

Chapter 9 - Pressure Test Requirements

DESC O&M Manual - Version 2022.5 October 5, 2022

[1.0 SCOPE \[192.501\]](#)

[2.0 REGULATORY REFERENCES](#)

[3.0 PROCEDURE](#)

[4.0 TRAINING/QUALIFICATIONS](#)

[5.0 DOCUMENTATION/FORMS \[192.517\]](#)

[6.0 RELATED DOCUMENTS](#)

[7.0 APPENDICES](#)

1.0 SCOPE [192.501]

This chapter describes the minimum *leak*-test and strength-test requirements for pipelines.

This chapter covers:

- General testing requirements for all pipelines.
- Test requirements for transmission pipelines and distribution mains.
- Test requirements for service lines

By establishing *MAOP* with the use of this procedure, all potentially hazardous leaks *shall* be identified and eliminated.

2.0 REGULATORY REFERENCES

49 CFR Part 192 §§ [192.18](#), [192.67](#), [192.501](#), [192.503](#), [192.505](#), [192.506](#), [192.507](#), [192.509](#), [192.511](#), [192.513](#), [192.515](#), [192.517](#), [192.619](#), [192.624](#)

3.0 PROCEDURE

[3.1 General requirements \[192.503\]\[192.515\]](#)

[3.2 Pressure test requirements for all plastic pipelines \[192.513\] \[192.619\]](#)

[3.3 Pressure test requirements for all steel pipelines \[192.503\] \[192.505\] \[192.507\]](#)

[3.4 Pressure test requirements for steel service lines \[192.511\]](#)

[3.5 Pressure test requirements for steel pipelines to operate below 100 psig \[192.509\]](#)

[3.6 Pressure test requirements for steel pipelines to operate at or above 100 psig and <20% SMYS \[192.507\]](#)

[3.7 Testing steel transmission pipelines \[192.505\]](#)

[3.8 Special conditions for Hydrostatic Testing](#)

[3.9 Spike Hydrostatic Pressure Test \[192.18\].\[192.506\]](#)

[3.10 Reinstating Facilities](#)

[3.11 Test Acceptability and Retesting](#)

[3.12 MAOP Reconfirmation \[192.67\].\[192.517\].\[192.619\].\[192.624\]](#)

3.1 General requirements [192.503][192.515]

(a) The following pipelines shall be tested prior to being placed in service:

- (1) All new pipelines
- (2) Relocated and replaced segments of pipelines.
- (3) Temporary by-passes

(b) All testing shall be conducted in accordance with this chapter. Since the test will be used in substantiating the MAOP, the test pressure, duration and other parameters *should* be chosen to establish the needed MAOP.

(c) If a *pipeline* is located in a *Class 4 location*, contact *Engineering* for specific test requirements.

(d) Exceptions to the Requirements of this Procedure

- (1) Final tie-in joints are exempt from these pressure test requirements, but shall be leak tested with a combustible *gas* indicator, leak soap or other approved leak-testing method.
- (2) Tapping equipment is exempt from this procedure. High pressure hoses used during the tapping process shall be leak tested as stated in (1).

(e) Safety and Environmental Protection

- (1) Consult with DEES and ECC concerning applicable environmental requirements.
- (2) Every reasonable precaution should be taken to protect employees, contractors and the general public while conducting pressure tests described in this procedure.
- (3) The test medium should be disposed of in a manner that will minimize damage to the environment and per discharge permitting requirements.
- (4) If a *main* or temporary by-pass is to be left unattended during testing, the pipe should be buried. Any exposed pipe required for testing apparatus

