Asset Maintenance

Gas Maintenance Plan 2012

Appendix 5H

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1 PURPOSE/SCOPE

This document describes the gas maintenance activities currently performed by SP AusNet on assets within the Gas Distribution and Transmission systems. It highlights that an appropriate program is in place to ensure that all plant and equipment operates safely, reliably and economically. It also ensures that security of supply is maintained, and that the specified key performance indicators for security of supply, asset integrity and leakage survey are achieved.

The Gas Maintenance Plan meets the requirements of:

- AS 4645.1 Gas distribution networks - Network management
- AS 4645.2 Gas distribution networks - Steel pipe systems
- AS 4645.3 Gas distribution networks - Plastics pipe systems
- AS 2885, Pipelines – Gas and Liquid Petroleum
- Gas Safety Act
- Gas Safety (Safety Case) Regulations
- Gas Distribution System Code
- SP AusNet Gas Safety Case

The document defines the work schedules and controls performed on the gas network and provide a system of review, continuous updating and improvement.

The assets are functionally divided into the following classifications:

1. Regulator Station Maintenance
2. SCADA Maintenance
3. Transmission System Maintenance
4. Distribution System Maintenance

2.0 PROCEDURE

The following provides a high level description of the various maintenance activities performed on each class of asset.

2.1 REGULATOR STATION MAINTENANCE

Regulator maintenance is carried out on the following classes of regulators:

- City Gate
- Field Regulator
- District Regulator
- Industrial Commercial Regulator
- Domestic Regulator

2.1.1 City Gate

A City Gate station is a regulating station, which provides for the transfer of gas from the Principal Transmission System (primarily owned by APA and in the Western Region by Gas Pipelines Victoria to a lower operating pressure system (SP AusNet transmission / distribution network). Most City Gate installations typically consists of a metering station (primarily owned by APA), a water bath heater, transmission pressure station valves and multiple runs of regulators with three (3) stages of over pressure protection.

All City Gate Stations are monitored at the SP AusNet Control Room twenty-four (24) hours a day, seven (7) days a week, via a SCADA system.

A City Gate station, including heater, is currently on a preventative maintenance program covered by;

- Scheduled Inspection / Operational Check
- Scheduled Full Maintenance (as determined by RCM Modelling)
- Breakdown Maintenance
- Site Maintenance

All maintenance is administered through the Q4 database.

The *30-4011 SP AusNet System Operations Manual, Section 2 Maintenance & Operations document* defines and provides details of the various maintenance procedures and is used as the prime reference by the approved Service Provider who have the responsibility to administer and manage all maintenance activities. All work is performed in accordance with Industry Standards and the Gas Safety (Safety Case) Regulations.

2.1.1.1 Maintenance Definitions

a. Scheduled Inspection / Operational Check

An Operational Check is a series of tests that determine if the systems and settings of the regulator station are correct and fully functional.

Any deviation from specification or functionality is investigated, the cause is determined, and an adjustment or repairs performed to return the system to normal and reliable operation. The testing procedure is issued in checklist form as part of a computer generated work request via the Q4 maintenance database.

All work performed, including repairs, is recorded in the Q4 maintenance management system and a hard copy file is held with the approved Service Provider.

Operational Checks are performed on all City Gates and gas pre-heaters every six months.

b. Scheduled Full Maintenance

Major maintenance is undertaken on a regulator station, where the primary equipment items are completely overhauled. Predetermined components are replaced, and all remaining components carefully inspected and replaced if worn or damaged.

The maintenance procedure is issued in checklist form as part of a computer generated work request via the Q4 maintenance database.

Comments on the overall condition of the unit are recorded.

Scheduled Full Maintenance is performed on all City Gates and water bath heaters at an interval, which vary as a result of the outcomes of a comprehensive risk assessment.

Timeframes may vary from three (3), six (6) yearly or ten (10) yearly dependent on the site, with some sites being allocated a “breakdown only” maintenance regime.

c. Breakdown Maintenance

Breakdown maintenance takes place when the normal function of a regulator station is significantly impaired.

Response to the failure is determined from its impact on the network, and is prioritised accordingly via SP AusNet’s Control Room procedures and alarm types.

Response may be immediate, or may be scheduled for a later, suitable time. The approved Service Provider records all work performed against the Work Request raised for the specific breakdown. All work performed, including repairs, is recorded in the Q4 computerised maintenance management system.

d. Site Maintenance

City Gate sites are to be kept in a clean, functional, safe and visually acceptable condition. This includes activities such as repair of site fences, painting of pipe work and equipment, painting of buildings, maintenance of grass to minimise fire hazards, pruning of trees, cleaning, housekeeping, and waste removal.

Site maintenance is typically carried out every four (4) months or as deemed necessary.

e. Valve Maintenance

All valves within a City Gate station require operational checks coinciding with the station operational check. Valve maintenance consists of:

- restoring access cover, tube and surroundings to standard (if valve is below ground)
- partially operating the valve to check for smooth operation,
- lubricant refill or replacement
- checking the installation for gas leaks

f. Heater Coil Inspection

Water bath and heat exchanger heater coil inspections are undertaken on City Gate stations at intervals not exceeding eight (8) years. Intervals vary depending on outcomes of the initial inspection. An inspection consists of:

- Decommissioning the heater
- Removing the heater coil
- Sandblasting the heater coil
- Visual and mechanical inspection and measurement of coil internal and external surfaces, and where required NDT (non destructive testing).
- Engineering assessment and data capture

g. Electric Heat Tracer Inspection

Inspection not exceeding eight (8) year interval. Remove coating and inspect condition of pipe.

Inspection may be via NDT methods such as X-ray to view pipe surface condition.

2.1.2 Field Regulators

Field Regulators are regulating stations that do not contain a metering station and are down stream of SP AusNet's Transmission or Distribution network. The inlet pressure is usually of a lower transmission pressure class (i.e. pressures up to 2800 kPa) with the outlet pressure being either high pressure or medium pressure. All maintenance is administered through the Q4 database system.

The *30-4011 SP AusNet System Operations Manual, Section 2 Maintenance & Operations document* defines and provides details of the various procedures and is used as the prime reference by the approved Service Provider. All work is performed in accordance to Industry Standards and the Gas Safety (Safety Case) Regulations.

