dipra
Ductile Iron Pipe
Research Association

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TAPPING

Ductile Iron Pipe vs. Polyvinyl Chloride Pipe

Last Revised:
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DIPRA conducted tests comparing the direct tapping of Ductile Iron Pipe and polyvinyl chloride pipe. Cost, time, internal pressures, material strength, and other factors were also compared with respect to tapping. All tests were conducted using prescribed procedures for each material. (Handbook of Ductile Iron Pipe published by the Ductile Iron Pipe Research Association; the Handbook of PVC Pipe Design and Construction published by Uni-Bell; and Operating Instructions for the Mueller B-100 and B-101 Drilling and Tapping Machine.)

Procedure

For this study, the Ductile Iron Pipe specimens were 6-inch diameter Pressure Class 350, with a standard cement mortar lining. It is significant to note that the nominal number of threads engaged for the 6-inch Pressure Class 350 Ductile Iron Pipe (0.250-inch wall thickness) would be equivalent to 3.5 threads for 3/4" taps. Considering the pipe curvature, full thread engagement is 2.76 for 3/4" taps. The PVC specimens were 6-inch diameter C900, DR-14, pressure class 200.*

Except for the full-length testing, all specimens were 5 feet long, sealed with mechanical joint end caps, and secured in a test press. All tapping was conducted with a Mueller B-100 Drilling and Tapping Machine.

Cost Comparison

A cost comparison of the equipment needed to install direct service connections in Ductile Iron Pipe and PVC pipe indicated that the equipment to tap PVC would cost approximately $90 more than the equipment to tap Ductile.

The tapping machine, corporation stops, and items such as screw plugs, Teflon™ tape, and lubricant are required for both materials and no comparison is necessary.

The Handbook of PVC Pipe Design and Construction, published by Uni-Bell, recommends the use of a "heavy protective blanket with a hole in the center" when tapping PVC pipe. After contacting a number of safety equipment vendors, waterworks distributors, the Occupational Health and Safety Administration, and, finally, Uni-Bell, the PVC pipe association, the researchers were unable to locate a protective blanket of this type. In order to comply with Uni-Bell's recommended procedures, the researchers fabricated a "protective blanket."

Cost Comparison

Ductile Iron Pipe		PVC Pipe	
Drill/tap 3/4" =	$115	Tap (3/4") =	$70
		Shell Cutter (3/4")	$91
		Removal Tool (3/4")=	$18
		Safety Blanket (estimated)	$25
Total =	$115	Total =	$204

Tapping Time

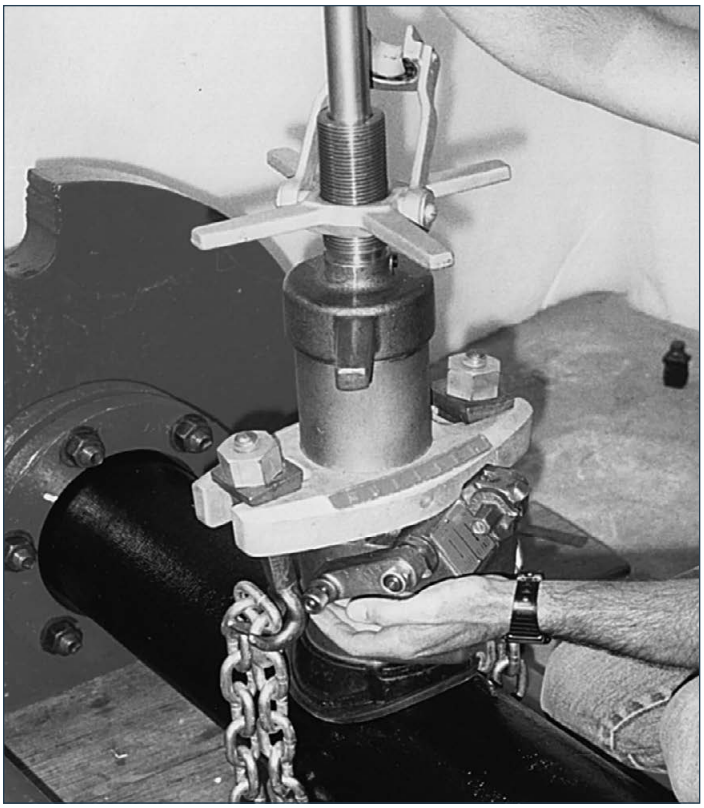
Each material was tapped according to recommendations. A moderate, thorough pace was used by the same tapping machine operator for all tests to achieve a representative comparison. All specimens were cut in 5-foot lengths, installed in the test press, and direct tapped under 60 psi internal water pressure. The tapping machine was positioned and mounted for each tap prior to the timing. The end of the tapping time was signaled after the corporation stop was inserted and torqued appropriately (30 ft-lbs for DIP and 27 ft-lbs for PVC).

