

Proposed Revision To: ☒ Standard Specifications For Public Works Construction ☐ Standard Plans For Public Works Construction	Change No. 350 UM (ASSIGNED BY GREENBOOK COMMITTEE)
Public Works Standards, Inc. c/o Associated General Contractors of California Los Angeles District Office 1906 West Garvey Avenue, Suite No. 100 West Covina, California 91760	Date Proposal Received 10/23/24 (ASSIGNED BY GREENBOOK COMMITTEE)
Subsection or Standard Plan to be revised: _____ On page(s): _____	
Warning: Public Contract Code §3400 prohibits any local agency specification that limits bidding, directly or indirectly, to any one specific concern or product. If this revision describes a proprietary or patented product, it must identify other products which equally perform the functions of the proprietary or patented product.	
Revision: I am proposing changes to the following sections of the Greenbook: 306-8.9.2.3 - Update wording regarding "Leakage" to be consistent with current versions of AWWA C600, C605 and M23. Update Table 306-8.9.2.3 with proper wording. "Leakage allowance" should be changed to "Test allowance/makeup water" 306-8.9.2.4 - Update wording regarding "Leakage" to be consistent with current versions of AWWA C600, C605 and M23.	
Reason For Revision: Language was changed in AWWA C600 and C605 regarding "Leakage Allowance" for PVC and ductile iron pipe due to existing wording causing confusion among end users. There is no leakage allowed with gasketed PVC or ductile iron pipe joints; makeup water is required to be added during hydrostatic testing due to joint expansion. In original versions of the standards, "leakage allowance" referred to the makeup water added during testing until the pressure remained static, and the term was changed in the early 2000's to address confusion.	
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Instructions: Use a separate form for each revision. Attach plain paper if more space is needed. For minor changes, copy present wording striking out words to be deleted and <u>underlining</u> new text. For major changes, rewrite or add paragraph or sections. All proposed revisions must include the reason(s) for the revision.	
Subcommittee Action: On <u>04/14/2026</u> _____ (Date) ☐ Recommended For 2027 ___ Supplement/Edition ☐ Rejected ☐ As Modified	Editorial Standards Subcommittee Review: On <u>05/19/2026</u> _____ (Date) ☐ Reviewed For Surf/Und/Spec/Plans Subcommittee ☒ NO Modifications ☐ As Modified
Greenbook Committee Action: On <u>07/16/2026</u> _____ ☒ Approved For <u>2027 Greenbook</u> Supplement/Edition ☐ As Modified (Date) ☐ Rejected	

Prior to use, the mandrel shall be certified by the Engineer or by another entity approved by the Engineer. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate the test.

If the mandrel fails to pass through the pipe, the pipe will be deemed to be over-deflected.

306-7.8.3.3 Inside Diameters Between 24 Inches (600 mm) and 36 Inches (900 mm). Deflections shall be determined by a method submitted to the Engineer in accordance with 3-8. Fittings shall be visually inspected to ensure the maximum allowable deflection has not been exceeded.

306-7.8.3.4 Inside Diameters Greater Than 36 Inches (900 mm). Deflections shall be determined by using a 1 inch (25 mm) diameter, nonadjustable metal bar; a minimum-radius rigid template; or by a method approved by the Engineer. Fittings shall be visually inspected to ensure the maximum allowable deflection has not been exceeded.

306-7.8.3.5 Laser Testing. The Contractor may substitute laser profile testing for mandrel testing.

306-7.8.3.6 Defective Work Remediation. Over-deflected pipe shall be uncovered and, if not damaged, reinstalled. Pipe subjected methods or process other than removal, which attempts, even successfully, to reduce or cure any over-deflection, shall be uncovered, removed from the Work site, and replaced with new pipe.

306-8 PREFABRICATED PRESSURE PIPE.

306-8.1 General. Prefabricated pressure pipe (pressure pipe) shall include pipe installations where:

- the pipeline is designed to operate under continuous pressure, or
- the pipeline is designed for bi-directional flow.

Installation of pipeline materials, fittings, valves and appurtenances shall conform to the pipe- specific Reference Specifications shown in Table 306-8.1 which shall be submitted to the Engineer in accordance with 3-8.4.

TABLE 306-8.1

Pressure Pipe Material	Material Specification	Installation Reference Specification¹
Ductile Iron Pipe	209-1	AWWA C600 and 306-8.2
Steel Pipe	209-2	AWWA C604, and 306-8.3
Concrete Pressure Pipe	207-3	AWWA M9 Chapter 14 and 306-8.4
PVC Pressure Pipe	209-4	AWWA C605 and 306-8.5
High Density Polyethylene (HDPE) Pressure Pipe	209-5	AWWA M55 Chapter 8 and 306- 8.5 <u>8.6</u>
Fiberglass Pressure Pipe	209-6	AWWA M45 Chapter 6 and 306- 8.6 <u>8.7</u>
Valves and Appurtenances	212	Manufacturer's installation and warranty requirements

1. Where the manufacturer issues installation instructions, these shall be submitted to the Engineer in accordance with 2.5.3 along with the specifications referenced above. Any conflicts or discrepancies between the Reference Specifications shown above and the manufacturer's installation instructions shall be brought to the Engineer's attention in writing prior to the start of pipe installation. The Contractor shall allow 10 Working Days for resolution.