2.1.2.1 Maintenance Definitions

a. Chart Runs

Field Regulators that have no form of SCADA monitoring are on a monthly chart run, whereby the operational parameters of the unit are visually examined.

b. Scheduled Inspection / Operational Check

An Operational Check is a series of tests that determine if the systems and settings of the regulating station are fully functional. Any deviation from specification functionality is investigated, the cause is determined and adjustments made or repaired to return the system to a normal and reliable operation. The testing procedure is issued in checklist form as part of a computer generated work request via the Q4 maintenance database. Repairs performed are recorded in the Q4 computerised maintenance management system.

Operational Checks are performed on all Field Regulators every six months.

c. Scheduled Full Maintenance

Major maintenance is undertaken on a regulator station, where the primary equipment items are completely overhauled. Predetermined components are replaced, and all remaining components carefully inspected and replaced, if worn or damaged. The maintenance procedure is issued in checklist form as part of a computer generated work request via the Q4 maintenance database. Comments on the overall condition of the unit are recorded.

Scheduled Full Maintenance is performed on all Field Regulators at an interval, which varies as a result of the outcomes of a comprehensive risk assessment and RCM analysis modelling.

Timeframes may vary from 6 yearly to 10 yearly dependent on the site, with some sites being allocated a “breakdown only” maintenance regime.

d. Breakdown Maintenance

Breakdown maintenance takes place when the normal function of a regulator station is significantly impaired. Response to the failure is determined from its impact on the network, and is prioritised accordingly via SP AusNet Control room procedures and alarm types.

The Service Provider records all work performed against the Work Request raised for the specific breakdown. All repairs are recorded in the Q4 computerised maintenance management system.

e. Site Maintenance

Site maintenance is the maintaining of the site in a clean, functional, safe and visually acceptable condition. This includes activities such as repair of site fences, painting of pipe work and equipment, painting of buildings and maintenance of grass to minimise fire hazards, pruning of trees, cleaning, housekeeping, and waste removal.

Site maintenance is usually carried out every four (4) months or as deemed necessary.

f. Valve Maintenance

Valve maintenance on all Field Regulators coincides with the scheduled regulator maintenance. All valves including, both inlet and outlet isolation valves are maintained. Valve maintenance consists of:

- restoring access cover, tube and surroundings to standard (if valve is below ground)
- partially operating the valve to check for smooth operation,

- lubricant refill or replacement and
- checking the installation for gas leaks.

2.1.3 District Regulator Maintenance

These are regulating stations, which control pressure levels in the low-pressure reticulation system by the reduction of either high or medium pressure, to low pressure. All district regulator maintenance is scheduled in the Q4 database and is issued monthly.

The 30-4011 SP AusNet System Operations Manual, Section 2 Maintenance & Operations document defines and provides the details of the various procedures and is used as the prime reference by the approved Service Provider. All work is performed in accordance to Industry Standards and the Gas Safety (Safety Case) Regulations.

2.1.3.1 Maintenance Definitions

a. Weekly Chart Run

All district regulators without SCADA are visited weekly whereby the following is checked:

- The presence of gas
- Resetting and rewinding the pressure control mechanical clocks
- Pressure recorder chart changing

b. Scheduled Inspection / Operational Check

An operational check is a series of tests that determine if the systems and settings of the district regulator are fully functional. Any deviation from specification functionality is investigated, the cause is determined and adjustments made or repair performed to return the system to normal and reliable operation. The testing procedure is issued in checklist form as part of a computer generated work request. All repairs are recorded in the computerised maintenance management system.

An Operational check is carried out primarily on a twelve (12) monthly basis, but some are performed at six (6) monthly intervals depending on historical records in relation to supply difficulties and the condition of inlet and outlet pipes.

c. Scheduled Full Maintenance

Major maintenance is undertaken on a district regulator, where the primary equipment items are completely overhauled. Predetermined components are replaced, and all remaining components carefully inspected and replaced, if worn or damaged. The maintenance procedure is issued in checklist form as part of a computer generated work request. Repair work carried out on the unit is recorded.

Scheduled Full Maintenance is performed on all district regulators every six years but may vary pending further RCM analysis.

d. Breakdown Maintenance

Breakdown maintenance takes place when the normal function of a regulating station is significantly impaired. Response to the failure is determined from its impact on the network, and is prioritised accordingly. The approved Service Provider records all work performed against the Work Request raised for the specific breakdown. All repair work is recorded in the computerised maintenance management system.

e. Valve Maintenance

Valve maintenance on all District Regulators coincides with the scheduled regulator maintenance. All valves, including the inlet isolation valve, are maintained. Valve maintenance consists of:

- restoring access cover, tube and surroundings to standard (if valve is below ground).
- partially operating the valve to check for smooth operation.
- lubricant refill or replacement. and
- checking the installation for gas leaks.

2.1.4 Large Industrial/Commercial Meter Regulators

Industrial/Commercial regulators provide gas at predetermined metering pressures from various reticulation systems. These units are designed to be placed on a consumer's property and typically consist of one or two regulator runs with some form of over pressure protection and meter. All Industrial/Commercial regulator units deemed as "System Operations" units or 'Large Units', consist of a maintenance cycle, which is scheduled in the Q4 maintenance database and issued on a monthly basis.

All meter regulating installations are classified as System Operations units except for specific units that address all of the following criteria:

If the unit is a single run unit with:

- Only one stage of pressure reduction i.e. a single self-operated regulator that has only one stage reduction. The regulator shall not be pilot operated.
- Overpressure protection by venting or a manual reset slam shut.
- A Metering Pressure of less than 4 kPa
- A diaphragm meter installed.
- Inlet not supplied from a Transmission Pressure system.

30-4011 SP AusNet System Operations Manual Section 1 General & Section 2 Maintenance & Operations, define and describe the details of the various procedures and is used as the prime reference by the approved Service Provider.

All work is performed in accordance to Industry Standards and the Gas Safety (Safety Case) Regulations.

2.1.4.1 Maintenance Definitions

2.1.4.1.1 Tariff D and Transmission Pressure supplied installations

a. Scheduled Inspection/Operational Check

A scheduled inspection/operational check is carried out to test correct regulator performance, overpressure/relief equipment settings and operation, regulator lockup and other requirements for effective regulator unit performance. This maintenance is carried out every six (6) or twelve (12) months dependent upon the site. For supply and safety reasons, as detailed in the *30-4011 SP AusNet Section 2 Maintenance & Operations document*, a more frequent inspection six (6) months) is provided to selected installations.

