger than two inches, use a tapping sleeve and valve. Taps should follow the placement guidelines in the Uni-Bell Tapping Guide for PVC Pressure Pipe.

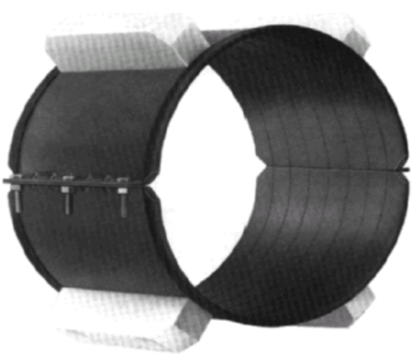
It is recommended that prior to tapping, those responsible for completion of the tap watch the video by the Uni-Bell PVC Pipe Association entitled "Direct Tapping PVC Pipe" and familiarize themselves with the Uni-Bell Tapping Guide for PVC Pressure Pipe. You may obtain these from your Diamond Pipe Sales Representative or from the Uni-Bell PVC PIPE Association (972-243-3902) www.UNI-BELL.ORG. Proper tapping procedures and tools are very important in maintaining safety.

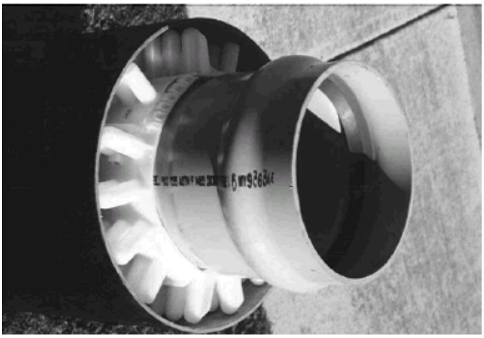
## - Casings -

Casings may be installed by boring where open excavation is not desirable, for example, under highways, runways, or railways. To provide long term support to the pipe and to prevent damage to belled sockets during installation, skids or casing



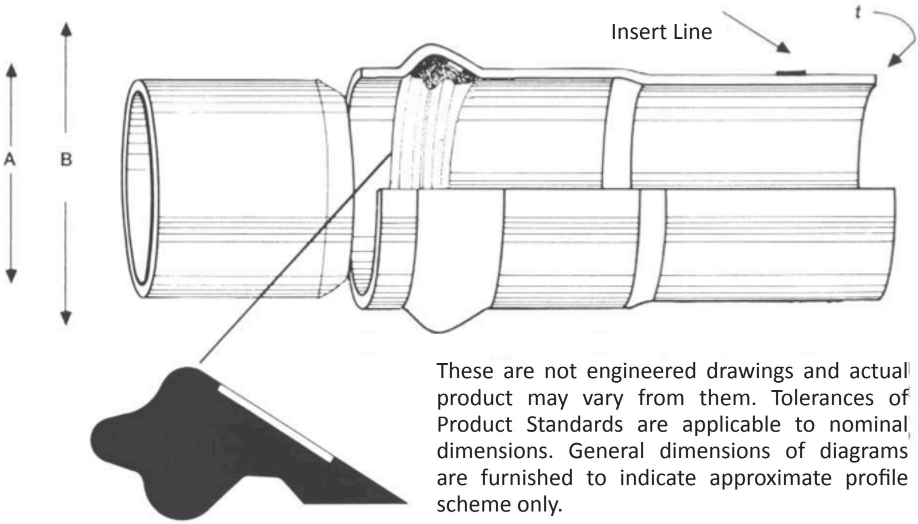

spacers must be attached to the pipe before the pipe is installed in casings. Casing spacers or skids should be fastened securely to the pipe with steel strapping, cables, or clamps. The installer must ensure the pipe is not "over-belled" or inserted beyond the second insert reference mark, the skids or casing spacers must be aligned with the reference marks on the spigot. Use of gasket lube between the skids and the casing can ease installation into the casing. Pipe dimensions may be found in the following tables. The socket diameter is the critical dimension for casing installation.