Three corporations were installed in each specimen of Ductile Iron Pipe 12 inches apart (there is no restriction on the distance between taps for Ductile Iron Pipe) and two corporations were installed in each of three PVC specimens 18 inches apart (the minimum recommended distance between taps for PVC). It was necessary to use five PVC specimens—as opposed to only two Ductile Iron specimens—because of irreparable damage to the pipe material during the various tests. All direct taps were performed on each specimen at the 12 o'clock position as set in the test press.

Test Results

Ductile Iron Pipe Pressure Class 350 Cement-Mortar Lined	PVC Pipe DR 14 (class 200)*	
DIP Specimen #1		PVC Specimen #3
Tap #1 = 18 minutes Tap #2 = 12 minutes Tap #3 = 17 minutes	PVC Specimen #1 Tap #1 = 30 minutes Tap #2 = 25 minutes	Tap #1 = No time-photos Tap #2 = 25 minutes
		PVC Specimen #4
DIP Specimen #2	PVC Specimen #2	Tap #1 = 27 minutes
Tap #1 = 18 minutes Tap #1 = 16 minutes Tap #1 = 15 minutes	Tap #1 = 25 minutes Tap #2 = 20 minutes	PVC Specimen #5 23 minutes
Average = 16 minutes	Average = 25 minutes	

Following recommended procedures, the researchers determined that tapping PVC pipe took approximately 36 percent longer than tapping Ductile Iron Pipe. The increased tapping time was attributed to the fact that PVC pipe must be tapped slowly and gently to prevent the accumulation of local stresses that can cause the pipe to fail.



Each material was tapped according to recommendations. The average time to tap Ductile Iron Pipe (left) was 16 minutes; the average time to tap PVC (right) was 25 minutes. Note that a "protective blanket with a hole in the center" was used while tapping the PVC pipe to comply with Uni-Bell's recommended procedures.

Leak Tests

After each tap was completed, the tapping machine was removed and the inserted corporation stop inspected. Initially, if any seepage or leaks were observed, the corporation stops were tightened. On the Ductile Iron specimens, corporation stops were allowed to be retorqued until the seepage or leak was stopped. This torque was then recorded. With the PVC specimens, the corporation stop was retorqued to 35 ft-lbs, the maximum recommended torque. For each material, internal water pressure was increased in 25 psi increments to each pipe's maximum pressure rating (350 psi for Pressure Class 350 Ductile and 200 psi for DR 14 PVC).* Corporation stops for both pipe materials had tetrafluoroethylene pipe thread tape (Teflon tape) applied. (NOTE: Uni-Bell recommends that Teflon tape be used on corporation stops prior to insertion in PVC pipe. With Ductile Iron Pipe, the use of Teflon tape is optional.)

Ductile Iron Pipe

Six 3/4-inch direct service connections were made on two Ductile Iron Pipe specimens using recommended procedures. All corporation stops were torqued to 30 ft-lbs. Of the six direct taps, only one exhibited any leakage. The leak was observed at the threaded connection to the pipe with an internal pressure of 175 psi. This corporation was then retorqued to 40 ft-lbs to stop the leak. After retorque of this single corporation, none of the connections exhibited any leaks, even at 500 psi, the pressure at which the tests were terminated.