This is termed a "schedule A".

This maintenance is identical to a schedule B maintenance but on a more frequent basis due to;

- Security of supply contractual requirements (Major customer)
- Location of installation
- Regulator unit configuration

- Unit off Transmission Inlet System

b. Scheduled Full Maintenance

Major maintenance is undertaken on all dual run Industrial/Commercial regulator units, where the primary equipment items are completely overhauled. Predetermined components are replaced, and all remaining components carefully inspected and replaced, if worn or damaged. The maintenance procedure is issued in checklist form as part of a computer generated work request.

All repair work is recorded.

A Scheduled Full Maintenance is performed on dual run industrial commercial regulators every six or ten years and is commonly referred to as a SR/1 (Schedule 1 maintenance). Frequency may vary pending a site analysis.

c. Breakdown Maintenance

Breakdown maintenance takes place when the normal function of a regulator unit is significantly impaired. Response may be immediate, or may be scheduled for a later, convenient time. All repair work is recorded in the computerised maintenance management system.

d. Valve Maintenance

Valve maintenance on all Large Industrial/Commercial Meter Regulators coincides with the scheduled regulator maintenance. All valves including, inlet isolation valve where accessible, is maintained. Valve maintenance consists of:

- restoring access cover, tube and surroundings to standard (if valve is below ground)
- partially operating the valve to check for smooth operation,
- lubricant refill or replacement
- checking the installation for gas leaks

e. Meter Maintenance

Scheduled Full maintenance:

- Industrial/Commercial meters are part of a change over program currently replacing time expired meters at ten (10), thirteen (13) or fifteen (15) years depending on the type of meter.
- Compliance testing is in accordance to AS/NZS 4944

Breakdown Maintenance:

- On report of a meter fault the Alliance Service Provider is despatched to replace the meter. If a flow computer is fitted a technician from Select Solutions also attends to ensure the meter's flow computer is functional.

f. Flow Computer

A data logger is an electronic device that records interval (usually on an hourly basis) gas usage using the index readings (i.e. pulses) from the mechanical meter. A flow computer is an electronic device used to record interval (usually on an hourly basis) gas usage, as well as using temperature and pressure readings of the gas on the site to accurately correct the measured flow. A flow computer is used, instead of a data logger if:

- the metering pressure is 100 kPa or greater.
- the annual load is greater than 100,000 gigajoules (100 TJ).

- the gas supply is unregulated, that is the pressure regulators are located downstream of the meter, a flow computer is mandatory.
- a flow computer is specifically requested by the retailer or customer, and payment for the flow computer has been agreed to.

If the annual load is greater than 100,000 gigajoules (ie 100 TJ), then telemetry is required to be installed along with the flow computer.

Flow Computers are calibrated to an accuracy of +/-1% every six (6) months by Select Solutions.

2.1.4.1.1 Tariff V sites

a. Scheduled Inspection/Operational Check (Schedule maintenance)

A scheduled inspection/operational check is carried out to test correct regulator performance, overpressure/relief equipment settings and operation, regulator lockup and other requirements for effective regulator unit performance. This maintenance is identical to schedule B maintenance but on a more frequent basis due to:

- Security of supply contractual requirements (Major customer)
- Location of installation
- Regulator unit configuration
- Unit supplied directly down stream of a Transmission pressure system

A scheduled inspection/operational check is performed on Tariff V industrial/commercial meters at an interval resulting from the outcomes of a comprehensive risk assessment and RCM analysis modelling. The outcomes are detailed below: As such, schedule inspection/operational checks are carried out either six (6) monthly or twelve (12) monthly dependent on site criticality and complexity of installation.

b. Scheduled Full Maintenance

Major maintenance is undertaken on Tariff V Industrial/Commercial regulator units, where the primary equipment items are completely overhauled. Predetermined components are replaced, and all remaining components carefully inspected and replaced, if worn or damaged. The maintenance procedure is issued in checklist form as part of a computer generated work request via the Q4 maintenance database. All repair work is recorded.

A Scheduled Full Maintenance is performed on Tariff V industrial/commercial meters at an interval resulting from the outcomes of a comprehensive risk assessment and RCM analysis modelling

Tariff V meters are either maintained every six (6) years or every ten years, dependent on site criticality and complexity.

c. Breakdown Maintenance

Breakdown maintenance takes place when the normal function of a regulator unit is significantly impaired. Response may be immediate, or may be scheduled for a later, convenient time. All repair work is recorded in the computerised maintenance management system.

Some sites are on a breakdown only maintenance schedule.

d. Valve Maintenance

Valve maintenance on all Large Industrial/Commercial Meter Regulators coincides with the scheduled regulator maintenance. All valves including, inlet isolation valve where accessible, is maintained. Valve maintenance consists of:

- restoring access cover, tube and surroundings to standard (if valve is below ground)
- partially operating the valve to check for smooth operation,
- lubricant refill or replacement
- checking the installation for gas leaks

e. Meter Maintenance

Scheduled Full Maintenance:

- Industrial/Commercial meters are part of a change over program currently replacing time expired meters at 15-year intervals. A field life extension program is in place where a percentage of meters from a meter type are tested each year and if these meters are within specification then the remainder of that type will be left in the field for a minimum of a further twelve (12) months in accordance with compliance testing to AS/NZS 4944.

Breakdown Maintenance:

- On report of a meter fault the approved Service Provider is despatched to replace the meter. If a flow computer is fitted a technician from Select Solutions also attends to ensure the meter's flow computer is functional.

f. Data Logger

A data logger is an electronic device that records interval (usually on an hourly basis) gas usage using the index readings (ie pulses) from the mechanical meter.

Data Loggers are calibrated to an accuracy of +/-1% once per year by DMS.

2.1.5 Small Industrial/Commercial Meter Regulators

Small Industrial/Commercial regulators provide gas at predetermined metering pressures from various reticulation systems.

