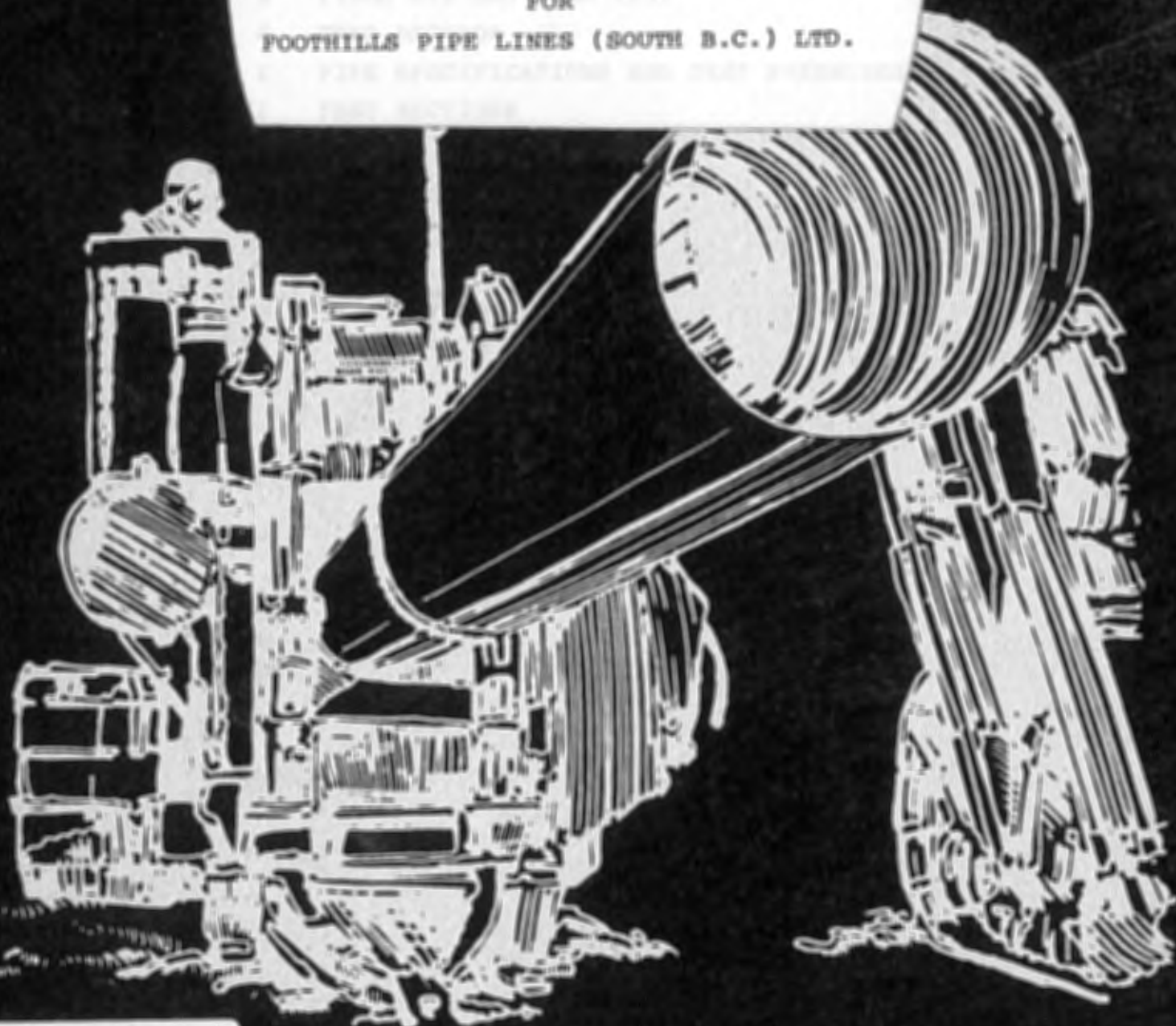


THE ALASKA HIGHWAY GAS PIPELINE PROJECT SOUTH B.C. SEGMENT

5

1. INTRODUCTION AIR
2. PIPE TEST PROCEDURE MANUAL
3. FIELD AIR TEST
FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.



1980/001-1

ALBERTA NATURAL GAS COMPANY LTD

AGENTS FOR FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

5

AIR
TEST PROCEDURE MANUAL
FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

Library
Office of the Pipeline Coordinator
1001 Noble Street, Suite 450
Fairbanks, Alaska 99701

October 1980

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INTRODUCTION

A. PURPOSE AND SCOPE

This manual has been prepared to establish a procedure for air testing three test sections in prebuild loop #2 of OWNER'S 914mm Pipeline through the southeast corner of British Columbia. This manual is supplemental to the requirements within the pipeline construction contract for Hydrostatic Strength and Leak Test.

All air testing shall meet the requirements of Part III of the National Energy Board Act Gas Pipeline Regulations.

B. TERMINOLOGY

OWNER	Foothills Pipe Lines (South B.C.) Ltd., or its designated agents.
MANAGER	Alberta Natural Gas Company Ltd, acting as agent for OWNER and its Resident Manager, his assistants, inspectors, representatives, agents and such other staff as may from time to time be designated as such by written notice given by MANAGER to CONTRACTOR.
CONTRACTOR	The party contracting to perform the hydrostatic testing.
ANSI	American National Standards Institute.
ASTM	American Society for Testing and Materials.
CSA	Canadian Standards Association.

B. TERMINOLOGY (continued)

TEMP	temperature
°C	degrees celsius
I.D.	inside diameter
O.D.	outside diameter
W.T.	wall thickness
s	second
min	minute
h	hour
l	litre
VOL.	volume
MPa	megapascals
kPa	kilopascals
mm	millimeters
m	meters
km	kilometers

PIPELINE CLEANING AND GAUGING

A. PIPELINE CLEANING AND PRELIMINARY GAUGING

In order that the completed pipeline shall be delivered to OWNER free from foreign objects, such as sand and dirt, and defects in workmanship, a cleaning and gauging pig shall be run through the entire length of line after backfilling, and in sections no greater in length than the test sections. The pig shall be supplied and maintained by CONTRACTOR as follows:

Pig: 4 rubber batch pig, without wire brushes.

Gauging Plate: mild steel, 13 mm thick, outside diameter 860 mm.

If, in the opinion of MANAGER, all foreign material has not been removed by one running of the pipeline pig, additional runs shall be made at the CONTRACTOR's expense until MANAGER is satisfied that the pipeline is free from all foreign material. The pig, driven by compressed air, shall be propelled against a back pressure of air in order to control the movement of the pig within the pipeline. After being run the gauging plate shall be free from dents, gouges, or scars. If the gauging plate is deformed, the cause of such deformation will be located and corrected, and the pig and gauging plate shall be rerun to the satisfaction of MANAGER's test

inspector and at CONTRACTOR's expense. If the cleaning and gauging pig becomes stuck CONTRACTOR shall not increase the pressure beyond 350 kPa in an attempt to free the pig. Notwithstanding anything herein contained, it is the sole responsibility of CONTRACTOR to deliver to MANAGER a completed pipeline free from any and all foreign objects and defects in workmanship.

