Gas Industry Standard

GIS/E58:2006

Specification for

Gland seals for insertion of polyethylene pipe into low pressure metallic gas mains

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Contents

Foreword

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Mandatory and non-mandatory requirements

For the purposes of a GIS the following auxiliary verbs have the meanings indicated:

can indicates a physical possibility;

may indicates an option that is not mandatory;

shall indicates a GIS requirement;

should indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment needs to be completed to show that the alternative method delivers the same, or better, level of protection.

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Brief history

First published as T/SP/TE/E2.1	
Editorial update to comply with GRM	October 2004
Edited by BSI in accordance with BS 0-3:1997	August 2006
Reviewed on behalf of the Gas Distribution Networks' Technical Standard Forum by BSI	September 2013
Reviewed by TSF	June 2018
Reviewed by TSF	April 2023

1 Scope

Gas Industry Standard specifies requirements for gland seals for insertion of polyethylene pipe into a metallic main under live gas conditions.

The gland seals specified are suitable for use on low pressure (LP) mains in the size range from 100 mm (4 in) to 450 mm (18 in) diameter.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 10216-1, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties*.

BS EN 10217-1, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties*.

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply.

3.1
low pressure (LP)
operating pressures not greater than 75 mbar

3.2
gland seal
seal arrangement for containing live gas between inserted polyethylene pipe and a carrier main

4 Construction and materials

4.1 All components shall be suitable for use with third family gases, which include natural gas.

4.2 The equipment shall be resistant to petroleum-based products such as oil, petrol and diesel, etc. It shall be no more than 21 kg in mass to comply with current manual handling legislation for single person movement. It shall also be durable enough for use in operations on the gas supply network by engineering teams.

5 Design

5.1 The gland seal shall be suitable for use with LP (75 mbar) gas mains.

5.2 The gland seal shall be capable of being attached to gas mains made from cast iron and steel in the size range 75 mm (3 in) to 450 mm (18 in) diameter.

5.3 Prior to the insertion of polyethylene pipe, the gland seal shall be capable of retaining mains pressure.

5.4 The gland seal shall be capable of sealing against standard polyethylene pipe in the size range 63 mm to 400 mm diameter, and peelable polyethylene pipe in the size range 75 mm, 90mm, 110 mm, 160 mm and from 250 mm to 400 mm diameter.

5.5 The gland seal shall be capable of containing live gas between polyethylene pipe and a carrier main during the insertion of polyethylene pipe through the gland seal at LP operating conditions.

5.6 After insertion of polyethylene pipe through the gland seal, the gland seal shall be capable of containing live gas between polyethylene pipe and a carrier main operating at LP conditions for a minimum period of 12 months.

5.7 Where the gland seal is used to seal between the main and the polyethylene pipe, the maximum polyethylene pipe size, corresponding to the nominal diameter of the main, shall be in accordance with Table 1. Furthermore, smaller sizes of polyethylene pipe within a particular size of main should be able to be accommodated by the gland seal.

5.8 The maximum design life of the gland seal shall be 12 months.

Table 1 — Carrier main nominal diameters and maximum polyethylene pipe diameters

Carrier main diameter		**Maximum polyethylene pipe diameter**
mm	(in)	mm
75	(3)	63
100	(4)	75
100	(4)	90
125	(5)	110
150	(6)	125
200	(8)	160
200	(8)	180
250	(10)	213 [a)]
300	(12)	268 [a)]
350	(14)	315
400	(16)	355
450	(18)	400
[a)] Polyethylene pipe diameters normally used for swagelining.		

6 Performance

6.1 Static sealing test

When the gland seal is tested in accordance with Annex A the leak rate shall be no more than 15 L/min.

NOTE A safety factor of 2 has been applied to the test pressures to cover acceptable gas leakage rates under LP operating conditions.

6.2 Retention test

When tested in accordance with Annex B the gland seal shall remain attached to the steel pipe.

NOTE A safety factor of 4 has been applied to the test pressures to cover acceptable retention loads under LP operating conditions.

6.3 Long term test

6.3.1 When the gland seal is tested in accordance with Annex C the leak shall be no more than 15 L/min.

6.3.2 The minimum design life of the gland seal should be 12 months. In the event that tests indicate that the design life is shorter, then this shall be stated. In all cases the design life shall be at least 6 months.

6.4 Membrane test

When the gland seal is tested in accordance with Annex D the leak rate shall be no more than 15 L/min.

6.5 Insertion of polyethylene pipe

When the gland seal is tested in accordance with Annex E the leakage rate shall be no more than 15 L/min.

NOTE It is acceptable to increase the amount of polyethylene pipe inserted through the gland seal as long as it meets the requirements of annex E. In this case an increased insertion length can be claimed for subsequent operational purposes.