- (f) Plastic pipe should not be tested above ground (except when preparing pre-tested pipe, by-passes or short sections attached to fittings). When pre-testing plastic pipe, environmental factors such as sunlight should be recognized and avoided if possible.
- (g) Pre-Testing Pipe (above ground)
 - (1) Perform test in a safe environment. Precautions should be taken to restrain pipe movement during test.
 - (2) For plastic pipe, assure the pipe surface does not exceed 100°F by performing test in a shaded area or a temperature controlled atmosphere.
- (h) Gauges Used For Testing Pipelines
 - (1) Contractor shall provide gauges for testing plastic services and mains.
 - (2) For tests not requiring pressure recording the following requirements should be met:
 - (i) A gauge ASME B40.100 accuracy Grade B.
 - (ii) Analog: 4" or larger dial with graduations of 2 psig or less and an upper range of 150 to 400 psig. Accuracy should be 1% or better, at full scale, or an equivalent digital gauge.
 - (3) Gauges should be stored, transported, maintained, and calibrated in accordance to company and manufacturer's procedures.
- (i) Bores across inaccessible areas, as determined by the company engineer or inspector, *may* be pre-tested for leaks prior to the bore. Bores shall be pressure tested after installation with the testing of the main.

3.2 Pressure test requirements for all plastic pipelines [[192.513](#)][[192.619](#)]

[3.2.1 Pressure test requirements for plastic service lines](#)

[3.2.2 Pressure test requirements for plastic mains](#)

NOTE: Large projects may require an engineered testing plan. As designated by Engineering, leak surveys may be specified for certain projects.

- (a) The test medium used for testing plastic pipelines should be air. Other mediums such as natural gas, water, or nitrogen *must* be approved by Engineering
- (b) Test Pressure
 - (1) Plastic pipelines and associated fittings should be tested to a minimum of 100 psig and a maximum of 115 psig unless otherwise approved by Engineering.
 - (2) Testing plastic pipelines and associated fittings designed to operate above 60 psig requires engineering approval
- (c) Temperature
 - (1) When testing plastic pipelines, the temperature of the thermoplastic material should not exceed 100°F.
 - (2) Pressure testing shall not commence until fusion cooling time is complete.

3.2.1 Pressure test requirements for plastic service lines

Service lines that are less than 2" in diameter *shall* be tested for at least 15 minutes. Service lines that are 2" or larger in diameter shall be tested for at least the same duration as mains.

3.2.2 Pressure test requirements for plastic mains

Plastic mains shall be tested as follows unless otherwise approved by Engineering.

(a) Test Duration

Table 9.1 Minimum Air Test Duration (hr.) by Length of Pipe					
Size (in.)	0'-150'	151'-500'	501'-1000'	1001'-2000'	2001' and longer
8 and larger	1	4	4	8	12
6	1	4	4	8	12
4	1	1	4	8	12
2 and less	1	1	4	8	12

(b) Plastic pipeline test durations should be limited to no more than 24 hours when feasible. If it is determined to leave a test for longer than 24 hours the test pressure should be lowered below 60 psig after the minimum test duration has been met to ensure leaks/damages are detected.

(c) Exceptions

- (1) Fittings installed on plastic pipelines shall be tested for a minimum of 15 minutes.
- (2) Temporary by-passes may be tested for a duration of 15 minutes if following conditions are met:
 - (i) All joints and fittings are exposed and soap tested during the pressure test
 - (ii) Exposed by-passes are not left unattended during test or once placed in service
 - (iii) Doesn't exceed 150' in length or as approved by Engineering

3.3 Pressure test requirements for all steel pipelines [\[192.503\]](#)[\[192.505\]](#)[\[192.507\]](#)

[3.3.1 Prefabricated Units](#)

[3.3.2 Components](#)

- (a) Test medium used for testing steel pipelines should be air, nitrogen, or water. Other mediums such as natural gas must be approved by Engineering
- (b) When air, nitrogen or natural gas is used as the test medium, the following maximum hoop stress limitations apply. Engineering approval is required for air, nitrogen tests or natural gas that subject the pipe to 30% of *SMYS* or greater.

Table 9.2 Maximum hoop stress allowed as percentage of SMYS

Class location	Maximum hoop stress allowed as percentage of SMYS	
	Natural Gas	Air or inert gas

1	80	80
2	30	75
3	30	50
4	30	40

3.3.1 Prefabricated Units

- (a) Prefabricated units designed to operate with an MAOP less than 30% SMYS should be tested for at least 1 hour to a pressure at least 1.5 times the design MAOP, unless specified by Engineering.
- (b) Prefabricated units designed with an MAOP of 30% SMYS or greater should be tested for at least 4 hours. Prefabricated units should be tested in accordance with the procedure in section [3.4](#) below to a pressure at least 1.5 times the design MAOP, unless specified by Engineering.
- (c) Prefabricated units designed to operate below 100 psig should be tested with air.
- (d) Prefabricated units designed to operate at or above 100 psig should be tested with nitrogen or water. Hydrostatic testing should be used when nitrogen testing is not safe, economically or physically feasible.
- (e) Compressor stations, regulating stations and metering stations shall be tested to a minimum *Class 3 location* requirements to substantiate the MAOP.