B. FINAL GAUGING

CONTRACTOR shall run an electronic Caliper Pig through the completed sections of the pipeline after air testing. Running the Caliper Pig requires that a back pressure of air is maintained on the Caliper Pig as recommended by the manufacturer.

The electronic Caliper Pig shall be supplied by MANAGER, and CONTRACTOR shall demonstrate its correct performance by pulling it through a sample piece of pipe with known defects.

CONTRACTOR shall submit the chart or record of the pigging run to MANAGER. If in MANAGER's opinion the chart or record produced is inconclusive or otherwise unacceptable due to CONTRACTOR's performance, the run shall be repeated at CONTRACTOR's expense until satisfactory results are obtained.

The maximum allowable pipe defects are specified in the latest revision of the CSA Standards Z-184. Any dents which exceed a maximum depth of two (2) per cent of the pipe diameter shall be corrected. If the analysis of the

B. FINAL GAUGING (continued)

Caliper Pig survey shows indications of pipe defects exceeding these allowable limits, CONTRACTOR shall locate and correct the defects and the Caliper Pig shall be rerun to the satisfaction of MANAGER.

FINAL AIR AND LEAK TEST

A. GENERAL

The pipeline and its appurtenances shall be air tested to prove its strength and tightness.

The air test includes:

- (a) performing leak test, and strength test at specified pressures, recording all test data, and de-pressuring line.
- (b) performing Caliper Pig run.
- (c) performing all tie-ins of the test sections.

NOTE: CONTRACTOR shall be responsible for locating leaks and making necessary repairs.

All test sections designated to be air tested shall be tested in accordance with the following paragraphs unless otherwise noted in this manual and in accordance with the National Energy Board Gas Pipeline Regulations.

B. NOTICE OF TEST COMMENCEMENT

CONTRACTOR shall keep MANAGER fully informed of its proposed test schedule in order that MANAGER may give proper notification to the National Energy Board.

MANAGER must notify the National Energy Board a minimum of seven (7) days in advance of the performance of the test. The Board shall be notified of any changes in the timing of the test by telephone or telegram as soon as such changes are known and not less than forty-eight (48) hours prior to commencement of the test.

B. NOTICE OF TEST COMMENCEMENT (continued)

MANAGER and CONTRACTOR shall also mutually notify all→ highway, railroad, municipal, provincial telephone, power, and all other authorities having jurisdiction in the test area, a minimum of forty-eight (48) hours prior to testing any section.

CONTRACTOR shall erect warning signs along the right-of-way at all public crossings and at all points where there is exposed pipe or an appurtenance. Contractor shall notify all persons living and working within 1500 feet of the pipeline prior to testing of the section. All persons living and working within 1000 feet of the test section and not required for the test or other Company operations shall be moved out after line pressure reaches 4000 kPa. CONTRACTOR shall maintain continual patrol in the vicinity of any public crossings for the duration of the entire test period including the pressuring period for pressures above 50% of the final minimum test pressure.

C. PIPE SPECIFICATIONS AND MAXIMUM TEST PRESSURES

The pipe specifications and maximum test pressures for the pipe utilized in this pipeline are listed in Appendix 1 of this manual.

D. TEST SECTIONS

CONTRACTOR shall divide the pipeline into test sections the chainage length and pipeline kilometer post locations of which are outlined in Appendix II of this manual. Test section ends shall overlap to accommodate tie-ins with tested pipe.

E. TEMPERATURE RECORDERS

Two temperature recorders shall be installed at each end of test section to monitor ground temperature at pipe depth and pipe temperatures at locations as directed by MANAGER. The recorders shall be located in manholes and the capillary tubes insulated to ensure their accuracy and dependability during adverse weather conditions. Temperature recorders shall only be inspected once every six (6) hours, to ensure that equipment is operating satisfactorily, since personnel are not allowed within 100 metres of the test section while section is under pressure.

F. PRESSURE RECORDER

A pressure recorder shall be connected to the pipeline section being pressure tested at the same location as the deadweight tester to accurately record the pressure during the test. The pressure recording and dead weight equipment shall be located a minimum of 100 metres from the test section. Pressure indicating gauges shall be installed as required. The accuracy of test instruments shall be confirmed by comparing the readings of the pressure recorder and the deadweight tester at 30 minute intervals throughout the test.

G. TEST INSTRUMENT ACCURACY

The accuracy of all test instruments shall be checked and verified, before and after all pressure tests, under the supervision of MANAGER.

H. TEST HEADS

Test heads used for the air test will be the same as the test head designed and built for hydrostatic testing.

The test head is shown in the drawing as listed in the Drawing section of this manual. The test head is designed for to have a maximum hoop stress of .6 SMYS when the line pipe is tested to 110%. Therefore, for the air test where the pipe is only tested to 93% the maximum hoop stress on the test head will only be .51 SMYS. This low stress level will give an added measure of safety.

I. COMPRESSOR PIPING

Contractor shall ensure that all connecting piping and fittings between the test head and the compressor is not stressed above .75 SMYS.

J. COMMUNICATIONS

The CONTRACTOR shall ensure that adequate communication facilities are available along the test section to permit the personnel conducting the test to communicate quickly and without interference.

K.* AIR TEST

The test section shall be gradually pressured to 20% of the specified minimum yield strength and held for temperature stabilization and leak test. Should any leakage be found during this leak inspection, the pressure shall be removed and the leak or leaks shall be repaired and a further leak test conducted. Once the leak test has been successfully completed, the section shall be brought to the required test pressure. At the test pressure the pressure chart shall be checked

- * against the deadweight tester and the test commenced. Pressure chart and deadweight reading shall be taken every 30 minutes, thereafter for the duration of the test. Should any rapid changes in test pressure occur, the test pressure readings shall be recorded every 15 minutes to establish if such variations are linear. Should the test pressure vary by more than 2-1/2%, return to the original test pressure shall be effected by the introduction or relief of the testing medium. Any re-pressuring of the pipe while under test shall require a further minimum test period of 24 hours. If required, due to temperature and hence pressure variations, to provide a documented successful test, the test period shall be extended.

L. TEST ACCEPTANCE

CONTRACTOR is responsible for holding proof tests for a minimum of twenty-four (24) hours and until MANAGER declares the test "acceptable".

When the MANAGER is satisfied that a successful air test of the pipeline section has been completed, the test result shall be communicated to the National Energy Board in support of an application for a "Leave-to-Open Order" to permit operation of the pipeline. To be declared "acceptable", the following conditions must be met during the proof test holding period.

(i) There shall be no leaks.

(ii) All changes in test pressure must be accounted for, and remain within $\pm 2\frac{1}{2}$ percent of the established 'on test' pressure.

L. TEST ACCEPTANCE (continued)

- (iii) Upon commencement of the twenty-four (24) hour hold period, 'bleeding off' or 'repressuring' to maintain test pressure within limits must be authorized by MANAGER.
- (iv) Deadweight pressure readings must be taken every thirty (30) minutes throughout the duration of the twenty-four (24) hour hold period.
- (v) Temperature and pressure chart recorders must be operational throughout the hold period.