6.6 Retraction of polyethylene pipe

When tested in accordance with Annex F the gland seal shall remain attached to the carrier main.

7 Quality and user instructions

User instructions shall be provided with each item of equipment.

8 Marking

Products conforming to GIS/E58 shall be permanently marked with the following information:

a) the number and date of this standard, i.e GIS/E58:2006 [1)];

b) the name or trademark of the manufacturer or their appointed agent;

c) the manufacturer's contact details;

d) production date;

e) model and serial number;

f) where authorized, the product conformity mark of a third party certification body, e.g. BSI Kitemark.

NOTE Attention is drawn to the advantages of using third party certification of conformance to a standard.

[1)] Marking GIS/E58:2006 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Annex A (normative)
Static sealing test

A.1 Principle

The integrity of the gland seal is determined.

A.2 Apparatus

A.2.1 *Steel pipe*, conforming to BS EN 10216-1 or BS EN 10217-1.

A.2.2 *Pressure source*, at 150 mbar.

A.2.3 *Flow meter*, capable of reading up to 20 L/min.

A.2.4 *Pressure gauge*, capable of measuring up to 175 mbar in steps of 1 mbar.

A.3 Test sample

Carry out this test on each combination of polyethylene pipe and carrier main specified in Table 1.

A.4 Procedure

Prepare a 2 m length of steel pipe, conforming to BS EN 10216-1 or BS EN 10217-1, for each size of main to be inserted.

Set up the gland seal onto the steel pipe and insert the polyethylene pipe as shown in Figure A.1.

Arrange for the steel pipe and the polyethylene pipe to be capped so that the arrangement can be pressurized.

Provide a suitable external restraint system prior to introducing pressure into the assembly to ensure that any failure will be contained. Pressurize the assembly to 150 mbar and hold for a period of 1 h. During this time monitor any leakage from the assembly.

A.5 Expression of results

Record and report the following:

a) pressure;

b) flow rate after 1 h.

A.6 Test report

The test report shall include the following information:

a) reference to this standard, i.e. GIS/E58;

b) the results of the determination;

c) any additional factors which may have affected the results of the test.

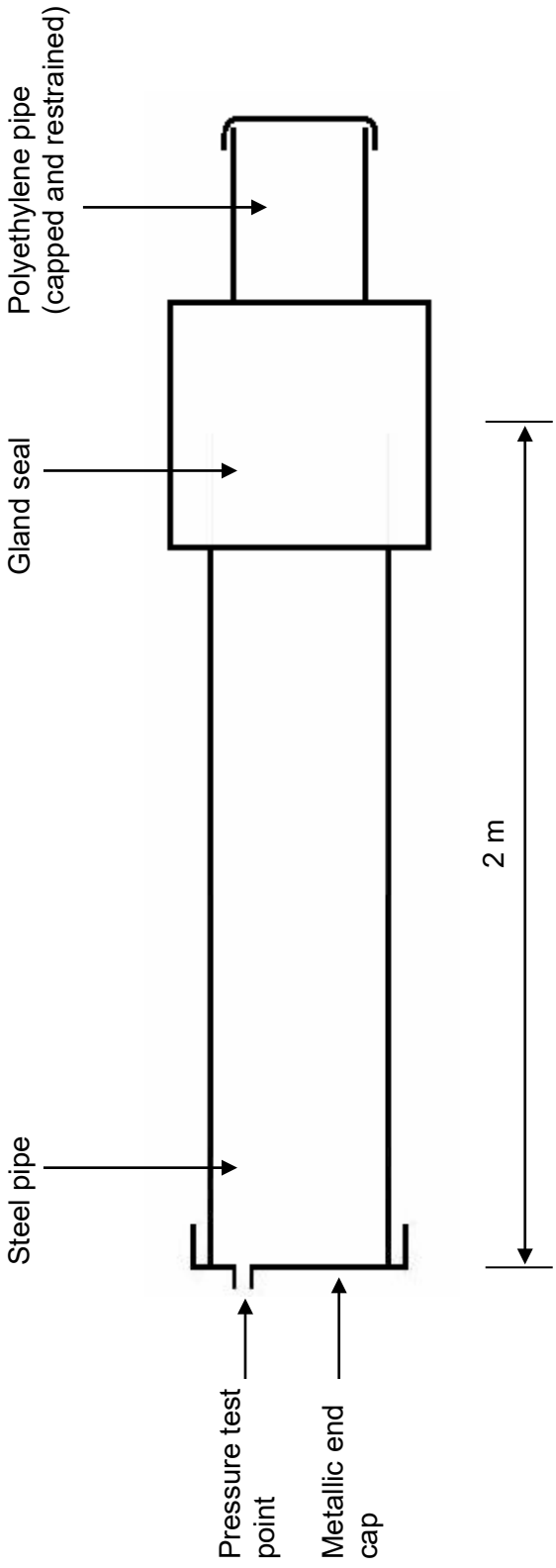

Figure A.1 — Assembly for seal gland pressure test

Annex B (normative)
Retention test

B.1 Principle

The ability of the attachment of the gland seal arrangement to the metal carrier pipe to contain the pressure loads under LP operating conditions is determined.

