AR 211
January 2024

Approval requirement 211

Plastic corrugated protection pipe

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Foreword

This GASTEC QA approval requirement (AR) has been approved by the Board of Experts product certification GASTEC QA, in which relevant parties in the field of gas related products are represented. This Board of Experts supervises the certification activities and where necessary require the GASTEC QA approval requirement to be revised. All references to Board of Experts in this GASTEC QA approval requirement pertain to the above mentioned Board of Experts.

This GASTEC QA approval requirement will be used by Kiwa Nederland BV in conjunction with the GASTEC QA general requirements and the KIWA regulations for certification.

Approved by Board of Experts:

Accepted by Kiwa Nederland B.V.:

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1 Introduction

1.1 General

This GASTEC QA approval requirement in combination with the GASTEC QA general requirements include all relevant requirements, which are adhered by Kiwa as the basis for the issue and maintenance of a GASTEC QA certificate for plastic corrugated protection pipe for multilayer systems.

This GASTEC QA approval requirements replaces the GASTEC QA approval requirements 211, dated September 2018.

List of changes:

- Textual review;
- Chapter 4 is textually reviewed and revised chapter division;
- Update list of referenced documents.

The product requirements have not been changed.

1.2 Scope

This approval requirement specifies the requirements for plastic corrugated protection pipe for the use in combination with multi-layer pipe systems.

Remark:
The use of pipe sleeves is obligatory as mentioned in NPR 3378-5. The inner diameter of the pipe sleeve shall be ≥ $D_{\text{multilayer pipe}}$ + 2mm, for outside diameters of multilayer pipes ≤ 63 mm. And ≥ 1,1 x $D_{\text{multilayer pipe}}$ for outside diameters of multilayer pipes > 63 mm.

2 Definitions

In this approval requirement, the following terms and definitions are applicable:

Appearance, signs of damage: Visible deformation, broken parts and signs of cutting and boring which are not in the design of any component of the unused fitting.

Board of experts: the Board of Experts GASTEC QA.

Compression: Difference between the initial diameter and the diameter of a test piece after compression at a specified load for a given time at a given temperature, the difference being referred to the initial thickness.

Compression set: The difference between the initial diameter and the final diameter of a test piece after compression for a given time at a given temperature and after a given recovery time, the difference being referred to the initial diameter.

Inside diameter: Measured inside diameter at any point, rounded up to the nearest 0,1 mm.

Outside diameter: Measured outside diameter through its cross section at any point of a pipe or spigot end of a fitting, rounded up to the nearest 0,1 mm.

3 Product requirements

3.1 Material composition

The material used for production of corrugated protection pipe shall be specified by the manufacturer in its quality system (ICQ).

3.2 Appearance

The profile of the corrugated protection pipe shall be regular. The inner and outer surface shall be smooth and free from holes, bubbles, contamination, or other damages.

3.3 Dimensions

The dimensions of the corrugated protection pipe shall be specified in the technical drawing of the manufacturer. The measurement of the dimensions shall be according to ISO 3126.

4 Performance requirements and testing methods

4.1 Resistance to compression

4.1.1 Requirement

The compression after 5 minutes constant load shall not be more than 22%. After neutralization of the load for a given period, the outside diameter shall be at least 85% of its original value.

4.1.2 Principle

A test piece is put under constant load for a specified time at a specified temperature. Before starting the test, the test piece is measured. Next the test sample will be measured during the applied load. After releasing the load and the specified conditioning time, a new measurement is carried out.

4.1.3 Apparatus

A test set-up is required, in which the test pieces can be loaded diametrically between two rigid, parallel plates at a temperature of (23 ± 2) ºC, see figure 1.

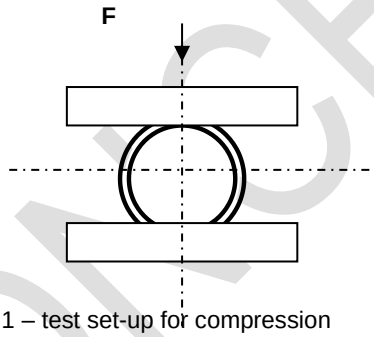

Figure 1 – test set-up for compression

4.1.4 Samples and test conditions

The corrugated protection pipe of which the resistance to compression is to be determined shall be marked on its outside with a line along one generatrix over its entire length. The marked line shall be exactly on one of the axial weld lines of the sample.

Four test pieces, a, b, c and d, respectively, shall be taken from this marked pipe such that the ends of the test pieces are perpendicular to the pipe axis and the length of each test piece shall be 100 ± 1 mm according to ISO 9969.

The test pieces shall be conditioned in air at 23 ± 2 °C for at least 24 h prior to testing.

The test shall be carried out at a temperature of 23 ± 2 ºC.

