

1. Introduction

Flexpipe Spoolable Products are designed to accommodate the pressure testing requirements specified by regulatory standards and codes. Due to the safety factors built into the pipe design, there is no need to upgrade to a higher pressure rated pipe if testing is required above the stated MAOP. Field pressure testing requirements and recommendations for Flexpipe Spoolable Products may depend on whether the pipeline is a new installation, a tie-in, or repair job.

2. Pressure Testing

2.1 General Guidance for Pressure Testing of New Pipelines

This section deals with field hydro testing of new pipelines that have not been commissioned into operation. Service testing of pipelines that have already been commissioned into operation is covered in Field Service Testing of Existing Pipelines.

The field hydrostatic hold pressure test level depends on the type of the Flexpipe Spoolable Product, the pressure rating of the Flexpipe Spoolable Product, and the class of the metallic flanges being used. Flexpipe recommends that new pipelines that have not been commissioned into operation be subjected to a field hydrostatic hold pressure test as follows:

- For FPLP, FCLP, and FPLP HT test at 1.25 x MAOP for 8 hours.

The test pressure and duration for the various pipe classes are shown in Table 1. Flexpipe requires monitoring the pipe system carefully to ensure that the pressure does not exceed the maximum permissible pressure shown in Table 1 at any time during the hydrostatic test at any point along the pipeline including low points.

Table 1: New Pipeline Hydrostatic Test Pressures and Durations

Class	FP150	FP301 FP301 HT	FP601 FP601 HT	FC801	FC901
Hydrostatic Test Pressure and duration ¹	2,586 kPa (375 psi) / 8 hours	6,467 kPa (938 psi) / 8 hours	12,928 kPa (1,875 psi) / 8 hours	17,237 kPa (2,500 psi) / 8 hours	19,395 kPa (2813 psi) / 8 hours
Maximum permissible pressure during testing ²	3,103 kPa (450 psi)	7,757 kPa (1,125 psi)	15,513 kPa (2,250 psi)	20,684 kPa (3,000 psi)	23,720 kPa (3375 psi)

1. Local regulations and requirements must be followed when pressure testing, including sour service pipelines. These requirements may supersede the listed pressures and times.
2. Maximum pressure during testing relates to the pipe component only. Other system components or regulations may further restrict these values. For example, flange ratings may lower the maximum pressure permitted.

NOTE!

Some pipe twist upon pressurization is expected for surface installations, or for buried pipelines with sections left exposed. It is recommended to allow the Flexpipe end fitting to freely rotate. If connected to a riser or other fixed connection, ensure the end fitting and pipe are properly secured to prevent twist.

WARNING!

Caution needs to be exercised when working around pressurized pipelines. Unsecured pipelines have the potential to twist and move while under pressure. Ensure personnel are aware of the hazards and stay clear of potential lines of fire.

NOTE!

In some cases, company specifications or local regulations may require a specific test pressure. It is important to meet all local regulations when field testing Flexpipe Spoolable Products.

WARNING!

For safety reasons, pressure testing with a gas medium is acceptable for test pressures up to a maximum of 2900 kPa (420 psi), provided that the below conditions are considered.

Under no circumstances will Flexpipe be liable in any way for any loss, damage or injury of any kind (whether direct, consequential, punitive or otherwise) incurred as a result of the use of a gas medium for pressure testing. Pressure testing with air or gas above 2900 kPa (420 psi) is at the discretion of the engineering resources of the pipeline operating company.

Pressure testing with a gas medium is only acceptable for pressure tests up to 2900 kPa (420 psi) provided that:

- It is not prohibited by local regulations or standards;
- Appropriate precautions are taken to protect the pipeline from damage and minimize the risks associated with a pressure test failure;
- Follow the company procedures and safety measures for air testing.

To minimize the potential risk of injury or property damage in the unlikely event of a pressure test failure, a relatively incompressible liquid such as water is recommended as the pressurizing medium. Methanol is compatible with Flexpipe Spoolable Products and is commonly used as an additive to prevent water from freezing at low temperatures.

