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European Assessment Document for

Service penetrations for pipes through walls and floors

This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

The EAD covers the service penetrations for pipes through walls and floors (hereinafter referred to as ”service penetration(s)”). The service penetrations cover an enduring water- and gas-tight insertion of pipes made of metal (stainless steel which fulfil corrosion resistance class 2 (CRC2) or higher) and/or synthetic materials into a building. They are matched to the respective wall or floor types such as those made of waterproof concrete or with sealing membranes and coatings.

The EAD covers three types of service penetrations (see Figure 1.1.1):

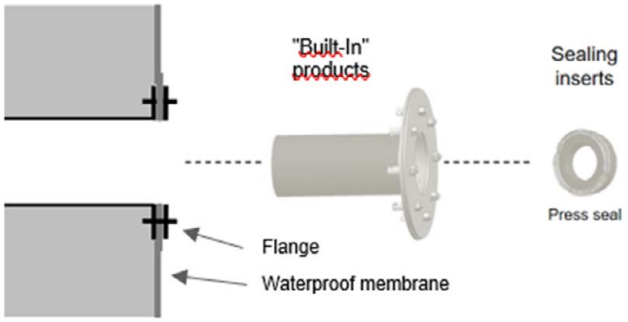
Type 1 is the built-in product, which is incorporated into the wall or floor during construction, generates a defined opening and shall ensure tightness to the surrounding wall or floor.

Type 2 is the add-on product, which is subsequently fixed over an opening in an existing wall or floor and shall ensure tightness to this wall or floor.

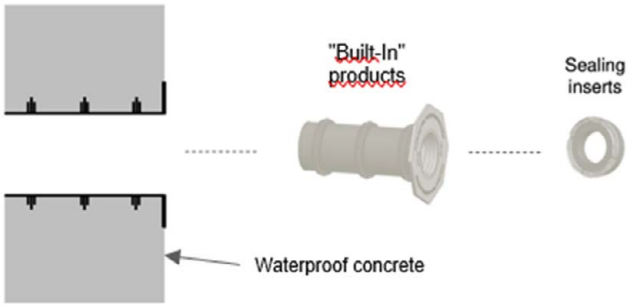
Type 3 is the sealing insert, which is installed in an existing opening and shall ensure tightness between the pipe and the surface of the opening.

The three types of service penetrations can be placed on the market and CE marked individually or in combinations of types 1 and 3 as well as 2 and 3.

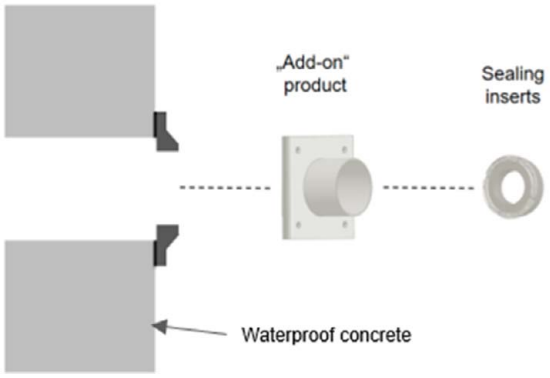
Type 1: Built-In product for shuttered concrete walls or floors with waterproof membrane



Type 1: Built-In product for waterproof concrete



Type 2: Add-on product for core drills in waterproof concrete walls or floors



Type 3: Sealing inserts for core drills in waterproof concrete walls

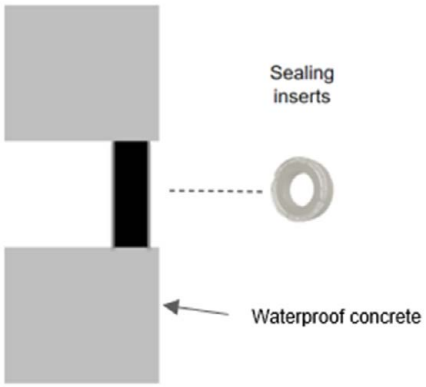


Figure 1.1.1: Types of service penetrations

The product is not covered by a harmonised European standard (hEN).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement, and repair of the product as he considers necessary.

