



**Specification for Registration as a
Stronger Christchurch Infrastructure Rebuild
Team (SCIRT)**

**Approved Polyethylene (PE) Pipe
Pressure Tester**

Version 1.0 29/4/2013

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1 INTRODUCTION

To minimise the potential for defective or incomplete PE pipeline pressure testing and the risk of damaging and reducing the asset life of the pipe, or worst case pipeline replacement ***only SCIRT Approved PE Pipe Pressure Testers are permitted to undertake pressure testing on SCIRT Authorised Work.***

With most pipeline installation projects, the main assurance that the asset owner has that the pipeline is leak-tight and fit-for-purpose is the final acceptance pressure test. PE pipes have a visco-elastic nature that results in a diminishing decay in pressure which commences immediately the pipe is pressurised. This property of PE necessitates special testing procedures to ensure that a pipeline is leak-tight.

While the standard for pressure testing (Appendix M of AS/NZS 2566.2) covers pressure testing of PE pipes, it contains a typographic error in the M7 test calculations and does not explain the why's and how's of the test procedures.

Specialist training has been deemed necessary to clarify PE pipe pressure testing procedures, the equipment necessary and to standardise the presentation of results.

FUNDING: Employment of the Independent Quality Person (IQP) to carry out duties stated in this document (apart from the initial Theory, M7 site and M5 site training) shall be funded by the respective Delivery team or Home organisation.

2 PURPOSE

The purpose of this register is to provide and maintain a record of a select number of highly skilled and resourced Approved PE Pipe Pressure Testers who have attained a range of levels of competence relating to pressure acceptance testing of PE pressure pipelines.

The levels of competence covered by this register are:

- Level 1: An Approved PE Pipe Pressure Tester who has the necessary knowledge and competency to verify that acceptance testing is carried out correctly and that the test results are reliable.
- Level 2: An Approved PE Pipe Pressure Tester who can undertake the M7 test (Pressure Rebound Test for pipelines of \leq DN 315) and have access to (and use) approved and calibrated equipment. They must also be capable of producing test results in the form required and have demonstrated competence via one full pressure test that has been observed by a SCIRT approved IQP. In addition, they must submit full test documentation and results for at least two M7 pressure tests for audit by an IQP before they can be certified for PE Level 2 testing.

Note: Attaining level 1 competence is a pre-requisite for level 2.

- Level 3: An Approved PE Pipe Pressure Tester who can undertake the M5 test (Constant Pressure test) and have access to (and use) approved and calibrated equipment. They must also be capable of producing test results in the form required and have demonstrated competence via one full pressure test that has been observed by a SCIRT approved Independently Qualified Person (IQP). In addition, they must submit

SCIRT Register of Approved Polyethylene Pipe Pressure Testers

full test documentation and results for at least two M5 pressure tests for audit by an IQP before they can be certified for PE Level 3 testing

Note: Attaining level 2 competence is a pre-requisite for level 3.

Current IQP`s approved by SCIRT Best Practice Working Group are:

Mark Heslin
Joe Johnstone
John R Black
Stu Potts

3 DEFINITIONS

The following definitions apply:

Approved PE Pipe Pressure Tester	<u>An individual</u> approved by SCIRT to carry out acceptance pressure testing of PE pipelines
Approved PE Pipe Pressure Testers' Register	A register held by SCIRT recording the names of Approved PE Pipe Pressure Testers and their level of attainment and competence
Authorised Work	Pressure acceptance testing of PE pipelines that is part of SCIRT infrastructure to become CCC assets
Council	The Christchurch City Council (CCC)
Calibrated Equipment	Equipment for measuring pressure or volume that meets the manufacturer's specified accuracy.
CSS	The CCC's Construction Standard Specifications
Delivery Team	The SCIRT Contractor who employs (may be via a subcontractor) the Approved PE Pipe Pressure Tester
Effective Date	The date on which the PE Pipe Pressure Tester is approved
EXITO	Extractive Industries Training Organisation
IDS	The CCC Infrastructure Design Standard
IQP	An Independent Qualified Person (IQP) that is approved by SCIRT Best Practice working Group to verify that PE Pipe Pressure Testers understand and are competent to undertake pressure testing to the various Levels of competence
NZWETA	New Zealand Water and Environment Training Academy
Re-calibrated Equipment	Measuring equipment (for pressure or water volume) that has been tested by a registered testing authority and adjusted or repaired as necessary to restore the equipment to the manufacturer's specified accuracy
STP	System test pressure as specified, not greater than 1.25 times the PN rating of the lowest rated component in the line being tested. Typical maximum for CCC work is PN rating.
Working Day	A day on which registered banks are open for business in Christchurch excluding Saturdays, Sundays and public holidays

4 VARIATION OF REGISTRATION SPECIFICATION

This specification shall apply from the Effective Date until varied by SCIRT upon giving not less than 20 Working Days notice in writing to the Approved Pressure tester.