Where new Flexpipe pipelines have been hydro tested in sections, retesting of the entire pipeline system is not required after tying in, provided:

- Pipe sections used for tie-ins, repairs, or replacement are pre-tested as per Section 2.2.
- Joints of the tie-ins, repairs, or replacements are left exposed as the pipeline is brought into service and visually monitored for leaks for at least four hours, at the highest available operating pressure.

2.2 Procedure for Field Pressure Testing of New Pipelines

For the purposes of this bulletin regarding pressure testing, “stabilization” means a decaying (i.e. decreasing) pressure loss that levels off and approaches an asymptote such as seen in the 8 hour hold portion in Figure 1 below.

The following procedure applies to hydro testing new pipelines that have not begun normal operation and covers all classes of Flexpipe Spoolable Products:

- 1) Use a medium density foam pig to push the air out of the line when filling the Flexpipe Spoolable Products with test fluid. The test fluid should be pumped into the system at the lowest possible point while having the air pushed out at the highest possible point. If a foam pig cannot be used, it is recommended that the system be vented in accordance with good engineering and industry practices by using a center tapped blind flange, nipple, pressure indicator and ball valve to release the air from the system at the branch locations.

NOTE!



It is recommended to allow time for test fluid to equalize with surrounding temperature. This generally results in more consistent tests. This can be done during the conditioning phase.

- 2) Pressurize the pipe initially to the Conditioning Pressure shown in Table 2 at a rate no faster than 1400 kPa/min (200 psi/min). Hold the conditioning pressure until the pressure stabilizes. A slight decrease in the conditioning pressure over this hold period is normal.

Table 2: Conditioning Pressures

Class	150	301	601	801	901
Conditioning Pressure	1,725 kPa (250 psi)	4,310 kPa (625 psi)	8,620 kPa (1,250 psi)	11,495 kPa (1,667 psi)	12,930 kPa (1,875 psi)

- 3) Pressure the line 1%-10% above the hydrostatic Test Pressure of the Flexpipe Spoolable Products. Do not exceed the maximum permissible test pressure in Table 1. Hold the pressure until it stabilizes. During this phase, the pressure can drop as much as 1,000 kPa (150 psi) in 15 minutes.
- 4) Increase the pressure to 1%-10% above the Test Pressure two more times. Hold after each pressure increase until the pressure stabilizes. Steps 2 through 4 (the conditioning phase) should be completed in no less than 1 hour, however typical time can take 4-8 hours. If the pressure is confirmed to have stabilized in less than 4-8 hours, the 8 hour test period can begin.

NOTE!



Longer lines at higher pressures may need a longer conditioning time as compared to short lines at lower pressures.

- 5) Pressurize the line once more back up to 1%-10% above the Test Pressure. This marks the beginning of the minimum 8 hour test period.
- 6) A decaying (i.e. decreasing) pressure loss that levels off and approaches an asymptote that is equal to or above the targeted hydrotest pressure for 8 hours can be considered a successful pressure test. This marks the end of the test period.

NOTE!



It is normal for a slight decrease in pressure to occur during the field test. This is due to pipe relaxation, which occurs in all reinforced thermoplastic pipes. A leak will result in a continuous depressurization, while pipe relaxation results in a pressure reduction that levels off.

- 7) After the test period has been successfully completed, depressurize the pipeline in a slow and controlled manner. A depressurization rate no faster than 1400 kPa/min (200 psi/min) is recommended.
- 8) Following depressurization, de-water the pipe as you would with other pipe systems.

The steps 2 through 8 discussed above are graphically represented in Figure 1 below.

