Guidelines for a Certificate of Fitness for High-Pressure Gas and Liquids Transmission Pipelines

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Contents

INTRODUCTION

In November 1999, the Health and Safety in Employment (Pipelines) Regulations 1999 [hereafter referred to as the HSE (Pipelines) Regulations 1999] were enacted to replace the existing Petroleum Pipelines Regulations 1984. The new regulations introduced a significant change in regulatory policy, requiring all pipelines to be operated with a current "Certificate of Fitness" issued by a recognised Certifying Authority.

These Guidelines are intended to provide guidance for the provision of a Certificate of Fitness for a pipeline, by a Certifying Authority recognised by the Secretary of Labour, in compliance with the requirements of the HSE (Pipelines) Regulations 1999. The Guidelines are intended to assist both the pipeline owner/operators and the certifying authorities to achieve the minimum requirements necessary in order to obtain a Certificate of Fitness for a pipeline.

In summary, in relation to a Certificate of Fitness for a pipeline, the HSE (Pipelines) Regulations 1999 require the ***"employer"*** ***(owner/operator)*** to ensure that:

- A pipeline is not to be operated unless there is a current Certificate of Fitness.
- The Certificate of Fitness is in respect of:
  - the pipeline; and
  - all equipment necessary for the safe operation of the pipeline.
- A copy of the Certificate of Fitness is to be provided to the Secretary before the pipeline is operated.

In respect of the ***"Certifying Authority"***, the HSE (Pipelines) Regulations 1999 impose the following duties:

- Carry out such inspections or examinations of pipelines, and equipment fixed to or associated with pipelines, as may be necessary to determine the safety of such pipelines and equipment.
- Issue Certificates of Fitness in respect of the safety of the structure of pipelines and other equipment necessary for the safe operation of the pipelines.
- Impose limitations or conditions if the pipeline or equipment no longer complies with the relevant Certificate of Fitness.
- Ensure that the certification is in accordance with a Code or Standard recognised by the Regulations, but as a minimum standard in accordance with the Code or Standard to which the pipeline was designed and built.
- Issue the Certificate of Fitness in accordance with Schedule 1.
- Specify the expiry date of the certificate, ensuring that the term shall be no longer than five (5) years.
- Consider the conditions of the "Pipeline Authorisation" (if any).

The HSE (Pipelines) Regulations 1999 also make reference to conditions when a pipeline or equipment no longer complies with the Certificate of Fitness:

- The pipeline is operated beyond the expiry date of the Certificate of Fitness issued; or

- If the pipeline or equipment:
  - Sustains damage; or
  - Shows signs of deterioration that could affect the integrity of the pipeline or equipment; or
  - Is structurally modified or replaced.

In the event that a pipeline or equipment no longer complies with the Certificate of Fitness, the pipeline must cease to operate, or may continue to operate under conditions or limitations imposed as required by the Certifying Authority.

For full details and legal requirements for the above information, refer to the appropriate sections of the HSE (Pipelines) Regulations 1999.

NOTE: The Certificate of Fitness issued by a Certifying Authority is specific to the owner/operator at the time of certification, and applies only to the pipeline and equipment specified on the certificate. Where a pipeline, with a current Certificate of Fitness, is assigned to another owner/operator, the Certifying Authority may need to confirm that the pipeline operating procedures, the safety management systems, and quality management systems, previously approved, are not invalidated by the assignment.

PURPOSE

The purpose of the Certificate of Fitness is to demonstrate to the regulating authority (Occupational Safety and Health Service, Department of Labour), by means of a recognised third party (Certifying Authority), that a pipeline and associated equipment is "fit for purpose" by confirmation that it is designed, constructed, operated, maintained and/or abandoned (as the case may be) in accordance with a recognised Code or Standard; or if parts are not covered by a Code or Standard, in accordance with generally accepted and appropriate industry practice.

Overall responsibility for the safety and integrity of the pipeline and associated equipment always remains the responsibility of the pipeline owner/operator. The third party certification, by means of a Certificate of Fitness, provides an independent audit of the owner/operator to verify that the pipeline and associated equipment is in compliance with a recognised Code or Standard. This audit provides a "snap shot" of the pipeline at the time of certification. The continued safe operation of the pipeline, in accordance with the recognised Code or Standard, remains the responsibility of the owner/operator for the duration of the certification issued. Before the expiry date of the Certificate of Fitness issued, or in the event that the pipeline and/or equipment no longer complies with the certificate due to the criteria specified in Regulation 11 of the HSE (Pipelines) Regulations 1999, the owner/operator must ensure that the certification is renewed for the continued operation of the pipeline.

A Certifying Authority may require a brief annual review to ensure that the pipeline continues to comply with the Code or Standard.

SCOPE

This document, *Guidelines for a Certificate of Fitness for High-Pressure Gas and Liquids Transmission Pipelines*, applies to all pipelines as defined in Regulation 2 of the HSE (Pipelines) Regulations 1999.

Regulation 2 of the HSE (Pipelines) Regulations 1999 defines a "pipeline" as follows:

"Pipeline"

(a) Means —

(i) Any pipeline that was authorised under the Petroleum Act 1937; or

(ii) Any pipeline or proposed pipeline likely to be permanent and used or intended to be used for the conveyance of any mineral, petroleum, geothermal fluid, natural gas, or any other fluid that, at ambient conditions, has inherent properties that may create a significant hazard; and

(b) Includes any part of a pipeline or proposed pipeline, including —

(i) Any directly associated fitting, pig launcher, or receiver; and

(ii) Any pressure vessel and its associated appurtenances, including any compressor, filter, separator, coalescer, or pulsation bottle; and

(iii) Any natural gas cooler associated with any pipeline compressor, pump, or tank; and

(iv) Any appurtenance required for the conveyance of the product or material in the pipeline or for its safe operation; but

(c) Does not include —

(i) Any bulk storage installation; or

(ii) Any pipeline wholly within the boundary of the plant that the pipeline is servicing; or

(iii) Any pipeline between a bulk storage installation and another form of transport that is not an extension of a pipeline as defined in these regulations; or

(iv) Any pipeline with a pressure of 2000 kP gauge or less under the control of a gas distributor and used to distribute gas from the boundary of the gas works or gate station or outlet flange supplying gas for distribution; or

(v) Any pipeline or part of a pipeline offshore that forms part of an offshore petroleum operation; or

(vi) Any pipeline 150 mm in diameter or less that is not associated with the production of electricity and that contains geothermal fluids; or

(vii) Any pipelines solely used for the purposes of conveying water:

IMPORTANT NOTE:

The Guidelines use the word "***should***" rather than "shall" in the recommendations. As the Guidelines cover a number of Pipeline Standards or Codes, all recommendations may not apply to all Standards or Codes, however all recommendations specific to one of the designated Codes or Standards will be ***mandatory***. Where the Guidelines reference statutory requirements in the recommendations, these provisions will be ***mandatory***.

GUIDELINES FOR CERTIFICATION: EXISTING PIPELINES

INTRODUCTION

The HSE (Pipelines) Regulations 1999 require every pipeline in existence at the date of commencement of the regulations, (enacted on 14 November 1999), to operate with a current Certificate of Fitness within 18 months of that date, or by 14 May 2001.

Codes or Standards

The Certificate of Fitness will certify that the pipeline, and all equipment necessary for the safe operation of the pipeline, complies with the Standard or Code to which the pipeline was designed, constructed, operated and maintained.

