

GUIDANCE NOTE GU20

TESTING METHOD FOR BASIC SAFETY ASSESSMENT CERTIFICATION FOR APPROVAL OF SEMI-FLEXIBLE GAS TUBING FOR LOW PRESSURE APPLICATIONS

CONTENTS

	Page
1. Foreword	1
2. Introduction	2
3. Basic Requirements and General Construction	2
4. Precautions	2
5. Leak-tightness Test	2
6. Tension Test	3
7. Bending Performance Test	3
8. Flexing Resistance Test	4
9. Kinking Test	4
10. Torsion Resistance Test	6
11. Pressure Test	7
12. Impact Resistance Test	7
Figure (a) Bending Test Rig	8
Figure (b) Flexibility Test Rig	8
Figure (c) Kinking Test Rig	9
Figure (d) Torsion Test	10
Figure (e) Impact Test Rig	10

1. Foreword

- 1.1 This document should be read in conjunction with the latest version of Guidance Note GU20 - Approval of Semi-Flexible Gas Tubing for Low Pressure Applications issued by the Gas Authority.
- 1.2 The applicant shall supply the prescribed number of lengths of a model of semi-flexible gas tubing to a HOKLAS laboratory in Hong Kong with notification to the Gas Authority for carrying out a Basic Safety Assessment Test in accordance with the following test method and any additional requirements as prescribed by the Gas Authority by reference to recognized type-specific product safety standard(s). A Basic Safety Assessment Certificate issued by the HOKLAS laboratory shall thus be obtained and submitted to the Gas Authority.
- 1.3 All testing procedures described in this test method shall be carried out by competent laboratory workers. The safety precaution given in the test method does not purport to address all of the safety concerns associated with the use of test method. It is the responsibility of the user of this test method to follow appropriate safety and health measures applicable to chemical, physical and mechanical testing laboratories.
- 1.4 This Test Method "CSST-TP2" is jointly prepared between GasSO and the HOKLAS laboratory, Quality Testing Services Limited in Hong Kong. This test method could meet the requirements of Basic Safety Assessment Certification for pre-approval conditions (stated in Clause 3.1.5 of GU20) and quality assurance for post-approval conditions (stated in Clause 4.3.2 of GU20). This test method is considered as suitable for testing of semi-flexible gas tubing for low pressure applications and acceptable by GasSO.

Enquiry on the current edition of the test method can be made to GasSO or the following contact:

Quality Testing Services Limited
15/F, 363 Java Road,
North Point,
Hong Kong.
Tel.: 2963 2718
Fax: 2911 9085

2. Introduction

These Test Procedures are based on the "AS 4631-2005, Limited flexibility connectors for gas", "BS 7838:1996, Corrugated stainless steel semi-rigid pipe and associated fittings for low-pressure gas pipework of up to DN50 " and relevant test procedures adopted by HOKLAS accredited laboratory to which cross reference shall be made on the requirements and methods. For any products of non-standard design, modification of test procedures and acceptance requirements may be considered with prior to the consent to by Gas Authority.

3. Basic Requirements and General Construction

Inspect the test samples and check the items according to the specifications and dimensions as provided by the applicant.

4. Precautions

Test samples are stored in the laboratory for at least 30 minutes prior to starting testing in order to achieve thermal equilibrium.

5. Leak-tightness Test

5.1 Apparatus

- a) Pressure gauge
- b) Stop watch
- c) Measuring cylinder and funnel

5.2 Procedure

5.2.1 Each test sample assembly with external protection if fitted shall be tested in a water tank with an internal air pressure of 3 bars for 30 seconds.

5.2.2 Use a measuring cylinder with a funnel for leakage measurement, indicated by the presence of air bubbles.

5.2.3 The assembly passes the test if the leakage rate is less than 0.01 l/h.

5.2.4 If required, sample assemblies after initial leak-tightness test shall be used for other tests. They shall undergo a final leak-tightness test after the other tests.

Note: In the initial leak-tightness test, any external protection shall remain in place intact while before the final leak-tightness test, 3 cuts of 20 mm length equally spaced along the length of the tubing shall be made to open any protection cover.