M. FAILURES

In the event of a failure during testing, CONTRACTOR shall, under the supervision of MANAGER, complete the pipe failure report in Appendix 3. If the failure is in the seam of the pipe, the entire joint in which the seam failure exists shall be removed from the pipeline. CONTRACTOR shall remove a minimum of one pipe diameter from each side of a failure. The piece(s) removed shall be marked for orientation with respect to the position in the pipeline and with the approximate chainage location of the failure. CONTRACTOR shall not cut on or damage the failed edge of the pipe during removal, transit or unloading at the storage location. If the failed portion is too long for transport or handling, it may be cut at right angles to the failure edge. All portions are to be retained. After repair of a pipeline failure, the section of pipe shall be re-tested.

N. PIPELINE DE-PRESSURING

As soon as possible after the test has been completed, the pressure shall be bled from the section. Care must be exercised when removing bull plugs or blanking plates to avoid injury or damage caused by a pressure build-up due to leaking valves. Extreme care must be taken when blowing down. No valve larger than 6 inches shall be used. Blowdown valves shall be opened carefully and blowdown continued at a rate that does not develop severe vibrations. Under normal circumstances no fitting of any type will be attached to the blowdown valve during blowdown. If filling or vent lines are attached they shall be adequately braced and tied down to prevent movement.

O. SAFETY

Pipeline testing shall be conducted by CONTRACTOR in such a manner as to protect the safety of all employees, the public and property in the vicinity of the pipeline.

No unauthorized person or persons on foot or in vehicles shall be allowed within 100 metres of the test section while it is under pressure.

All timber, heavy snow, etc. within a radius of 25 metres of the pressuring equipment and connecting lines shall be removed.

TEST RECORDS

A. GENERAL

All field test data will be compiled by CONTRACTOR and signed as required by CONTRACTOR, MANAGER and the National Energy Board representative.

For each test section, MANAGER will require originals of the following information for their permanent records:

- 1) test section drawing
- 2) cleaning, gauging and displacement pig run data
- 3) deadweight readings
- 4) pressure recorder chart
- 5) temperature recorder charts
- 6) failure reports

The data for all tests will be accurately recorded on proper test forms. Sample copies of test forms are included in Appendix III and are hereinafter described:

1) Cleaning and Gauging Pig Run Data

CONTRACTOR will complete this form whenever a cleaning or gauging operation is performed on a test section. MANAGER's inspector and CONTRACTOR's test supervisor will sign the form and keep copies. The original will be delivered to MANAGER.

2) Displacement Pig Run Data

CONTRACTOR will complete this form whenever a displacement operation is performed on a test section. MANAGER's inspector and CONTRACTOR's test supervisor will sign the form and keep copies. The original will be delivered to MANAGER.

3) Daily Testing Report

CONTRACTOR will prepare a daily testing report for each day any test operation is being conducted. The test data compiled on this report will be a brief resume of all tests being conducted on the System, including:

- a) acceptance or rejection of tests completed this date.
- b) progress status of tests underway.
- c) a description providing a documental record of any other events that occurred during testing operations.

The CONTRACTOR's test supervisor and MANAGER's inspector will sign this form. The original will be delivered to MANAGER.

4) Twenty-Four Hour Strength Test Data

CONTRACTOR will complete this form for each 24 hour strength test which must be performed on every test section. Sufficient data and supplementary remarks shall be recorded to adequately provide for determination of acceptance or rejection of the test. When the test is successfully completed, the report will be signed by the CONTRACTOR's test supervisor and MANAGER's engineer and will be initialled by the National Energy Board's authorized representative. The original will be delivered to MANAGER along with originals of the pressure and temperature recorder charts.

5) Pipe Failure Report

CONTRACTOR will prepare this form for each failure that occurs during the testing operations on the System. The information recorded on this form will provide a complete record of test conditions at the time of failure and a detailed description of circumstances surrounding the failure to allow a careful analysis in determining the cause of failure. This form will furnish the basis for claims in case of defective workmanship or materials. Photographs of the failure will be taken and included with the report. CONTRACTOR's test supervisor and MANAGER's engineer will sign this form. The original will be delivered to MANAGER.

FINAL TEST REPORT

At completion of testing operations, CONTRACTOR will prepare a testing summary report which will be submitted with all test files to MANAGER.

During the testing operation, the original test forms with all signatures, pressure and temperature recorder charts and record photographs will be transferred, after reviewing, checking and signing, to MANAGER. At the completion of the job, all other copies of the test reports will be transferred to MANAGER.

SAMPLE TEST FORMS

Sample copies of test forms, which will be made available to CONTRACTOR upon request during testing operations, are included in Appendix III of this manual.

A P P E N D I X I

PIPE SPECIFICATIONS

AND TEST PRESSURES

PIPE SPECIFICATIONS AND TEST PRESSURES

PIPE DESCRIPTION			Design Factor	Proposed M.O.P. (kPa)	Minimum Mill Test Pressure (kPa)	FIELD TEST DATA			
O.D. (mm)	W.T. (mm)	Spec. CSA Z245.2				Minimum Test Pressure (kPa)	Maximum Test Pressure (kPa)	%SMYS	%MOP
914	8.89	GR 448 CAT II	0.72	6280	8290	7850	8115	93%	129%
914	10.67	GR 448 CAT II	0.60	6280	9940	7850	8115	78%	129%

NOTE: 1) Test medium field testing shall be air.
 2) Test medium for mill testing shall be water.

A P P E N D I X I I

TEST SECTIONS

AIR TEST SECTIONS

<u>Section</u>	<u>Land Description</u>	<u>From (kmP)</u>	<u>To (kmP)</u>	<u>Length (km)</u>	<u>Pipe Description (Pipe Measurement in mm)</u>	<u>Reference Drawing</u>	<u>Hold Period (Hours)</u>
A-1	From: Parcel 82 D.L. 4589* To: Parcel 82 D.L. 4589	31.2	38.4	7.2	914 x 8.89 & 914 x 10.67 CSA Z-245.2 Gr. 448 CAT II	5-08-02-00-AT-0001	24
A-2	From: Parcel 82 D.L. 4589 To: D.L. 4589*	38.4	40.2	1.8	"	5-08-02-00-AT-0002	"
A-3	From: D. L. 4589* To: D. L. 4589	40.2	48.5	8.3	"	5-08-02-00-AT-0003	"

* Indicates Test Point

A P P E N D I X I I I

TEST FORMS



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

CLEANING AND GAUGING PIG RUN DATA

JOB: _____

DATE: _____

SECTION: FROM: _____ TO: _____

PURPOSE OF PIG RUN: _____

TYPE OF PIG: _____

TIME: START: _____ END: _____

SECTION LENGTH (m): _____

SPEED OF PIG (m/sec): _____

CONDITION OF PIG:

START: _____

FINISH: _____

MATERIAL PUSHED OUT BY PIG: _____

COMMENTS: _____

TEST SUPERVISOR: _____

TEST INSPECTOR: _____



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

DISPLACEMENT PIG RUN DATA

JOB: _____

DATE: _____

TEST SECTION NO.: _____

PURPOSE OF PIG RUN: _____

TYPE OF PIG: _____

TIME: START: _____ END: _____

SECTION LENGTH (m): _____

SPEED OF PIG (m/sec.) _____

CONDITION OF PIG: _____

START: _____

FINISH: _____

COMMENTS: _____

TEST SUPERVISOR: _____

TEST INSPECTOR: _____



ALBERTA NATURAL GAS COMPANY LTD

AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

DAILY TESTING REPORT

JOB: _____

DATE: _____

WEATHER CONDITIONS: _____

TEMPERATURE (°C): HIGH: _____ LOW: _____

REFERENCE TEST FORMS: _____

REPORT: _____

TEST SUPERVISOR: _____

TEST INSPECTOR: _____

TWENTY - FOUR HOUR STRENGTH TEST DATA

JOB:

DATE: _____

TEST SECTION NO. :

HYDROSTATIC TEST DRAWING NO.:

TIME WHEN YIELD TEST OR PLOT WAS COMPLETED:

TIME WHEN PUMP WAS DISCONNECTED: _____

PRESSURE WHEN YIELD TEST OR PLOT WAS COMPLETED:

TEMPERATURE (°C): START: FINISH:

DEAD WEIGHT PRESSURE AND TEMPERATURE READINGS

PAGE 1 OF 2

TWENTY - FOUR HOUR STRENGTH TEST DATA

TIME

PRESS. - kPa

TEMP. - °C

COMMENTS

TEST SUPERVISOR: _____

TEST ENGINEER: _____



ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

PIPE FAILURE REPORT

JOB: _____

DATE: _____

TEST SECTION NO.: _____

TIME OF FAILURE: _____

LOCATION OF FAILURE: _____

ELEVATION AT FAILURE: _____

PRESSURE AT FAILURE: _____

FAILED PIPE DATA _____ mm O.D. x _____ mm W.T.

GRADE: _____ SPEC: _____

MFG. BY: _____ JOINT NO.: _____

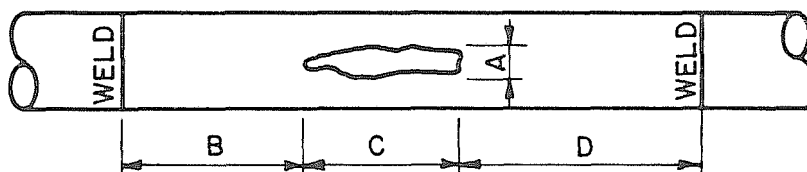
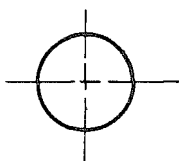
REPLACEMENT PIPE DATA _____ mm O.D. x _____ mm W.T.

GRADE: _____ SPEC: _____

MFG. BY: _____ JOINT NO.: _____

DATE REPAIRED: _____

POSITION AND SIZE OF FAILURE :



NOTE POSITION OF FAILURE AND DIMENSIONS :

A : _____ mm B : _____ mm

C : _____ mm D : _____ mm

DESCRIPTION AND POSSIBLE CAUSE OF FAILURE: _____

DAMAGES OR INJURIES: _____

TEST SUPERVISOR: _____

TEST ENGINEER: _____

A P P E N D I X I V

TEST INSTRUMENTS

TEST INSTRUMENTS

All instruments being used in the test shall have been properly calibrated before the test to ensure accurate results. CONTRACTOR shall have personnel at test site who are capable of operating, maintaining and calibrating the instruments being used for the test. Test instruments, as listed below, shall be furnished by CONTRACTOR. Quantities shown are the minimum for one test crew. If multiple crews are required to avoid delays, each test crew shall be equipped with the instruments listed below:

<u>ITEM</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
1	2	Deadweight type pressure gauge having a useful range of 0-15,000 kPa and an accuracy of ± 1.0 kPa. One gauge is to be available at the test site as a backup unit.
2	2	Chart type pressure recorder utilizing 24 hour circular charts and a useful range from 0-15,000 kPa. The charts must have a maximum increment size of 200 kPa. One pressure recorder is to be available at the test site as a backup unit.
3	4	Chart type temperature recorders utilizing 24 hour circular charts and a useful range from -5°C to 40°C . The charts must have a maximum increment size of 1°C . One temperature recorder is to be available at the test site as a backup unit.

<u>ITEM</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>
4	2	Thermometer, -40 to 100°C range, accurate and readable to at least 1/2°C.
5	4	Gauge, pressure 0 to 16,000 kPa range, 4 1/2" dial, 1/2" NPT lower connection.

A P P E N D I X V

PIG RUN SEQUENCE

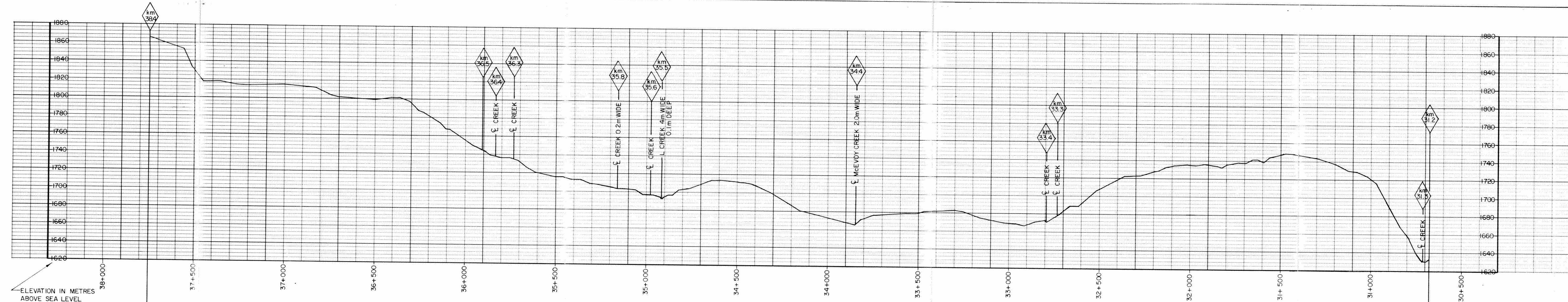
PIG RUN SEQUENCE

<u>RUN</u>	<u>TYPE</u>	<u>PURPOSE</u>
1	Gauging pig - 4 rubber batch pig without wire brushes but with sizing plate.	Line sizing and cleaning.
2	Caliper pig - electronic with chart.	Checking for dents and buckles.

DRAWINGS

DRAWINGS

<u>DRAWING NUMBER</u>	<u>TITLE</u>
<u>AIR TEST DRAWINGS</u>	<u>ALASKA HIGHWAY GAS PIPELINE PROJECT</u> <u>914 mm O.D. GAS PIPELINE</u>
5-08-02-00-AT-0001	Air Test Section A-1 Sta. 30+ 660 to 37+754.1
5-08-02-00-AT-0002	Air Test Section A-2 Sta. 37+ 754.1 to 39+412
5-08-02-00-AT-0003	Air Test Section A-3 Sta. 39+ 412 to 47+850.4
5-08-02-00-TP-0025	Typical Hydrostatic Test Warning Sign
5-08-02-00-EN-0003	914 mm Hydrostatic Test Head MOP 9590 kPa
5-08-02-00-EN-0004	914 mm Hydrostatic Test Head Bracket Details