Standards or Codes applicable to transmission pipelines and associated equipment in operation in New Zealand include the following:

- US Minimum Federal Safety Standards for Gas Lines - Part 192
- ASME B31.3 *Chemical Plant and Petroleum Refinery Piping*
- ASME B31.4 *Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols*
- ASME B31.8 *Gas Transmission and Distribution Systems*
- *Institute of Petroleum Pipeline Safety Code* (IP Part 6)
- NZS 5223 *Code of Practice for High Pressure Gas and Petroleum Liquids Pipelines*
- NZS/AS 2885 *Pipelines — Gas and Liquid Petroleum.*

Each Standard or Code will have a different set of criteria to certify the pipeline.

Where a pipeline does not have a Standard or Code specified, and the pipeline was in operation prior to November 1999, the New Zealand Standard NZS 5223 should be used.

An operator may elect to have a pipeline certified to a higher Standard or Code.

Authorised Pipelines

Gas, liquid petroleum and mineral transmission pipelines were issued with a "pipeline authorisation" under the provisions of Part II of the Petroleum Act 1937. "Pipeline authorisations" were not issued for new pipelines constructed after 1993 when the Petroleum Act 1937 was revoked, following the introduction of the Health and Safety in Employment Act 1992 that year.

"Pipeline authorisations" are equivalent to a 'licence" and contained technical details and conditions specific to each pipeline. For the certification of an authorised pipeline, the "pipeline authorisation" must be consulted as the document may provide relevant details which could include the following:

- The Code or Standard to which the pipeline was designed, constructed, operated and maintained.
- The defined start and end points of the pipeline. (NOTE: These points may differ from the Code definitions but the "pipeline authorisation" takes precedence).
- The maximum allowable operating pressure (MAOP).
- Pipe specifications and minimum wall thickness.
- Special conditions applicable to the pipeline due to the nature of the product, or to specific features identified along the pipeline route.

Non-Authorised Pipelines

Non-authorised pipelines consist of gathering lines, flow lines, intra-field pipelines, and those transmission pipelines designed, constructed, and operated after the Petroleum Act 1937 was revoked in 1993. For these pipelines, the Code or Standard used in the design, construction, operation and maintenance of the pipeline was specified by the owner/operator prior to construction.

ISSUES FOR CONSIDERATION FOR CERTIFICATION

For the certification of an existing pipeline, an assessment of fitness is more difficult than that required for a new-built pipeline, as a physical examination of the pipeline is limited when the pipeline is buried below ground. The assessment would be expected to focus primarily on the service history and the ongoing operation and maintenance plans for the pipeline.

Due to the limitations in physically examining the existing pipeline, it is recommended that operators prepare a "Pipeline Integrity Report" to demonstrate that the pipeline complies with Code or Standard requirements, and is fit for service. Part of the "Pipeline Integrity Report" should include a risk assessment of the pipeline. The report would provide an assurance to the operator that all risks had been identified and were appropriately managed. The document will also provide the essential information necessary to determine the condition of the pipeline, and will also provide a benchmark for the pipeline owner/operator to demonstrate that the asset is safe to operate. All statements and analyses included in the report should be supported by the appropriate data and documentation, or should reference supporting data where applicable.

The "Pipeline Integrity Report" would provide a Certifying Authority with an auditible document upon which to base an assessment for the issuance of a Certificate of Fitness in accordance with the requirements of the HSE (Pipelines) Regulations 1999.

An assessment for the certification of an existing pipeline would be expected to consider at least the following issues:

1. DESIGN VERIFICATION

Where available, the operator should have compiled sufficient design information to demonstrate that the pipeline and appurtenances were designed in accordance to

relevant Codes and accepted industry practice.

The operator should prepare a facilities description for each pipeline, describing in summary the pipeline details including layout, components, design criteria, acceptance limits, and the operational philosophy for the pipeline.

1.1 Design Review

A design review should be undertaken to verify compliance with Code requirements at the time of construction, and that any additions, or modifications to the pipeline have been in accordance with the original design specifications. The design review should consider, but not be limited to, the following:

1.1.1 Design Criteria

The operator should demonstrate, by documentation, the design criteria for the pipeline. Evidence should be available to demonstrate that the pipeline limitations established by the design criteria have not been exceeded during the operation of the pipeline.

1.1.2 Design Life

The design life of the pipeline should be verified from the original design criteria to ensure that the pipeline remains operating within the specified period of the stated design life. The operator is required to have completed, and accepted, an approved engineering investigation where a pipeline has been operated beyond the end of the design life.

1.1.3 Location Classification

The operator should demonstrate that the design class locations along the pipeline route are reviewed, and where necessary reclassified, where land use changes have occurred along the pipeline easement. The reclassification of location class may have required additional mitigation methods.

1.1.4 Maximum Allowable Operating Pressure (MAOP) Determination

The operator should document the method adopted for the determination of the MAOP established for the pipeline. Where the MAOP has been increased or decreased from the original design criteria, the operator is required to demonstrate the methodology used to establish the revised MAOP, and evidence of the regulatory approval granted.

1.1.5 Material Specification

The material specifications of the pipeline components should be documented on file. The operator should demonstrate that all additions, modifications, and repairs to the pipeline comply with the design specifications.

1.1.6 Product Specification

The original product specifications for the pipeline should be verified to ensure compliance with the original design parameters. Where a change in the specification of the pipeline product has occurred, evidence of regulatory approval would be required.

1.1.7 Corrosion Allowance

The design of the pipeline should be reviewed to verify the level of corrosion allowance designed into the pipeline. The operator should demonstrate how the pipe wall thickness is assessed to ensure adequate pipeline integrity to enable continued operation up to the MAOP.

1.1.8 Crossings

Crossings including road, rail, waterways and tunnels should be inspected and tested by the operator at appropriate intervals to ensure ongoing integrity in accordance with the design criteria.

1.1.9 Review of Pipeline Route

The operator should demonstrate that the pipeline route is systematically assessed at appropriate intervals to ensure that the pipeline design is not compromised by new hazards identified along the pipeline route. Where changes have been made to the land use on the easement, or land stability has been compromised, appropriate mitigating methods have been implemented for the pipeline.

2. CONSTRUCTION VERIFICATION

A review of key documentation retained from the construction phase of the pipeline should be reviewed and verified for Code compliance. Of significant importance are the pipe jointing details and the acceptance criteria, the joint coating procedures, the quality of the backfill and pipe padding material, and the cleaning and gauge pigging of the pipeline.

2.1 Construction Details

Materials used in the construction of the pipeline should be verified to be consistent with the pipeline design criteria and specifications. Pipe bends should be consistent with the design and operational performance of the pipeline.

2.2 Welding

Welding procedures and welder qualifications should be made available by the operator to assess compliance with the pipeline jointing and acceptance criteria of the weld by NDT methods. Quality assurance packages will provide most of this data.

2.3 Trenching and Backfill

The operator should provide details of the padding, warning tape, and backfill used in the trench. Details of rock shielding in areas with stony soils should be reviewed.

2.4 Crossings

Details of all crossings, including rail, road, waterways and tunnels constructed should be verified with the design requirements.

2.5 Depth of Burial

The operator should demonstrate evidence of the depth of burial along the pipeline route, and that adequate procedures are in place to ensure adequate cover is maintained over the entire length of the pipeline.

2.6 As-Built Drawings

The operator should demonstrate that "as-built" drawings have been completed for the pipeline, following construction, and that all additions and modifications to the pipeline are included on such drawings.

2.7 Coatings

Procedures for the application of pipe coatings, quality assurance evidence and the experience of personnel should be provided where available.