DIAMOND PLASTICS® CORPORATION

**RIEBER SEAL AWWA C900**
**PIPE DIMENSIONS**




These are not engineered drawings and actual product may vary from them. Tolerances of Product Standards are applicable to nominal dimensions. General dimensions of diagrams are furnished to indicate approximate profile scheme only.

| Nominal Size | Pipe O.D. (A) | Approximate Socket O.D. (B) | C900 Minimum Wall (t) DR-14 | DR-18 | DR-25 |
|---|---|---|---|---|---|
| 4” (100) | 4.800 (121.9) | 6 ½” | .343 (8.71) | .267 (6.78) | .192 (4.88) |
| 6” (150) | 6.900 (175.3) | 9 ¼” | .493 (12.52) | .383 (9.73) | .276 (7.01) |
| 8” (200) | 9.050 (229.9) | 11 ¾” | .646 (16.41) | .503 (12.78) | .362 (9.19) |
| 10” (250) | 11.100 (281.9) | 14 ¼” | .793 (20.14) | .617 (15.67) | .444 (11.28) |
| 12” (300) | 13.200 (335.3) | 16 ¾” | .943 (23.95) | .733 (18.62) | .528 (13.41) |

| Nominal Size | Pipe O.D. | Approximate Socket O.D. | C900 Minimum Wall DR-14 | DR-18 | DR-21 | DR-25 | DR-32.5 | DR-41 | DR-51 |
|---|---|---|---|---|---|---|---|---|---|
| 14” (350) | 15.300 (388.6) | 19 ¼” | | .850 (21.59) | .729 (18.51) | .612 (15.54) | .471 (11.96) | .373. (9.47) | |
| 16” (400) | 17.400 (442.0) | 21 ¾” | 1.243 (31.57) | .967 (24.56) | .829 (21.05) | .696 (17.68) | .535 (13.59) | .424 (10.77) | |
| 18” (450) | 19.500 (495.3) | 24 ¼” | 1.393 (35.38) | 1.083 (27.51) | .929 (23.60) | .780 (19.81) | .600 (15.24) | .476 (12.09) | .382 (9.70) |
| 20” (500) | 21.600 (548.6) | 26 ¾” | 1.543 (39.19) | 1.200 (30.48) | 1.029 (26.14) | .864 (21.95) | .665 (16.89) | .527 (13.39) | .424 (10.77) |
| 24” (600) | 25.800 (655.3) | 31 ¾” | 1.843 (46.81) | 1.433 (36.40) | 1.229 (31.22) | 1.032 (26.21) | .794 (20.17) | .629 (15.98) | .506 (12.85) |
| 30” (750) | 32.000 (812.8) | 38 ½” | 2.286 (58.06) | 1.778 (45.16) | 1.524 (38.71) | 1.280 (32.51) | .985 (25.02) | .780 (19.81) | .627 (15.93) |
| 36” (900) | 38.300 (972.8) | 45” | | 2.128 (54.05) | 1.824 (46.33) | 1.532 (38.91) | 1.178 (29.92) | .934 (23.72) | .751 (19.08) |
| 42” (1050) | 44.500 (1130.3) | 53” | | | 2.119 (53.82) | 1.780 (45.21) | 1.369 (34.77) | 1.085 (27.56) | .872 (22.15) |
| 48” (1200) | 50.800 (1290.3) | 59 ½” | | | 2.419 (61.44) | 2.032 (51.61) | 1.563 (39.70) | 1.239 (31.47) | .996 (25.30) |
| 54” (1350) | 57.560 (1462) | 66 ¾” | | | | 2.303 (58.50) | 1.771 (44.98) | 1.404 (35.66) | 1.129 (28.68) |
| 60” (1500) | 61.610 (1565) | 72” | | | | 2.465 (62.61) | 1.896 (48.16) | 1.503 (38.18) | 1.208 (30.68) |

### - Haunching & Initial Backfill -

Initial backfill is completed in two stages and should be completed as soon as possible after the pipe has been laid. The first stage (haunching) should be placed in layers of no more than six inches (150mm) at a time up to the springline of the pipe. Compact as required by the designer of the pipe system. The second stage of initial backfill is again placed in no more than six inch (150mm) layers from the springline to a point 6 to 12 inches (150 - 300mm) above the top of the pipe. Both stages of initial backfill material shall be free of large stones (1-1/2" or larger) frozen material, or debris. Attention should be given to assure that no voids remain between the pipe, trench bottom, and sides of the trench.