These units are designed to be placed on a customer's property and typically consist of a single regulator run with a normal metering pressure (i.e. 1.1 kPa or 2.75 kPa). A 'Small' unit is:

- a unit where the metering pressure is not above normal pressure (i.e. above 1.1 kPa or 2.75 kPa
- a unit where the meter capacity is not greater than 140 m^3/hr (5,500 MJ/hr) and is supplied from the low pressure system
- a unit where the meter capacity is not greater than 30 m^3/hr (1,200 MJ/hr) and is supplied from the medium, high or transmission pressure system

All maintenance work is performed in accordance to Industry Standards and the Gas Safety (Safety Case) Regulations.

These units typically do not have any scheduled maintenance and are repaired on a breakdown only basis by qualified technicians.

2.1.5.1 Maintenance Definitions

a. Breakdown Maintenance

Breakdown maintenance takes place when the normal function of a regulator unit is significantly impaired. Most of these breakdown activities are activated via a public report. Response may be immediate, or may be scheduled for a later, suitable time.

b. Meter Replacement

Small industrial/Commercial meters are part of a change over program. This program currently tests 'time expired' meter families at fifteen (15)-year intervals and allows field life extension in accordance with AS/NZS 4944.

2.1.6 Domestic Meter/Regulator set

Domestic Meter/Regulator sets provide gas at predetermined metering pressures from various reticulation systems. These units are designed to be placed on a customer's property and typically consist of a single regulator run with a normal metering pressure (ie 1.1 kPa or 2.75 kPa under certain circumstances).

2.1.6.1 Maintenance Definitions

There is no scheduled domestic regulator maintenance.

a. Breakdown Maintenance

Breakdown maintenance takes place when the normal function of a regulator unit is significantly impaired. Response is immediate and is typically initiated via the public.

b. Meter Replacement

Domestic meters are part of a change over program currently replacing 'time expired' meters at fifteen (15)-year intervals. A field life extension program is in place where a percentage of meters from a meter type are tested each year and if these meters are within specification then the remainder of that meter type may be left in the field for a further period of time in accordance with the requirements of AS/NZS 4944.

2.2 SCADA MAINTENANCE

SCADA Maintenance is broken into 4 categories.

- **Monitored Sites**

  These sites have a simple functionality and only monitor site pressure and status information. These sites are maintained once per year.

- **Fringe Sites (control systems)**

  These sites measure fringe pressure information that is used to perform automatic upstream pressure control. These sites are maintained once per year.

- **Fringe Sites (monitor systems)**

  These sites measure fringe pressure and status information for system monitoring purposes. These sites are maintained once per year

- **Controlled Sites**

  These sites perform pressure control functionality and monitor site information. These sites are currently maintained once per year.

  Maintenance to the RTU's is detailed below.

2.2.1 SCADA Motor Maintenance

SCADA motor maintenance ensures that the electric motor and pilot regulator are working correctly and are dispensing the correct pressures. The SCADA motor is checked for operation at each regulator Operational Check and is completely overhauled at each regulator full maintenance.

The *30-4011SP AusNet System Operations Manual Section 2 Maintenance & Operations document* defines and describes the details of the various procedures involved in the maintenance of the SCADA motor and is used as the prime reference by the Alliance Service Provider.

2.2.2 General Maintenance Principles

RTU installations consist of field instrumentation, eg transmitters and RTU equipment, which includes a signal conversion of analogue to digital. Once a signal has been converted to digital and verified, eg at the test port it is assumed that the system is calibrated and that that signal will be transmitted intact to the host site.

Systems and equipment are calibrated to within their level of uncertainty, in effect if they are within the specification they are regarded as acceptable.

General principle is to calibrate from the transmitter input to the RTU test port. If the readings obtained are within tolerance then the system is regarded as acceptable. If the readings fall out of tolerance, each item in the system, i.e. the transmitter and RTU, A to D, is checked and adjusted individually.

All RTU Installations are maintained annually in accordance with *Technical Specification SP4163-SCADA-RTU Scheduled Maintenance*.

2.2.3 Instruments

Instruments used in calibration are generally accurate to 0.1% and are calibrated each six (6) months either via an accredited testing laboratory or locally tested against a newly calibrated instrument.

2.2.4 Analogue

Each analogue element in the system has its own manufacturer-specified accuracy, typically:

- Pressure Transmitters 0.1% to 0.25% span depending on model.
- Analogue to Digital conversion (RTU) 0.1 to 0.2 % depending on model.

When combined into a system these potential errors can become, in worst case additive and allow errors of up to 0.45 %.

2.2.5 Pressure Transmitters

In carrying out calibration works the method used is to input a known pressure to the transmitter at 0%, 25%, 50%, 75% and 100% range and verify the reading at the RTU test port, after the analogue to digital conversion, as being within 0.2% span at each level input. If this figure is met there is not further action.

2.2.6 Temperature Transmitters

Temperature transmitters generally utilise an RTD device as a sensor and signal conditioner to convert the resistance value to a 4mA to 20mA signal to be applied to the RTU.

The RTD device is inherently stable and history indicates that they are not subject to minor drift or change.

Any RTD fault causes major shift and the result is quickly observed.

2.2.7 Digitals

Digitals are switch or other sensor operated points which return either an on or off state to the RTU and host. Examples are door switches, slam shut monitor switches, heater fail (pressure) switches and mains failure alarms.

Testing is based on activating the switch generally by its normal activation method, eg turning off mains for mains fail and observing the action at the RTU test port.

2.2.8 Pressure Switches

Pressure switches are used in fringe pits and heaters to indicate failures.

Testing of pressure switches is carried out by input of pressure to the switch and steadily decreasing the pressure until the switch is observed to operate. The pressure is gradually increased until the switch again operates.

There will generally be a difference in the operating levels.

2.2.9 Other Parameters

Items such as battery voltage etc are directly measured and compared with the current readings at the test port.

2.3 TRANSMISSION PIPELINES

SP AusNet currently has twenty (20) individual licensed pipelines totalling 183 kms. Each pipeline is licensed and 'permits to operate' are administered by DPI (Department of Primary Industries).

Written consent from the Minister of DPI and ESV (Energy Safe Victoria) is required prior to any pipeline alterations proceeding or works by other authorities involving proposed structures within three metres of a licensed pipeline (refer to the Pipelines Act).