Leak Tests — Ductile Iron Pipe (350 psi Working Pressure Rating)

Internal Pressure (psi)	Specimen #1			Specimen #2		
	Corp. #1	Corp. #2	Corp. #3	Corp. #1	Corp. #2	Corp. #3
50	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks
175	No Leaks	No Leaks	No Leaks	Link at threads** (1 drop/4 sec.)	No Leaks	No Leaks
200	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks
300	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks
500	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks	No Leaks

** Retorqued corporation stop to 40 ft-lbs to stop leak.

Conditions:
1. Two 5-foot DIP specimens.
2. Three taps per specimen.
3. 12 inches between each corporation.
4. All corporations with two wraps of Teflon tape.
5. All corporations torqued to 30 ft-lbs.

PVC Pipe

Eight 3/4-inch direct service connections were made on five PVC specimens using recommended procedures. All corporation stops were torqued to 27 ft-lbs. Of the eight direct taps, five leaked prior to reaching the final 200 psi internal pressure. *All leakage occurred at the threaded connection of the pipe and corporation stop.*

Each of the five leaking connections was retorqued, or tightened, to 35 ft-lbs. Again, the internal pressure was increased and three of these connections continued to leak prior to the pipe's 200 psi working pressure.* If a PVC pipe continues to leak after a corporation stop is torqued to 35 ft-lbs, the water main must be taken out of service. Then the corporation must be removed, threads inspected and cleaned, and, finally, the corporation stop reinstalled with 27 ft-lbs of torque and checked again.

Leak Tests — PVC Pipe (200 psi Pressure Rating)*

Internal Pressure (psi)	Specimen #1		Specimen #2	
	Corp. #1	Corp. #2	Corp. #1	Corp. #1
50	No Leaks	No Leaks	No Leaks	No Leaks
75	No Leaks	No Leaks	No Leaks	No Leaks
100	Slight seepage at threads	No Leaks	No Leaks	No Leaks
125	Leak - One drop every 30 sec. Retorqued to 35 ft-lbs. Leak Stopped	No Leaks	No Leaks	Leak - One drop every 40 sec. Retorqued to 35 ft-lbs. Leak Stopped.
150	No Leaks	No Leaks	No Leaks	No Leaks
175	No Leaks	No Leaks	Seepage at threads. Retorqued to 35 ft.-lbs.	No Leaks
200	No Leaks	Seepage at threads. Retorqued to 35 ft.-lbs.	No Leaks	Leak - One drop every 20 sec. Corp. already @ 35 ft-lbs.

Leak Tests — PVC Pipe (200 psi Pressure Rating)* — continued

Internal Pressure (psi)	Specimen #3		Specimen #4	Specimen #5
	Corp. #1	Corp. #2	Corp. #1	Corp. #2
50	No Leaks	No Leaks	No Leaks	No Leaks
75	No Leaks	No Leaks	No Leaks	No Leaks
100	No Leaks	No Leaks	No Leaks	Leak-one drop every 5 sec. Retorqued to 35 ft-lbs. Leak Stopped.
125	Leak-one drop every 50 sec. Retorqued to 35 ft-lbs. Leak Stopped	No Leaks	No Leaks	No Leaks
150	No Leaks	No Leaks	No Leaks	Seepage at threads.
175	No Leaks	No Leaks	No Leaks	Leak - One drop every 50 sec.
200	Leak - One drop every 50 sec. Already at 35 ft.-lbs.	No Leaks	No Leaks	Leak - Corp. already at 35 ft-lbs.

Note: Manufacturers recommend initial torque of corporation stops @ 27 ft-lbs and retorquing not to exceed 35 ft-lbs.