6. Tension Test

6.1 Apparatus

- a) Rigid support
- b) Suitable weights
- c) Leak-tightness test apparatus as in 5.1

6.2 Procedure

6.2.1 A test sample assembly, after passing the initial-tightness test, shall be connected to the rigid support.

6.2.2 Apply a force in Newton of 60 times the nominal bore in mm or 600 N, whichever is greater, by suspending the specified mass for a period of 10 min, applied along the longitudinal axis.

6.2.3 Remove the hose from the support and repeat the leak-tightness test according to Section 5.

7. Bending Performance Test

7.1 Apparatus

- a) Test apparatus as in Figure (a)
- b) As shown in Figure (a), the clearance between the quarter pie and terminal of end fitting may be adjusted so as to suit for different size / design of the end fitting.

7.2 Procedure

- 7.2.1 A test sample assembly, after passing the initial-tightness test, shall be connected to the apparatus as shown in Figure (a). Care shall be taken to avoid torsion on the assembly during installation. Make sure that the hose stand of the testing rig is set at the correct position.
- 7.2.2 Adjust the apparatus to apply a force of 30 N to one end of the connector and at right angles to the plane in which the opposite end is secured.
- 7.2.3 The force described in 7.2.2 above is to be repeated 30 times.
- 7.2.4 Remove connector from apparatus and examine for any signs of deterioration.
- 7.2.5 The tested assembly shall undergo a final leak-tightness test according to Section 5.

8. Flexing Resistance Test

8.1 Apparatus

- a) Test apparatus as in Figure (b).
- b) As shown in Figure (a), the clearance between the quarter pie and terminal of end fitting may be adjusted so as to suit for different size / design of the end fitting.

8.2 Procedure

- 8.2.1 A test sample assembly, after passing the initial-tightness test, shall be connected to the apparatus as shown in Figure (b). Care shall be taken to avoid torsion on the assembly during installation. Make sure that the hose stand of the testing rig is set at the correct position.
- 8.2.2 Adjust the spring tension to apply a force of 20 N to the hose when in the flexed position.
- 8.2.3 Allow the apparatus to operate through 30 flexings each consisting of a complete cycle of 180° .

8.2.4 Remove hose from apparatus and test for final leak-tightness according to Section 5.

8.2.5 Examine for any signs of deterioration.

9. Kinking Test

9.1 Apparatus

- a) Test apparatus as in Figure (c)
- b) 5 kg mass
- c) Air flow meter capable of measuring the specified capacity to an accuracy of +/-5%
- d) Pressure gauge capable of measuring 50 Pa to an accuracy of +/-5%.
- e) Flow rate controlling device

9.2 Procedure

9.2.1 Fit a length of pipe, of the same nominal bore as the hose and a length at least ten times its diameter, to the hose assembly.

9.2.2 Fit the pressure gauge to the inlet pipe at five diameters from the end fitting so that the tapping into the bore of the pipe is flush and smooth.

9.2.3 Connect the inlet pipe through the flow meter and flow rate controlling device to the air supply.

9.2.4 Support the hose assembly so that it is straight.

9.2.5 Turn on the air supply and adjust so that the flow rate through the meter (corrected to 15°C and 101.325 kPa if not direct reading under these conditions) is equal to the rate specific in the following table.

Nominal Bore (mm)	Air Flow rate (m ³ /h)
10 - 15	1.0
20 - 25	2.3

9.2.6 Record the pressure gauge reading

9.2.7 If the pressure gauge reading is 50 Pa or less, loop the connector to the minimum radius specified by the

manufacturer as shown in Figure (c).

- 9.2.8 Adjust the parallel constraints to restrain the connector lightly.
- 9.2.9 Suspend the 5 kg mass from the connector.
- 9.2.10 If the connector under the weight of the applied load is not adequately restrained, re-loop and adjust the restraints inwards a further 5 mm.
- 9.2.11 Should the connector again pull free and straighten, discontinue the test and report the hose as meeting the requirement.
- 9.2.12 After 5 min adjust the flow rate to that specified in Section 9.2.5 and determine pressure drop across the kinked connector.
- 9.2.13 Unload and straighten the connector. Leave sample suspended for a recovery period of 30 min.
- 9.2.14 Adjust the flow rate to that specified in Section 9.2.5 and determine the pressure drop across the connector/connector assembly.
- 9.2.15 The assembly passes the test if:
 - the connector cannot be retained in a loop; or
 - the pressure drop with the connector looped and loaded does not exceed the initial value by more than 60 Pa; and
 - the pressure drop after the connector has been unloaded and straightens does not exceed the initial value by more than 10 Pa.