Pressure pipe shall be laid to the lines and grades shown on the Plans.

Joint restraints shall be constructed using welds, flanges, mechanical joints, or manufactured joint restraints as shown on the Plans or specified in the Special Provisions.

After the joints have been constructed, the pipe shall not be disturbed in any manner.

The Engineer may require removal and relaying of any pipe which is not true in alignment or shows excessive settlement after laying.

At the close of work each Day, or whenever the Work ceases for any reason for more than 40 minutes, each exposed end of the pipe shall be securely closed unless otherwise approved by the Engineer.

306-8.2 Ductile Iron Pipe.

306-8.2.1 General. Ductile iron pipe shall be assembled in accordance with AWWA C600 and the applicable manufacturer's installation instructions.

306-8.2.2 Installation.

306-8.2.2.1 Push-On Joints. Push-on joints shall be assembled in accordance with AWWA C600 and the following:

- a) On long radius curves, trenches shall be excavated wider than shown in Table 306-3.4 (B) to allow for straight-line assembly before deflection.
- b) Cutting and machining shall conform to the manufacturer's installation and warranty requirements. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, or any other method that may fracture the pipe or produce ragged, uneven edges.
- c) Gasket recess and bell sockets of pipe or fittings and plain ends of mating pipe shall be cleaned. Joints shall be dirt-free.
- d) Plain ends, sockets, and gasket shall be lubricated using soapy water or an approved pipe lubricant conforming to AWWA C600. Lubrication for spigot ends and instructions for lubricant use shall be supplied by the pipe manufacturer.
- e) An elastomeric gasket ring shall be inserted into the gasket recess and be completely seated.
- f) Spigot and bell ends shall slide together without displacement of elastomeric gasket.
- g) The pipe shall be installed with the bell end facing in the direction of laying unless otherwise approved by the Engineer.
- h) The spigot shall be inserted into the bell and forced slowly into position, using a large bar lever and wood block across the pipe end. For large pipe, a come-along (with padding that will not scratch the pipe) may be used.
- i) After assembling the pipe in a straight line, horizontal or vertical deflections shall be made at the joints to conform with the alignment shown on Plans.

Push-on restrained joints shall incorporate flex-ring, split-ring or ring segments and shall be installed in accordance with the manufacturer's installation instructions for the joint design used.

Allowable push-on joint deflections shall not exceed the following:

TABLE 306-8.2.2.1

Pipe Nominal Diameter	Allowable Push-on-Joint Deflection	Allowable Restrained Joint Deflection
3-inch through 4-inch (75 to 100 mm)	4.0°	n/a
6-inch through 12-inch (150 to 300 mm)	4.0°	3.2°
14-inch (350 mm) and larger	2.4°	1.6°

The values shown in Table 306-8.2.2.1 are based on 80 percent of that recommended by AWWA M41 Table 11-4 and 11-5 in accordance with paragraph 4.3.4.4 of AWWA C600.

306-8.9.2.2 Preparation. The Contractor shall apply test pressures at an approved outlet or fitting located within 5 feet (1.5 m) vertically of the lowest point of each pipe section to be tested. The Contractor shall provide and later securely plug such fittings. Where air valves or other suitable outlets are unavailable, the Contractor shall provide approved taps and fittings for air release, and securely plug these later.

The Contractor shall flush all mains and services with potable water (or water as otherwise approved by the Engineer and jurisdictional regulatory agencies) after the completion of construction. A sufficient number of suitable outlets at the end(s) of line(s) being flushed shall be provided in addition to those shown on the Plans to permit flushing of mains with water at a velocity of at least 2.5 feet per second (750 mm/s) over its entire length. Outlets provided shall meet the requirements for the fittings specified for the type of main constructed. Velocity through outlets and fittings shall not exceed 25 feet per second (750 mm/s) during flushing. Drainage facilities shall be constructed as necessary to ensure water lines do not become contaminated during flushing.

The Contractor shall provide sufficient hoses, fittings and equipment to direct flushing water to an established point of discharge. The discharge point shall be an improved drainage structure capable of accepting the flow without damaging existing improvements or creating a public hazard. The Contractor shall also provide dechlorination of the flushing water chlorine residual as required to meet applicable NPDES permit requirements. Flushing in or adjacent to public streets shall be scheduled during periods of low traffic volume. Traffic control during flushing and discharge of flushing water onto traffic lanes shall be as specified in the Special Provisions.