2.8 Cleaning and Gauging

Details of the pigging of the pipeline for cleaning and gauging should be available. Details of the gauge plates will provide evidence of pipe wall condition in terms of freedom form ovality and dents.

3. PRESSURE TESTING VERIFICATION

A review of the hydrostatic pressure test procedures and records will be required to confirm that the pipeline and all associated equipment have been tested and certified to operate at the designated maximum working pressure. Any equipment or components not included in the pressure test must be accompanied by a suitable certificate.

3.1 Testing

The operator should provide evidence of the maximum and minimum test pressures calculated and stipulated for the hydrostatic pressure test, and details of the testing procedures. Evidence of the pipeline fill volumes, strength tests and settle tests should be reviewed.

3.2 Hydrostatic Test Records

The hydrostatic test records should be examined to confirm that the pipeline was tested in accordance with procedures as has been certified fit to operate at the designed pressure. The operator will be required to furnish evidence that the hydrostatic pressure test was witnessed by a statutory authority.

NOTE: Consult Completion of Satisfactory Test Certificates (Form 7) or certificates from a Certifying Authority.

3.3 Equipment Certificates

Any equipment or components not included in the test must be accompanied by

certification that the component has been tested to operate at the designed pressure. The items not included in the test must only be an exempted item.

NOTE Exempted items include meters, some pumps, reliefs, pressure control devices.

4. OPERATION REVIEW

A review of the pipeline operation will form a key part of the pipeline Certificate of Fitness assessment. Evidence will need to be provided to assure the assessor that the pipeline is operated, and will be continued to be operated, in compliance with the engineering design criteria and Code requirements. The assessment should focus on the adequacy of operating procedures, emergency procedures, and the competency of operating and supervisory personnel.

4.1 Operating Procedures

The operator should have normal operating procedures in place that ensure that the pipeline is only operated under the conditions it was designed, constructed, tested and certified. The normal operating procedures should be in a written format as a control document that demonstrates how the pipeline will be operated in accordance with Code requirements.

4.2 MAOP Management

The operator should demonstrate in the operating procedures how the MAOP will be managed to ensure that during normal operations the MAOP will not be exceeded, and that at transient pressure the pipeline pressure will not exceed 110% of the MAOP.

4.3 Easement Management

The operator should demonstrate that adequate procedures are in place for the management of the pipeline easement to ensure that the pipeline is free from identifiable leaks, and that any unacceptable risks to the pipeline are identified. The procedures should include reference to the following:

4.3.1 Patrolling

Pipeline surveillance should be assessed to ensure that the type and frequency of the surveillance is determined by the consequences of the hazards identified along the pipeline route, and what mitigation methods have been implemented on the pipeline. Reference will need to be made to any special surveillance conditions that may have been imposed on the pipeline by the pipeline authorisation. These imposed conditions will take precedence. The operator should maintain written evidence of pipeline surveillance and demonstrate corrective action, where required.

4.3.2 Landowner Liaison

The operator should have procedures to ensure that regular third party awareness is undertaken to inform all landowners, occupiers and appropri-

ate authorities of the pipeline operation and emergency procedures. The procedures should capture changes in land ownership to ensure all new owners, or occupiers, are informed.

4.3.3 Land Use Changes

The operator should have procedures in place to reassess the location classification along the pipeline route in response to changes in land use. Where the land use changes have occurred, additional mitigating measures may have been required.

4.3.4 Control of Third Party Works

The operator should have an appropriate work permit system in place, and work procedures, to control external interference, including third party works, in the vicinity of the pipeline. The operator should have a one-call system in place for notification of intended works.

4.4 Safety and Operating Plan

The operator should have a safety and operating plan that adequately describes the pipeline system and facilities, identifies all possible events and the safeguards in place for these events, and details of pipeline inspections, surveys, maintenance intervals, etc. planned for the ongoing operation of the pipeline.

4.5 Emergency Procedures

The operator should have an emergency plan in place for the pipeline. The emergency plan will need to demonstrate that emergencies are responded to promptly, and that periodic drills dealing with emergencies are undertaken. All emergency contact lists must be current, and all operational personnel fully aware of their responsibilities in terms of the plan.

4.6 Operator Competency

The operator should maintain adequate records to demonstrate that all operational personnel have the necessary training and skill to safely carry out their assigned tasks.

4.7 Isolation Valves

The operator should ensure that procedures are in place to demonstrate that all isolation valves, and associated safety equipment, are regularly inspected and function tested.

4.8 Signage

The operator should ensure that pipeline markers, visible and identifiable from both the air and ground, mark the pipeline route in accordance with the spacing and construction requirements of the Code.

4.9 Incident Investigation/reporting

The operator should have an adequate procedure for reporting, and investigating all

incidents that have occurred on or in the near vicinity of the pipeline, including leaks, third party damage, near-miss incidents, equipment failure, overpressure, etc. All incidents should be adequately investigated and corrective action taken where recommended. All incidents for each pipeline should be documented to record the pipeline history.

4.10 Odourant injection

Where required, the operator should demonstrate that adequate procedures are in place to ensure adequate dosing of the pipeline product is established and maintained, and that appropriate safety precautions are provided and maintained.

4.11 Change Management

Where any changes to the original specified design conditions have occurred, the operator should demonstrate that these changes have been fully assessed, and the appropriate regulatory approval has been issued.

4.12 Operations Review

The operator should have procedures in place to review, at appropriate intervals, the suitability of the pipeline systems and the conditions of the pipeline operation, to include a review of the design life if exceeded, a review of MAOP, and a review of the pressure control and overpressure protection systems.

5. MAINTENANCE REVIEW

A review of the maintenance procedures and pipeline history will form the key element in the pipeline assessment. A review of the maintenance procedures and records will provide the assessor with an indication of whether the pipeline is still operating within the design criteria, and Code requirements. In other words, whether the pipeline is still "fit for purpose".

In addition to maintaining comprehensive internal records and procedures for all pipelines, all owners/operators should compile data in a pipeline integrity management plan for each pipeline at least on an annual basis. The pipeline integrity management plan will provide the data for the "Pipeline Integrity Report."

5.1 Pipeline Integrity

The operator should have a documented system for pipeline maintenance and corrosion prevention to ensure that the pipeline is maintained to operate to the design criteria. The operator should demonstrate that periodic audits are undertaken to assess the integrity of the pipeline, and the adequacy of the operational and maintenance procedures.

5.2 Monitoring Plan

The operator should ensure that a monitoring plan is in place to track and document the inspection and testing requirements detailed in the Safety and Operating Plan, to ensure compliance of the pipeline with the engineering design.

5.3 Pipeline Inspection and Assessment

The operator should demonstrate that an inspection and assessment of is undertaken to include a full visual survey of all the above-ground sections of the pipeline, and an audit of the corrosion control facilities. The operator would need to provide evidence of the external and internal condition of the piping. Intelligent pigging surveys are an accepted method of demonstrating the external and internal condition of a pipeline. Other methods that may be considered include an assessment of the critical sections of a pipeline, with subsequent bell hole inspections of coatings and a measurement of wall thickness. Evidence from coupons cut from the pipe during hot tapping or documented internal examinations during valve removal etc. can be considered as part of the assessment. The operator should establish the period of inspection of the pipeline based upon the past history of the pipeline, current condition, rate of deterioration, and statutory requirements. Defects posing a risk to the integrity of the pipeline shall be rectified immediately.