10. Torsion Resistance Test

10.1 Apparatus

- a) BS 21 Rc threaded block as in Figure (d)
- b) Torque wrench

10.2 Procedure

- 10.2.1 Secure one end-fitting of the test assembly, after passing the initial-tightness test, in a BS 21 Rc threaded block as

shown in Figure (d)

- 10.2.2 Rotate the other end-fitting around its longitudinal axis until the applied torque has reached the value given in the following table or until the free end of the test assembly has passed through 10 complete rotations, whichever is the sooner.

Nominal Size of Pipe	Torque Nm
DN 10 - 15	9
DN 20 - 22	25

The nominal sizes of the semi-flexible gas tubing are DN12 and DN20.

- 10.2.3 During the test, restrain the end-fittings so that the length of the test assembly remains the same and the axes of the end-fittings remain in line.
- 10.2.4 Remove the tested assembly and repeat the leak-tightness test according to Section 5.

11. Pressure Test

11.1 Apparatus

- a) Pressure test apparatus
- b) Stop watch

11.2 Procedure

- 11.2.1 A test sample assembly, after passing the initial leak-tightness test, shall be connected to the pressure test apparatus.
- 11.2.2 The assembly with external protection if fitted shall be tested under hydraulic pressure of 5 bars for 30 seconds. The assembly fails the test if leakage occurs.
- 11.2.3 The tested assembly shall undergo a final leak-tightness test according to Section 5.
- 11.2.4 The assembly passes the test if the leakage rate is less than 0.01 l/h.

12. Impact Resistance Test

12.1 Apparatus

a) Impact test rig

12.2 Procedure

12.2.1 A test sample assembly, after passing the initial leak-tightness test, shall be placed on the impact test rig.

12.2.2 Place a mobile plate of dimensions as shown in Figure (e) on top of the tubing.

12.2.3 A mass of 5 kg shall be dropped on the tubing freely from a height of 600 mm.

12.2.4 The tested assembly shall undergo a final leak-tightness test according to Section 5.

12.2.5 The assembly passes the test if the leakage rate is less than 0.01 l/h.

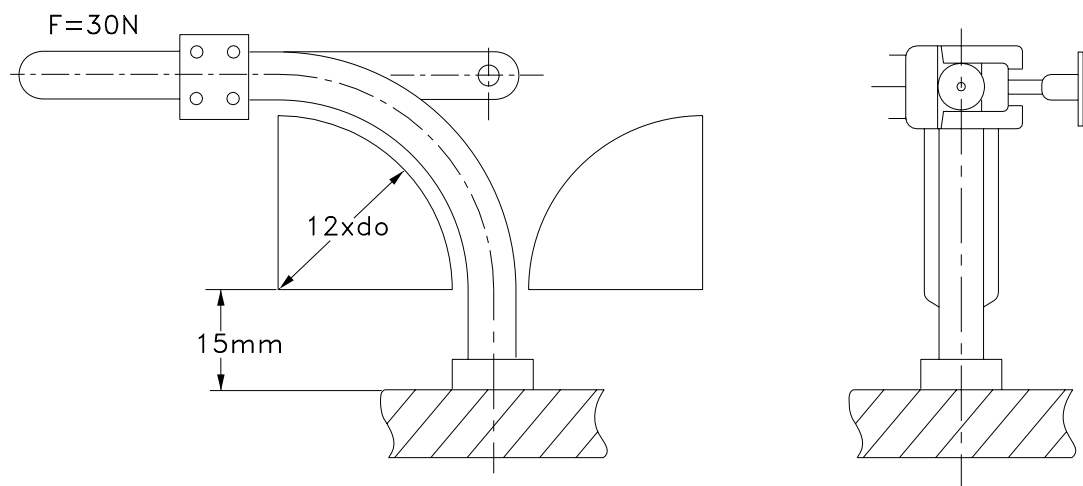


Figure (a) Bending Test Rig (Refer to Clause 7.1)