B.2 Apparatus

B.2.1 *Carrier pipe*, conforming to BS EN 10216-1 or BS EN 10217-1.

B.2.2 *External restraint system*, to permit some axial movement between the gland seal and the carrier pipe to which it is attached.

B.2.3 *Pressure source*, of 300 mbar.

B.2.4 *Pressure guage*, capable of measuring up to 325 mbar in steps of 1 mbar.

B.3 Test sample

Carry out this test on a single gland seal for each size of metallic main in combination with any size of polyethylene pipe as shown in Table 1.

B.4 Procedure

Prepare a 2 m length of carrier pipe, conforming to BS EN 10216-1 or BS EN 10217-1, for each size of carrier pipe to be inserted. Set up the gland seal onto the carrier pipe and insert the polyethylene pipe as shown in Figure B.1. Arrange for the carrier pipe and the polyethylene pipe to be capped so that the arrangement can be pressurized. Provide a suitable external restraint system prior to introducing pressure into the assembly to ensure that any failure will be contained.

Pressurize the assembly to 300 mbar and hold for a period of 1 h.

B.5 Expression of results

Record and report the following:

a) pressure after 1 h;

b) whether the fitting has remained attached to the carrier pipe.

B.6 Test report

The test report shall include the following information:

a) reference to this standard, i.e. GIS/E58;

b) the results of the determination;

c) any additional factors which may have affected the results of the test.