ELEVATION IN METRES
ABOVE SEA LEVEL

TEST HEAD SEE DWG
5-08-02-00-EN-0003

TEST SECTION HIGH POINT	
ELEVATION	1867.0 m
TEST PRESSURE	7850 kPa

TEST SECTION LOW POINT	
ELEVATION	1632.0 m
TEST PRESSURE	8084 kPa

TEST SECTION TEST POINT	
ELEVATION	1632.0 m
TEST PRESSURE	8084 kPa

NOTES

1. TEST MEDIUM IS AIR.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
3. DEAD WEIGHT TESTER, PRESSURE RECORDER, AND PRESSURE PUMP ARE ALL LOCATED AT TEST POINT.
4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. STATIC AIR PRESSURE CHANGE PER METRE OF ELEVATION IS 0.995 kPa.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-TP-0042 AIR RELIEF VALVE
- 5-08-02-00-AL-0004 PLAN AND PROFILE
- 5-08-02-00-AL-0005 PLAN AND PROFILE

LENGTH OF TEST SECTION	7.2 km
VOLUME OF TEST SECTION	4540 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR.448 CAT II
MAXIMUM TEST PRESSURE	8084 kPa
% SMYS (MAXIMUM)	92.7%
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %

PREPARED BY:

RONIVEN

CONSULTING ENGINEERS LTD.

CALGARY, CANADA

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
0	ISSUED FOR APPROVAL	80-9-24	dbt		

ALBERTA NATURAL GAS COMPANY LTD

[Signature]
CHIEF ENGINEER

NORTHERN PIPELINE AGENCY
CANADA



ALBERTA NATURAL GAS COMPANY LTD

AGENTS FOR

FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

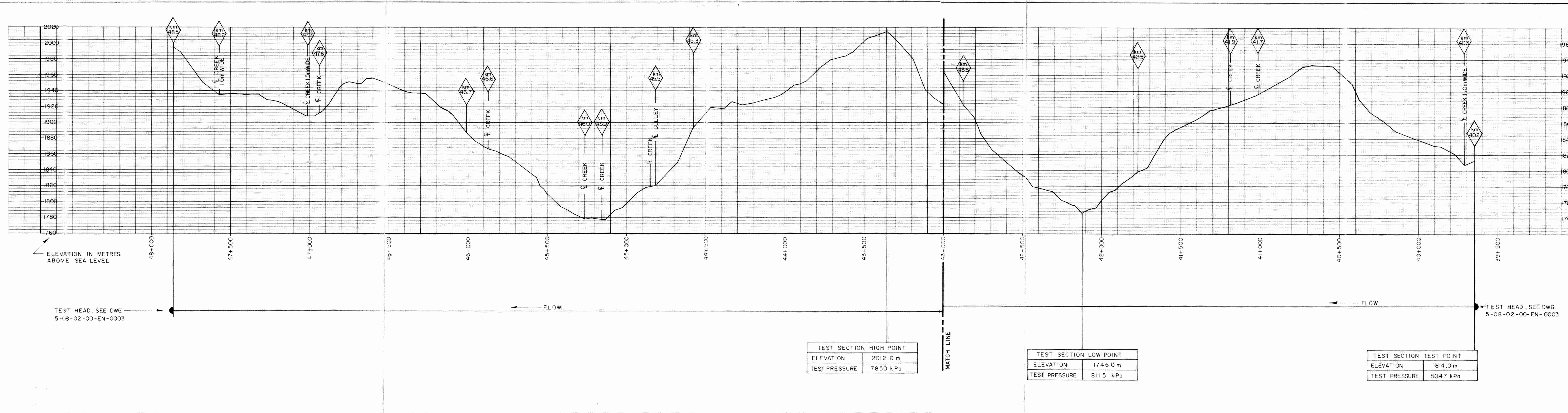
ALASKA HIGHWAY GAS PIPELINE PROJECT

914 mm O.D. GAS PIPELINE

AIR TEST SECTION A-1

STATION 30+660 TO 37+754.1

RGN	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0



NOTES

1. TEST MEDIUM IS AIR.
2. PROPOSED MAXIMUM OPERATING PRESSURE IS 6280 kPa.
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4. FOR LOCATIONS OF HEAVY WALL PIPE REFER TO PLAN AND PROFILE AS REFERENCED BELOW.
5. STATIC AIR PRESSURE CHANGE PER METRE OF ELEVATION IS 0.995 kPa.

REFERENCE DRAWINGS

- 5-08-02-00-EN-0003 HYDROSTATIC TEST HEAD
- 5-08-02-00-TP-0042 AIR RELIEF VALVE
- 5-08-02-00-AL-0006 PLAN AND PROFILE

LENGTH OF TEST SECTION	8.3 km
VOLUME OF TEST SECTION	5235 m ³
DESIGN FACTOR	0.72
PIPE O.D. x W.T.	914 mm x 8.89 mm
SPECIFICATIONS	CSA Z 245.2 GR.448 CAT II
MAXIMUM TEST PRESSURE	8115 kPa
% SMYS (MAXIMUM)	93 %
MINIMUM TEST PRESSURE	7850 kPa
% SMYS (MINIMUM)	90 %

PREPARED BY:

RONIVEN
CONSULTING ENGINEERS LTD. CALGARY, CANADA

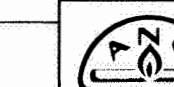
REVISIONS

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ALBERTA NATURAL GAS COMPANY LTD