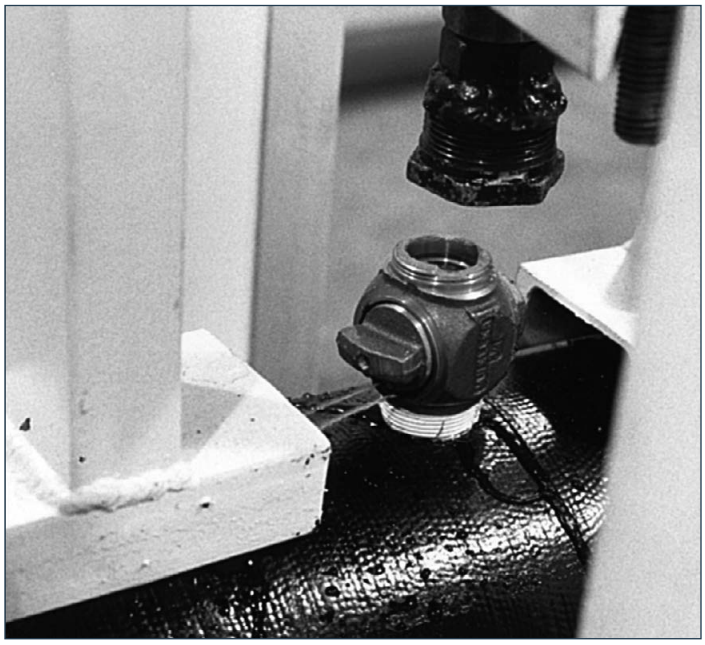
Conditions:
1. Five 5-foot PVC specimens.
2. Two taps per Specimens #1, #2, and #3.
3. One tap per Specimens #4 and #5.
4. 18 inches between corporations on Specimens #1, #2, and #3.
5. All corporations with three wraps of Teflon.
6. All corporations torqued to initial 27 ft.-lbs.

Pull-Out Tests

Following the leak tests, pull-out tests were conducted to evaluate the strength and integrity of each threaded connection to the pipe material. Each pipe was securely installed in the test press, filled with water, and brought up to 60 psi internal water pressure. The 3/4-inch corporations were checked for proper torque ratings, and, when required, the DIP specimens were torqued to 40 ft-lbs and PVC specimens were torqued to 35 ft-lbs.

A "pull-out" apparatus was mounted on the test press directly over the corporation stop. This apparatus utilizes a 10-ton hydraulic ram that connects to a fixture threaded onto the respective corporation stop. A hydraulic pump with a previously calibrated gauge was used to apply hydraulic pressure to the ram.

The hydraulic ram with an effective area of 2.074 square inches enables a conversion from pressure in psi to pounds of force pulling on the corporation stop connection. This force was applied in increments of 250 psi, or approximately 500 pounds of force.



Pull-out tests were conducted to evaluate the strength and integrity of each threaded connection to the pipe material. For Ductile Iron Pipe (left), the leakage occurred to the corporation stops at an average of 2,834 pounds of pulling force. In every case, the leaks were observed on the corporation stop plugs and not at the threaded connection to the pipe. Failure, which occurred at an average of 9,644.1 pounds of pulling force, occurred at the threaded connection for the service line, not the threaded connection to the pipe. Pull-out tests on PVC pipe (right) resulted in leakage at the threaded connection to the pipe at an average of 2,800 pounds of pulling force; failure at an average of 4,558 pounds. In every instance, the pulling force caused the pipe wall to break in the area of the corporation stops, resulting in the destruction of the pipe itself in the general area of the direct tap connection.

Ductile Iron Pipe

For Ductile Iron Pipe, leakage occurred to the corporation stops at an average of 2,834 pounds of pulling force. In all three cases, *the leaks were observed on the 3/4-inch corporation stop plugs and not at the threaded connection to the pipe*. Actual failure occurred at an average of 9,644.1 pounds of pulling force. This failure occurred to the threaded connection for the copper service line, not the threaded connection to the pipe where leakage never occurred.