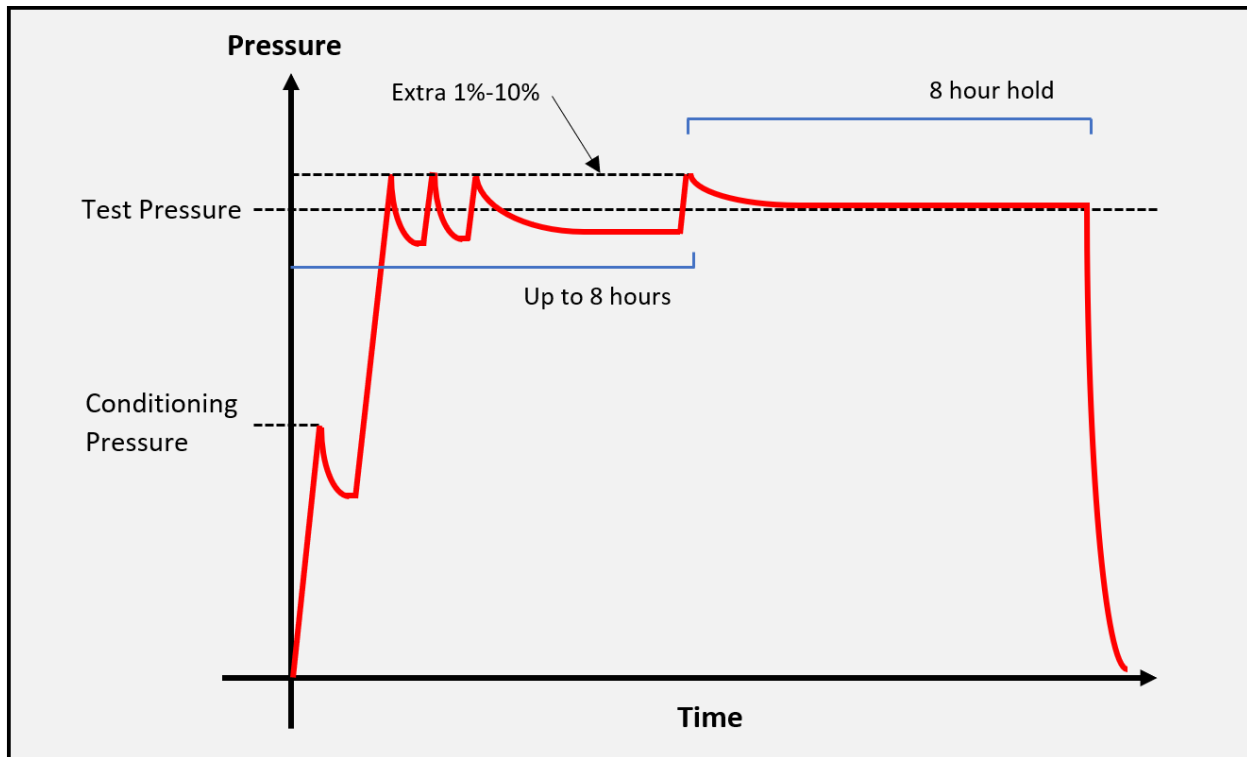


Figure 1: Pressure Test Profile

2.3 Field Service Testing of Existing Pipelines

When a cut out is replaced, a failure is repaired, or a tie-in is connected to a previously operating pipeline, the integrity of the new pipe section and the connections used to join or repair the pipeline is ensured by both of the following:

- The pipe section used for repairs, replacement or tie-ins is pre-tested as per Section 2.2.
- The repaired, replaced, or connected section is left exposed as the pipeline is brought into service and visually monitored for leaks for at least four hours, at the highest available operating pressure.

Frequent hydrotesting of a pipeline after it has been commissioned into operation is not recommended. Hydro testing pipelines to a pressure greater than MAOP is generally only appropriate prior to a new pipeline being commissioned into operation, for infrequent integrity testing, or infrequent testing after repairs. Hydrotesting pipelines up to MAOP is typical after pipeline tie-ins, for frequent integrity testing, or when reactivating a shut-in pipeline. Contact Flexpipe Engineering for clarification as required.

3. Pressure Test Troubleshooting

Certain conditions may lead to a stabilization period longer than the typical 4-8 hours. For example, colder environments or testing fluids may have a slower pressure drop. Other factors such as pipeline length or the ratio of liquids to gases in the testing fluid (e.g. air in the line) can affect pressure drop and testing time. It is also important to account for elevation changes and head pressure when determining test pressure. For more information, contact Flexpipe.

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COLD WEATHER INSTALLATION - for temperatures below 0°C (32°F)

In cold temperatures where there is a risk of the fluid freezing in the Flexpipe Spoolable Products, methanol (or other antifreeze agents compatible with HDPE) can be mixed into the test fluid to lower its the freezing point. Ensure that the fluid is not allowed to freeze in the pipeline as it will damage the pipe and require replacement of the affected section.