Maintenance activities that are performed on a schedule for all Transmission Pipelines are as follow:

- Pipeline Patrol
- Pipeline Reviews
- Leakage Survey
- Cathodic Protection
- Valve maintenance
- Intelligent Pigging

A description of each maintenance activity is given below.

2.3.1 Pipeline Patrol (security)

All licensed pipelines are patrolled on a regular working basis in accordance with the procedure laid down in *AS 2885 and SP AusNet Technical Specification SP 4161.*

As part of the pipeline patrol the following maintenance activities are carried out;

a. Pipeline Inspection

Whereby the observation and recording of works, potential works, surface conditions, access impediments or any other factors in the vicinity of a licensed pipeline are reported and acted upon.

b. Maintenance of Easements and Markers

Maintenance of easements and pipeline markers on an as need basis.

c. Property Owner Visits

All property owners whereby the transmission pipeline passes through their property are visited twice a year.

2.3.2 Transmission Pipeline Reviews

AS 2885.3 Pipelines – Gas and Liquid Petroleum – Operation and Maintenance requires the following reviews be conducted every 5 years:

- Review of pressure-control and over-pressure protection systems
- Review of remaining / extending design life
- Review of Maximum Allowable Operating Pressure (MAOP)
- Review of location classes
- Safety Management Study

SP AusNet's plan for reviewing each pipeline is:

Pipeline Licence No.	PIPELINE	REVIEW DATE			
		PRESSURE -CONTROL	DESIGN LIFE	MAOP	LOCATION CLASS
16	(C-I-C)	2012	2012	2012	2012
17	(C-I-C)	2012	2012	2012	2012
18	(C-I-C)	2012	2012	2012	2012
19	(C-I-C)	2012	2012	2012	2012
54	(C-I-C)	2012	2012	2012	2012
57	(C-I-C)	2012	2012	2012	2012
64	(C-I-C)	2012	2012	2012	2012
76	(C-I-C)	2012	2012	2012	2012
80	(C-I-C)	2012	2012	2012	2012
82	(C-I-C)	2012	2012	2012	2012
84	(C-I-C)	2012	2012	2012	2012
90	(C-I-C)	2012	2012	2012	2012
97	(C-I-C)	2012	2012	2012	2012
99	(C-I-C)	2012	2012	2012	2012
113	(C-I-C)	2012	2012	2012	2012
184	(C-I-C)	2013	2013	2013	2013
188	(C-I-C)	2012	2012	2012	2012
189	(C-I-C)	2012	2012	2012	2012

Pipeline Licence No.	PIPELINE	REVIEW DATE			
		PRESSURE -CONTROL	DESIGN LIFE	MAOP	LOCATION CLASS
190	(C-I-C)	2013	2013	2013	2013
191	(C-I-C)	2013	2013	2013	2013
192	(C-I-C)	2013	2013	2013	2013
193	(C-I-C)	2013	2013	2013	2013
194	(C-I-C)	2013	2013	2013	2013
195	(C-I-C)	2013	2013	2013	2013
196	(C-I-C)	2012	2012	2012	2012
197	(C-I-C)	2012	2012	2012	2012
198	(C-I-C)	2013	2013	2013	2013
199	(C-I-C)	2013	2013	2013	2013
200	(C-I-C)	2013	2013	2013	2013
203	(C-I-C)	2012	2012	2012	2012
221	(C-I-C)	2013	2013	2013	2013
235	(C-I-C)	2013	2013	2013	2013
256	(C-I-C)	2012	2012	2012	2012
257	(C-I-C)	2012	2012	2012	2012
NA	(C-I-C)	2013	2013	2013	2013

2.3.3 Leakage Survey

Transmission pipelines are on a one (1) year systematic survey frequency, whereby over a one (1) year cycle; the entire transmission pipeline is surveyed. The survey consists of the use of a mobile or portable Flame Ionisation Based gas detector.

All gas leaks reported on the Transmission system are investigated immediately and repaired. Criteria as specified in *Australian Standard AS2885.3 Pipelines – Gas and Liquid Petroleum – Operation and Maintenance*, *Technical Standard 5201 Leakage Management* and the *Gas Safety Act* are strictly adhered to.

2.3.4 Cathodic Protection

Corrosion protection systems are designed, monitored and maintained as a cost-effective means of preserving steel assets and controlling maintenance and replacement costs of the gas Transmission system. Corrosion protection for the gas Transmission system is achieved by the use of protective coatings, cathodic protection, and stray current drainage. Electrical isolation and electrical surge protection are necessary adjuncts to these systems.

All maintenance practices are carried out in accordance with the following references.

- AS 2885 Pipeline – Gas and Liquid Petroleum
- AS 2832 Cathodic Protection of Metals
- AS 2239 Galvanic (sacrificial) Anodes for Cathodic Protection
- Victorian Government Cathodic Protection Regulations-1998
- Corrosion Protection Services Manual
- Technical Standard 2315 - Cathodic Protection – Transmission Systems

As part of Cathodic Protection the following maintenance activities are carried out;

a. Potential Survey

At intervals not exceeding six (6) months a potential survey of the pipeline, including tests for stray current electrolysis must be performed. This survey ensures an acceptable level of protection is being maintained on the pipeline. The steel pipeline may be considered protected when the potential on all parts of its surface is equal to or more negative than -850mV relative to a saturated copper/copper sulphate reference electrode.

A summary of the results of these surveys is submitted annually to the Chief Electrical Inspector.

SP AusNet' target protection level for its transmission mains are 98%.

b. CPU (Corrosion Protection Unit) Maintenance

A CPU is a device providing cathodic protection current, powered from an external energy source. There are a number of CPU units on the Transmission system. All cathodic protection units are monitored at monthly intervals.

Identified faults are repaired to ensure that the particular pipeline is being protected satisfactory.

c. Coating Defect Survey

This is a survey conducted by traversing directly above a coated main along its length using equipment and techniques designed to identify any defects in the coating. Methods in common use are "Pearson Holiday" and Direct Current Voltage Gradient (DCVG) testing.