Pull Out Tests — Ductile Iron Pipe

Pulling Force	Specimen #1		
	Corp. #1	Corp. #2	Corp. #3
1,037 lbs	No Leaks	No Leaks	No Leaks
2,074 lbs	No Leaks	Leak at corp. plug - 1,866.6 lbs	No Leaks
3,111 lbs	Leak at corp. plug - 3,111 lbs	Leak at corp. plug	Leak at corp. plug - 3,525.8 lbs
4,148 lbs	Leak at corp. plug	Leak at corp. plug	Leak at corp. plug
6,222 lbs	Leak at corp. plug	Leak at corp. plug	Leak at corp. plug
9,333 lbs	Leak at corp. plug	Failure of corp. plug - 9,229.3 lbs	Leak at corp. plug
10,370 lbs	Failure of corp. plug - 10,162.6 lbs	—	Failure of corp. plug - 9,540.4 lbs

NOTES: Internal water pressure @ 60 psi. All corporation stops torqued to 40 ft-lbs. Average load to failure: 9,644.1 lbs. All corporation stops failed in the same manner: 1. In all tests, no leakage occurred at threaded connection with pipe. 2. Leakage occurred at corporation plug.

PVC Pipe

The test on PVC specimens resulted in leakage at the threaded connection to the pipe at an average of 2,800 pounds of pulling force. *In all instances, the pulling force caused the pipe wall to break in the area of the corporation stop, pulling pieces of the pipe wall out in the area of the corporation stops, resulting in destruction of the pipe itself in the general area of the direct tap connection.* These failures occurred at an average of 4,558 pounds of pulling force, less than half that required to cause failure to the corporation service line connection on the Ductile Iron Pipe.

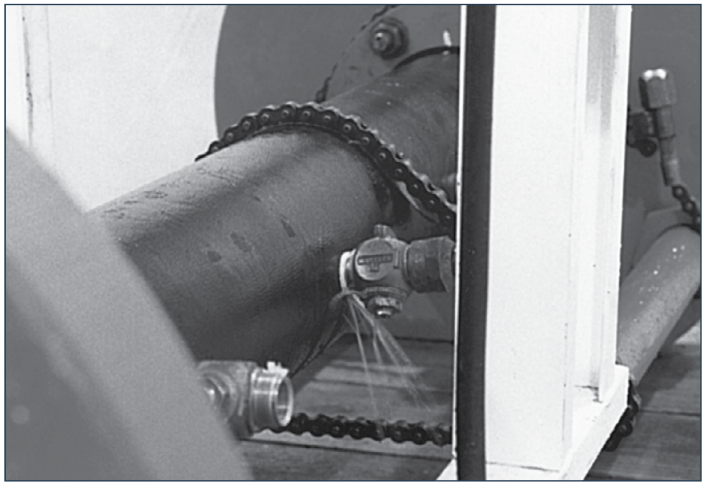
Pull Out Tests — PVC Pipe

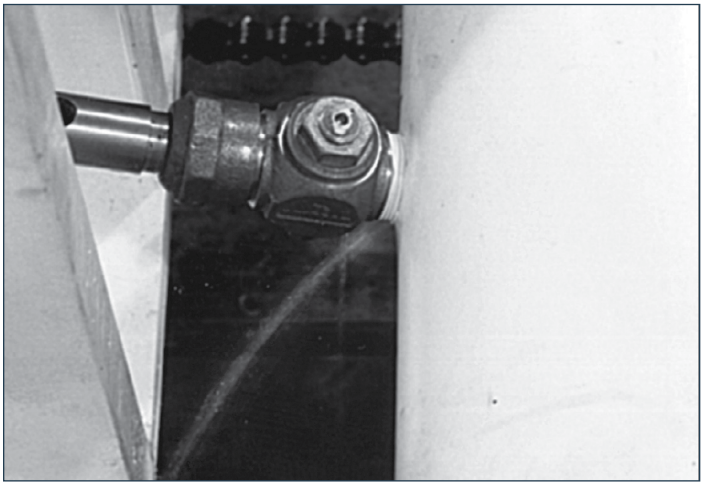
Pulling Force	Specimen #1		Specimen #4	Specimen #5
	Corp. #1	Corp. #2	Corp. #1	Corp. #2
1,037 lbs	No Leaks	N/A	No Leaks	Leak at threads - 829.6 lbs
2,074 lbs	No Leaks	N/A	No Leaks	Leak
3,111 lbs	No Leaks	N/A	No Leaks	Leak
3,630 lbs	No Leaks	N/A	No Leaks	Leak
4,148 lbs	Leak at threads - 3,836.9 lbs	N/A	Leak at threads - 3,733.2 lbs	Leak
5,185 lbs	Failure - 4,770 lbs	Failure - 4,542 lbs	Failure - 4,459.1 lbs	Failure - 4,459.1 lbs

