Proposed Revision To:	Change No.
☒ **Standard Specifications For Public Works Construction** ☐ **Standard Plans For Public Works Construction**	**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):**

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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 underlining 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 _____ (Date)

☐ Recommended For _____ Supplement/Edition

☐ Rejected ☐ As Modified

Editorial Standards Subcommittee Review:

On _____ (Date)

☐ Reviewed For Surf/Und/Spec/Plans Subcommittee

☐ NO Modifications ☐ As Modified

Greenbook Committee Action:

On _____ (Date) ☐ Approved For _____ Supplement/Edition ☐ As Modified

☐ Rejected

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 mrn/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 mis) 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~~ Test Allowance. ~~Allowable leakage shall be determined as follows:~~ Properly assembled gasketed pipe joints do not leak. The 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.

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

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

in which L = ~~allowable leakage~~ test allowance (makeup water), 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.

$$(Ls1 = SD(P)^{112}/794{,}800)$$

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

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

Lus = 10 gallons per inch-diameter per mile of pipe per 24 hours

Lsr = 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~~ test allowance shall be as shown in Table 306-8.9.2.3.

TABLE 306-8.9.2.3

Pipe Diameter	~~Allowable Leakage~~ Hydrostatic test makeup water allowance in PVC OR Ductile Iron Pipe, Gallons per Hour per 1000 (Liters per Hour per 1,000 m) of Pipe				Allowable Leakage in Gasketed Steel Pipe, Gallons per Hour per 1000 (Liters per Hour per 1,000 m) of Pipe	Additional Allowable Leakage through Seals of Closed Valves, Gallons (Liter) per Valve
	Test Pressure					
	150 psi (1.0 MPa)	200 psi (1.4 MPa)	250 psi (1.7 MPa)	300 psi (2.1 MPa)	All Pressures	All Pressures
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)	0.94 (11.7)	0.63 (7.82)	0.06 (0.23)
10" (250 mm)	0.83 (10.3)	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~~ 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. ~~Leakage~~ Makeup water added 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~~ 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