Pipeline coating assessment surveys shall be carried out at intervals determined by evaluation of risk associated with corrosion attack. Pipelines are either currently on a 10 year cycle (as determined by the then Gas & Fuel) or at 5 year intervals for reasons given below:

- Pipeline age
- Location of pipeline – inner suburbia, under hard surface, and stray current activities
- No means for pigging
- Number of faults detected on previous cycle
- Balance of work over 5 years
- Collection of more data to complement Integrity Management Plan

Following the non destructive coating survey, SP AusNet carries out dig ups to visually validate identified coating faults. The number of dig ups is considered based on the overall risk profile of the pipeline such as age of pipeline and type of coating, result of previous dig ups, potential loss of gas supply, public safety, environmental damage etc.

The below table outlines the current coating fault survey schedule by pipeline:

COATING FAULT SURVEY			
Licence No	**Diameter (mm)**	**Name**	**Scheduled Survey**
84	200	(C-I-C)	2013
76	300	(C-I-C)	2015
64	250	(C-I-C)	2015
197	350	(C-I-C)	2014
54	250	(C-I-C)	2013
18	400	(C-I-C)	2013
203	450	(C-I-C)	2014
189	200	(C-I-C)	2012
188	200	(C-I-C)	2012
19	300	(C-I-C)	2013
196	200	(C-I-C)	2014
113	500	(C-I-C)	2014
99	250	(C-I-C)	2015
97	200	(C-I-C)	2016
90	150	(C-I-C)	2016
82	300	(C-I-C)	2016
80	250	(C-I-C)	2016
57	300	(C-I-C)	2016
17	150	(C-I-C)	2014
16	100	(C-I-C)	2016

d. Stray Current Electrolysis Testing

This testing is undertaken in conjunction with the Victorian Electrolysis Committee (VEC) and is performed to identify any stray currents and interference connections that may be entering the ground from the tram and train system. This testing is carried out in a 5-year cycle. The testing is governed by the VEC and is not subject to variation by SP AusNet.

e. Protection from Electrical Surges and Induced Voltage

SP AusNet undertakes protection from the effects of electrical surge currents on gas pipes. Such currents may originate from lightning, or from earth fault currents on adjacent powered facilities, or may be induced by fault currents in nearby powerlines. Surge protection is carried out to limit the voltage on pipes to levels which:

5. Are consistent with accepted safety standards for protection of personnel who may come in contact with the pipe.
6. Will not cause damage to the pipe coating system or to the electrical isolation devices (such as isolating joints and fittings), which form part of the pipe corrosion control system.
7. Will not cause damage to the pipe metal due to high energy electric arcing.
8. Will not cause an electric arc that could act as a source of ignition in the event of a simultaneous gas escape.

Measures employed to control or minimise the effects of electrical surges include:

9. Surge diversion devices such as varistors, spark gaps, NiCad Battery/polarisation cells.
10. Electrical earthing in the form of discrete electrodes, earthing beds or lengths of earthing cable.
11. Earth safety mats to limit step and touch potentials adjacent to accessible points on the pipe.
12. Measures that restrict access to direct contact with the pipe or pipe appurtenances.

In 2010, a comprehensive study was carried out identifying all regulator pits which require surge protection for the middle pipework section. A risk assessment was undertaken which led to a prioritised list of pits to be protected (Details can be found in strategy document AMS 30-25).

All surge protection devices are inspected for effective operation at twelve (12) month intervals. Polarisation cells are checked for electrolyte level every twelve (12) months. Where protection devices fail the protection requirements, the device is reassessed and the installation redesigned as necessary.

Polarisation cells have their electrical characteristics measured every five (5) years. Such measurements normally require laboratory testing. Only cells, which have the required electrical characteristics, are returned to service.

2.3.5 Valve Maintenance

Valve maintenance for all valves on a Transmission pressure system consists of:

- restoring access cover, tube and surroundings to standard
- partially operating the valve to check for smooth operation,
- lubricant refill or replacement
- checking the installation for gas leaks

Scheduled valve maintenance is currently performed every twelve (12) months.

2.3.6 Transmission Pipeline Pigging

Internal inspection by pigging of licensed pipeline number 203 Keon Park West to North Melbourne (Ring main) is conducted on a fifteen (15) to twenty (20) year cycle. The

results of the pigging operation conducted in December 2009, indicate that the pipeline is in good condition. The identified coating faults are currently being assessed and planned for rectification accordingly.

SP AusNet' licensed pipelines are in good condition due to

- The high level of maintenance activity performed on Transmission pipelines.
- High quality of gas supplied (extremely low water and Sulphur content)
- Conservative design of SP AusNet's pipelines (all pipelines currently operate at less than 40% of SMYS) – refer to APPENDIX B – PIPELINE % SMYS.
- New technology being available to determine internal corrosion via external inspection
- The internal condition of the pipelines can be accessed by comparison with neighbouring pipelines that have been pigged.
- Pipelines and sections of pipelines will be subject to in depth risk analysis and prioritisation, with the establishment of a Pipeline Integrity Management Plan implemented.

In addition to introducing new, non-intrusive pipeline metal loss detection techniques, it is proposed to investigate opportunities to conduct intelligent pigging on selected pipelines in order to establish better baseline knowledge on the condition of SP AusNet' pipelines.

No Pipeline pigging test is scheduled on any SP AusNet Transmission Pipelines in 2012.

2.4 DISTRIBUTION SYSTEM-MAINS AND SERVICES

SP AusNet gas distribution system consists of mains and gas services supplying gas to domestic, commercial and industrial customers.

All mains and services are maintained in accordance with

- AS 4645.1 Gas distribution networks - Network management
- AS 4645.2 Gas distribution networks - Steel pipe systems
- AS 4645.3 Gas distribution networks - Plastics pipe systems
- Technical Standard TS 4127 Distribution Mains and Services
- Technical Standard TS 4004 Policy on Valves in Systems Operating at less than 1050kPa.
- Technical Standard TS 5201 Leakage Survey – Gas Distribution System
- Gas Safety (safety Case) Regulations
- SP AusNet Standard Procedure Manual

The Gas Distribution System Code, Schedule 1, Part A, describes minimum pressure requirements that must be maintained for all of SP AusNet's gas network systems as a condition of SP AusNet's distribution license. Maintenance activities that are performed to a schedule on the Distribution System are:

- Mains and Services Renewal
- Leakage Survey
- Cathodic Protection
- Valve Maintenance
- Marker Post Maintenance
- Exposed Pipe Maintenance

- Syphon Maintenance

A description of each maintenance activity is given below.