NOTES: Internal water pressure @ 60 psi except for Specimen #1 — Corp. #2, where the pipe wall had been damaged while testing Corp. #1. All corporation stops torqued to 35 ft-lbs. Average load to leakage: 2,800 lbs. Average load to failure: 4,557.6 lbs. In all instances, the pulling force caused the pipe wall to break in the area of the corporation stop, pulling pieces of the pipe wall out in the area of the corporation stops, resulting in destruction of the pipe in the general area of the direct tap connection. The specimens also cracked in various directions at the point of failure.

Cantilever Load Tests

Cantilever load testing was conducted to evaluate the strength of the threaded connections of the two pipe materials. The procedure was similar to that used for the pull-out tests, the only difference being the specimens were rotated 90 degrees and a slightly different connection apparatus to the corporation stops was used. This apparatus had a pivot type connection point at the corporation, which allowed a deflection of approximately 15 degrees. Each cantilever test was done in increments of 25 psi hydraulic pressure, which was later converted to inch-pounds bending moment at the interface between the pipe and corporation stop. Failure was defined by the loss of pressure being applied.





Cantilever load testing was conducted to evaluate the strength of the threaded connections of the two pipe materials. The average bending moment to cause leakage of the corporation stops in Ductile Iron Pipe (left) was 2,742 in-lbs. Leakage occurred at the corporation plug on the stop and not at the threaded connection. Failure of the corporation stops averaged 4,721 in-lbs and occurred at the exposed threads just outside the connection to the pipe. Tests on PVC specimens (right) resulted in leakage at an average of 1,990 in-lbs and, in all cases, the leak occurred at the threaded connection to the pipe. Failure occurred at an average of 3,269 in-lbs, resulting in an elongation of the threaded hole in the pipe wall. The threads in the PVC pipe wall stretched or compressed and stripped.

Ductile Iron Pipe

The average bending moment to cause leakage of the corporation stops in Ductile Iron Pipe was 2,742 in-lbs. As in the pull-out tests, leakage occurred at the corporation plug on the stop and not at the threaded connection. Failure of the corporation stops averaged 4,721 in-lbs and occurred at the exposed threads just outside the connection to the pipe. Leakage never occurred at the threaded connection to the pipe.

PVC Pipe

Tests on PVC specimens resulted in leakage at an average of 1,990 in-lbs and, in all cases, the leak occurred at the threaded connection in the pipe. Failure occurred at an average of 3,269 in-lbs and resulted in an elongation of the threaded hole in the pipe wall. Closer examination revealed that the threads in the PVC pipe wall stretched or compressed and stripped.

Cantilever Load Tests — Ductile Iron Pipe

Pulling Force	Specimen #2		
	Corp #1 (5 5/32" Arm Length)	Corp #2 (5 1/16" Arm Length)	Corp #3 (5 1/16" Arm Length)
104 lbs	No Leaks	No Leaks	No Leaks
207 lbs	No Leaks	No Leaks	No Leaks
311 lbs	No Leaks	No Leaks	No Leaks
363 lbs	No Leaks	No Leaks	No Leaks
415 lbs	No Leaks	No Leaks	No Leaks
467 lbs	No Leaks	Leak at corp. plug 2,362 in-lbs (197 ft-lbs)	Seepage at corp. plug
519 lbs	No Leaks	Leak at corp. plug	Leak at corp. plug 2,657 in-lbs (221 ft-lbs)
570 lbs	No Leaks	Leak at corp. plug	Leak at corp. plug
622 lbs	Leak at corp. plug 3,208 in-lbs (267 ft-lbs)	Leak at corp. plug	Leak at corp. plug
674 lbs	Leak at corp. plug	Leak at corp. plug	Leak at corp. plug
Failure	Corp. failed at threads external to pipe connection 4,598 in-lbs (383 ft-lbs)	Corp. failed at threads external to pipe connection 4,462 in-lbs (372 ft-lbs)	Corp. failed at threads external to pipe connection 5,102 in-lbs (425 ft-lbs)