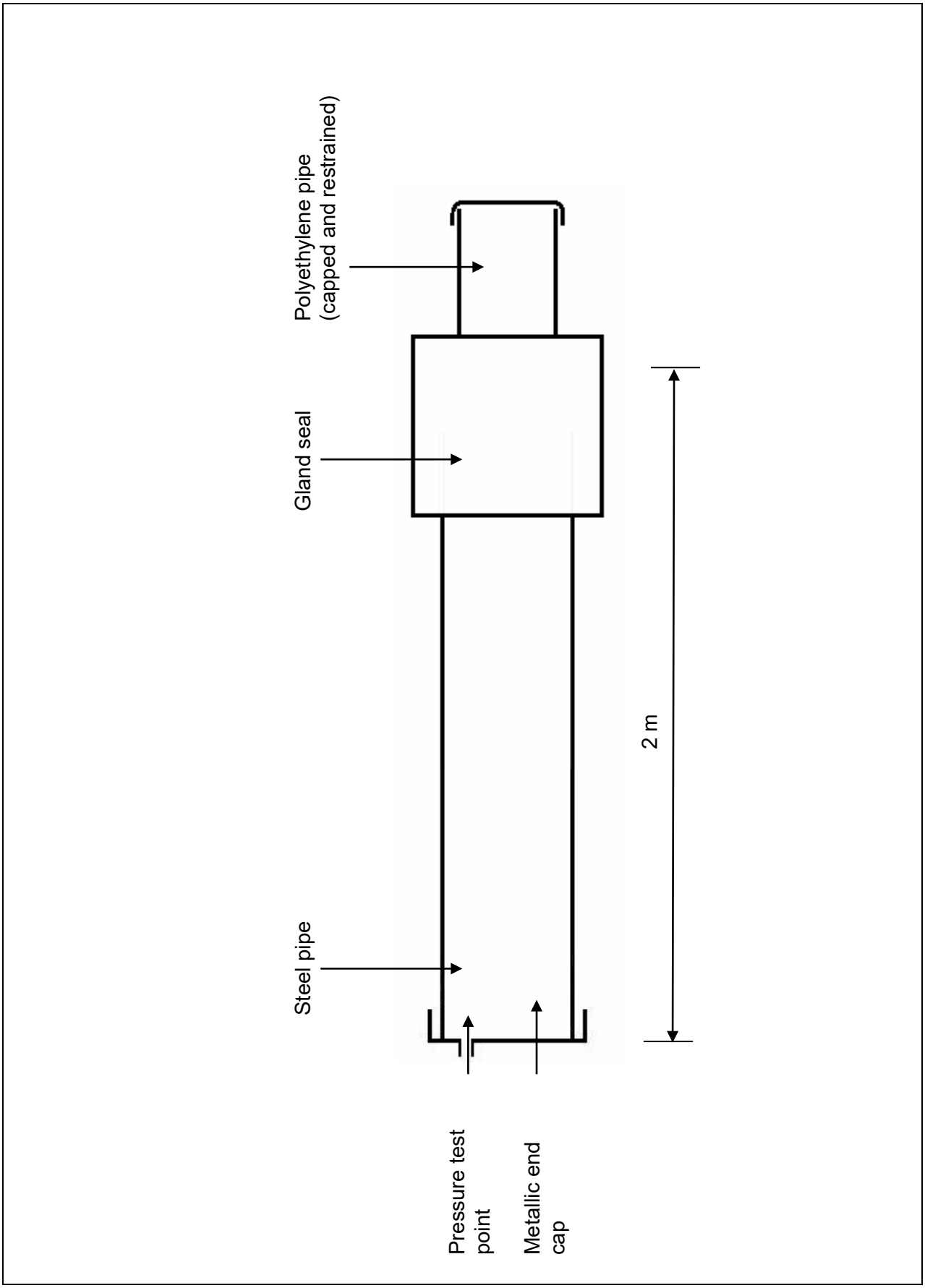

Figure B.1 — Assembly for seal gland retention test

Annex C (normative)
Long term test

C.1 Principle

The ability of the gland seal arrangement to contain gas during its design life is determined.

C.2 Apparatus

C.2.1 *Carrier pipe*, conforming to BS EN 10216-1 or BS EN 10217-1.

C.2.2 *Pressure source*, of 150 mbar.

C.2.3 *Pressure gauge*, capable of measuring up to 175 mbar in steps of 1 mbar.

C.2.4 *Flow meter*, capable of measuring up to 20 L/min in steps of 1 L/min.

C.3 Test sample

Carry out this test on a single gland seal for each size of polyethylene pipe to be accommodated, in combination with any size of metallic pipe as shown in Table 1. However, within a set of gland seal sizes to be tested, at least one shall be chosen to accommodate each size of metallic main.

C.4 Procedure

2 m length of carrier pipe conforming to BS EN 10216-1 or BS EN 10217-1 for each arrangement to be tested. Set up the gland seal onto the carrier pipe and insert the polyethylene pipe as shown in Figure C.1.

Arrange for the carrier pipe and the polyethylene pipe to be capped so that the arrangement can be pressurized.

Provide a suitable external restraint system prior to introducing pressure into the assembly to ensure that any failure will be contained.

Pressurize the assembly to 150 mbar and hold for a period of 12 months. Test the seal for leakage at least each month to confirm that pressure is being contained.

After 12 months reduce the pressure to 100 mbar and test the seal for leakage.

C.5 Expression of results

Record and report the following:

a) pressure, in mbar, at monthly intervals over 12 months together with any associated leakage rate in L/min;

b) at 12 months the pressure, in mbar, together with any associated leakage rate in L/min.

C.6 Test report

The test report shall include the following information:

a) reference to this standard, i.e. GIS/E58;

b) the results of the determination;

c) any additional factors which may have affected the results of the test.