3.3.2 Components

- (a) For components other than pipe being replaced or added to a pipeline, a strength test after installation is not required if the manufacturer of the component certifies that:
 - (1) The component was tested to at least the pressure required for the pipeline to which it is being added or
 - (2) The component was manufactured under a quality control system that ensures that each item manufactured is at least equal in strength to a prototype and the prototype was tested to at least the pressure required for the pipeline to which it is being added.
 - (3) Examples of these components include, but are not limited to, valves, tees, elbows, and tapping fittings.
- (b) Components installed in or on steel mains should be pressure tested in-line when practical. All components that are not pressure tested shall be leak tested when installed.
- (c) The preferred method of leak testing components is to pressurize with air or nitrogen to operating pressure for 10 minutes. Any test above current operating pressure (at the time of leak testing) should have engineering review.

3.4 Pressure test requirements for steel service lines [[192.511](#)]

- (a) Typical service lines that are less than 2" shall be tested to a minimum of 100 psig for a minimum duration of 15 minutes.
- (b) Services 2" or larger, those to be stressed to 20% or more of SMYS, or unusually long services shall be tested in accordance with the requirements for main of equivalent pressure.
- (c) If feasible, the service-line connection to the main must be included in the test. If not feasible, it must be given a leakage test at the operating pressure when placed in service.

- (a) Test pressure shall be a minimum of 1.5 times design MAOP or 100 psig, whichever is greater.
- (b) Steel main to be operated at 0 – 100 psig shall be tested with air or nitrogen for durations stated [Table 9.3](#) below unless otherwise specified by Engineering.
- (c) The pressure and temperature during the test shall not exceed the rating of any pipe or component being tested.
- (d) The test duration will depend on the total length/volume of the system being tested. Engineering shall specify test durations for pipe larger than 12".
- (e) Pipe to be stressed to 20% or more of SMYS shall be tested in accordance with the requirements for MAOP of 100 psig or greater.

Table 9.3 Minimum Air Test Duration by Length

Minimum Air Test Duration (hr.) by Length of Pipe					
Size (in.)	0'-150'	151'-500'	501'-1000'	1001'-2000'	2001' and longer
8 and larger	1	4	4	8	12
6	1	4	4	8	12
4	1	1	4	8	12
2 and less	1	1	4	8	12

3.6 Pressure test requirements for steel pipelines to operate at or above 100 psig and <20% SMYS [[192.507](#)]

- (a) Documentation of testing pipelines shall be completed using the applicable system form. At a minimum, the following information shall be documented:
 - (1) An approved analog gauge with pressure recording chart or a digital pressure recording gauge shall be used to document all phases of the test. The chart shall be attached to the test report.
 - (2) Ambient temperature during the test shall be documented
 - (3) If a deadweight reading is specified by engineering, deadweight pressure readings and corresponding temperature readings shall be documented at least every hour.
 - (4) Test medium used.
 - (5) Elevation profile if procedure in [Appendix 9-1 Computation of Hydrostatic Test Parameters](#) is used to determine test section limits.
 - (6) Leaks and failures and the action taken.
 - (7) Name of the individual responsible for the test. If the individual is not a DENC and DESC employee, the name of the individual's employer shall also be noted.
- (b) If the test is administered by non-DENC and DESC personnel, a DENC and DESC representative shall ensure that test has been documented accurately and sign the form. The Test Report with the charts attached shall be forwarded to Engineering Services and maintained for the useful life of the pipeline.
- (c) Test pressure shall be at least 1.5 times the design MAOP, unless specified by Engineering.
- (d) If water is specified, the duration shall be determined according to [Table 9.4](#).