5 APPLICATION FOR APPROVAL

5.1 *Application process*

The Applicant shall:

- a) Be very familiar with this specification
- b) Have undertaken SCIRT approved training and have demonstrated competence for approval as an Approved PE Pipe Pressure Tester to Level 1, 2 or 3.
- c) Complete the application form
- d) Send the application form, and supporting documentation to the SCIRT Polyethylene Pipe Best Practice Working Group co-ordinator:

David Fitzmaurice – david.fitzmaurice@SCIRT.co.nz

5.2 *Competence requirements*

The applicant shall provide evidence of having undertaken the SCIRT PE pressure testing training sessions (or an equivalent and approved alternative, with written evidence and contacts with details for verification) and proof of competence for Levels 1, 2 and 3 as more fully described below.

Level 1: Personnel must have attended approved training courses and be able to demonstrate an appropriate level of awareness, knowledge and competence relating to PE pipes, including; the basics of testing, the equipment required and the presentation of results. This will mean attendance at all three of the SCIRT training sessions (background and theory, M7 and M5 tests) or an approved, equivalent alternative. Approved Level 1 training will be considered sufficient to provide the necessary background for personnel to progress to Levels 2 and 3 competences. It will also enable engineers and supervisors to verify that acceptance testing is being carried out competently and that the test results are reliable

Level 2: Personnel must have attained Level 1 competence as a pre-requisite. They must also have attended an approved training course and be able to demonstrate a good working knowledge of the M7 test (Pressure Rebound Test for pipelines of \leq DN 315) and have access to (and use) approved and calibrated equipment. They must also be capable of producing test results in the form required and have demonstrated competence via one full pressure test that has been observed by a SCIRT approved IQP. In addition, they must submit satisfactory test documentation and results for at least two pressure tests carried out within the last 12 months for audit by an IQP before they can be certified for PE Level 2 testing.

Level 3: Personnel must have attained Level 2 competence as a pre-requisite. They must also have attended an approved training course and be able to demonstrate a good working knowledge of the M5 (Constant

Pressure Test) and have access to (and use) approved and calibrated equipment. They must also be capable of producing test results in the form required and have demonstrated competence via one full pressure test that has been observed by a SCIRT approved IQP. In addition, they must submit satisfactory test documentation and results for at least two pressure tests carried out within the last 12 months for audit by an IQP before they can be certified for PE Level 3 testing.

5.3 Renewal and On-Going Refresher Training

In order to renew their Approved Tester status (required every 24 months), PE Pipe Pressure Testers shall provide evidence of at least two tests carried out during 2 years from the effective date of their last approval.

The final documentation that accompanied these pressure tests shall be submitted for audit and approval by a SCIRT approved IQP. Testers shall be prepared to attend an interview and to answer the IQP's questions, should that be deemed necessary.

When a tester has not conducted a PE pressure test of the required level for over 2 years, refresher training will be required.

NOTE: If in the future a course is available via NZWETA, EXITO or other certified trainer; a training certificate in the applicant's name that is relevant to the M5 and M7 tests, that was received within the last two years, or other relevant training will be considered on a case by case basis.

SCIRT will also consider the applicant's track record of completing projects to standards, using quality systems and providing quality documentation.

5.4 Testing equipment and hardware requirements

The applicant must provide evidence that they either own (or have access to) fully maintained and calibrated equipment and that only such equipment is used for any authorised work.

The pressure testing equipment required to carry to pressure tests is described generally below with some suggested equipment.

a. Pipeline hardware:

Suitable blank end plates that are leak-tight and have a pressure rating compatible with the STP, complete with gaskets, bolts and nuts.

Isolating valves, pipes and pipe fittings as necessary to make leak-tight connections from the pressure test rig to the pipeline under test.

Notes: The end plates shall be drilled and tapped (or have flanged inlets for large diameter pipelines) to allow for air bleed, water ingress, drainage, and pressure measurement.

The pressure measurement tapping point shall be separate from the water inlet point.

b. Pressure pump:

The pressure pump capacity and pressure required can vary from a positive displacement hand pump with ≈ 30 ml per stroke to a motor powered centrifugal pump with a capacity of > 10 Litres/second at 1,600 kPa or more. Note that a hand pump can be entirely suitable for pipelines of DN 63 that are 300 m long.