[Signature]
CHIEF ENGINEER

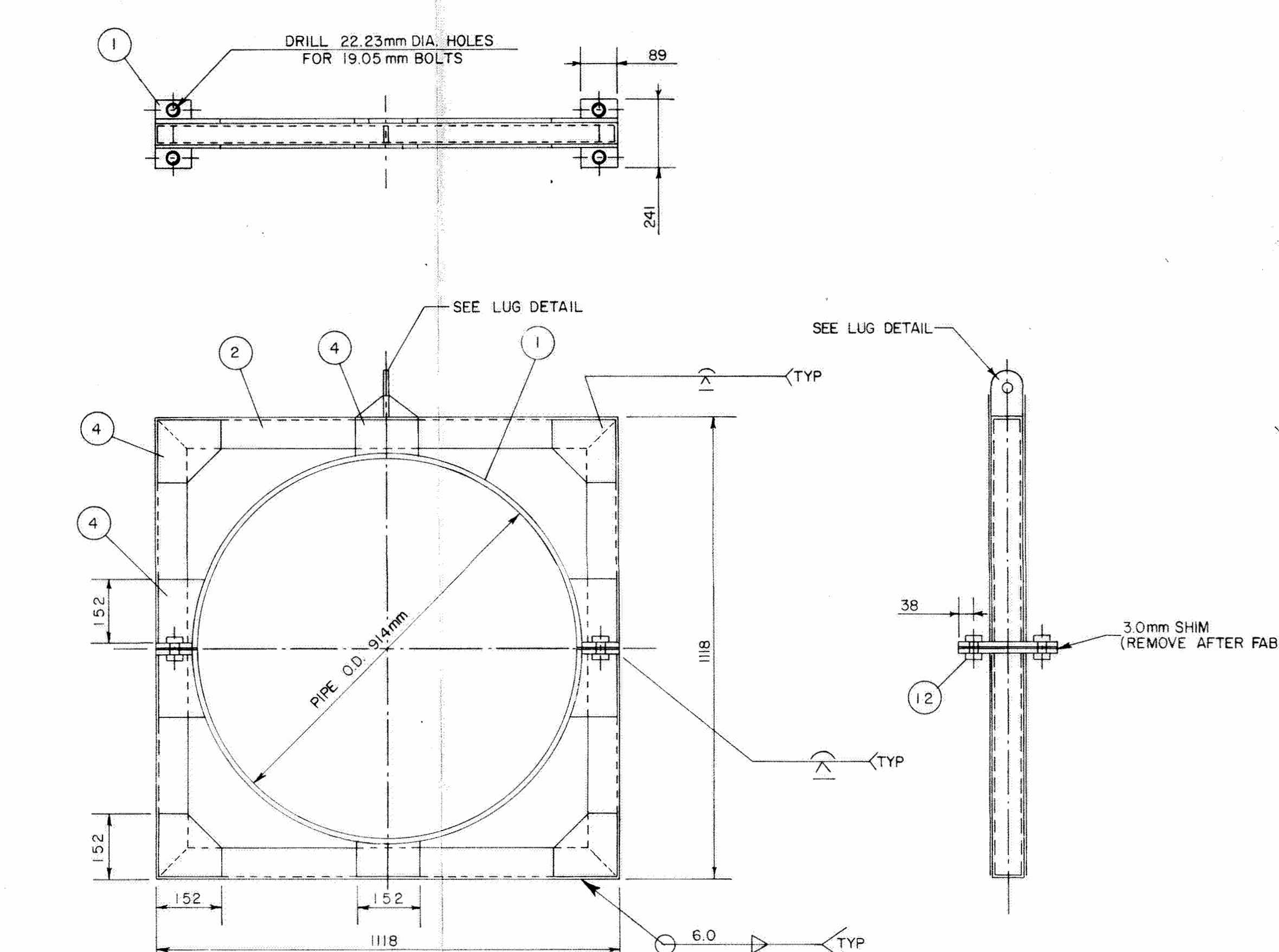
NORTHERN PIPELINE AGENCY
CANADA



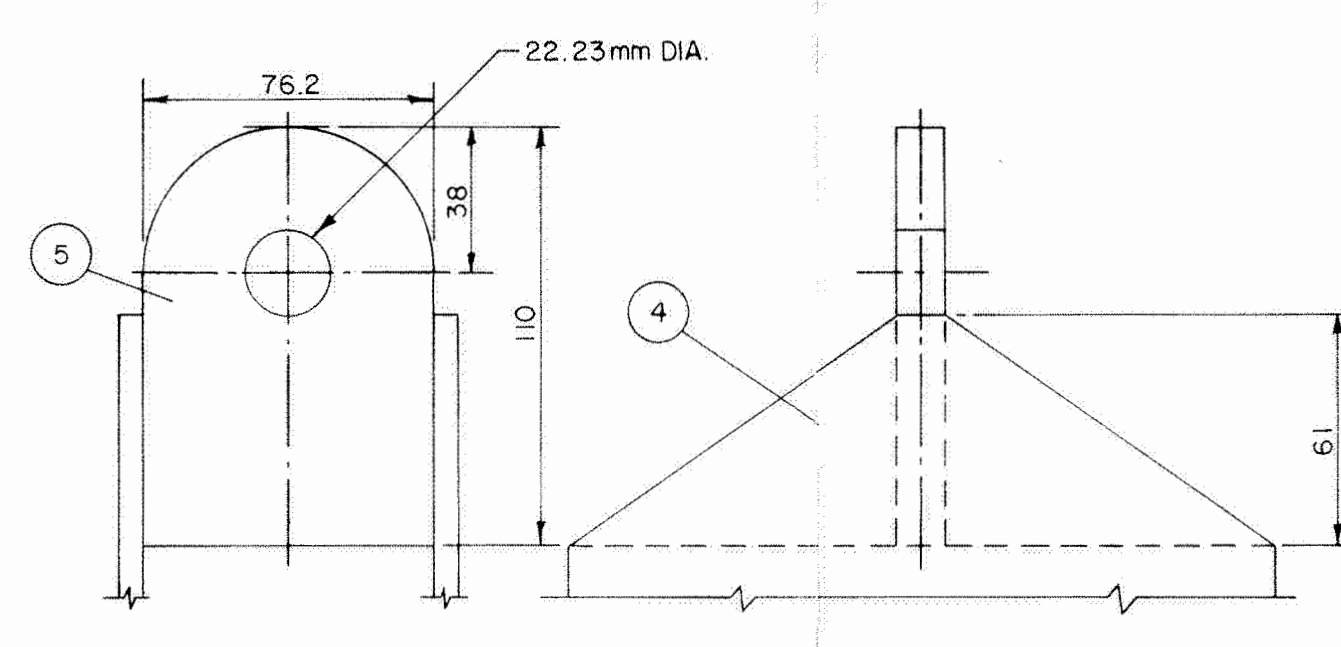
ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

ALASKA HIGHWAY GAS PIPELINE PROJECT
914 mm O.D. GAS PIPELINE
AIR TEST SECTION A - 3
STATION 39+412 TO 47+850.4

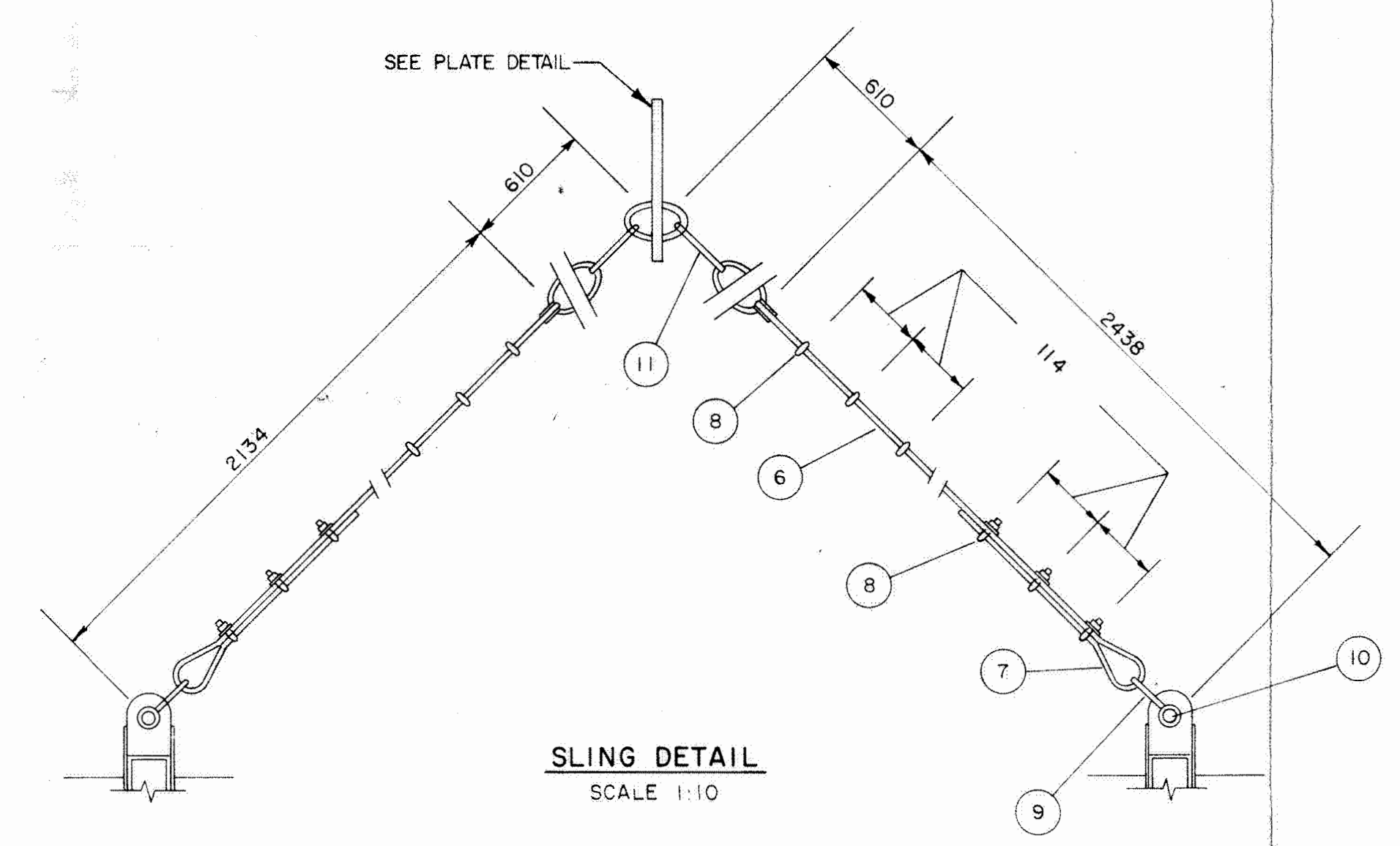
RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0	8	0	2	0	0
				A	T	0
						0
						3
						0