Unless otherwise specified, the Contractor shall make the arrangements for, and provide the water for, flushing and its subsequent discharge.

306-8.9.2.3 Allowable Leakage Hydrostatic Test Allowance. ~~Allowable leakage shall be determined as follows:~~ The hydrostatic testing allowance shall be defined as the allowed quantity of makeup water supplied to the pipe section during the test to maintain a pressure within 5 psi (34 kPa) of the specified test pressure.

Makeup water shall be computed as the total quantity of water pumped into the pipeline during the test period, including water added to reach the specified test pressure for the final time. Makeup water added shall not exceed the rate specified for the type of pipe tested.

No ductile iron or PVC pipe installation will be accepted if leakage the quantity of makeup water exceeds that determined by the following formula (taken from AWWA C600 or AWWA C605):

$$L_{us} = SD(P)^{1/2} / 148,000$$

in which

- L = ~~allowable leakage~~ hydrostatic test allowance, in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of pipe, in inches
- P = average observed test pressure of the pipe being tested, as shown, in pounds per square inch gauge, based on the elevation of the lowest point in the line or section under test and corrected to the elevation of the test gauge.

$$(L_{s1} = SD(P)^{1/2} / 794,800)$$

Change 350 UM Updated (October 23, 2025)

(Lsr in liters per hour, S in meters, D in millimeters, P in kilopascals)

No gasketed steel pipe installation will be accepted if ~~leakage~~ hydrostatic test allowance exceeds that determined by the following formula (taken from AWWA C604):

$L_{us} = 10$ gallons per inch-diameter per mile of pipe per 24 hours

$L_{sr} = 0.93$ liters per millimeter-diameter per kilometer of pipe per 24 hours

When testing against closed valves, an allowance of 0.0078 gallons per hour per inch of nominal valve size may be added to that computed using formulas above to account for leakage around seals.

For PVC, ductile iron, or gasketed steel pipe, allowable leakage hydrostatic test allowance shall be as shown in Table 306-8.9.2.3.

TABLE 306-8.9.2.3

Allowable Leakage Hydrostatic Test Allowance in PVC OR Ductile Iron Pipe, Gallons per Hour per 1000 <u>ft</u> (Liters per Hour per 1,000 m) of Pipe					Allowable Leakage makeup water in Hydrostatic Test Allowance in Gasketed Steel Pipe, Gallons per Hour per 1000 <u>ft</u> (Liters per Hour per 1,000 m) of Pipe	Additional Allowable Leakage Hydrostatic Test Allowance through Seals of Closed Valves, Gallons (Liters) per valve
Pipe Diameter	Test Pressure				All Pressures	All Pressures
	150 psi (1.0 MPa)	200 psi (1.4 MPa)	250 psi (1.7 MPa)	300 psi (2.1 MPa)		
3" (75 mm)	0.25 (3.10)	0.29 (3.60)	0.32 (3.97)	0.35 (4.35)	0.24 (2.98)	0.02 (0.08)
4" (100 mm)	0.33 (4.10)	0.38 (4.72)	0.43 (5.34)	0.47 (5.84)	0.32 (3.97)	0.03 (0.11)
6" (150 mm)	0.50 (6.21)	0.57 (7.08)	0.64 (7.95)	0.70 (8.69)	0.47 (5.84)	0.05 (0.19)
8" (200 mm)	0.66 (8.20)	0.76 (9.44)	0.85 (10.6 <u>0</u>)	0.94 (11.7 <u>0</u>)	0.63 (7.82)	0.06 (0.23)
10" (250 mm)	0.83 (10.3 <u>0</u>)	0.96 (11.92)	1.07 (13.29)	1.17 (14.53)	0.79 (9.81)	0.08 (0.30)
12" (300 mm)	0.99 (12.30)	1.15 (14.28)	1.28 (15.90)	1.40 (17.39)	0.95 (11.80)	0.09 (0.34)
14" (350 mm)	1.16 (14.41)	1.34 (16.64)	1.50 (18.63)	1.64 (20.37)	1.10 (13.66)	0.11 (0.42)
16" (400 mm)	1.32 (16.39)	1.53 (19.00)	1.71 (21.24)	1.87 (23.22)	1.26 (15.65)	0.12 (0.45)
18" (450 mm)	1.49 (18.50)	1.72 (21.36)	1.92 (23.85)	2.11 (26.20)	1.42 (17.64)	0.14 (0.53)
20" (500 mm)	1.66 (20.62)	1.91 (23.72)	2.14 (26.58)	2.34 (29.06)	1.58 (19.62)	0.16 (0.61)
24" (600 mm)	1.99 (24.71)	2.29 (28.44)	2.56 (31.79)	2.81 (34.90)	1.89 (23.47)	0.19 (0.72)
30" (750 mm)	2.48 (30.80)	2.87 (35.64)	3.21 (39.87)	3.51 (43.59)	2.37 (29.43)	0.23 (0.87)
36" (900 mm)	2.98 (37.01)	3.44 (42.72)	3.85 (47.81)	4.21 (52.59)	2.84 (35.27)	0.28 (1.06)
42" (1050 mm)	3.48 (43.22)	4.01 (49.80)	4.49 (55.76)	4.92 (61.10)	3.31 (41.11)	0.33 (1.25)
48" (1200 mm)	3.97 (49.30)	4.59 (57.00)	5.13 (63.71)	5.62 (69.80)	3.79 (47.07)	0.37 (1.40)
54" (1350 mm)	4.47 (55.51)	5.16 (64.08)	5.77 (71.66)	6.32 (78.49)	4.26 (52.91)	0.42 (1.59)
60" (1500 mm)	4.97 (61.72)	5.73 (71.16)	6.41 (79.61)	7.02 (87.18)	4.73 (58.74)	0.47 (1.78)
64" (1600 mm)	5.30 (65.82)	6.12 (76.01)	6.84 (84.95)	7.49 (93.02)	5.05 (62.72)	0.50 (1.89)