A water-blaster or weed-spray pump can be used but it may be difficult to

control the water flow with the required precision, especially if the pump capacity is greater than necessary for the pipeline under test. The pulsing flow may be difficult to meter accurately. **The tester will be required to prove the meters' accuracy.**

SPECIAL NOTE: that over-pressurising to more than 25% above the PN rating of the lowest component of the pipeline under test is likely to result in rejection and replacement of the whole pipeline.

A pressure relief valve may be used to minimise the risk of accidentally over-pressurising the pipeline. However, to be effective it must be sized correctly in relation to the pump capacity and the allowable amount of over pressure. It must be easily and reliably adjusted and checked for each different STP. Unless these conditions are met, a relief valve is likely to be a waste of time.

c. Pressure measuring/logging equipment:

Accurate and repeatable pressure measurement is critical for pressure acceptance testing. It is a mandatory requirement that the pressure in the pipeline under test is continuously data-logged during the test. A logging interval of 5 seconds is preferred but up to 10 seconds will be acceptable.

The pressure transducer shall have:

- An accuracy of $\pm 0.5\%$ of full scale (or better)
- A resolution of 0.1% of full scale (or better)
- A pressure range so that the STP falls within 20 – 95% of the range

The Data-logger shall:

- Be capable of recording at intervals of between 5 and 10 seconds (at least) with date/time stamp to the nearest second.
- Have its time clock correctly set for date and time and be adjusted for daylight saving time as appropriate

A logger capable of logging volume pulse inputs may be used in conjunction with a meter with appropriate output.

Note that a logging pressure gauge may be the most practical and reliable unit for PE pressure acceptance testing.

Suitable equipment includes:

The Crystal Engineering XP2i series datalogger gauge, available from, <http://www.cps.co.nz/shop/datalogging/pressure-datalogging/datalogging/P152/C144>.

The Teltherm Additel 681 series digital pressure gauge, available from, <http://www.teltherm.co.nz/shop/Pressure/Digital+Pressure+Gauges/0025+FS+Accuracy+Series+681.html>

The A D Riley LogOr smart logger, available from <http://www.adriley.co.nz/index.htm>.

A check pressure gauge shall be used for all tests. This check gauge shall have:

- An accuracy of $\pm 1\%$ of full scale
- A 100 mm dial (minimum) for a conventional pressure gauge
- Readability of 10 kPa or better
- A pressure range so that the STP falls within 50 – 90% of the

range.

Digital pressure gauges that meet the accuracy requirements above will be acceptable.

The datalogger and gauge shall read within 5% of each other. If they do not agree within this limitation, the cause shall be determined and the faulty unit/s replaced or recalibrated before the test is carried out.

d. Water meter

A water meter is required for measuring the volume of water either drawn off (for the M7 Test) or added at intervals (for the M5 test). The meter shall be sized such that the rate of flow does not exceed the meter's Q_4 (overload flow rate) and is greater than the meters Q_1 (minimum flow rate).

Note that a Class 1 or Class 2 water meter to OIML R 49-2 will be satisfactory provided the flow rate metered is between Q_1 and Q_4 . A meter with a Q_3 (maximum continuous flow rate) of 2.5 m³/hr would be satisfactory for testing a pipeline of up to DN 500 and 150 metres length.

Electro-magnetic flow meters will be acceptable. Meters with a pulsed volume output may be used in conjunction with a multi-channel datalogger provided the pulse volume allows the test results to be assessed.

For large pipelines (M5 test only), the meter may need to have a Q_3 of 40 m³/hr (or more), depending on the pipe diameter under test and the pump capacity.

6 CALIBRATION OF EQUIPMENT

Water meters and pressure gauges shall be checked for calibration (and recalibrated if necessary) at least **every 12 months by an approved provider**. In addition, a calibration check and recalibration or repair is required immediately if:

- A water meter has been damaged or exposed flows beyond Q_4 .
- A pressure gauge or transducer has been damaged or exposed to pressures beyond full scale.

The use of equipment that is out of calibration is not permitted. The Approved tester shall have the calibration certificates for the equipment on site at all times during authorised work.

7 REGISTRATION NOTIFICATION

All attendees shall be issued with a certificate of attendance following each of the SCIRT training courses.