5.4 Coatings Maintenance

The operator should have a procedure in place to ensure that the pipeline coating above and below ground is assessed, and repaired where necessary, at an appropriate interval. For underground piping, an acceptable coating defect survey, CP results, and visual inspection methods can be used to assess the coating integrity.

5.5 Pipewall Defect Assessment

The operator should ensure that pipewall defects are assessed by detailed analysis in accordance with Code requirements. Where defects are found to be in excess of the Code requirements they shall be removed, replaced or repaired as directed by the Code. Records of pipewall defect assessments, and the action taken, shall be documented.

5.6 Internal Corrosion

The operator should demonstrate that an estimation of the potential rate of the internal degradation of the pipeline has been assessed with regard to the pipeline product. Where a corrosive product is transported, an accepted corrosion mitigating measure shall be demonstrated such as linings, inhibitors, corrosion allowance, etc.

5.7 External Corrosion

The operator should demonstrate the measures taken to protect the external surface of the pipeline. Pipe coatings shall be suitable for the service conditions and be properly applied by qualified personnel. Coating repairs must be carried out in accordance with strict procedures to ensure adequate protection and compatibility with the existing coatings. Extra measures are required in circumstances where the pipe coating may be damaged by rock, etc. Where CP is used, it must be operated in accordance with the design criteria. Extra pipe wall thickness may be used in some applications to provide additional protection.

5.8 Stress Corrosion Cracking

If stress corrosion cracking (SCC) is a concern, the operator must be able to demonstrate how the susceptibility to SCC is reduced, and what risk reduction measures are in place.

5.9 Ancillary Equipment Assessment

The operator should ensure that all valves are inspected and function tested at appropriate intervals to ensure that they are fully operable, free from leaks, secure, free from corrosion, and are properly supported. Inspections should be made in areas prone to corrosion, such as pipeline supports, and areas where the pipe enters the ground. All inspections and tests shall be documented.

5.10 Casing Inspections

The operator should have procedures to regularly inspect and test pipeline casings for electrical isolation, and the absence of product leakage.

5.11 Repairs

The operator should demonstrate that procedures are in place to ensure corrective action is initiated immediately to a pipeline leak, and where necessary steps are taken to shut down the pipeline, or reduce the operating pressure to effect the repair. The operator should ensure that an acceptable repair strategy is in place, and that permanent repairs are undertaken in accordance with strict procedures and Code requirements.

6. GATE STATIONS, COMPRESSOR STATIONS, PUMP STATIONS

6.1 Stations

The operator should have procedures in place to ensure that all stations for pumps, compressors, meters, mainline valves, pressure regulators, odourisers and others are operated safely for both operational personnel and the public. All stations should be adequately fenced and secured.

6.2 Vessels

The operator should ensure that all pressure vessels are tested and certified at the appropriate intervals by third party inspection, and that the pressure equipment is not operated outside of the specified design limits.

6.3 Compressors and Pumps

The operator should ensure that compressors, pumps and similar equipment are operated and maintained in accordance with the manufacturer's recommendations. All safety systems should be checked and tested at appropriate intervals, and all records kept.

7.1 Cathodic Protection (CP) System

7.1.1 Design

The operator should demonstrate that the cathodic protection system, where used, meets the design criteria for protection of the pipeline. Details of the derivation of the total current required, resistivity of the soils along the pipeline route, and the identification of any special features on the route that may affect the CP system should be documented. The spacing of the test points must comply with location class requirements along the pipeline.

7.1.2 CP Monitoring

The operator should ensure that inspections are carried out at appropriate intervals to ensure that the CP system is operating satisfactorily in conformance to the design criteria. The inspections should be documented and verify that the transformer and rectifier units, stray current control and drainage bonds are operating correctly. The operator should carry out pipeline potentials, and tests for stray current electrolysis at appropriate intervals and document. Steel casings should be tested to ensure electrical isolation from the pipeline.

7.2 Leak Detection

7.2.1 Design

The operator should ensure that the leak detection system fully meets the design criteria and functions in accordance within the full range of pipeline operations. The leak detection system should be designed to operate to adequately detect and respond to pipeline leakage.

7.2.2 Monitoring

The operator should ensure that the leak detection system is inspected and tested to be fully operational in accordance with the design criteria.

7.3 Overpressure Protection

7.3.1 Design

The operator should demonstrate that appropriate pressure control devices are in place to ensure that the pipeline and associated equipment are not operated in excess of the MAOP.

7.3.2 Inspection and Testing

The operator should demonstrate that adequate procedures are in place to ensure that all pressure control and protective equipment is subjected to systematic inspection and testing to demonstrate that the equipment is operating correctly and the devices are set to function at the correct pressure.

NOTE: INCOMPLETE RECORDS:

Inevitably, particularly with pipelines constructed prior to 1980, there will be instances where pipeline records may not be complete.

The primary source of data for each pipeline is with the owner/operator. Additional sources where pipeline records are kept are as follows:

Occupational Safety and Health Service, Department of Labour

— contact the Chief Petroleum Inspector.

Crown Minerals, Ministry of Economic Development

— contact an Advisor, Policy and Risk Management Group.

All requests for information from Government Departments must be made through the owner/operator, for commercial reasons.

Individual hydrostatic pressure test records may be missing from the pipeline files. However, if a Form 7 — Certificate of Satisfactory Test — is available for that section of pipeline, the initial pressure integrity of the pipeline would have been assured. If a particular Form 7 certificate cannot be traced for a pipeline, initial verification of the integrity of the pipeline would be assumed if the regulatory authority acknowledged and approved the ongoing operation of the pipeline since construction.

In some instances where records may be incomplete, the Certifying Authority may have to use "sound engineering judgement". A written explanation with details of the reasoning and the conclusions derived, must accompany cases where "sound engineering judgement" has been used.

GUIDELINES FOR CERTIFICATION: NEW PIPELINES

INTRODUCTION

A Certificate of Fitness for a new pipeline, will certify that the pipeline, and the equipment necessary for the safe operation of the pipeline, complies with the requirements of the Codes and/or Standards to which the pipeline is to be designed, constructed, operated and maintained. The process for the certification of the pipeline will require a methodical and systematic assessment and review of each section of the applicable Code/Standard. The assessment for a new pipeline would be more structured and tangible than an assessment for an existing pipeline.

Codes/Standards

The owner/operator of a new pipeline will specify the Standards or Codes applicable to the pipeline. Preference should be given to adopting the NZS/AS 2885 Pipeline Standard. This Standard requires a risk assessment in the design phase, and was initially adopted as a NZS/AS Standard to replace the outdated New Zealand Standard NZS 5223. The NZS 5223 Standard is still referenced in the HSE (Pipelines) Regulations 1999 as it is still applicable to existing pipelines, but should be discouraged from use for new pipeline projects.

The Code or Standard used for the design and construction phases of the pipeline may differ from the Code or Standard adopted for the operation and maintenance, however a written justification should accompany such a decision.

ISSUES FOR CONSIDERATION FOR CERTIFICATION

The guidance details listed below are based on "best practice" in accordance with NZS/AS 2885 Standard and may not be applicable to all Codes.

In terms of "best practice" the assessment would be expected to consider the following issues:

1. DESIGN

Every pipeline shall be leak-tight and have the necessary capability to safely withstand all reasonably predictable influences to which it may be exposed during the whole of its design life.

1.1 Risk Assessment

1.1.1 The operator should demonstrate that each threat to the pipeline and each risk from loss of integrity of a pipeline are systematically identified and evaluated, and that action to reduce threats and risks from loss of integrity is implemented so that risks are reduced to as low as reasonably practical (ALARP).

