



Code of Practice

**Upstream Polyethylene Gathering
Networks - CSG Industry**

Companion Paper CP-08-002

**Strength Test Methods and
Considerations**

Rev 1

April 2025

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Acknowledgements

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Feedback on this Companion Paper or recommendations for the preparation of other Companion Papers is encouraged.

A form has been provided to enable the submission of feedback. A link to the form can be found on the CSG Committee page on the APGA website here:

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If there are problems with the feedback form, please contact:

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Preface

Companion Papers have been developed by the Working Group responsible for the *APGA Code of Practice for Upstream PE Gathering Networks - CSG Industry* (the Code) as a means to document technical information, procedures and guidelines for good industry practice in the coal seam gas (CSG) industry.

Since 2008, the development of the LNG export industry based in Gladstone, Queensland, with its related requirement for a large upstream CSG supply network of pipelines and related facilities presented the impetus for significant improvements in design and best practice approach.

The principal motivation for the initial development of the APGA Code of Practice was safety and standardisation in design and procedures and to provide guidance to ensure that as low as reasonably practicable (ALARP) risk-based requirements were available to the whole CSG industry. Accordingly, the Code is focused solely on this industry and the gathering networks using locally- manufactured PE100 pipeline. The Code is a statutory document within Queensland.

The incorporation of Companion Papers in the Code is intended to provide information and best practice guidelines to the Industry, allowing the Code to be limited to mandating essential safety, design, construction and operation philosophies and practices.

These documents form part of the suite of documents together with the Code and are intended to:

- a) be used in the design, construction and operation of upstream PE gathering networks
- a) provide an authoritative source of important principles and practical guidelines for use by responsible and competent persons or organisations.

These documents should be read in conjunction with the requirements of the Code to ensure sound principles and practices are followed. These documents do not supersede or take precedence over any of the requirements of the Code.

A key role of the Companion Papers is to provide the flexibility to incorporate endorsed industry practices and emerging technologies expeditiously, as/when necessary.

A related benefit is that the Companion Papers can be referenced by the wider resources industry which uses similar PE gathering networks for gas or water handling, including coal bed methane (CBM) in underground coal mines; mine de-watering; or the emerging biogas industries (agricultural, landfill, etc.).

1 Scope

The scope of this Companion Paper is to detail the requirements of strength test methods, test tools and equipment, installation of test equipment in order to undertake strength test as required by the Code of Practice.

Pipeline filling for hydraulic test only is detailed in this Companion Paper.

Component testing and hot tapping during emergency response pressure testing are also covered in the Companion Paper.

2 Tools and equipment

The following tools and equipment are required:

- a) Test pressure gauges and temperature measuring devices calibrated by a recognised and certified testing agency.
NOTE: Test pressure gauges shall be sensitive enough to accurately measure pressure change required by the acceptance criteria. Digital gauges with ± 1 kPa sensitivity should be used. The measuring devices shall be calibrated at a minimum of 12 monthly intervals
- b) Pressure rated hoses equipped with hose restraint.
- c) Pressure test warning signs, barricading.
- d) Approved test headers.
- e) Air compressor with oil filter/separator and cooler or suitable supply of water, meters and pump.
- f) Silencer or muffler for discharging air during de-pressurisation of pneumatic tests.
- g) Flexible hoses shall include whip sock protection.

The test procedure shall be fully documented and approved by the Operator. This approval may include a formal hazard assessment or other suitable risk assessment method.

The temperature of air or water being injected into the pipeline may be significantly higher than ambient conditions. Consideration shall be given to the installation of an after-cooler on the compressor to prevent overheating when using a pneumatic strength test and air temperature measurement during pressurisation.