### - Acceptance Testing -

If portions of the pipeline are tested as they are completed, and if the joints are to be exposed during testing, center loading the pipe to resist movement of the pipe during testing is recommended. After testing, the pipe embedment requirements are to be followed in placing the initial backfill around the exposed joints prior to completing the final backfill. Fill the pipeline slowly, limiting the flow to approximately one foot per second, making sure that there is no imposed surge or water hammer.

## Approximate Volume of Water Required to Fill Pipe

| Pipe Size | U.S. gal/100ft | liters/30.48 meters |
|---|---|---|
| 4" | 70 | 265 |
| 6" | 153 | 579 |
| 8" | 259 | 980 |
| 10" | 405 | 1533 |
| 12" | 573 | 2169 |
| 14" | 810 | 3066 |
| 16" | 1050 | 3975 |
| 18" | 1315 | 4978 |
| 20" | 1615 | 6113 |
| 24" | 2305 | 8725 |
| 30" | 3545 | 13419 |
| 36" | 5078 | 19222 |
| 42" | 7197 | 27244 |
| 48" | 9400 | 35583 |
| 54" | 12447 | 47117 |
| 60" | 14265 | 53999 |

Take steps to ensure that all entrapped air is released from the line while filling. **Entrapped air can lead to very unsafe explosive failures. Fire hydrants are not an adequate replacement for air / vacuum release valves.** The pipeline should be filled but not pressurized until ready to conduct the pressure tests. Appropriate pressure relief, air release and vacuum release valves should be installed prior to testing. Duration of test pressures should be in accordance with the contract specifications as set forth by the designing engineer. Repair any leaks encountered prior to completing the backfill.

After any necessary repairs are made subsequent to the initial test, a system leakage test should be conducted to determine if the piping system was installed correctly. The make-up water allowance (gallons) from the table below were determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7{,}400}$$

Where:
- **L** = testing allowance, gal/hr
- **N** = number of joints in the tested line (pipe and fittings)
- **D** = nominal diameter of pipe, in
- **P** = average test pressure, lb/in$^2$

The same precautions and procedures exercised during system pressure tests should also be taken in preparing the pipeline for the system leakage tests. Purge the pipeline of any entrapped air, and test in accordance with contract specifications. ***PVC pipe joints do not leak when properly constructed;*** an allowable make-up water allowance is provided to account for the losses which may occur with the addition of appurtenances and accessories along with expulsion of entrapped air, movement due to seating of valves or joint restraints, and a slight increase in pipe diameter due to internal pressure.