BRACKET DETAILS
SCALE 1:10



LUG DETAIL
SCALE 1:2



SLING DETAIL
SCALE 1:10

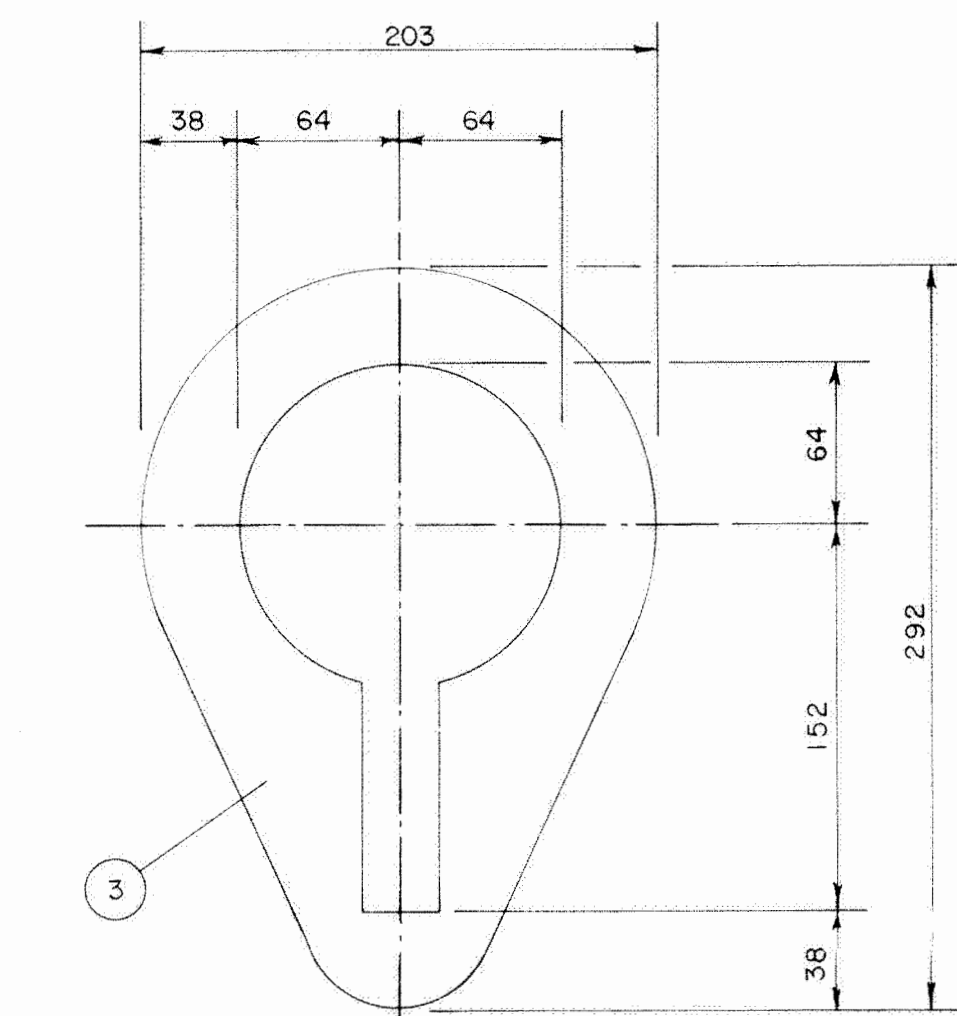


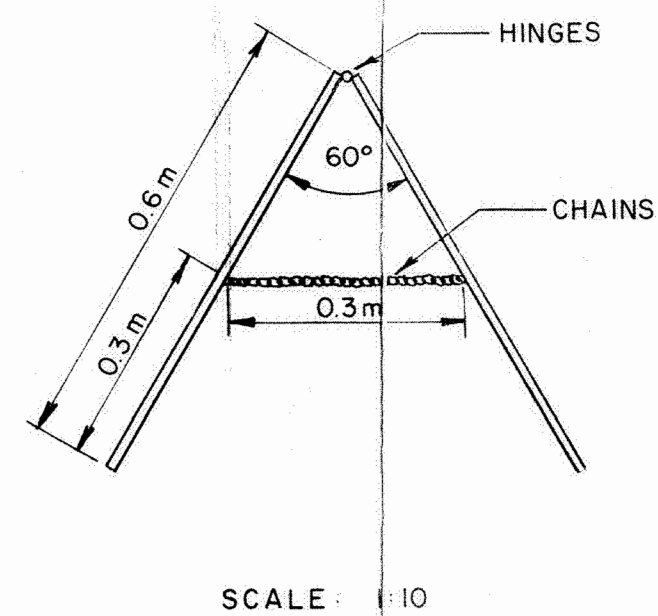
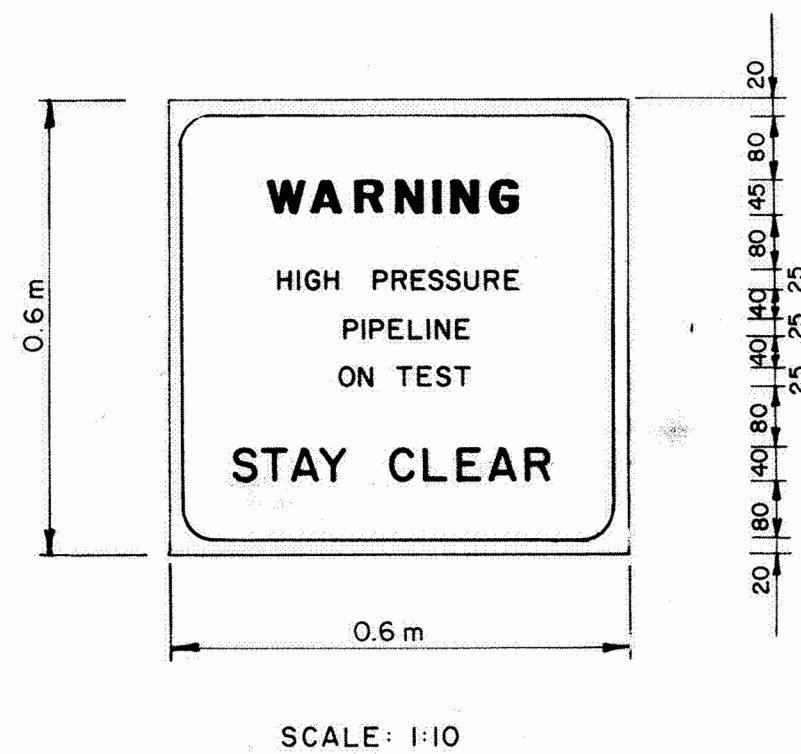
PLATE DETAIL
SCALE 1:3