NOTES: Internal water pressure @ 60 psi. All corporation stops torqued to 40 ft-lbs. **None of the three tests showed any leakage or failure of threaded connection.**

Cantilever Load Tests — PVC Pipe

Pulling Force	Specimen #2		Specimen #3	
	Corp #1 (5" Arm Length)	Corp #2 (5 3/16" Arm Length)	Corp #1 (5 3/16" Arm Length)	Corp #2 (5 1/8" Arm Length)
104 lbs	No Leaks	No Leaks	No Leaks	No Leaks
156 lbs	No Leaks	No Leaks	No Leaks	No Leaks
207 lbs	No Leaks	No Leaks	No Leaks	No Leaks
259 lbs	No Leaks	No Leaks	No Leaks	No Leaks
311 lbs	No Leaks	No Leaks	Seepage at threads	Leak at threads 1,594.4 in-lbs (132.87 ft-lbs)
363 lbs	No Leaks	No Leaks	Leak at threads 1,882.8 in-lbs (156.9 ft-lbs)	Leak
415 lbs	No Leaks	Leak at threads 2,151 in-lbs (179.31 ft-lbs)	Leak	Leak
467 lbs	Leak at threads 2,333 in-lbs (194.44 ft-lbs)	Leak	Leak	Leak
Failure	3,318.4 in-lbs (276.53 ft-lbs)	3,550.43 in-lbs (295.87 ft-lbs)	3,442.84 in-lbs (286.9 ft-lbs)	2,763.61 in-lbs (230.3 ft-lbs)

NOTES: Internal water pressure @ 60 psi. All corps. torqued @ 35 ft-lbs.
Four tests showed leakage at an average of 1,990 in-lbs (116 ft-lbs) and failure at 3,268.82 in-lbs (272.4 ft-lbs).

Full Length Tapping PVC Under Stress

Installation of PVC pipe allows for a degree of bending to occur on the entire pipe length. This amount of allowable bending was calculated and applied to several pipe lengths in which direct taps were to be installed. Four such taps were installed on the outer diameter of this bend (pipe wall in tension) and four to the inner diameter of the bend (pipe wall in compression).

With the pipe wall in tension, all four corporation stops were found to leak at the threads when torqued to 27 ft-lbs. Each was retorqued to 35 ft-lbs and internal pressure increased to a maximum of 200 psi. After this tightening, three of the four corporation stop connections continued to seep water. With the pipe wall in compression, two of the four connections exhibited seepage when the corporation stops had an initial torque of 27 ft-lbs. When these two were retorqued to 35 ft-lbs and internal pressure increased to 200 psi, one of the corporation stops continued to seep water.

Tension

PSI	Specimen #1 - FL				Specimen #2 - FL			
	Corp. #1 (3/4 inch)		Corp. #2 (3/4 inch)		Corp. #1 (3/4 inch)		Corp. #2 (3/4 inch)	
	27 ft-lbs	35 ft-lbs	27 ft-lbs	35 ft-lbs	27 ft-lbs	35 ft-lbs	27 ft-lbs	35 ft-lbs
60	Seepage	No Leaks	Seepage	No Leaks	Seepage	No Leaks	Seepage	No Leaks
100	—	No Leaks	—	Seepage	—	No Leaks	—	Seepage
125	—	No Leaks	—	Seepage	—	No Leaks	—	Seepage
150	—	Seepage	—	Seepage	—	No Leaks	—	Seepage
175	—	Seepage	—	Seepage	—	No Leaks	—	Seepage
200	—	Leak	—	Seepage	—	No Leaks	—	Seepage

NOTES: All seepage was noted at the threaded connection. Seepage is defined as water forming around the threaded connection. Leak is defined as 1 drop per minute (off the pipe).