1.1.2 The operator has a procedure to ensure that the identification of threats and risks from loss of integrity and their evaluation is an ongoing process over the life of the pipeline, at a recommended period not exceeding 5 years.

1.1.3 The assessment of risks and the management of risks is carried out by competent and experienced personnel.

1.2 Design Criteria

1.2.1 The operator should carry out a structured design process, appropriate to the requirements of the specific pipeline, to ensure that all safety, performance and operational requirements are met during the design life of the pipeline.

1.2.2 The design process should include an assessment of risks to the pipeline and the community and shall reflect the obligation of the designer to provide reasonable protection for the pipeline and the community against the consequences of the hazards identified during the assessment of risks.

1.2.3 The design criteria for the pipeline system should be defined and documented and should be appropriate to the approved design life. The design criteria should include, but not be limited to the following:

i. Design pressure, internal and external;

ii. Design temperature;

iii. Wall thickness including design factor and corrosion allowance, internal and external;

iv. Stress and strain;

v. Fracture control;

vi. Special construction such as river, road and rail crossings, tunnels, above-ground piping;

vii. Operating and maintenance philosophy;

viii. Fluids to be carried.

1.2.4 The design life of the pipeline should be stated, and is to be used as the basis for design.

1.3 Pipeline Route

1.3.1 The operator should undertake a detailed investigation of the route of the pipeline and the environment in which the pipeline is to be constructed, having regard to public safety, pipeline integrity, environmental impact and the consequences of escape of the pipeline product.

1.3.2 The investigation should include details of any known or expected development or encroachment along the route, the location of underground obstructions, pipelines, services and structures and all other pertinent data.

1.3.3 The route investigation study should include an geotechnical assessment of the geology, ground stability and earthquake risk along the route of the pipeline.

NOTE: The geotechnical investigation should be signed off by a registered engineer or an equivalent competent person.

1.3.4 The location of the pipeline should be classified for possible risks to the integrity of the pipeline, the public, property and the environment, in accordance with the Code class requirements.

1.3.5 The operator should identify the pipeline route and the location of the pipeline within the route.

1.3.6 The operator shall install pipeline markers along the route, visible and identifiable from both the air and ground, and spaced and constructed in accordance with Code requirements.

1.4 Protection from External Interference

1.4.1 The operator should design the pipeline so that a combination of physical measures and procedural measures are implemented to prevent loss of integrity from external interference by identified threats.

NOTE: Physical measures can include separation, and resistance to penetration. Procedural measures can include marking, and administrative procedures.

1.4.2 The operator should identify and document, in the pipeline design, the external interference events for which design for pipeline protection is required.

NOTE: Activities which could occur during the design life of the pipeline should be considered.

1.5 Control and Management of the Pipeline

1.5.1 The operator should design an appropriate system for monitoring and managing the safe operation of the pipeline, having regard to the location, size, and capacity, and the data recording and reporting requirements.

1.5.2 The remote and unmanned facilities should be designed with an appropriate local control system capable of safely operating that section of the pipeline, and if required, safely shutting down that section of the pipeline during any time that the communication and supervisory control system is unserviceable.

1.5.3 The design parameters for the system should be defined and verified.

1.5.4 Pressure control systems should be provided and should control the pressure so that nowhere on the pipeline does the pressure exceed the MAOP under steady-state conditions; and 110% of the MAOP under transient conditions.

1.5.5 Pressure control and a second pressure limiting system are mandatory.

NOTE: The second system may be a second pressure control, or an overpressure shutoff system, or a pressure relief.

1.5.6 Valves should be provided to isolate the pipeline in segments for maintenance, operation, repair, and for the protection of the environment and the public in the event of loss of pipeline integrity.

1.5.7 The position and the spacing of the valves should comply with Code requirements.

1.5.8 Individual main line valves should be equipped with a closing mechanism that can be remotely operated from a control centre.

1.6 Materials

1.6.1 The identity of all materials should be recorded and the records maintained until the pipeline is abandoned or removed.

NOTE: The identification is to include test results and inspection reports.

1.6.2 Materials and components should comply with a recognised and acceptable Standard.

NOTE: All certificates should be originals, or certified copies of the original certificate.

As a minimum, all tubular goods, valves, vessels, fittings, etc. should be accompanied by a DIN 31 C certificate, and identification to ensure traceability. The DIN 31 C certification would ensure, by third party verification, that the equipment or materials supplied complied with the manufacturer's specifications.

1.6.3 Materials and components complying with Standards not recognised in a nominated Code should be qualified.

1.7 Stations

1.7.1 Stations, including compressor, pump, metering and pressure regulating stations, shall be protected from damage caused by the environment, anticipated accidents, third parties and other random causes, and shall comply with requirements for performance and safety of operating personnel and members of the public.

2. CONSTRUCTION

Every pipeline shall be constructed in compliance with the engineering design for the pipeline, by construction personnel who are competent, and where required qualified for the task. The construction should be carried out to ensure the safety of the public, construction and operating personnel, equipment, adjacent property, the pipeline, and to prevent damage to the environment.

2.1 Construction Safety Plan

2.1.1 A construction safety plan should be prepared and approved.

NOTE: The plan should address the control and management of hazards such as proximity to power lines, other pipelines, and services; safety of public areas; open excavations; handling of hazardous materials; traffic control and site security, etc.

2.2 Survey

2.2.1 The operator should carry out a survey to locate the pipeline relative to permanent marks and benchmarks, in accordance with the engineering design.

2.2.2 The existence of services, structures and other obstructions in or on the route should be checked, identified and recorded before construction begins.

2.2.2 A record of surveys should be kept for incorporation into the "as built" drawings on completion of the pipeline.

2.3 Handling of Components

2.3.1 Pipes, including coatings, coating material, welding consumables and other components shall be handled, transported and stored in a manner that will provide protection from physical damage, harmful corrosion and other types of deterioration.

2.4 Inspection of Pipe and Components

2.4.1 Pipes and components should be inspected before any anti-corrosion coating is applied.

2.4.2 Anti-corrosion coatings should be inspected and subjected to a holiday test immediately before the pipe is installed.

2.4.3 All damage judged to be a defect should be removed or repaired by a recognised method.

NOTE: Defects may include ovality, buckles, dents, gouges, grooves, notches.

2.5 Changes in Direction

2.5.1 Changes in direction, including sags and overheads required to enable pipelines to follow the required routes, and the base of trenches should be made by accepted methods.

2.6 Cold-Field Bends

2.6.1 Cold-field bends in line pipe should be made by qualified and experienced operators using a qualified and approved cold-field bending procedure.

2.6.2 The qualification test and procedure for cold-field bending should be fully documented.

NOTE: The bend qualification procedure should establish acceptance limits for buckles, strains, and ovality, and consider the affects on the anti-corrosion coatings.

2.7 Welded Joints

2.7.1 All welds shall be made by qualified welders using a qualified weld procedure.

2.7.2 Welders shall be qualified to demonstrate an ability to follow the appropriate qualified welding procedure and the dexterity to make welds using that procedure to the requirements of the nominated Standard.

2.7.3 Welding procedures shall be qualified to demonstrate that a test weld made in accordance with the welding procedure has the required mechanical properties such as strength, ductility and hardness; and is sound and free of defects.

NOTE: A welding procedure may be qualified by either qualification by testing, or qualification by documentation.