2.4.1 Mains and Services Renewal

SP AusNet replaces/renews its gas pressure mains and services in order to

- Lower risk due to mains leaks and mains blockages
- Enhance customer service in areas of the network serviced by defective pipes
- Improve reliability and safety
- Increase the value of its assets
- Control and reduce UAFG
- Improve system supply capacity
- Replace 'old' type Low Pressure District Regulating Stations
- Move towards a uniform High Pressure gas network
- Reduce maintenance costs

To identify distribution mains for replacement, SP AusNet undertakes analysis on areas considered to be high risk and high benefit.
Gas mains replacement areas, identified as high risk and high benefit, and are selected via the implementation of the following strategic analysis:

- Network Planning and Performance identify areas of poor gas supply and areas where high pressure backbone reinforcement is required.
- Identification of mains within High Breakage Zone (HBZ) areas.
- HBZ areas are areas which have historically recorded high number of breakages and public reported leaks. These areas consist of large quantities of cast iron pipe in reactive clay based soils susceptible to high ground movement.
- Low pressure pipes within close proximity to existing high pressure networks.
- Round table discussions with field maintenance personnel identifying pockets of multiple repairs and outages through local knowledge. This information is sometimes not obvious through the use of Spatial Analysis due to the inability to demonstrate local knowledge and also to piece together cause and effect scenarios to identify trouble areas.
- Medium Pressure cast iron areas
- Taken into account the outcomes of the above analysis, sizeable block renewals are developed via the use of data from the asset maintenance database and Spatial Analysis. The renewal block is finally reviewed with Network Planning and Performance representatives to ensure continuity and security of the surrounding low pressure network.

Source: AMS 30-11 – Gas Mains Replacement Strategy.

2.4.2 Leakage Survey

All pipes within SP AusNet's distribution network are risk assessed to determine their leakage survey cycle. This assessment looks at the mains pipe pressure, material type and area category.

Annual surveys will continue to be carried out in places of public congregation and areas classified as higher risk, i.e. transmission pipelines and internal services.

The survey consists of the use of a mobile or portable Flame Ionisation Unit, which detects gas leaks. All gas leaks reported on the Distribution system are categorised into Class 1or Class 2 leaks and investigated in accordance with the standard.

Criteria as specified in *Technical Standard 5201 Leakage Management* and the *Gas Safety Act* are strictly adhered to.

2.4.3 Cathodic Protection

Corrosion protection systems are designed, monitored and maintained as a cost effective means of preserving steel assets and controlling maintenance and replacement costs of the gas distribution steel pipe system. Corrosion protection for the gas distribution system is achieved by the use of protective coatings, cathodic protection, and stray traction current drainage. Electrical isolation and electrical surge protection are necessary adjuncts to these systems. All maintenance practises are carried out in accordance with the following references.

- AS 4645 Gas distribution networks
- AS 2832 Cathodic Protection of Metals
- AS 2239 Galvanic (sacrificial) Anodes for Cathodic Protection
- Victorian Government Cathodic Protection Regulations-1998
- Corrosion Protection Services Manual
- Technical Standard 2314 Cathodic Protection – Distribution Systems

As part of Cathodic Protection, the following maintenance activities are carried out;

a. Potential Survey

At intervals not exceeding six (6) months on high risk networks and intervals not exceeding twelve (12) months on lower risk networks a potential survey of the protected steel pipe is performed. This survey provides an acceptable level of protection is being maintained on the steel pipe. SP AusNet's target protection levels are:

- High pressure pipe 90%
- Medium pressure pipe 85%
- Low pressure pipe 85%

b. CPU (Corrosion Protection Unit) Maintenance

A CPU is a device providing cathodic protection current, powered from an external energy source. All cathodic protection units are monitored at monthly intervals. Identified faults are repaired to ensure that the particular pipe is being protected satisfactory.

c. Coating Defect Survey

This is a survey conducted by traversing directly above a coated main along its length using equipment and techniques designed to identify any defects in the coating. Methods in common use are "Pearson Holiday" and Direct Current Voltage Gradient (DCVG) testing.

Pipe coating assessment surveys shall be carried out as required by evaluation of risk associated with corrosion.

d. Coiling Survey

Location of unintentional earthed contacts to buried mains is required to facilitate their subsequent removal and to allow the cathodic protection system to function efficiency.

e. Stray Current Electrolysis Testing

This testing is performed to identify any stray currents and interference connections that may be entering the ground from the tram and train system. This testing is carried out in

a five (5) year cycle as specified in conjunction with the Victorian Electrolysis committee or as determined via the implementation of a test model.

f. Protection from Electrical Surges and Induced Voltage

SP AusNet undertakes protection from the effects of electrical surge currents on gas pipes. Such currents may originate from lightning, or from earth fault currents on adjacent powered facilities, or may be induced by fault currents in nearby powerlines. Surge protection is carried out to limit the voltage on pipes to levels which:

1. Are consistent with accepted safety standards for protection of personnel who may come in contact with the pipe.
2. Will not cause damage to the pipe coating system or to the electrical isolation devices (such as isolating joints and fittings), which form part of the pipe corrosion control system.
3. Will not cause damage to the pipe metal due to high energy electric arcing.
4. Will not cause an electric arc that could act as a source of ignition in the event of a simultaneous gas escape.

Measures employed to control or minimise the effects of electrical surges include:

1. Surge diversion devices such as varistors, spark gaps and polarisation cells.
2. Electrical earthing in the form of discrete electrodes, earthing beds or lengths of earthing cable.
3. Earth safety mats to limit step and touch potentials adjacent to accessible points on the pipe.
4. Measures that restrict access to direct contact with the pipe or pipe appurtenances.

All surge protection devices are inspected for effective operation at twelve (12) month intervals. Polarisation cells are checked for electrolyte level every twelve (12) months. Where protection devices fail the protection requirements, the device is reassessed and the installation redesigned as necessary.

Polarisation cells have their electrical characteristics measured every five (5) years. Such measurements normally require laboratory testing. Only cells, which have the required electrical characteristics, are returned to service.