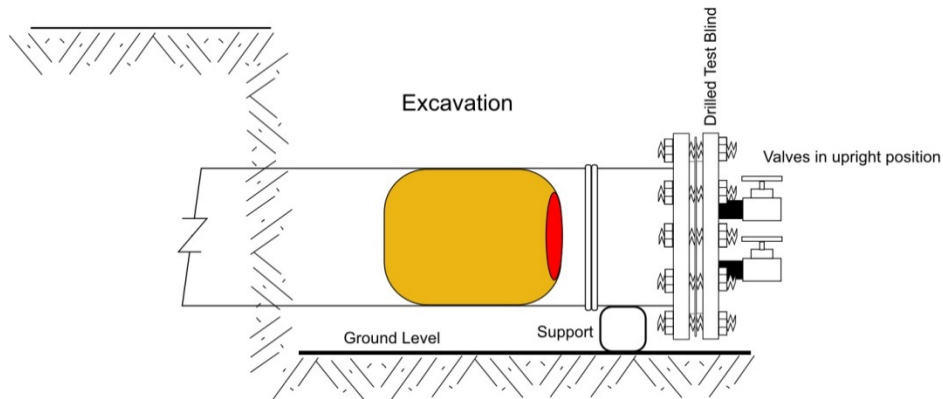


Figure 1 - Typical certified test header

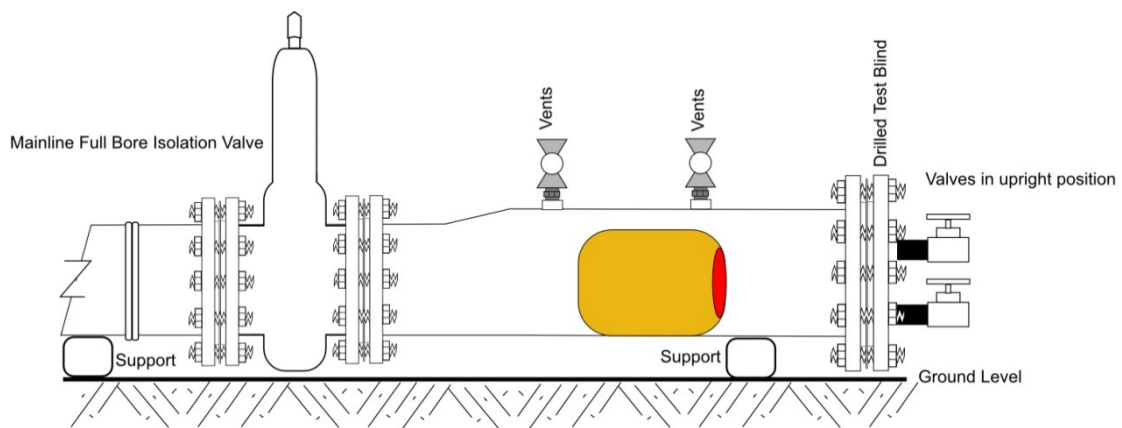


Figure 2 - Test Header/ Pig Catcher

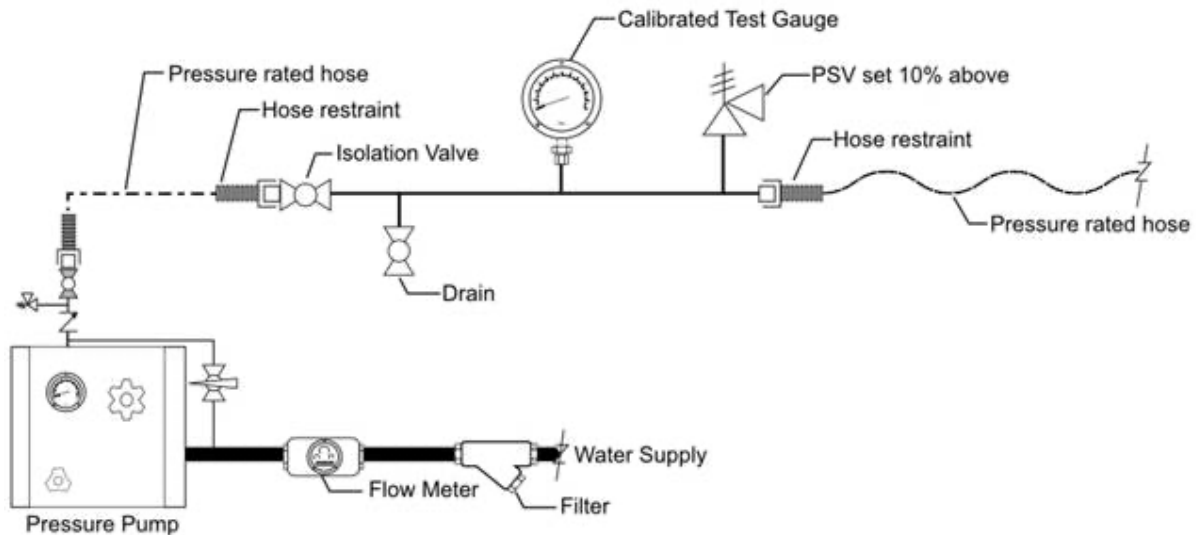
3 Installation of test equipment

Suitable test equipment shall be connected to the pipeline. Requirements include:

- a) The location of the test equipment shall consider suitable escape routes in the event of an emergency.
- b) Test equipment shall be located in accordance with the exclusion zone detailed in this code.
- c) The pipeline shall be restrained against movement. Ideally the ends of the pipeline being tested should be backfilled.
- d) Exposed pipe should be shielded from direct sunlight during testing operations. This can be achieved by using a suitable shading material (not black).
- e) The test equipment shall be checked by the Operator and a service test carried out on the temporary test equipment prior to the introduction of pressure.
- f) Suitable warning notices shall be prominently displayed at the boundaries of the exclusion zone.

- g) Consideration should be made to the test equipment having a suitable method of over pressure protection using a device set to 10 per cent above the maximum calculated test pressure.