The outside diameters, d_{0a}, d_{0b}, d_{0c} and d_{0d}, of the respective test pieces, a, b, c and d, shall be determined at mid-length cross-section by in accordance with ISO 3126 at the positions respectively 0°, 90°, 180° and 270° in relation to the marking line on the pipe.

Measurements on the outside diameter shall take into account at least two ribs of the corrugated profile of the pipe.

NOTE By definition: d_{0a} = 0 °C, d_{0b} = 90 °C, d_{0c} = 180 °C and d_{0d} = 270 °C.

Subject the test pieces, equally divided along the length, to a gradually applied load of 200 N.

Measure, after 5 minutes of applying the load, the outside diameter of the test piece along the central axis of the load direction. Express the measured compression as a percentage of the initial outside diameter.

Neutralize the load after 5 minute and let the test pieces rest.

Determine, after 1 minute of neutralizing the load, again the outside diameter of each test piece along the central axis of the former load direction and express the permanent compression as a percentage of the initial outside diameter.

4.2 Resistance against impact

4.2.1 Requirement

After 10 impacts, no breakage of the corrugated protection pipe shall occur. In case of 1 breakage, repeat the test with twice the numbers of test pieces. Over a total of 30 test pieces not more than 2 breakages shall occur.

4.2.2 Apparatus

For the test, a free-fall testing machine is needed, provided with a falling object with a spherical arm end with a radius of 12.5 mm and a V-shaped supporting block mounted at an angle of 120º. Besides this a climate chambre or cooling is needed, in which the test samples can be conditioned at a temperature of 0 ± 1 ºC.

4.2.3 Test samples

For each pipe size 10 test samples are needed with a length of 100 mm. The test samples shall be brought to a temperature of 0 ± 1 ºC in water or air. For cooling in water, the cooling time is 30 minutes and for cooling in air it is 60 minutes.

4.2.4 Procedure

Lay the test samples on the V-block and let the falling object drop on the middles of the test samples. Each test sample must be tested within 10 seconds of being taken out of the cooling trough. The test conditions to be met for testing are shown in the table below:

Nominal external diameter of the tube concerned [1]	Mass of falling object in g, [2]	Drop height in mm [3]
Up to and including 25 mm	250	1000
> 25 mm	250	2000
1) This refers to the tubes that are concerned with the tube sleeves to be tested. 2) Tolerance: - 0/+ 5 g. 3) Tolerance: - 0/+ 5 mm.		

Table: Test conditions for pipe sleeves

4.3 Mass per length

4.3.1 Requirement

The mass per length of the corrugated protection pipe shall be specified by the manufacturer.

4.3.2 Procedure

For determining the mass per length three samples of protection pipe are needed of a length of approximately 1m. The actual length shall be determined as accurately as possible. The mass of these pipes shall be determined to an accuracy of 0.1 gram with the aid of a weighing apparatus. The mass per length is taken to be the arithmetic mean value of the quotients of the measured lengths and weights.

5 Marking, instructions and packaging

5.1 Marking

The tube sleeves shall be marked clearly and permanently at distances of a maximum of 2.5 m with at least the following information.

- GASTEC QA, GASTEC QA logo or word mark;
- Inside diameter;
- Manufacture name or logo;
- Production code or date.

5.2 Instructions

The supplier shall provide instructions. These instructions shall be in the Dutch language and describe that the product is GASTEC QA certified. In addition, the instructions shall contain information about:

- The use and installation of the product;
- Minimum bending radius.

5.3 Packaging

The product shall be pack in such a way that contamination or damaging is not possible.

6 Summary of tests

This chapter contains a summary of tests to be carried out during:

- The initial product assessment;
- The periodic product verification;

6.1 Test matrix

Description of requirement	Clause	Test within the scope of		
		Initial product assessment	Product verification	
			Verification	Frequency
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Corrugated protection pipe				
Material composition	3.1	X	X	Once a year
Appearance	3.2	X	X	Once a year
Dimensions	3.3	X	X	Once a year
Resistance to compression	4.1	X	X	Once a year
Resistance to impact	4.2	X	X	Once a year
Mass per length	4.3	X	X	Once a year
Marking	5.1	X	X	Once a year
Instructions	5.2	X		
Packaging	5.3	X		

7 List of referenced documents and source

7.1 Standards / normative documents

All normative references in this Approval Requirement refer to the editions of the standards as mentioned in the list below.

ISO 3126	Plastics piping systems — Plastics components — Determination of dimensions
ISO 9969	Thermoplastics pipes — Determination of ring stiffness
NPR 3378-5	Practical guideline gas installations – section gas pipelines – Part 5: construction – guidance for NEN 1078 and NEN 8078

7.2 Source

Parts of the text of this approval requirement have been based on BRL 5610.