It is assumed that the product will be installed in accordance with the Manufacturer's Product Installation Instructions (MPII) or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations, e.g., with regard to the intended end use conditions, having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA as long as the details of the assessment methods as laid down in this EAD are respected.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The product is intended to be used for sealing of service penetrations for pipes for gas or installations for water not intended for human consumption through walls and floors against humidity and water and, if needed, also against gas in building surrounding underground, excluding fire resistant walls or floors. The products are not intended to be used for energy conservation.

Three types of products are to be distinguished: Products for preinstallation (Built-in products), subsequent installation (Add-on products) and sealing inserts.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the service penetrations for the intended use of 25 years when installed in the works (provided that the service penetrations are subject to appropriate installation (see 1.1). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[1].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD

1.3.1 Specific terms

1.3.1.1 Watertightness

Describes the tightness of the pipe to the concrete, which prevents water from penetrating into the building between the concrete and the service penetration.

1.3.1.2 Built-in product

For the purposes of this EAD, built-in products are penetrations made of various materials which are inserted and cast into the formwork in walls and floors to create a gas- and watertight penetration in the formwork. Built-in products exclusively ensure the tightness against the surrounding wall material. Matched sealing inserts shall be used for sealing against the media pipes.

1.3.1.3 Built-in products with integrated sealing insert

Built-in products with integrated sealing inserts are penetrations made of various materials which are inserted and cast into the formwork in walls and floors panels to create a gas- and watertight penetration. Built-in products with integrated sealing insert ensure both the tightness against the surrounding wall / floor material as well as against media pipes.

1.3.1.4 Add-on product

For the purposes of this EAD, add-on products are used to provide wall/floor penetrations. They can be attached using various fasteners. Add-on products only ensure tightness against the surrounding wall/floor material. Matched sealing inserts shall be used for sealing against the media pipes.

1.3.1.5 Add-on products with integrated sealing insert

For the purposes of this EAD, add-on products with integrated sealing insert are used to provide wall/floor penetrations. They can be attached using various fasteners. Add-on products exclusively ensure tightness against the surrounding wall/floor material as well as against media pipes.

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1 The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

1.3.1.6 Sealing inserts

For the purpose of this EAD sealing inserts are used to seal the annular space of a penetration gas- and watertight both to its wall/floor and to the media pipes located therein.

1.3.1.7 Split Variants

A split variant describes a divisible product which is suitable for subsequent assembly due to the split.

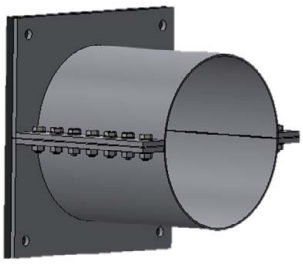


Figure 1.3.1.7.1: Split Variant

1.3.1.8 Closed Variants

A closed variant describes a product that cannot be separated and is therefore not suitable for subsequent installation.

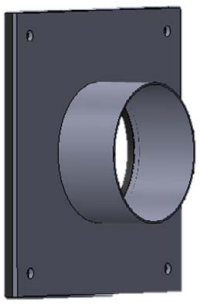


Figure 1.3.1.8.1: Closed Variant

1.3.1.9 Waterproof concrete

Water-impermeable concrete structures are constructions which are erected without additional external surface sealing, and which prevent the passage of water in liquid form solely due to the concrete and constructive measures such as joint sealing and crack width limitation.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4.