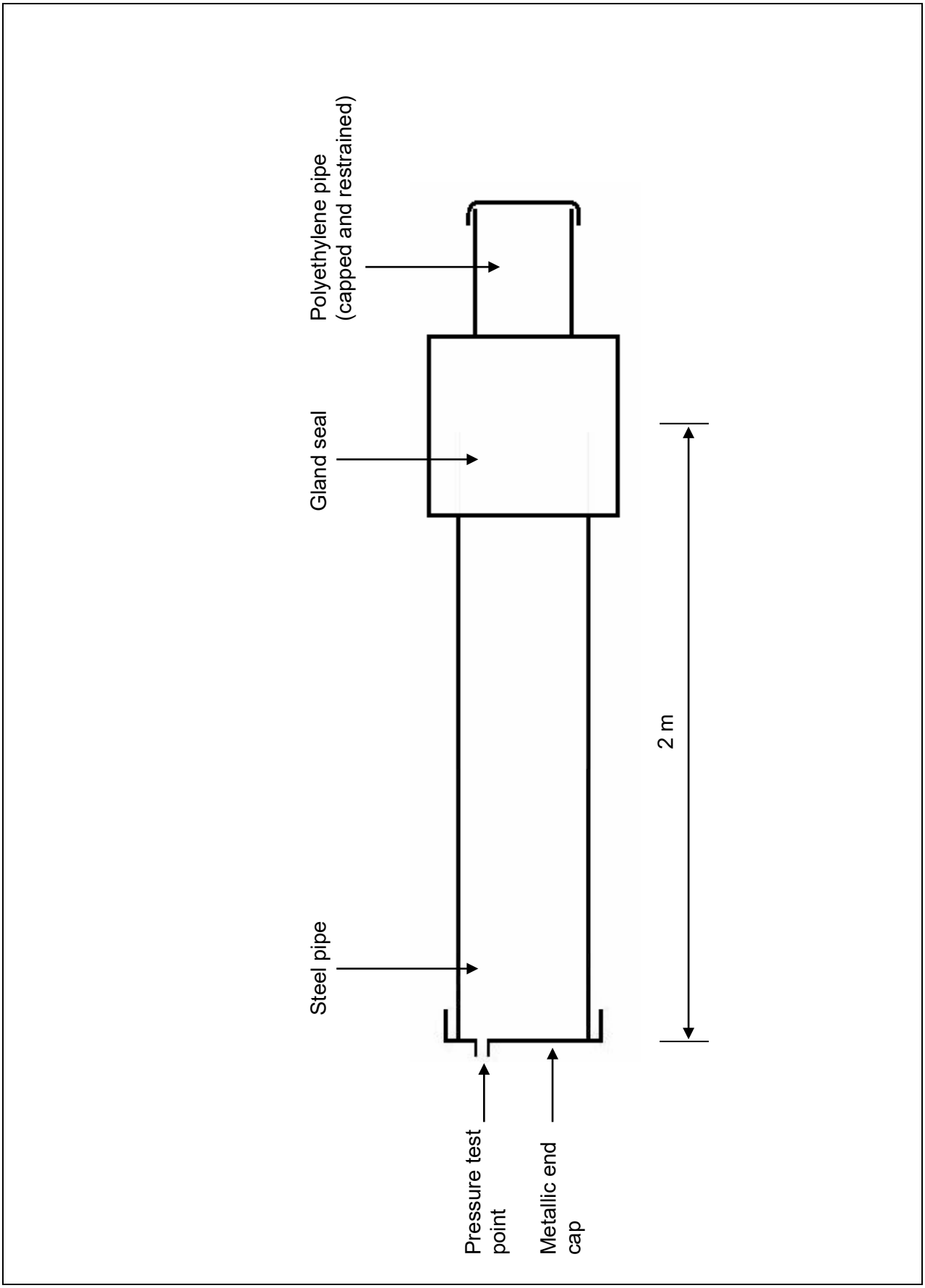

Figure C.1 — Assembly for seal gland life test

Annex D (normative)
Membrane test

D.1 Principle

The ability of the gland seal membrane to contain gas prior to insertion of the polyethylene pipe is determined.

D.2 Apparatus

D.2.1 *Steel pipe*, conforming to BS EN 10216-1 or BS EN 10217-1.

D.2.2 *External restraint system*, to ensure any failure shall be contained.

D.2.3 *Pressure source*, of 150 mbar.

D.2.4 *Pressure gauge*, capable of measuring up to 175 mbar in steps of 1 mbar.

D.2.5 *Flow meter*, capable of measuring up to 20 L/min in steps of 1 L/min.

D.3 Test sample

Carry out this test for each combination of polyethylene pipe and metallic main as shown in Table 1.

D.4 Procedure

Prepare a 2 m length of steel pipe conforming to BS EN 10216-1 or BS EN 10217-1 for each arrangement to be tested. Set up the gland seal onto the steel pipe as shown in Figure D.1. Cap the steel pipe so that the arrangement can be pressurized.

Provide a suitable external restraint system prior to introducing pressure into the assembly to ensure that any failure will be contained.

Pressurize the assembly to 150 mbar and hold for a period of 1 h.

D.5 Expression of results

Record and report the following:

a) pressure, in mbar, after 1 h;

b) any associated leakage rate, in L/min.

D.6 Test report

The test report shall include the following information:

a) reference to this standard, i.e. GIS/E58;

b) the results of the determination;

c) any additional factors which may have affected the results of the test.