## "Make-up" Allowance for PVC Pipe

| | Average test pressure in line, psi | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pipe Size, in. | 50 | | 100 | | 150 | | 200 | | 250 | |
| | Testing allowance/1000 ft (50 joints) | | | | | | | | | |
| 4 | 0.19 | (0.72) | 0.27 | (1.02) | 0.33 | (1.25) | 0.38 | (1.44) | 0.43 | (1.63) |
| 6 | 0.29 | (1.10) | 0.41 | (1.55) | 0.50 | (1.89) | 0.57 | (2.16) | 0.64 | (2.42) |
| 8 | 0.38 | (1.44) | 0.54 | (2.04) | 0.66 | (2.50) | 0.76 | (2.88) | 0.85 | (3.22) |
| 10 | 0.48 | (1.82) | 0.68 | (2.57) | 0.83 | (3.14) | 0.96 | (3.63) | 1.07 | (4.05) |
| 12 | 0.57 | (2.16) | 0.81 | (3.07) | 0.99 | (3.75) | 1.15 | (4.35) | 1.28 | (4.85) |
| 14 | 0.67 | (2.54) | 0.95 | (3.60) | 1.16 | (4.39) | 1.34 | (5.07) | 1.50 | (5.68) |
| 16 | 0.76 | (2.88) | 1.08 | (4.09) | 1.32 | (5.00) | 1.53 | (5.79) | 1.71 | (6.47) |
| 18 | 0.86 | (3.26) | 1.22 | (4.62) | 1.49 | (5.64) | 1.72 | (6.51) | 1.92 | (7.27) |
| 20 | 0.96 | (3.63) | 1.35 | (5.11) | 1.66 | (6.28) | 1.91 | (7.23) | 2.14 | (8.10) |
| 24 | 1.15 | (4.35) | 1.62 | (6.13) | 1.99 | (7.53) | 2.29 | (8.67) | 2.56 | (9.69) |
| 30 | 1.43 | (5.41) | 2.03 | (7.68) | 2.48 | (9.39) | 2.87 | (10.86) | 3.21 | (12.15) |
| 36 | 1.72 | (6.51) | 2.43 | (9.20) | 2.98 | (11.28) | 3.44 | (13.02) | 3.85 | (14.57) |
| 42 | 2.01 | (7.61) | 2.84 | (10.75) | 3.48 | (13.17) | 4.01 | (15.18) | 4.49 | (17.00) |
| 48 | 2.29 | (8.67) | 3.24 | (12.26) | 3.97 | (15.03) | 4.59 | (17.38) | 5.13 | (19.42) |
| 54 | 2.58 | (9.77) | 3.65 | (13.82) | 4.47 | (16.92) | 5.16 | (19.53) | 5.77 | (21.84) |
| 60 | 2.87 | (10.86) | 4.05 | (15.33) | 4.97 | (18.81) | 5.73 | (21.69) | 6.41 | (24.26) |

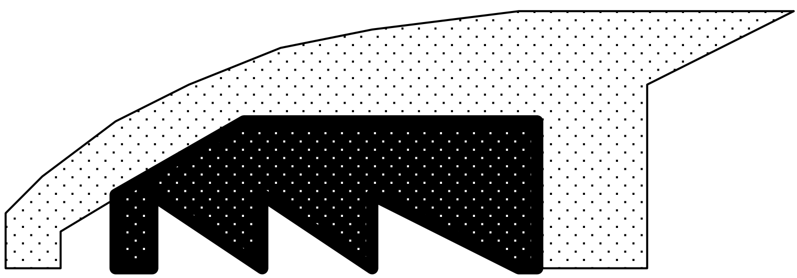
## - Final Backfill -

After placement and compaction of pipe embedment materials, the balance of backfill materials may be returned to the trench. The material should not contain large stones or rocks, frozen materials, or debris. Compaction procedures of the remainder of the backfill should be in accordance with the contract specification.

## - Diamond LOK 21® -

Diamond Lok-21® is standard AWWA C900 pipe with a modification to the bell to accommodate a casing and gripper ring to provide a thrust restraint joint. The additional length of the bell changes the assembly marks, ***for this reason when connecting Diamond Lok-21 to C900 sized pipe, the proper assembly mark for the bell being used should be applied to the spigot being inserted.*** Diamond Lok-21® should be unloaded, handled and strung the same as for our standard AWWA C900 pipe. Those guidelines may be found in other parts of this document. A separate installation guide detailing the specific installation guidelines is provided with each load of Diamond Plastics Lok-21 pipe. Both guides should be read entirely before beginning the installation of the product.

**Illustration of metallic restraint casing and gripper-ring.**



**Points of Gripper-Ring toward back of bell**

Prior to joint assembly, any dust or foreign material must be removed from the relative joining areas of the socket and the spigot. Verify that the points of the gripper ring are pointed toward the back of the bell and away from the bell entrance. The points are sharp and care should be taken when verifying proper direction. When in proper position the gripper ring can be easily rotated (turned) by hand within the casing cavity—if the ring is not in proper position, it won't easily rotate within the casing cavity. Several things can cause the ring to loose its ability to rotate freely. Dirt, dust, moisture between the ring and casing , or an improperly sized ring may be the reason. After checking these things if the ring still does not rotate freely contact your Diamond Plastics representative

**It is extremely important that the casing and gripper ring assembly be clean. This along with straight alignment reduces the assembly force required.**

Lubricate the spigot end and the gasket of the socket. Insure straight alignment and push the spigot into the socket until the entry lip of the socket is between the two assembly marks. Be careful not to over-assemble because the gripper ring will not allow the spigot to be pulled out to proper position. The assembled joint can not be pulled apart without potential damage to the joint.