2.1 Essential characteristics of the product

Tables 2.1.1 to 2.1.3 show how the performance of the service penetrations is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of the service penetrations type 1 (built-in product) and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class/Description
Basic Works Requirement 3: Hygiene, health and the environment			
2	Axial load	2.2.2	Description and level
3	Impact load	2.2.3	Description and level
4	Radial load	2.2.4	Description and level
5	Temperature resistance	2.2.5	Description and level
6	Watertightness	2.2.6	Description and level
7	Gastightness	2.2.7	Description and level
8	Aging	2.2.8	Description

Table 2.1.2 Essential characteristics of the service penetrations type 2 (Add-on product) and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class/Description
Basic Works Requirement 3: Hygiene, health and the environment			
2	Watertightness	2.2.6	Description and level
3	Gastightness	2.2.7	Description and level
4	Aging	2.2.8	Description

Table 2.1.3 Essential characteristics of the service penetrations type 3 (sealing insert) and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class/Description
Basic Works Requirement 3: Hygiene, health and the environment			
2	Watertightness	2.2.6	Description and level
3	Gastightness	2.2.7	Description and level
4	Aging	2.2.8	Description

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant essential characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

Which of the following tests are relevant for the particular products can be seen in Annex A.

2.2.1 Reaction to fire

The following options shall be used for the assessment of the reaction to fire performance of the service penetrations and their description in the ETA:

a) The service penetration exclusively consisting of materials listed in Decision 96/603/EC, is considered to satisfy the requirements of class A1 of the reaction to fire performance in accordance with the Commission Decision 96/603/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended uses being covered by that Decision.

b) The service penetration or its components (not falling under option "a)") are considered as small components, if they satisfy all of the following requirements:
   - they are not made from material of class A1 or A2 of the reaction to fire,
   - they have a mass ≤ 50 g,
   - they have a size of ≤ 50 mm x ≤ 50 mm or a diameter of ≤ 57 mm (equal area size as for a rectangular size of ≤ 50 mm x ≤ 50 mm) and
   - they have a distance ≥ 200 mm to similar components being situated on the surface of a product made of material of classes B, C, D, or E of the reaction to fire;
     or
     it is completely embedded all-round in non-melting material of class A1 of the reaction to fire without any possibility to ignite or to propagate fire.

   In this case the component can be considered as a small component without the need for testing and classification of the reaction to fire performance, because their contribution to fire can be seen as negligible due to their very small dimensions.

c) The service penetration not covered by options "a)" and "b)" shall be tested, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1. The service penetration shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

   The necessary tests according to EN ISO 11925-2 shall be performed with edge exposure as well as with surface exposure on specimens as follows:
   - either as flat as possible product cut from the service penetration or as flat board made from the material of the service penetration,
   - mounted in a free-hanging position without any substrate behind or mounted on a standard calcium-silicate board according to EN 13238, if tests fail with a free-hanging specimen configuration,

   If required, the necessary tests in accordance with EN 13823 (SBI) shall be performed on specimens of the service penetration which are prepared as follows:

- either with flat as possible product pieces cut from the service penetration or with pieces of flat boards made from the material of the service penetration, each variant with the largest possible dimensions,
- which are placed side by side with closed butt joints on a calcium-silicate standard substrate in accordance with EN 13238 and directly positioned in front of the backing board of the SBI test rig,
- and with fixing of each piece of the specimen onto the standard substrate with four small metal nails or screws (one fixing mean in each corner of the boards).

If the service penetration consists of different materials, these different materials shall be tested separately unless option “b)” applies. The most onerous results of the tests and the subsequent classification of the materials shall be used as basis for the classification of the entire service penetration.

The following product parameters shall be considered for the service penetration and the different materials (if to be tested separately – see above) when preparing the test specimens and executing the relevant reaction to fire tests:

- variations of a product family (as defined by a combination of certain raw materials and certain type of production process),
- highest and lowest thickness, if relevant,
- highest and lowest density, if relevant.

The results of tests considering the aforementioned parameters in fully are valid for:

- all variations of the defined product family,
- the tested thickness or the whole range between those thickness values tested,
- the tested density or the whole range between those density values tested.