2.7.4 Welded joints shall be designed to be capable of withstanding the design forces, and, for pressure-containing components, shall be leak-tight in accordance with AS 1978.

2.7.5 Welding shall be carried out under the supervision of an approved person who has the appropriate experience and training in the supervision of welding of pipelines and the use of ancillary equipment.

NOTE: Current CBIP certification is acceptable.

2.7.6 Production welds shall be examined and assessed by inspectors qualified or experienced for the tasks, and shall be approved.

NOTE: Current CBIP certification is acceptable.

2.7.7 Production welds shall be subjected to visual examination and non-destructive examination.

2.7.8 Visual examination of welds shall be made to determine that the surfaces are free from unacceptable discontinuities and the weld is dimensionally correct.

2.7.9 The methods of non-destructive examination, the equipment, and the examining personnel shall be collectively capable of producing indications of discontinuities in welds which can be interpreted and evaluated in order to determine whether the criteria of acceptance have or have not been attained.

2.7.10 Non-destructive testing personnel engaged in the supervision or interpretation of results shall have appropriate qualification from an acceptable testing organisation.

2.7.11 Organisations undertaking non-destructive testing shall have appropriate laboratory accreditation.

2.7.12 The proposed radiographic procedure shall contain all the necessary information to enable radiographs to be taken, processed, and viewed to the requirements of the Standard.

2.7.13 The proposed radiographic procedure shall be qualified.

2.7.14 Repairs to welds containing unacceptable defects shall be made using an approved repair procedure.

2.7.15 Records of welds, showing the location, number completed, the number non-destructively tested, and the welds that were rejected and repaired, along with all evidence, shall be kept and maintained by the operator until the pipeline is abandoned or removed.

2.8 Flanged Joints

2.8.1 Flanged joints should be installed in accordance with accepted practice which address alignment, uniform stressing, gasket compression and bolt make-up.

2.9 Casings, Tunnels, Covering Slabs and Culverts

2.9.1 The installation of pipelines in casings, culverts, tunnels, and beneath covering slabs, and their construction, should be in accordance with the engineering design.

2.9.2 Procedures should ensure that during the installation of a pipeline in a casing, culvert, or tunnel, damage to the pipeline and the anti-corrosion coating will be prevented.

2.10 System Controls

2.10.1 Control devices, safety devices, instruments and equipment required for pipelines should be installed in accordance with the recommendations of the manufacturer and the engineering design.

NOTE: Instruments are to be located and installed to enable inspection and calibration without interruption to the operation of the pipeline.

2.11 Attachment of Electrical Conductors

2.11.1 Any copper electrical conductor that is connected to a pipe or to another pressure containing component (including conductors used for cathodic protection) should be installed so that the connection will remain mechanically secure and electrically conductive throughout the design life.

2.12 Pipeline Location

2.12.1 Pipe should be positioned in the pipeline as required by the engineering designs according to wall thickness, SMYS, diameter and coating.

2.12.2 Pipelines should be installed at a safe distance from underground structures, services, or pipelines.

2.12.3 The pipeline installation should evaluate and avoid the imposition of external stresses from, or on, any other underground structure or pipeline.

2.12.4 Where a pipeline is laid parallel to or crosses an underground structure, service, or pipeline with a clearance of less than 300 mm, the pipeline should be protected from damage that might be caused by the other structure or pipeline and protected from electrical contact.

NOTE: In urban areas, pipelines should be installed below any existing underground services.

2.12.5 There should be sufficient clearance for any maintenance or repairs to be carried out on the pipeline.

2.13 Trench Construction

2.13.1 The site should be prepared with the width necessary for the safe and orderly construction of the pipeline trench.

2.13.2 Excavation should be performed in a safe manner, with any damage to buried services, structures, and other pipelines, avoided.

2.13.3 The width of the trench should be sufficient to allow the pipeline to be installed in a position without being damaged and to permit full consolidation of padding and backfill material.

2.13.4 The bottom of the trench should be free from cave-ins, roots, rocks, welding materials and other debris that could cause damage to anti-corrosion coatings on the installed pipeline.

2.14 Installation of Pipe in a Trench

2.14.1 The pipeline should be installed in the trench with a firm continuous bearing on the bottom of the trench or padding, and will rest in the trench without the use of an external force to hold it in place, until backfilling is completed.

2.14.2 Where conditions prevail that the anti-corrosion coating or the pipe in the trench could be damaged, padding or a rock shielding material should be used.

NOTE: The rock shielding should comply with the design requirements of the cathodic protection system.

2.14.3 The padding and shading should be of a fine-grained material of uniform composition and free from rock and debris that could damage the anti-corrosion coating or pipe.

2.14.4 The padding and shading should have a resistivity in the same order as the undisturbed soil at the base of the trench, and is to be in continuous contact with the pipeline.

2.14.5 The trench should be backfilled and consolidated in a manner that will prevent damage to the anti-corrosion coating or pipe, and minimise settlement of the soil.

2.14.6 Where trench spoil contains material that could damage the coating or the pipe, and is to be used as a backfill, shading or rock shielding material should be used.

2.15 Directionally Drilled Pipelines

2.15.1 Where a section of pipeline is to be installed by directional drilling, the procedures should be approved and appropriate measures taken to ensure compliance with those procedures.

2.16 Reinstatement

2.16.1 Reinstatement should be undertaken as soon as possible after backfilling has been completed, and all equipment, materials and debris have been removed.

2.16.2 Appropriate measures should be undertaken to prevent erosion and scour along the pipeline route.

2.17 Cleaning and Gauging of Pipelines

2.17.1 After completion of the construction and before pressure testing, the inside of pipelines should be cleared of foreign objects.

2.17.2 Suitable inspection pigs should be used to determine whether the pipeline contains dents or ovality in excess of acceptable limits.

2.18 Records

2.18.1 On completion of construction, as built drawings that identify and locate the pipeline, stations, valves, pipe fittings and cathodic protection system should be prepared.

2.18.2 Permanent reference marks and benchmarks should be included on the drawings, and an appropriate scale, suitable for the detail and location, selected.

3. INSPECTION, TESTING AND COMMISSIONING

Appropriate inspection and testing, undertaken as necessary during manufacture, transport, handling, welding, pipeline construction and commissioning, will ensure that the completed pipeline complies with the engineering design and relevant standards and has the intended quality and integrity to operate safely within the design parameters.

3.1 Inspection and Test Plan Procedures

3.1.1 The operator should prepare and document a plan and procedures covering all inspections and tests covering Code requirements and in accordance with the engineering design.

3.1.2 Inspections and tests should be undertaken by competent personnel with the appropriate training and experience, and in accordance with the procedures.

3.1.3 Each aspect of construction should be inspected by an appropriately competent person to ensure compliance with the engineering design.

3.1.4 Where an inspection or test reveals that a specific requirement has not been meet, corrective action shall be taken and documented.

3.2 Pressure Testing

3.2.1 All pipelines shall pass an approved strength test and an approved leak test before commencing operation.

NOTE: Except for components that are exempted from field testing which may include the following:

- approved pretested pipe;
- some components that have an adequate pressure rating complying with a recognised Standard;
- tie-in welds;
- small bore controls, instruments and sampling piping.

3.2.2 Approved strength tests and approved leak tests shall comply with AS 1978.

3.2.3 The approved test procedure should include reference to the following:

- the maximum and minimum strength test pressures;
- the methods for monitoring and controlling the tests;
- the precautions necessary to ensure the safety of the public and testing personnel;
- the criteria for the assessment of leak tightness.