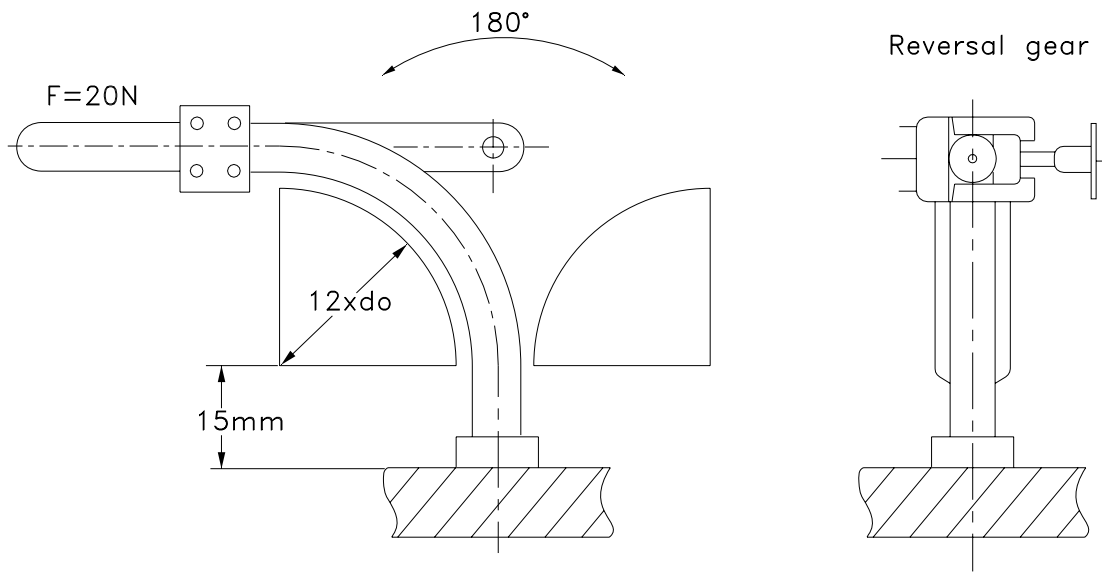


Figure (b) Flexibility Test Rig (Refer to Clause 8.1)