MATERIAL LIST					
ITEM	DESCRIPTION	QTY	UNIT	P.O.	
				NO.	ITEM
1	FLAT BAR, 89mm X 12.7mm THICK, M.S., ASTM A-36.	8	m		SUPPLIED BY SHOP
2	76mm CHANNEL AT 7.44 kg/m ASTM A-36.	9.4	m		"
3	PLATE, 304.8mm X 203.2mm X 19.05mm THICK M.S., ASTM A-36.	1	EACH		"
4	FLAT BAR, 152.4mm X 6.35mm THICK, M.S. ASTM A-36.	5.2	m		"
5	LUG, 114.3mm X 76.2mm X 12.7mm THICK, M.S., ASTM A-36.	2	EACH		"
6	19.05mm DIA. ORDINARY LAY WIRE CORE ROPE 6 X 26	6.2	m		"
7	19.05mm THICK THIMBLE, EX. HVY., CROSBY - LAUGHLIN' G-414.	4	EACH		"
8	19.05mm CROSBY CLIPS.	16	EACH		"
9	19.05mm GALVANIZED ROUND PIN ANCHOR SHACKLE	2	EACH		"
10	19.05mm DIA. BOLT, A-307, C/W NUTS & WASHERS.	2	EACH		"
11	19.05mm CHAIN BBB, TRADE	1.3	m		"
12	BOLT, 19.05mm DIA. X 51.4mm LONG, A-307, C/W NUTS & WASHERS	8	EACH		"

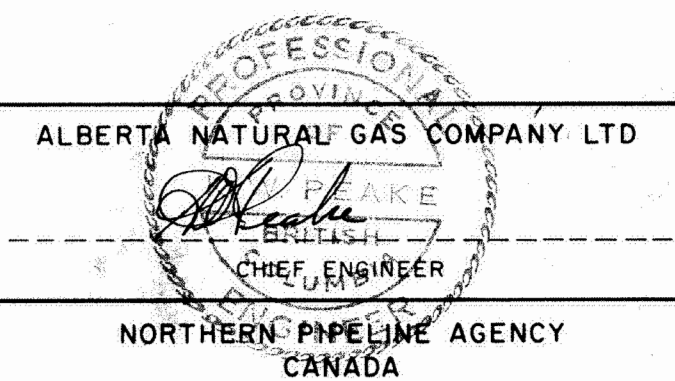
- NOTES
1. MATERIAL IN BILL OF MATERIALS IS LISTED FOR TWO COMPLETE LIFTING BRACKETS (TWO (2) BRACKETS REQUIRED PER TEST HEAD).
 2. ALL DIMENSIONS ARE IN MILLIMETRES.
 3. ENTIRE BRACKET ASSEMBLY TO BE FABRICATED USING FULL LENGTH 6.0mm FILLET WELDS ON ALL SIDES.
 4. SEE DRAWING 5-08-02-00-EN-0002 AND 5-08-02-00-EN-0003 FOR 914mm TEST HEAD DETAILS.
 5. AFTER FABRICATION THE ENTIRE ASSEMBLY SHALL BE PAINTED SILVER WITH A RUST PREVENTATIVE PAINT.
 6. ADJUST THE DISTANCE BETWEEN BRACKETS AND CABLE LENGTH FOR LIFTING HEIGHT AFTER FABRICATION.
 7. BRACKETS SHALL BE FABRICATED TO FIT SECURELY AROUND THE CIRCUMFERENCE OF THE TEST HEAD.


REVISIONS <table border="1"> <tr> <th>REV</th> <th>DESCRIPTION</th> <th>DATE</th> <th>BY</th> <th>CHKD</th> <th>APPR</th> </tr> <tr> <td>0</td> <td></td> <td></td> <td>dbt</td> <td></td> <td></td> </tr> <tr><td> </td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td> </td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td> </td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td> </td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td> </td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td> </td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td> </td><td></td><td></td><td></td><td></td><td></td></tr> </table>							REV	DESCRIPTION	DATE	BY	CHKD	APPR	0			dbt																																													ALBERTA NATURAL GAS COMPANY LTD. CHIEF ENGINEER	NORTHERN PIPELINE AGENCY CANADA	<div> ALBERTA NATURAL GAS COMPANY LTD. <small>AGENTS FOR</small> FOOTHILLS PIPE LINES (SOUTH B.C.) LTD. </div> <div> 914mm HYDROSTATIC TEST HEAD BRACKET DETAILS </div> <div> <small>SCALE: AS SHOWN</small> <table border="1"> <tr> <th>RGN</th> <th>ZONE</th> <th>FACIL</th> <th>NO.</th> <th>DWG TYPE</th> <th>DRAWING NO.</th> <th>REV</th> </tr> <tr> <td>5</td> <td>0</td> <td>8</td> <td>0</td> <td>2</td> <td>0</td> <td>0</td> </tr> </table> </div>	RGN	ZONE	FACIL	NO.	DWG TYPE	DRAWING NO.	REV	5	0	8	0	2	0	0
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1. WARNING SIGN SHALL BE PLACED NEAR ALL ROADS CROSSING SECTIONS OF THE PIPELINE WHICH ARE ON TEST.
2. WARNING SIGN SHALL HAVE MESSAGE PRINTED ON BOTH SIDES.
3. LETTERING SHALL BE RED ON WHITE BACKGROUND.
4. SIGN SHALL BE CONSTRUCTED OF 19mm PLYWOOD AND SHALL BE HINGED AND CHAINED NEAR BOTH EDGES.
5. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

[illegible]

REFERENCE DRAWINGS



 ALBERTA NATURAL GAS COMPANY LTD
AGENTS FOR
FOOTHILLS PIPE LINES (SOUTH B.C.) LTD.

TYPICAL HYDROSTATIC TEST WARNING SIGN

RGN.	ZONE	FACILITY	NO.	DWG. TYPE	DWG. NO.	REV.
5	0 8	0 2	0 0	T P	0 0 2 5	0