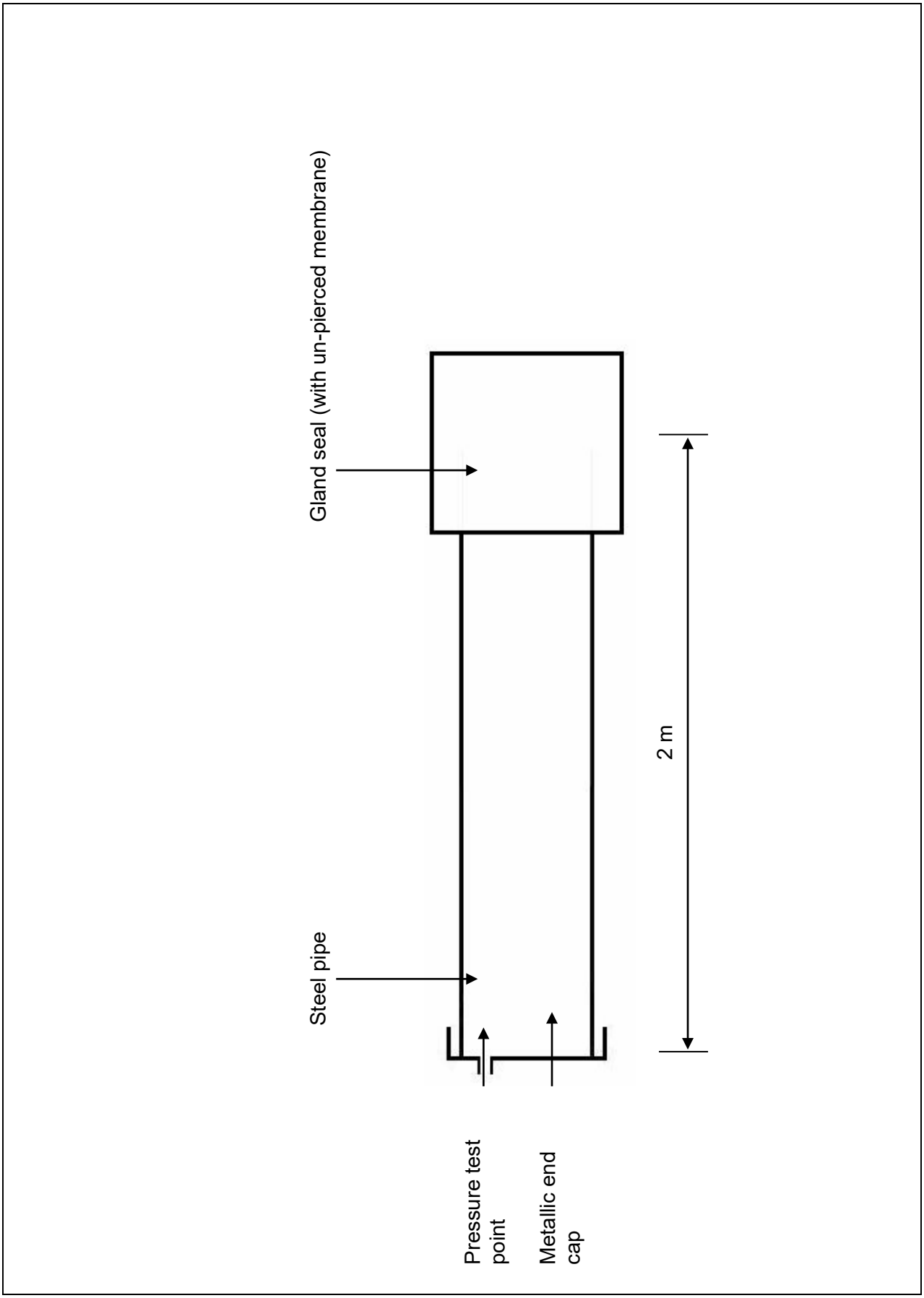

Figure D.1 — Assembly for membrane test

Annex E (normative)
Insertion of polyethylene pipe

E.1 Principle

The ability of the gland seal to withstand any wear accumulated by the insertion of polyethylene pipe is determined.

E.2 Apparatus

E.2.1 *External restraint system*, to ensure any failure shall be contained.

E.2.2 *Pressure source*, at 75 mbar.

E.2.3 *Pressure gauge*, capable of measuring up to 100 mbar in steps of 1 mbar.

E.2.4 *Flow meter*, capable of measuring up to 20 L/min in steps of 1 L/min.

E.3 Test sample

Carry out this test on a single gland seal for each size of polyethylene pipe to be accommodated, in combination with any size of carrier main as specified in Table 1.

E.4 Procedure

Prepare a representative section of main to accommodate the gland seal. Insert polyethylene pipe to represent a minimum 200 m length of insertion.

NOTE It is acceptable to increase the length of polyethylene pipe if necessary.

Remove the gland seal and set up the gland seal onto the steel pipe and insert a length of polyethylene pipe as shown in Figure E.1. Cap the steel pipe and the polyethylene pipe so that the arrangement can be pressurized. Provide a suitable external restraint system prior to introducing pressure into the assembly to ensure that any failure will be contained.

Pressurize the assembly to 75 mbar and hold for a period of 1 h.

E.5 Expression of results

Record and report the following:

a) pressure, in mbar, after 1 h;

b) any associated leakage rate in L/min.