Compression

PSI	Specimen #1 - FL				Specimen #2 - FL			
	Corp. #1 (3/4 inch)		Corp. #2 (3/4 inch)		Corp. #1 (3/4 inch)		Corp. #2 (3/4 inch)	
	27 ft-lbs	35 ft-lbs	27 ft-lbs	35 ft-lbs	27 ft-lbs	35 ft-lbs	27 ft-lbs	35 ft-lbs
60	No Leaks	—	No Leaks	—	Seepage	No Leaks	Seepage	No Leaks
100	No Leaks	—	No Leaks	—	—	No Leaks	—	No Leaks
125	No Leaks	—	No Leaks	—	—	No Leaks	—	No Leaks
150	No Leaks	—	No Leaks	—	—	No Leaks	—	No Leaks
175	No Leaks	—	No Leaks	—	—	Seepage	—	No Leaks
200	No Leaks	—	No Leaks	—	—	Leak	—	No Leaks

NOTES: All seepage was noted at the threaded connection. Seepage is defined as water forming around the threaded connection. Leak is defined as 1 drop per minute (off the pipe).

Summary

This study on direct service connections to Ductile Iron and PVC pipe resulted in a number of interesting observations:

1. Costs of equipment for direct service connections to PVC pipe exceed those for direct tapping Ductile Iron Pipe.
2. All things being equal, direct tapping PVC will involve more time than direct tapping Ductile Iron Pipe—in some instances up to 36 percent more time.
3. Using recommended procedures, three out of eight direct taps in PVC leaked at a pressure less than the maximum rated working pressure (200 psi).* In these instances, the PVC line would have to be taken out of service, corporation removed, tap cleaned and inspected, and the corporation reinstalled and retested for leakage.
4. Using recommended procedures, 100 percent of the direct service connections on the Ductile Iron Pipe exhibited no leakage–even with more than 350 psi of pressure.
5. The pull-out and cantilever tests revealed that direct taps in Ductile Iron Pipe exhibit greater strength and integrity than those made in PVC. It is significant that, in both tests, it was the PVC pipe itself that failed; but with Ductile Iron Pipe, it was the corporation stop that failed.
6. The full-length PVC pipe tests under bending stress indicate a greater risk of direct service connections leaking when PVC pipe has allowable bending stress applied.*
7. Tapping did not harm the cement mortar lining of Ductile Iron Pipe. In every case, the lining remained intact and the cement did not spall.
8. Tests reported herein reaffirm that Pressure Class 350 Ductile Iron Pipe can be direct-tapped with confidence and that the resultant thread engagement is more than adequate to effect a watertight seal.

Notes:

1. In 6-inch diameter, Pressure Class 350 Ductile Iron Pipe has the same pipe wall thickness as Special Thickness Class 50 Ductile Iron Pipe (0.25 inches).
2. Pressure Class 350 Ductile Iron Pipe is the lowest pressure class available in 6-inch diameter size.

***ANSI/AWWA C900 was revised in 2007 at which time the factor of safety was reduced from 2.5 to 2.0 and the surge pressure allowance was eliminated. As a result, the same DR-14 Pressure Class 200 pipe is now rated at 305 psi. The higher internal pressures now allowed for DR-14 PVC pipe will likely result in more leakage for PVC pipe than was reported for the tests summarized in this document. The impact of the 2007 revisions to the AWWA C900 design standard should be carefully considered in all aspects of the design of PVC pipe.**

For more information contact DIPRA or any of its member companies.

Ductile Iron Pipe Research Association

An association of quality producers dedicated to the highest pipe standards through a program of continuing research and service to water and wastewater professionals.

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