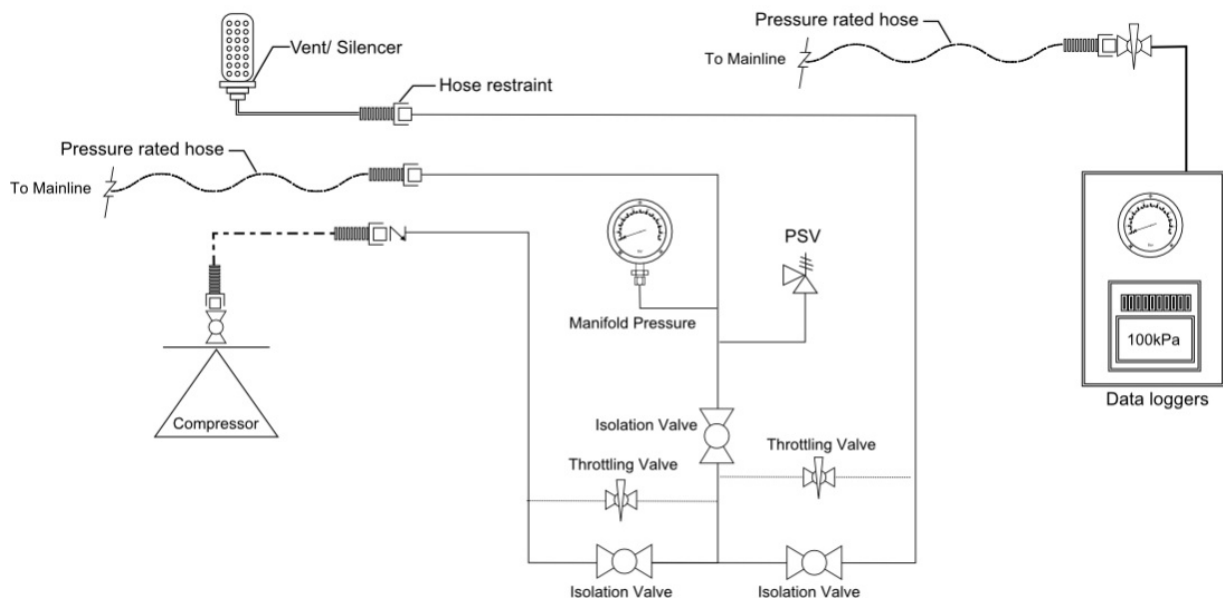
TYPICAL TEST SET UP



Note: Pump set ups may vary according to the type of pump used. It is recommended to have a Non return valve, PSV, filtration and Flow measurement device within the pump set up to control and protect the system.

Figure 3 - Hydraulic test setup

TYPICAL PNEUMATIC MANIFOLD TEST SET UP



Note: It is recommended to have a Non return valve and PSV to control and protect the system. A second instrumentation line should be used to monitor the system pressure

Figure 4 - Pneumatic test setup

4 Filling - Hydraulic test only

The objective is to fill the pipeline with water to ensure that residual air content in the section is minimised. This may be controlled by using a pig propelled with water to expel the air or by the release of air through air valves at high points in the pipeline.

Consideration should be given to elevations and where required a back pressure used to control the pig speed.

Where pigging is not a viable option due to short sections of pipe, dual diameter pipe lines or large volume systems, filling is to be conducted so that all air is expelled from all possible high point vents.

5 Component testing

5.1 General

Numerous components manufactured from PE100 pipe are used in gathering networks, including valve manifold assemblies, risers, low point drains, T-sections, high point vents and riser sections (e.g. for pressure testing). If components will be subjected to a main line pressure test before commissioning, pressure preliminary testing may be undertaken in accordance with Section 5.2 of this companion paper to achieve the following outcomes:

- Sample preliminary testing of manufactured assemblies as an additional quality assurance.
- Reduce risk of component failure (e.g. electrofusion pipe saddles at tie-in locations).
- Meet compliance requirements where preliminary testing is determined to be required or mandatory (e.g. prefabricated trenchless construction pipeline strings).

Assemblies that are installed within the pipeline post commissioning, and will not be subjected to the main line pressure test, are to be tested in accordance with Section 8 of the Code.

5.2 Component preliminary testing

Component preliminary testing can be carried out using water, air or nitrogen as a test medium. A dedicated test area is to be established, with appropriate procedures. The pressure is raised to the test pressure in increments of 25 per cent, stopping at each increment to allow for settlement. On reaching the test pressure, in accordance with Section 8.4.1, the network should be held for a 30 minutes stabilisation period at the test pressure. On completion of a 60 minutes strength test the test pressure should be reduced to MAOP before approaching the component to inspect for leaks. The component shall be depressurised prior to manual handling.

NOTE 1. Air testing is normally restricted to on-site applications or small bore component factory testing. Exclusion zones must be maintained as per the requirements of Code, i.e. a minimum of five (5) metres.

NOTE 2: When installing small bore fittings - for example saddles (including self tapping small bore saddle), it is required to pressure test the saddle (where practical) prior to cutting in to header for a minimum 30minute visual test. The benefit of undertaking a minimum of 30minute test is to mitigate the difficulty of repairing / replace the fitting if faulty.