3.2.4 The operator should determine the minimum pressure for the strength test of the pipeline.

3.2.5 The acceptance criteria for a strength test should be evidence that the pipeline can withstand a specified pressure for a specified period to show that the pipeline has the required pressure strength.

3.2.6 The acceptance criteria for a leak test should be evidence that at least one of the following have been met:

- evidence of a visual assessment in which no leakage of fluid was observed with the naked eye at the end of the hold period;
- evidence that for a small-volume test section, the change in pressure during the hold period does not indicate leakage;
- evidence that for a large-volume test, the unaccountable pressure change is less than that nominated in the test procedure.

3.3 Test Records

3.3.1 The operator shall retain a record of the results of the inspections and tests until the pipeline is abandoned or removed.

3.4 Commissioning

3.4.1 Operational patrolling of the pipeline should commence immediately the leak and strength tests of the pipeline are completed.

3.4.2 A written handover from the construction phase to operations should be undertaken.

3.4.3 The operator should ensure that personnel responsible for the operation and maintenance of the pipeline are adequately trained and experienced in all

aspects of the equipment in their control, and are aware of the properties of the pipeline product.

3.4.4 The operator should ensure that there are adequate procedures in place to ensure that the pipeline is filled in a safe manner.

4. OPERATION

Sufficiently detailed and appropriate operating procedures, in accordance with Code requirements, should be developed based upon operational experience and knowledge of the facilities and conditions under which they are operated. All operating personnel shall be suitably qualified, trained and experienced to acceptable industry standards.

4.1 Normal Operating Procedures

4.1.1 The operator should have normal operating procedures in place that ensure the following criteria are met:

- the pipeline is operated only under the conditions it was designed, constructed, tested and approved;
- has written procedures (controlled document) for the operation and maintenance of the pipeline in accordance with Code requirements, and demonstrates compliance with this document;
- the MAOP will not be exceeded during normal operation, and that at transient pressure will not exceed 110% of the MAOP;
- the operating temperature of the pipeline is such that thermal stress limits used in the pipeline design are not exceeded.

4.1.2 The operator should ensure that pipeline surveillance is carried out to ensure that the pipeline is free from identifiable leaks and to identify any unacceptable risks to the pipeline, particularly any unnotified external interference near the pipeline.

4.1.3 The type and frequency of surveillance required for the pipeline should be dependent on the consequences of a hazard, the hazard reduction methods that are in place, and other mitigation measures implemented for the pipeline operation.

4.1.4 The operator should ensure that all stations for pumps, compressors, meters, mainline valves, pressure regulators, odourisers and others are operated safely for both operating personnel and the public, and that they are adequately secured.

4.1.5 The operator should ensure that third party awareness of the pipeline with the appropriate authorities, landowners, occupiers, etc. is undertaken to inform all affected parties of the pipeline operation and emergency procedures.

4.1.6 The operator should ensure that an appropriate work permit system and work procedures are in place to control external interference, including third party, near the pipeline.

4.1.7 The operator should provide for leakage detection systems or periodic leakage surveys of the pipeline in the operating and maintenance plan.

NOTE: The extent and frequency of the leakage surveys should be determined by the operating pressure, age of the pipeline, class location, and the nature of the product transported.

4.2 Safety and Operating Plan

4.2.1 The operator should ensure that a safety and operating plan is established, monitored, and maintained, to detail the policy for the protection of personnel, the public and the environment.

4.2.2 The safety and operating plan should contain reference to the following:

- a full description of the pipeline and all associated facilities and equipment;
- an analysis of the likely hazards including a systematic identification, causes and consequences of such events; and the proposed operational, maintenance and organisational safeguards in place;
- operational safeguards including the maintenance schedule, pipeline inspections, and CP surveys;
- emergency plan.

4.3 Emergency Plans

4.3.1 The operator should ensure that an emergency plan is established for the pipeline.

4.3.2 Procedures should be established to ensure that all necessary personnel attend the site of the emergency as soon as possible.

4.3.3 The operator should ensure that an up-to-date contact list of all such personnel is maintained.

4.3.4 The operator should ensure that emergency procedures are established and all operational personnel are fully aware of, and fully trained in their application.

4.3.5 The operator should ensure that the necessary planning and preparation to implement emergency actions in the event of an accident, a failure or other emergency are undertaken.

NOTE: Actions taken would include drills, liaising with appropriate authorities, preventative measures, remedial actions, etc.

4.4 Venting and Purging Procedures

4.4.1 The operator should ensure that adequate precautions are taken to prevent the accidental ignition of a possible hazardous concentration of flammable vapour or gas during pipeline operations or venting.

NOTE: Procedures should include hazardous area classification, restriction of matches and lighters, metallic bonding, and safe electrical installations.

4.4.2 The operator should ensure that all purging operations are undertaken in accordance with an approved procedure.

4.5 Operating Condition Changes

4.5.1 The operator should have procedures in place to ensure that where any changes to the originally approved design conditions occur or are proposed,

these changes are fully assessed to ensure the integrity of the pipeline is not impaired and that the safety of the public, operating personnel or protection of the environment is not diminished.

4.6 Operations Reviews

4.6.1 The operator should have procedures in place to review, at approved intervals, the suitability of systems and conditions of the pipeline operation, including the following:

- review of design life, if to be exceeded;
- review of pressure control and overpressure protection systems;
- review of MAOP;
- review of class locations.

4.6.2 The operator should keep a record of approved changes of operating conditions, all engineering investigations, and work carried out in connection with any change in operating conditions, and the records should be maintained until the pipeline is abandoned or removed.

5. MAINTENANCE

The pipeline, coatings and ancillary equipment must be periodically and systematically assessed to ensure that the pipeline continues to operate within the approved design parameters. The pipeline will require ongoing maintenance to ensure operation within the specified parameters. Where a pipeline is damaged or corroded to the extent that continued operation would be unsafe, the pipeline shall be shut down or operated at a reduced pressure until a repair is effected.

5.1 Pipeline Integrity

5.1.1 The operator shall have a documented system for pipeline maintenance and corrosion prevention.

5.1.2 The operator shall ensure that the pipeline and equipment is maintained to operate to the system MAOP by ensuring sufficient pipe wall thickness at all locations, adequate joint integrity, and an adequate and fully functional pressure control system.

5.1.3 The operator shall prepare a monitoring plan, as part of the safety and operating plan, to document and follow a plan detailing the inspections and tests that are necessary to ensure the pipeline will continue to comply with the engineering design.

5.1.4 The operator shall conduct periodic audits and assessments to assess the integrity of the pipeline, review the operational and maintenance procedures, and implement appropriate measures, where required, to ensure continuing pipeline integrity.

5.1.5 The operator shall ensure that inspections are carried out by appropriately qualified and experienced personnel, to identify actual or potential problems that could affect the integrity of the pipeline, and shall plan and perform any maintenance to rectify any such problems.

5.2 Pipeline Inspection and Assessment

5.2.1 The operator shall ensure that an inspection and assessment of the pipeline is undertaken to include a full visual survey of all above ground sections of the pipeline, and an audit of the corrosion control facilities.

NOTE: Intelligent pigging results should be considered in assessing pipeline integrity.

5.2.2 The operator shall establish the period of inspection based on the past reliability of the pipeline, current knowledge of its condition, the rate of deterioration (corrosion rates and coating degradation), and statutory requirements.

5.2.3 The operator shall immediately rectify any matter that is assessed as inadequate or posing an immediate risk.

5.3 Coatings Maintenance

5.3.1 On above-ground pipework the operator shall ensure that the coating is assessed at appropriate intervals, a period of not more than 12 months, and is repaired or replaced if external corrosion is occurring.