The Diamond Lok-21®'s restraint system provides uniform circumferential contact with a simple push together system that is suited for directional drilling operations, encasements, and other applications which require joint restraint. It can sustain the following levels of pull force:

Maximum Allowable Pull Force (straight alignment)

| Size | Force (Pounds) | Size | Force (Pounds) |
|---|---|---|---|
| 4” | 15,000 | 16” | 60,000 |
| 6” | 20,000 | 18” | 70,000 |
| 8” | 30,000 | 20” | 80,000 |
| 10” | 40,000 | 24” | 100,000 |
| 12” | 45,000 | | |

The pull loads used in directional drilling and casing installations should be measured and set not to exceed the allowable pull forces that are listed above.

In horizontal drilling applications the angular deflection and bending radius for the finished installation should comply with the guidelines contained in AWWA C605 (The minimum bending radius is the pipe diameter times 250), In these kinds of applications the entrance and exit may require a more severe bending radius. Caution is advised in that the strength of the bell could be exceeded resulting in broken pipe.

## LIMITED WARRANTY AND LIABILITY

Diamond Plastics Corporation, 1212 Johnstown Road, P. O. Box 1608, Grand Island, NE 68802, does hereby warrant subject to the limitations hereinafter stated, its PVC Pipe to be free from defects in material and workmanship under normal use and service for a period of twelve (12) months from the date of invoice. This limited warranty extends only to the original purchase for use, and will be void if the product is used under conditions other than those for which it was designed or if it is not used in compliance with all instructions contained in any operating manual or specification sheets provided for such product.

**The sole obligation of Diamond Plastics Corporation, under this limited warranty, and the exclusive remedy of the purchaser under this limited warranty is the repair or replacement, without charge, F.O.B. shipping point, of such products or parts of products only, <u>specifically excluding any labor or installation thereof</u>,** which Diamond Plastics Corporation, after inspection, determines to be defective. Purchase must notify Diamond Plastics Corporation, in writing at its address shown above within ten (10) days from the date of discovery of any claimed defect specifically stating the details of such defect, and, if requested by Diamond Plastics Corporation, return the defective product, freight prepaid, to Diamond Plastics Corporation, F.O.B. shipping point as shown on Diamond Plastics Corporation's order acknowledgement.

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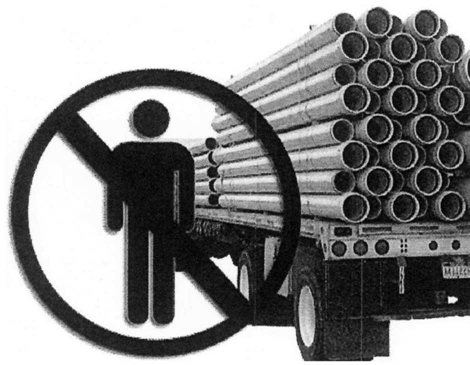
# WARNING

DO NOT UNLOAD BED ON UNLEVEL GROUND.

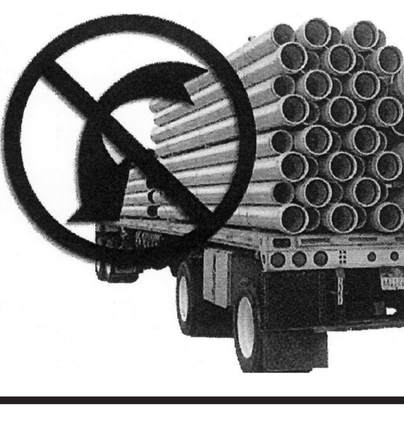
DO NOT STAND OR WALK BESIDE THE TRUCK WHILE UNLOADING.



# FALLING PIPE

## CAN CAUSE SERIOUS INJURY OR DEATH

DO NOT ROLL PIPE TO UNLOAD



DO UNLOAD WITH FORKS THAT EXTEND TO SUPPORT ALL OF THE PIPE IN THE BUNDLE.