2.4.4 Valve Maintenance

Valve maintenance for all accessible critical valves off the Distribution system is carried out in accordance with *Technical Standard TS 4004 Policy on Valves in Systems Operating at less than 1050kPa* and Australian Standard · *AS 4645 Gas distribution network management*

Valve maintenance consists of:

- restoring access cover, tube and surroundings to standard
- partially operating the valve to check for smooth operation,
- lubricant refill or replacement
- checking the installation for gas leaks
- For system critical valves maintenance is carried out:
    - every two (2) years to check for leaks and access
    - every six (6) years for operation and lubricant

2.4.5 Marker Post Maintenance

Marker Post Maintenance is performed as required to distribution pipe markers within the distribution and transmission systems.

2.4.6 Exposed Pipe Maintenance

Maintenance on all exposed pipe is done in accordance with AS 4645 and SP AusNet Field Procedure 6.15 Inspection of Exposed Gas Pipelines. Each exposed pipe is visited annually for a condition inspection. Exposed pipe is repaired and recoated as required.

2.4.7 Syphon Maintenance

Syphon maintenance, whereby problematic syphons are pumped of debris, is performed on a dynamic schedule based on the syphons history of collection.

2.4.8 Internal Service Maintenance

A four yearly "internal service condition report" on identified internal services, based on history, the approved Service Provider shall maintain safety inspections, leakage survey and any requested alterations. For further detail refer to *Technical Standard 4165 Policy for Internal Gas Services Installations*.

3 APPENDICES

Appendix A - Gas Maintenance Activities

Appendix B – Pipeline % SMYS

APPENDIX A – GAS MAINTENANCE ACTIVITIES

Asset	Type Of Maintenance	Comment	Frequency
City Gate	Operational Check	Heaters	6 monthly
City Gate	Operational Check	Regulators (Check)	6 monthly
City Gate	Periodic Maintenance	Regulators (Full Strip)	3, 6 or 10 Years
City Gate	Periodic Preventative	Painting	As required
City Gate	Operational Check	Slam Shut (Check)	6 monthly
City Gate	Periodic Maintenance	Slam Shut (Full Strip)	3, 6 or 10 Years
City Gate	Periodic Maintenance	Heater Coil	6 yearly
City Gate	Periodic Maintenance	Coalescer	6 or 10 Years
SCADA	Operational Check	Controlled sites	12 monthly
SCADA	Operational Check	Monitored sites	12 monthly
SCADA	Operational Check	Fringe site (Control)	12 monthly
SCADA	Operational Check	Fringe site (monitor)	12 monthly
SCADA	Periodic Preventative	SCADA Motor	6 yearly
City Gate/Field Regulator	Site Maintenance	Weeding/Safe house keeping	4 monthly or as required
Field Regulator	Operational Check	Regulators (Non SCADA)	Monthly chart Run
Field Regulator	Operational Check	Regulators (Check)	6 monthly
Field Regulator	Periodic Preventative	Regulators (Full Strip)	6 or 10 Years
Field Regulator	Periodic Preventative	Painting	As Required
Field Regulator	Operational Check	Slam Shut (Check)	6 monthly
Field Regulator	Periodic Preventative	Slam Shut (Full Strip)	6 or 10 Years
District Reg	Operational Check	Check	1 Week / Monthly
District Reg	Operational Check	Regulators (Check)	6 monthly
District Reg	Operational Check	Regulators (Check)	12 monthly
District Reg	Periodic Preventative	Regulators (Full Strip)	6 Yearly
District Reg	Periodic Preventative	Painting	As Required
Large I&C Meter Reg Set	Operational Check	Regulators	12 monthly/6 monthly
Large I&C Meter Reg Set	Periodic Preventative	Regulators	0, 6 or 10 Years
Large I&C Meter Reg Set	Periodic Preventative	Painting	As Required
Large I&C Meter Reg Set	Operational Check	Data logger / Flow Computer (metering)	6 or 12 monthly

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Asset	Type Of Maintenance	Comment	Frequency
Large I&C Meter Reg Set	Operational Check	Coalescer	3. 6 or 12 monthly
Small I&C Meter Reg Set	Breakdown	Regulators	As required
Small I&C Meter Reg Set	Breakdown	Painting	As required
Domestic Reg	Breakdown	Replacement	As required
Transmission Pipeline	Operational Check	Patrol Includes Marker post	Daily
Transmission Pipeline	Operational Check	Leakage Survey	Yearly in accordance with TS 5201
Transmission Pipeline	Predictive Replacement	Replacement	As required
Transmission Pipeline	Operational Check	Valve	12 monthly
Transmission Pipeline	Periodic Preventative	Exposed Pipe	12 monthly
Transmission Pipeline		Corrosion Protection	
Transmission Pipeline	Operational Check	a. Potential Survey	6 monthly
Transmission Pipeline	Operational Check	b. CPU Monitoring	Monthly
Transmission Pipeline	Operational Check	c. Coating Defect Survey	5 yearly or 10 yearly
Transmission Pipeline	Operational Check	Upstand Transition Piping	12 monthly
Mains	Predictive Replacement	Replacement	Yearly
Mains	Breakdown	Replacement	As required
Mains	Operational Check	Critical Valve Check	2 Yearly
Mains	Periodic Preventative	Marker Post	Yearly
Mains	Operational Check	Exposed Pipe	Yearly
Mains	Periodic Preventative/Breakdown	Syphons	As required
Mains & Services (High Risk)	Operational Check	Leakage Survey	Yearly in accordance with TS 5201

Asset	Type Of Maintenance	Comment	Frequency
Mains & Services Internal Service	Operational Check	Leakage Survey	In accordance with TS 5201
Mains & Services	Operational Check	Corrosion Protection	
		a. Potential Survey	6 monthly / 12 monthly
		b. CPU Monitoring	monthly
		c. Coiling Survey	As it requires.
		Upstand Transition Piping	2 Yearly
	Periodic Preventative	Exposed Pipe	Yearly
Service	Breakdown	Replacement	As Required
Service	Predictive Replacement	Replacement	As Required
Service	Operational Check	Valve	In conjunction with Sys Ops Reg Check
Meter Domestic	Breakdown	Replacement	As required
Meter Domestic	Predictive Replacement	Replacement	15 Years +
Meter I&C	Breakdown	Replacement	As Required
Meter I&C	Period Preventative	Replacement	10 Years plus

APPENDIX B – PIPELINE % SMYS

(C-I-C)