NOTE: Examinations to specifically focus on the underside of the pipe, and pipe support connections for blistering or coating disbonding.

5.3.2 For below-ground piping, the operator shall ensure that coating disbonding is minimised, and the cathodic protection system effectively protects all coating holidays.

5.3.3 The operator shall ensure that the condition of the coating on underground piping is assessed by an acceptable method.

NOTE: The assessment can be achieved by evaluating cathodic protection data, special coating defect surveys, visual inspection from selected locations of bellhole excavations.

5.3.4 The operator shall ensure all records are maintained.

5.4 Pipewall Defect Assessment

5.4.1 The operator shall ensure that pipewall defects are assessed by detailed analysis, and where found to be in excess of Code criteria, they are removed, replaced or otherwise repaired.

5.4.2 The operator shall ensure that where corrosion is detected, the nature, extent, depth and cause are investigated, and that the pipeline is operated at a safe operating pressure until permanent repairs are made.

5.4.3 The operator shall ensure that corrosion is assessed in accordance with Code requirements.

5.5 Ancillary Equipment Assessment

5.5.1 The operator shall ensure that all valves are inspected and function tested at approved intervals to ensure that they are fully operable, not leaking, secure, free from corrosion, and properly supported.

5.5.2 The operator shall ensure that areas prone to corrosion such as pipe support areas, and sections of pipe entering the ground are regularly inspected and assessed.

5.6 Cathodic Protection System Inspection

5.6.1 The operator shall ensure that inspections are carried out to verify the correct operation of the transformer and rectifier units, stray current control and drainage bonds at an interval not exceeding two months, and to Code requirements.

5.6.2 The operator shall ensure that cathodic protection inspections, including pipeline potential surveys, and tests for stray current electrolysis are carried out at intervals not exceeding 12 months.

5.6.3 The operator shall ensure that the cathodic protection system is operating satisfactorily in conformance to the design criteria.

5.6.4 Steel casings shall be maintained electrically isolated from the pipeline.

5.7 Pressure Control and Protective Equipment

5.7.1 The operator should have procedures to ensure that all pressure control and protective equipment is subjected to systematic inspection and testing to demonstrate that the equipment is operating correctly and set to function at the correct pressure.

5.8 Pig Trap Maintenance

5.8.1 The operator should ensure appropriate maintenance of all components of pig traps at approved intervals or just prior to use.

NOTE: Checks to include end closure seals, bleed blocks, electrical bonds, locking rings, pig signallers, fasteners, etc.

5.9 Casing Maintenance

5.9.1 Maintenance schedule established by the operator should include appropriate checks on casings and attachments.

NOTE: Includes checks for pipe to casing contacts or resistive bonds, and sniffing of annulus vents for hydrocarbons.

5.10 Pipeline Repairs

5.10.1 The operator shall ensure procedures are in place so that corrective action is initiated immediately a leak is detected.

5.10.2 Where a pipeline is damaged or corroded to the extent that continued operation would be unsafe, the pipeline shall be shut down or the operating pressure reduced to a safe level, until necessary repairs have been completed and inspected and it is safe to resume normal operation.

5.10.3 The operator shall plan an acceptable repair strategy.

5.10.4 Permanent repairs shall be undertaken in accordance with strict procedures and criteria.

6. MITIGATION OF CORROSION

Approved measures shall be taken to mitigate corrosion and other destructive processes such as stress corrosion cracking, which could affect the integrity of the pipeline. The measures selected shall consider the potential for both internal and

external corrosion and degradation. Critical to the corrosion mitigation strategy is that the design of the corrosion and condition monitoring systems must provide assurance that the measures implemented are successfully achieving their objectives.

6.1 Rate of Degradation

6.1.1 An assessment shall be made of the possible degradation mechanisms that may affect the pipeline, and an estimation made of the potential rate of degradation, taking into consideration the internal and external conditions, and changes expected over the life of the pipeline.

6.2 Internal Corrosion Mitigation Methods

6.2.1 The interior surface of a pipeline conveying a corrosive or potentially corrosive fluid shall be protected against corrosion.

NOTE: Accepted corrosion mitigation methods for internal surface of a pipeline are an internal lining, corrosion inhibitors or biocides, and a calculated corrosion allowance.

6.3 External Corrosion Mitigation Methods

6.3.1 The exterior surface of a pipeline exposed to corrosive agents shall be protected against corrosion.

6.3.2 External anti-corrosion coatings and materials used for the repair of defects or protection of field welds shall have physical, electrical and chemical properties that have been demonstrated by tests, investigations or experience to be suitable for the installation and service conditions of the pipeline and the environment for the duration of the design life of the pipeline.

6.3.3 Procedures for the preparation of the surface of the pipe and the application of the coating and repair material shall be developed and approved.

6.3.4 The application of the coating and of site repairs shall be subject to an approved quality assurance programme.

6.3.5 The integrity of the coating shall be tested as soon as the pipeline has been fully installed.

6.3.6 The wall thickness of the pipe may be increased as an allowance for corrosion based on assessment of the corrosion rate and the design life of the pipeline.

6.3.7 The pipeline may be protected from corrosion by the application of direct current to maintain the potential of the pipewall metal sufficiently negative with respect to the environment by the application of galvanic anodes, or by means of an impressed current system.

6.3.8 The cathodic protection system meets the design criteria for protection of the pipeline.

6.3.9 The current required for the cathodic protection shall be determined by experimentation or by calculation, and the assumption for the derivation of the total current requirement shall be documented.

6.3.10 An allowance shall be provided to cater for structure coating deterioration over the life of the pipeline, and to mitigate interference affects with any secondary structures.

6.3.11 The environmental resistivity of the sites, the performance characteristics of the anodes shall be documented.

6.3.12 Features along the pipeline route that may affect the cathodic protection system shall be documented and considered in the design.

6.3.13 Provision shall be made for test points for the measurement of the potential of the pipeline at intervals along a structure, so that the effectiveness of the cathodic protection system can be verified.

NOTE: Spacing of test points in an urban area Location Classes T1 and T2 would be every kilometre, extending to two to five kilometres in rural areas R1 and R2. Additional test points should be located at critical points such as road and rail crossings, crossings with other structures, water crossings, etc.

6.3.14 Electrical isolation joints and electrical earthing, if required, shall be designed for the application.

6.4 External Anti-corrosion Coating

6.4.1 Surface preparation, coating material, application methods, and testing methods for the surface coating shall be subject to quality control.

6.4.2 The quality control procedures for the surface coating shall be approved.

6.4.3 The coating shall have chemical and physical properties suitable for the engineering design, and shall be compatible with the pipeline service conditions and environmental conditions for the full design life.

6.4.4 Procedures shall be developed to ensure that the coating is not damaged during handling, construction and testing.

6.4.5 The suitability of the coating shall be demonstrated for the service and environmental conditions of the pipeline.

NOTE: Tests results, investigations or experience are acceptable.

6.4.6 Procedures for the application of the coating shall be developed so that the desired physical and chemical qualities are obtained.

6.4.7 Where a joint is made in a pipeline or a repair is made to the external coating, the material used shall be compatible with the original coating and shall be suitable for the method of installation, the pipeline service conditions, and the environmental conditions.

6.4.8 Procedures shall be developed for the coating of the joint and for making a repair so that the desired physical and chemical qualities are obtained, and are subject to an approved quality control programme.