- (e) Water is the preferred test medium when testing at higher pressures and when testing long sections of larger pipe. Water is essentially incompressible so less time is needed to pressurize pipelines with large volumes to higher pressures. Conversely, water pressure is more quickly bled from the pipeline. The weight of water shall be considered where a pipeline is mechanically suspended or supported. Also sources of water and discharge point for test water must be identified prior to testing. [Table 9.5](#) may be referenced to determine test parameters for standard pipe sizes.
- (f) If air, nitrogen or other gaseous medium are specified, the minimum test duration shall be determined using [Table 9.3 Minimum Test Duration by Length](#). Engineering may require longer test durations at their discretion. The pressure and temperature during the test shall not exceed the rating of any pipe or component being tested.
- (g) If during the test the segment is to be stressed to 20% or more of SMYS and natural gas, inert gas, or air is the test medium:
- (1) A leak test must be made at a pressure between 100 psig and the pressure required to produce a hoop stress of 20% of SMYS, or
 - (2) The line must be walked to check for leaks while the hoop stress is held at approximately 20% of SMYS.

3.7 Testing steel transmission pipelines [[192.505](#)]

- (a) For transmission pipelines and associated fittings to be operated at >20% SMYS, hydrostatic testing should be used according to the following procedure. These procedures shall be used as a reference to develop a job-specific testing plan, approved by engineering, and should include the following:
- Test Pressure with an acceptable high-low range
 - Test Duration
 - Fill volume and process
 - Stabilization period
 - Elevation calculations
 - Pressurization Process
 - Water and dewatering process (along with all required notifications, etc.)
- (b) The test pressure shall be determined according to the following:
- (1) Minimum: 1.5 times operating pressure or as specified
 - (2) Maximum: Hoop stress at 100% of SMYS for water as test medium. Up to a maximum of 2220 psig unless approved or specified by Engineering
 - (3) Preferred: Hoop stress at 90 - 95% of SMYS for water as test medium

Table 9.4 Minimum Hydrostatic Test Duration

Test Section Type	Minimum Hydrostatic Test Duration	
	Operating pressure < 30% SMYS	Operating pressure is 30% SMYS & above
Transmission and mains	4 hrs	8 hrs
Prefabricated units, sections under 100' where post-installation test is impractical, and	1 hr	4 hrs

Table 9.5 Test parameters for testing with water

OD [INCHES]	wt [INCHES]	SMYS [psi]	Press @ 90% SMYS [psi]	Press @ 95% SMYS [psi]	elevation limit [feet]	volume per linear ft [cubic feet]	water wght per linear ft [lb]
12.750	0.375	35000	1852.94	1955.88	237.74	0.7854	49.01
12.750	0.250	52000	1835.29	1937.25	235.48	0.8184	51.07
8.625	0.322	35000	2352.00	2482.67	301.77	0.3474	21.68
8.625	0.219	42000	1919.58	2026.23	246.29	0.3656	22.81
6.625	0.280	35000	2662.64	2810.57	341.63	0.2006	12.52
6.625	0.188	42000	2145.33	2264.51	275.25	0.2130	13.29
4.500	0.237	35000	3318.00	3502.33	425.71	0.0884	5.52
4.500	0.188	42000	3158.40	3333.87	405.23	0.0928	5.79
2.375	0.218	35000	5782.74	6104.00	741.95	0.0205	1.28
2.375	0.154	35000	4085.05	4312.00	524.13	0.0233	1.45
1.315	0.179	35000	8575.67	9052.09	1100.29	0.0050	0.31
1.050	0.113	35000	6780.00	7156.67	869.90	0.0037	0.23