E.6 Test report

The test report shall include the following information:

a) reference to this standard, i.e. GIS/E58;

b) the results of the determination;

c) any additional factors which may have affected the results of the test.

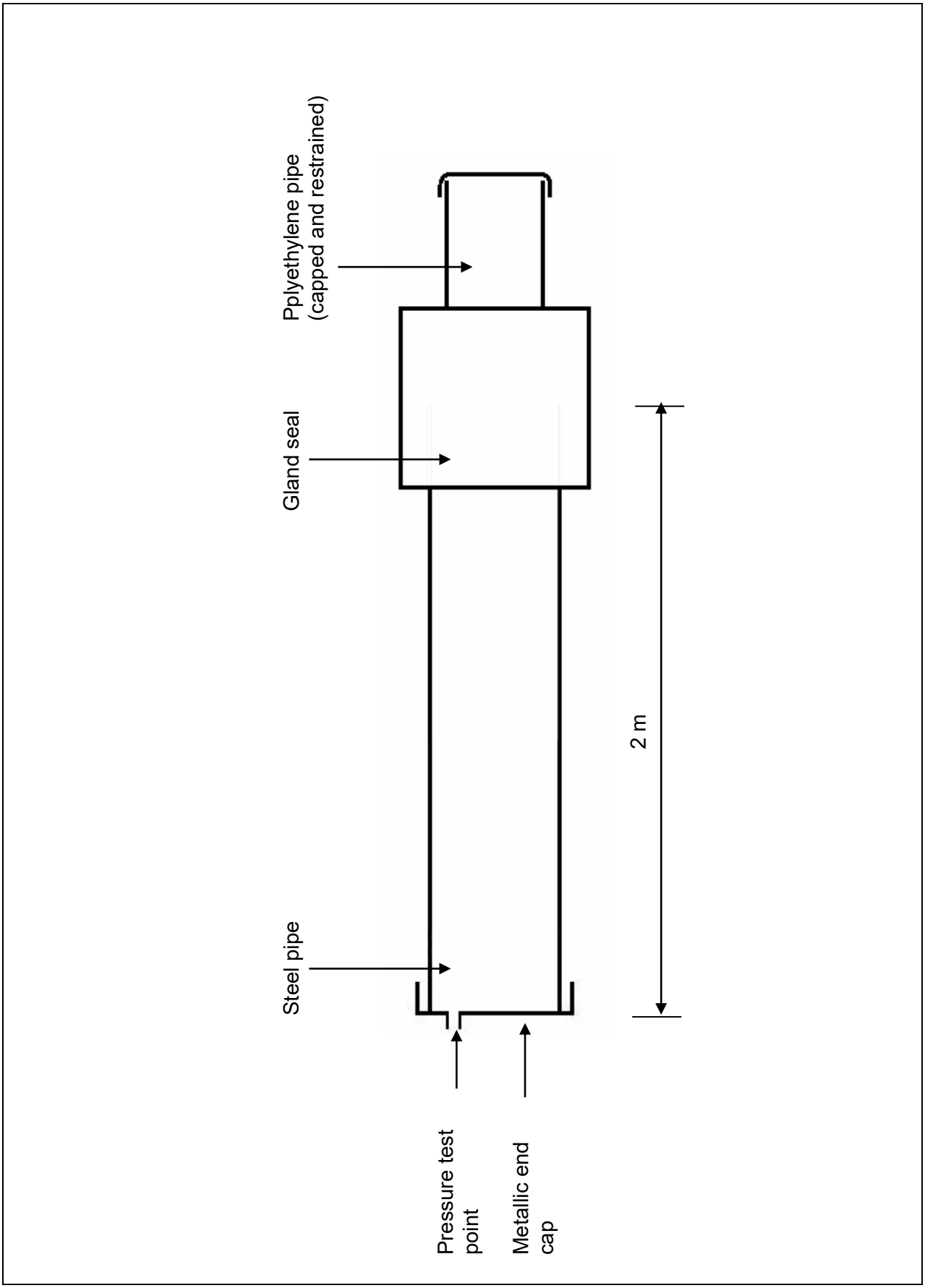

Figure E.1 — Assembly for polyethylene pipe insertion test

Annex F (normative)
Retraction of polyethylene pipe

F.1 Principle

The ability of the gland seal to remain attached to the carrier pipe, if the polyethylene pipe is retracted out of the main, is determined.

F.2 Apparatus

F.2.1 *Polyethylene pipe pushing machine*.

F.3 Test sample

Carry out this test on a single gland seal for each size of polyethylene pipe to be accommodated, in combination with the smallest carrier pipe specified in Table 1.

F.4 Procedure

Prepare a representative section of carrier pipe to accommodate the gland seal.