For welded steel pipe, no leakage will be permitted.

For HDPE pipe, no leakage will be permitted.

306-8.9.2.4 Test Procedure. A 4-hour hydrostatic pressure test shall be performed in accordance with the following:

Pipe, appurtenances, and permanent thrust blocks shall be submitted to a hydrostatic pressure test after they have been installed and backfilled sufficiently, and after temporary plugs, caps, thrust blocks and shoring have been installed to provide the required restraint.

The test pressure shall be 50 pounds per square inch (350 kPa) in excess of the working pressure shown on the Plans for the class of pipe constructed unless the test pressure is specified elsewhere in the Contract Documents.

The Contractor shall conduct pressure tests or retests subsequent to any trench backfill compactive effort

that is performed using compacting equipment having an overall weight in excess of 100 pounds (45 kg).

If butterfly valves or other pipeline appurtenances may have a maximum working water pressure less than test pressure, the Contractor shall apply a minimum back pressure on these closed devices equal to the difference between the test pressure and the rated pressure of the device.

The Contractor shall complete and pass the pressure test and disinfection tests specified in 306-8.9.4 prior to connecting any new line to the existing pipe and mains. Test of new mains shall be conducted with the new valves open, and the open ends of pipes, valves, and fittings suitably closed or blind-flanged. Valves shall be operated and checked prior to the test period.

The maximum length of pipe to be included in any one test shall not exceed 2,500 feet (760 m) or the distance between the valves, whichever is greater. Suitable test bulkheads, blocking, and fittings shall be installed as necessary to permit such sectionalizing.

The Contractor shall fill the pipeline slowly and maintain at operating pressure for at least 24 hours prior to testing to satisfy any system water absorption. While filling and immediately prior to testing, all air shall be expelled from the pipeline.

The Contractor shall then pressurize the pipeline to the specified test pressure following a 48-hour soak period. When the test pressure has been reached, pumping shall be discontinued until the line pressure has dropped 10 pounds per square inch (70 kPa), at which time the line pressure shall again be pumped up to the test pressure. This procedure shall be repeated until 4 hours have elapsed from the time the test pressure was first applied. At the end of this period, the pressure shall be pumped up to the test pressure one last time.

~~Leakage shall be computed as the total quantity of water pumped into the pipeline during the test period, including water added to reach the specified test pressure for the final time. Leakage shall not exceed the rate specified for the type of pipe tested.~~

The Contractor shall repeat the testing until the ~~leakage~~ makeup water does not exceed the specified ~~leakage rate~~ hydrostatic test allowance.
The Contractor shall repair all visible leaks regardless of the amount of leakage.

All tests shall be completed in the presence of the Engineer who will record the results.

306-8.9.3 Testing of Valves and Appurtenances. Field testing of valves and appurtenances shall conform to the following:

TABLE 306-8.9.3

Item	Test for	Test Standard
Valves and Appurtenances	Installation and Leakage	Visual Inspection for drip-tight service under pressure for all joints and for all valves in closed position.
	Anchorage and Support of Exposed Pipe	Visual inspection of finished installation. support in accordance with California Plumbing Code Table 3-1 and 3-2
	Pressure Test	See 306-8.9.2.2
	Bacteriological Test	See 306-8.9.4.6
	Valve Actuators	Operate valve through 10 full cycles of opening and closing. Valve shall operate from full open to full close without sticking, or binding and without required operating torque exceeding 150 ft-lbs at any point
	Field Performance	Demonstrate compliance to Contract Documents, AWWA standards and manufacturer's printed literature
	11-Month Anniversary Warranty Inspection	306-8.9.6