3.8 Special conditions for Hydrostatic Testing

- (a) When testing in rolling terrain use at least 90% SMYS at the highest elevations unless this results in greater than 95% SMYS at the lowest elevations, or results in greater than 1.5 times the maximum rated pressure of any valves, fittings, etc.
- (1) If this is not possible, then the target test pressure at the highest elevations may be reduced to less than 90% SMYS if the resulting test pressure is sufficient to achieve the design MAOP.
 - (2) Pressure shall be measured at the highest point of the test section or the pressure needed at the highest point shall be computed in accordance [Appendix 9-1 Computation of Hydrostatic Test Parameters](#) to ensure the minimum test pressure is met.
 - (3) When the difference between the highest elevation and lowest elevation of the test section exceeds the elevation limit stated in Table 9.5, test section limits shall be determined by Engineering.
- (b) Remove as much air as possible from the pipeline prior to hydrostatic testing.
- (c) Pressurize in increments. Consider using three increments prior to obtaining test pressure range. Hold at each increment for 15 minutes or until pressure stabilizes.
- (d) The water temperature should be stabilized prior to the beginning of the test. Sections of exposed pipe should be minimized. Larger sections of exposed pipe should be insulated wherever practical.
- (e) When re-testing a pipeline that was previously in-service and distillates are present then all test water shall be captured in a frac tank. If capturing large amounts of water is impractical contact engineering. Water shall be analyzed by DENC and DESC Environmental. DENC and DESC Environmental will provide instruction on how to discharge.

- (g) Once water has been discharged, tested pipe shall be dried using pigging, swabbing, and/or conditioned air.

State Specific: South Carolina

Discharge permitting and water testing is required for hydrostatic test volumes greater than 3,000 gallons.

3.9 Spike Hydrostatic Pressure Test [192.18] [192.506]

- (a) A job specific testing plan should be created prior to performing a hydrostatic spike pressure test.
- (b) A hydrostatic spike pressure test shall be conducted at the lesser of 1.5 times MAOP or 100% SMYS, for at least 15 minutes within the first 2 hours of an 8-hour test.
- (c) The use of a spike hydrostatic pressure test is appropriate for time-dependent threats such as stress corrosion cracking, selective seam weld corrosion, manufacturing and related defects including; defective pipe and pipe seams and other forms of defect or damage involving cracks or crack-like defects.
- (d) A spike hydrostatic pressure test may be conducted:
 - (1) As a method for pressure testing transmission lines that operate at a hoop stress of 30% or more of SMYS, or;
 - (2) To assess for a specific threat (examples above) when identified by Integrity Engineering and approved by Engineering.
- (e) If a different spike hydrostatic test method is to be performed, PHMSA must be notified within 90 days of the test. The notification shall be sent to InformationResourcesManager@dot.gov, and shall include the following:
 - (1) Descriptions of the technology or technologies to be used for all tests, examinations, and assessments;
 - (2) Procedures and processes to conduct tests, examinations, assessments, perform evaluations, analyze defects, and remediate defects discovered;
 - (3) Data requirements, including original design, maintenance and operating history, anomaly or flaw characterization;
 - (4) Assessment techniques and acceptance criteria;
 - (5) Remediation methods for assessment findings;
 - (6) Spike hydrostatic pressure test monitoring and acceptance procedures, if used;
 - (7) Procedures for remaining crack growth analysis and pipeline segment life analysis for the time interval for additional assessments, as required; and
 - (8) Evidence of a review of all procedures and assessments by a qualified technical subject matter expert.

3.10 Reinstating Facilities

See [Chapter 12-F Reinstating and Pressure Testing of Service Lines/Abandonment or Deactivation of Facilities](#)

3.11 Test Acceptability and Retesting

- (a) DENC and DESC reserves right for retest based on an Engineering review of the test procedures and results documentation, with regards the requirements detailed in the above sections.
- (b) For every 5 degree Fahrenheit change in temperature, there will be about a 1 psig change in pressure during an air test. Any greater deviation contact Engineering before placing pipe into service.

* Note: if calculations are needed:

The following method of temperature correction may be used with air or nitrogen:

$$P_2 + 14.7 = (P_1 + 14.7) \times [(460 + T_2) / (460 + T_1)]$$

P is gage pressure in psig @ temperature T in degrees Fahrenheit

3.12 MAOP Reconfirmation [[192.67](#)] [[192.619](#)] [[192.517](#)] [[192.624](#)]

Effective July 1, 2020, for pipelines that do not have *TVC* records for documenting the design of the pipe, MAOP reconfirmation shall be performed in accordance with [192.624](#), per GD-OM-L-060-001, [MAOP Reconfirmation](#).