A Level 1 Approved tester's card will be issued to all trainees after they have completed all three SCIRT training courses and **successfully completed an on-line questionnaire**

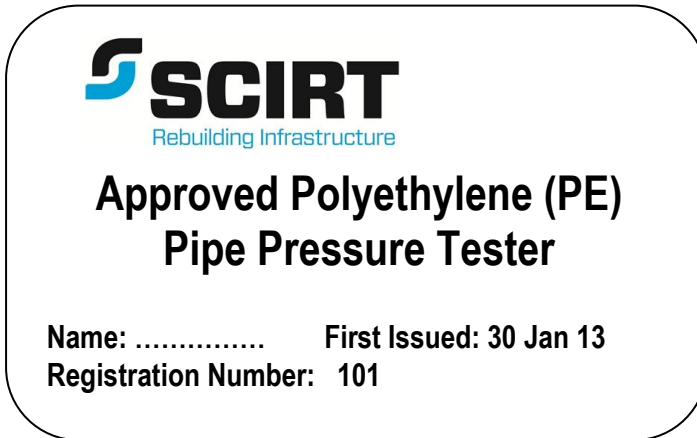
A Level 2 card will be issued after trainees have successfully completed the requirements for Level 1 and after meeting the additional requirements in 5.2 Level 2 above.

A Level 3 card be issued after trainees have successfully completed the requirements for Level 2 and after meeting the additional requirements in 5.2 Level 3 above.

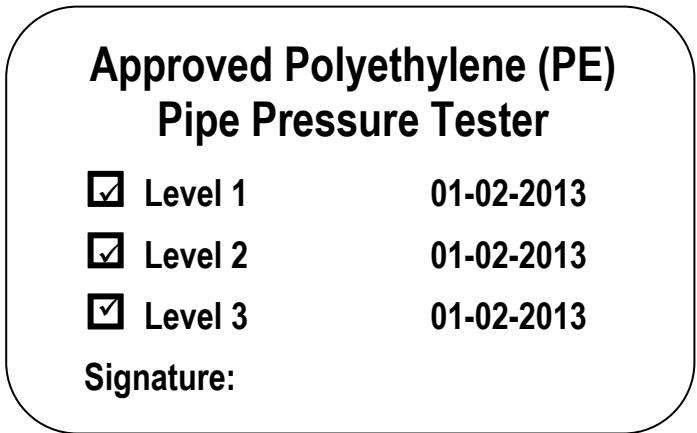
These cards shall have photo ID and shall be carried by the Approved Tester at

all times while engaged on authorised work, to be produced when requested by CCC or SCIRT staff inspecting the testing.

Registration card shown below.



Front of card



Rear of card

8 APPROVED PE PIPE PRESSURE TESTER

The Approved Pressure tester shall:

- Be bound by this specification
- Carry out the works in accordance with the requirements of the CSS and the intent of AS/NZS 2566.2.
- Support the Delivery team in providing all the pressure acceptance test documentation, pressure logs (in .csv or .xls format), reports and records.
- Comply with the Delivery teams Health and Safety and Contract Quality Plan
- Comply with all relevant statutes, regulations and by-laws.

9 SUSPENSION OF REGISTRATION

9.1 Suspension

An Approved PE Pipe Pressure Tester will have their registration suspended if:

- 1 Test procedures are not in accordance with CSS and the training received
- 2 Damaged or un-calibrated equipment has been used
- 3 Health and safety procedures have not been followed
- 4 It is found that test results have been falsified deliberately
- 5 Wilful disregard of a reasonable instruction from a SCIRT authorised person

9.2 Suspension Revocation

Revocation of suspension may only apply to items 1 to 3 above. To apply for revocation of the suspension, written proof of the following is required:

- Refresher training for both the M5 and M7 tests with the PE Best Practice team training specialist
- Documentation showing that any faulty equipment has been repaired, re-calibrated or replaced
- The tester has attended approved Health and Safety refresher training

The Polyethylene Pipe Best Practice Working Group coordinator may then reinstate the Approved Pressure Tester's status. If successful with the application, the applicant will need to demonstrate competence by engaging a SCIRT approved IQP to observe and endorse one full pressure test before being issued with a new Approved PE Pressure Pipe Testers Registration.

10 CANCELLATION OF REGISTRATION

If an Approved Tester's registration has been suspended for items 4 or 5 in clause 9.1 above, the registration will be cancelled and SCIRT is unlikely to consider any future applications for registration as an approved tester.

If registration is cancelled due to lack of action by the affected party within 3 months of service of the suspension notice, the affected party must apply for approval in compliance with clause 5 – Application for Approval.

11 GENERAL

The Approved PE pressure tester's registration is personal and may not be assigned.

No waiver of any breach, or failure to enforce any provision of these Conditions at any time by the SCIRT shall in any way limit or waive SCIRT's right to subsequently require strict compliance with these Conditions.

Audits may at any time be carried out to ensure procedures and practices are in line with the standards, and that appropriate, well maintained and calibrated equipment is being used.