Insert a 12 m length of polyethylene pipe into the gland seal as shown in Figure F.1, and then retract the polyethylene pipe at the maximum possible retraction rate that will be experienced in normal field operating conditions.

NOTE For references purposes an average retraction rate would be of the order of 1.5 m/min although the peak rate associated with a pushing machine may be above this value. Operating instructions for current range pipe pushing machines should be consulted.

F.5 Expression of results

Record and report the following:

a) the retraction rate;

b) the degree of attachment of the gland to the carrier pipe.

F.6 Test report

The test report shall include the following information:

a) reference to this standard, i.e. GIS/E58;

b) the results of the determination;

c) any additional factors which may have affected the results of the test.

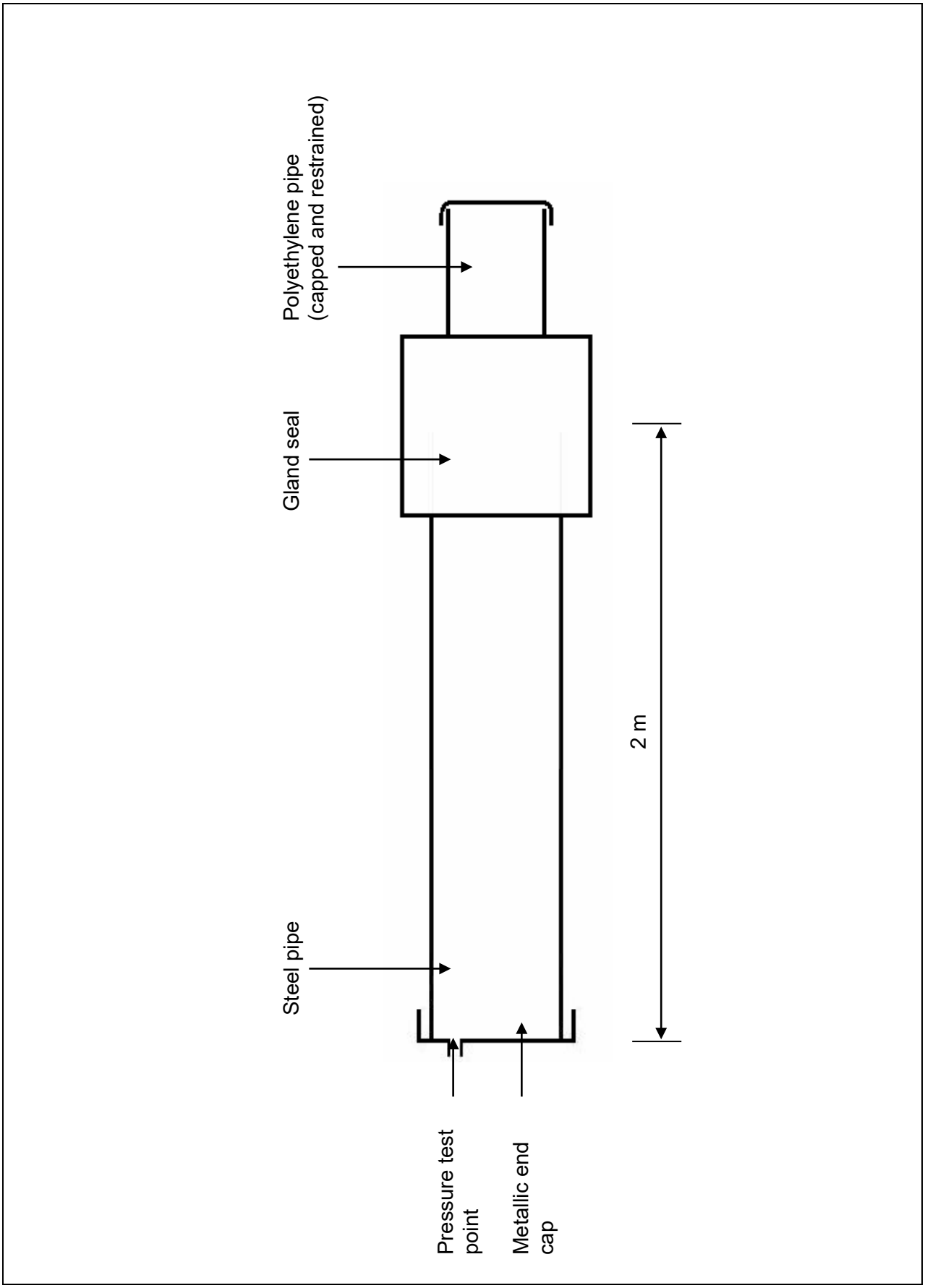

Figure F.1 — Assembly for polyethylene pipe retraction test