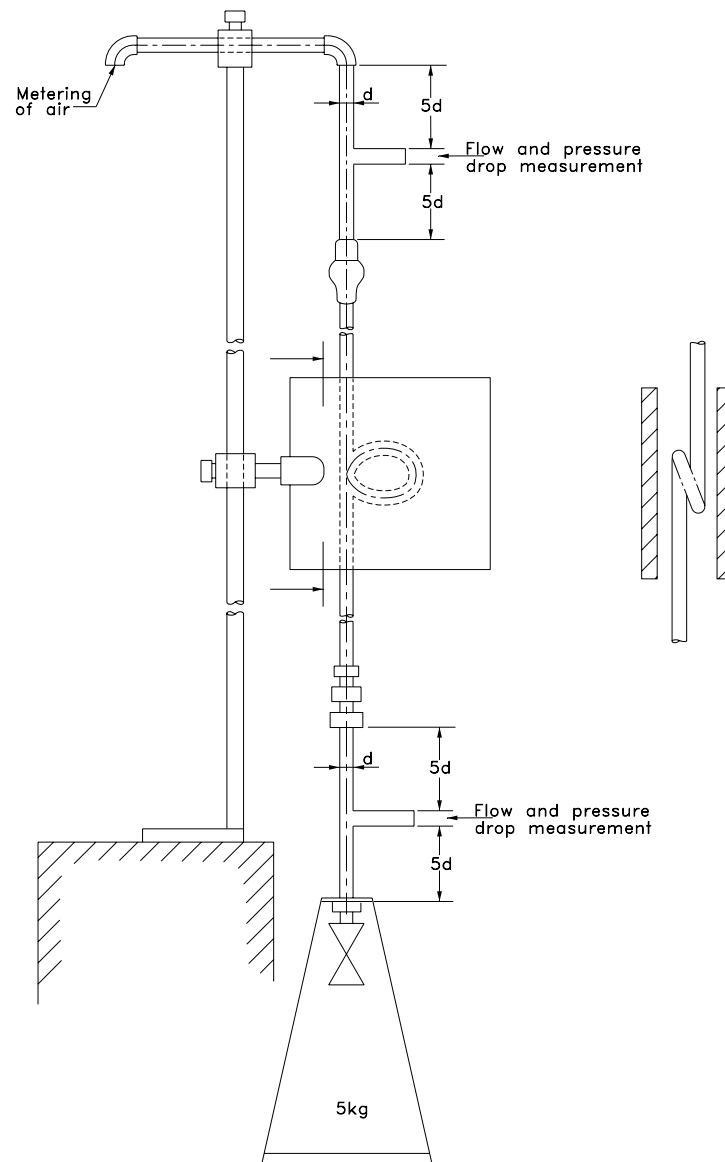


Figure (c) Kinking Test Rig

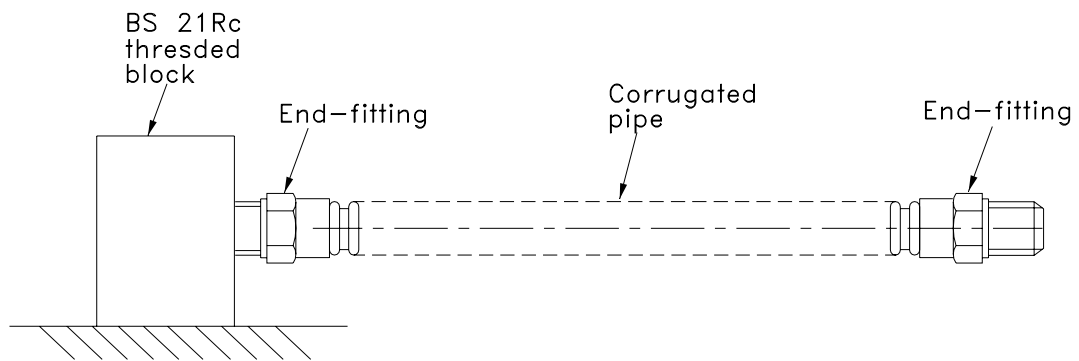
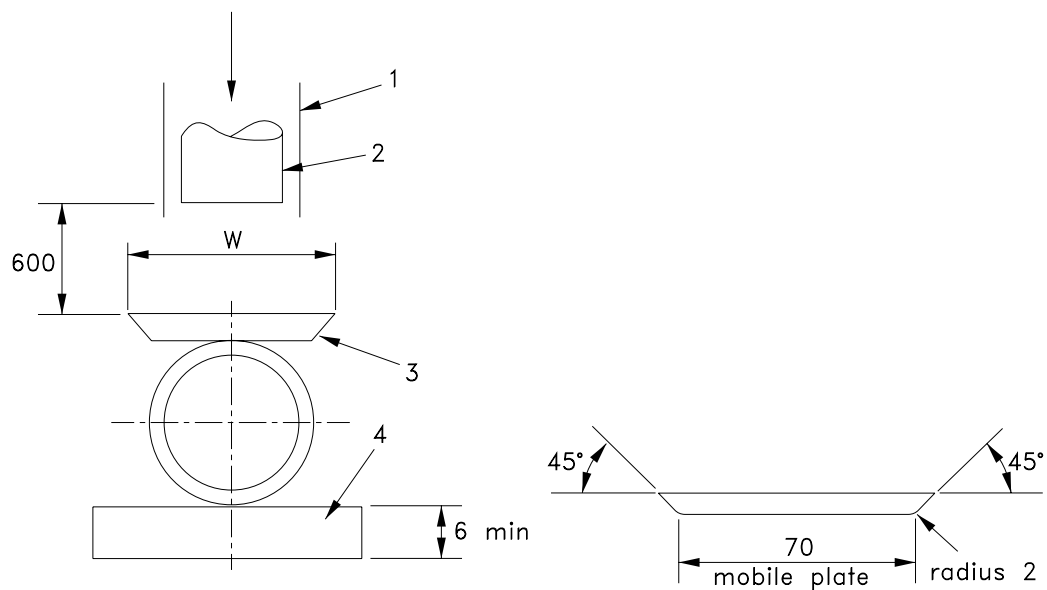


Figure (d) Torsion Test Rig

**Key**

1. Guiding shell
 2. Mass of 5 kg
 3. Mobile steel plate of 70 mm length
 4. Supporting steel surface
- W External diameter of semi-flexible gas tubing assembly + 20 mm approx.

Figure (e) Impact Test Rig