4.0 TRAINING/QUALIFICATIONS

See the appropriate system Operator Qualification Program.

5.0 DOCUMENTATION/FORMS [[192.517](#)]

(a) Test Documentation

- (1) Pipeline test records shall be kept for the useful life of the pipeline. Test records for mains should be documented on the Pipeline Test Record and maintained in the original work order file. Test records for service lines should be documented on service orders and maintained in accordance with company record requirements.
- (2) Pressure recording charts (digital or analog) should be used when testing mains that meet any of the following conditions:
 - (i) Test is left unattended by a qualified employee
 - (ii) Test pressure is over 115 psig
 - (iii) Specified by engineer or inspector
- (3) For tests where pressure recording is required, an approved analog gauge with pressure recording chart or a digital pressure recording gauge shall be used.
- (4) Non-recording pressure gauges may be used for service lines, or for mains with MAOP less than or equal to 60 psig if an hourly pressure and temperature log is documented.

(b) Charts, printed graphs, and other visual test pressure records should be reviewed and documented with the Project ID and signature of the project

State Specific: South Carolina

- [Pipeline Test Report](#) (PDF file)

(c) For pipelines to be operated at pressures of 100 psig and under, the following shall be documented on the original work order. If recorders are used to document the test, recording charts shall be attached to the work order.

- Date
- Time
- Test pressure
- Test duration
- Test medium
- Work order number
- Project number
- Name of the person conducting the test
- Gauge calibration info

6.0 RELATED DOCUMENTS

None at this time.

7.0 APPENDICES

Appendix 9-1 Computation of Hydrostatic Test Parameters

[Click to open printable PDF copy of Appendix 9-1.](#)

COMPUTATION OF HYDROSTATIC TEST PARAMETERS

A. Definition of Terms

OD = pipe outer diameter (inches)

P = pressure (psi)

t = pipe wall thickness (inches)

S or SMYS = specified minimum yield strength (psi)

L = length (ft)

B. Computation of Pressure Due to a Positive Elevation Differential

The pressure due to an elevation differential may be approximated as follows:

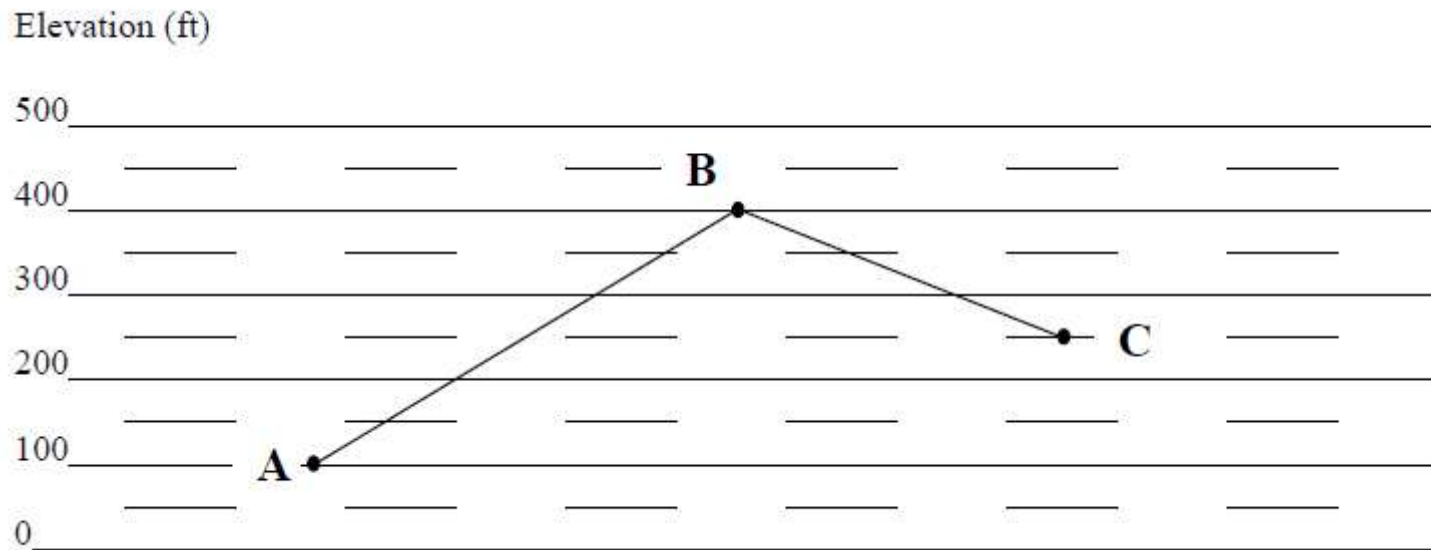
$$P \text{ (psi)} = \text{elevation differential (feet)} \times .433 \text{lb/ft-in}^2$$

The hydrostatic pressure at 100% SMYS may be computed as follows:

$$P \text{ (psi)} = 2St/OD$$

The total pressure at a test point will be the hydrostatic pressure plus the pressure due to the positive elevation differential.

Consider section ABC below consisting of 1000 feet of 6.625" OD, .188" wt, Grade B steel pipe.



Example: If the pressure at point B above is 1000psi, then the total pressure (as measured with a gauge) at point A is computed as follows:

$$\begin{aligned} P_A &= 1000\text{psi} + (.433\text{lb/ft-in}^2 \times \text{positive elevation differential}) \\ &= 1000\text{psi} + (.433\text{lb/ft-in}^2 \times 300\text{ft}) \\ &= 1000\text{psi} + 130\text{psi} \\ &= 1130\text{psi} \end{aligned}$$

Approximately 130psi of pressure at point A is due to the positive elevation differential.

C. Determining the Test Section Limits

Among other considerations, the elevation differential shall be considered when determining the sections of pipe to be tested. Typically the desired test

gauge location must be considered to determine the test pressure (measured at the gauge) as determined in the example below.

Example: If a minimum pressure of 90% SMYS is desired in test section ABC above and the test pressure cannot exceed 95% SMYS, the pressures at points A, B and C must be checked to ensure that the test section is tested within the 90 - 95% of SMYS range.

$$P_B = .90 \times 2St/OD = 1788\text{psi}$$

Minimum test pressure is calculated at B since a positive elevation differential does not add to the static pressure.

$$P_A = P_B + (.433 \times 300 \text{ feet}) = 1918\text{psi which is approximately 96\% of SMYS}$$

$$P_C = P_B + (.433 \times 150 \text{ feet}) = 1853\text{psi which is approximately 93\% of SMYS}$$

The pressure at A will exceed the maximum test pressure (95% of SMYS) if the minimum test pressure is obtained at point B. In this case, test section AB must be divided into two or more sections so the maximum test pressure of 95% of SMYS will not be exceeded. The test sections of AB should be similarly checked to ensure the pressure throughout the each section is between 90 and 95% SMYS.

D. Volume of Water Needed to Fill Pipe

The volume of water needed for a hydrostatic test should be considered when determining the source of water and for determining the discharge location of the test water. The following formula should be used to approximate the amount of water per linear foot of pipe needed for a hydrostatic test:

$$V (\text{ft}^3) = 3.1416 \times ((OD-2t) / 24)^2 \times L \quad \text{or}$$

$$V (\text{gal}) = 23.4991 \times ((OD-2t) / 24)^2 \times L$$

Example: The volume of water needed for section ABC above shall be computed as follows:

$$V = 23.4991 \times ((6.625-2(.188)) / 24)^2 \times 1000 = 1593 \text{ gal}$$

E. Weight of the Test Water

The weight of the test water should be considered when hydrostatically testing mechanically supported pipe such as pipe supported by bridge hangers. The weight of the water plus the weight of the facility being tested should not exceed the rating of the mechanical supports.

$$W (\text{lb}) = V (\text{ft}^3) \times 62.4 \text{ lb/ft}^3 \quad \text{or}$$

$$W (\text{lb}) = V (\text{gal}) \times 8.342 \text{ lb/gal}$$

Example: The weight of water needed for section ABC above would be computed as follows:

$$W = 1593 \times 8.342 = 13,289 \text{ lb}$$

(UNCONTROLLED IF PRINTED)