The reaction to fire class of the service penetration and of the different materials (if tested separately – see above) shall be given in the ETA together with those conditions for which the classification is valid or it has to be stated that the service penetration (or a component of it) does not need to be tested because it is considered to be a small component and its contribution to fire growth and fire spread can be neglected.

2.2.2 Axial load

When placed in formwork, the service penetration is subjected to mechanical and hydrostatic effects of the fresh concrete. The resistance of the service penetration against axial loads concerning dimensional stability (deformation) and watertightness shall be assessed as follows:

The test specimen consists of one service penetration of a built-in product (with or without sealing insert). The test conditions are specified in Annex C, Clause C.1 and the test specimen shall be stored under these conditions for at least 24 hours before the start of the test.

The test specimen shall be positioned vertically on a flat surface. Test load shall be set up at specified speed and contact shall be maintained for the required time.

Load application speed: 1,2 kN/min

Start test load F: 1000 N (default), e.g., as ballast weight. If failed, the test load can be reduced in 100 N steps. In addition, other (e.g., higher) loads can be applied, according to Manufacturer’s Product Installation Instructions (MPII).

Load duration: 24 h
Number of test specimen: 1

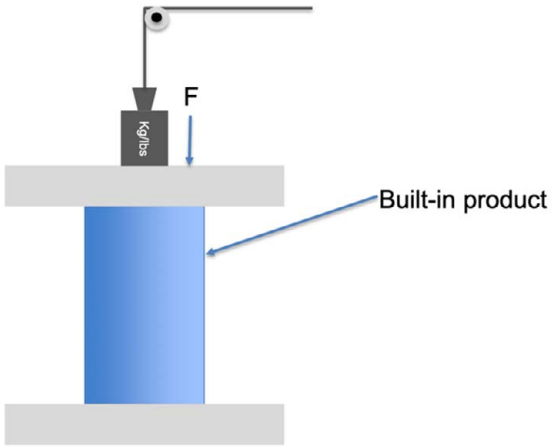


Figure 2.2.2.1: Test built-up for axial load test

Note:

One example to bring up test load could be: The ballast shall be provided with suitable eyelets so that it can be suspended from a test specimen using lashing means. The speed of load application and the duration of the mechanical load test on the contact surface shall be observed. At the end of the test period, the test weight is removed.

If failed, the test load can be reduced in 100 N steps. In addition, other (e.g., higher) loads can be applied until reaching the load (level) at which both tests (according to dimensional stability and watertightness) are passed. The performance shall be given in the ETA in accordance with Annex A.

Dimensional stability (deformation):

The test is considered to be passed if the test mandrel slides through the service penetration by its own weight of 1 kg. The test mandrel for built-in products is a cylinder whose outer diameter is 2 mm (permissible tolerance on the outer diameter of the test mandrel -0,5 mm) smaller than the nominal inner diameter of the built-in product to be tested.

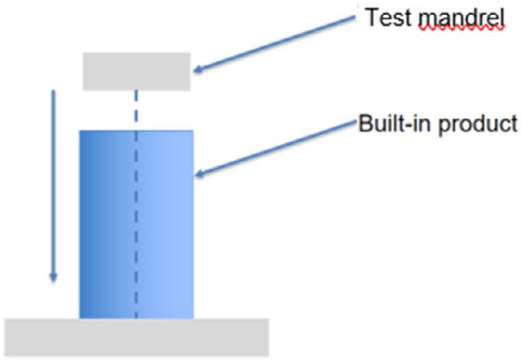


Figure 2.2.2.2: Test built-up with test mandrel

Watertightness:

After testing the dimensional stability, the watertightness test shall be performed by dipping the test specimen according to its installation position totally into coloured water. If the test specimen is not delivered with watertight closing caps, the end faces can be sealed watertight with the aid of suitable blanking plugs using sealing compounds.

Test duration: 20 minutes

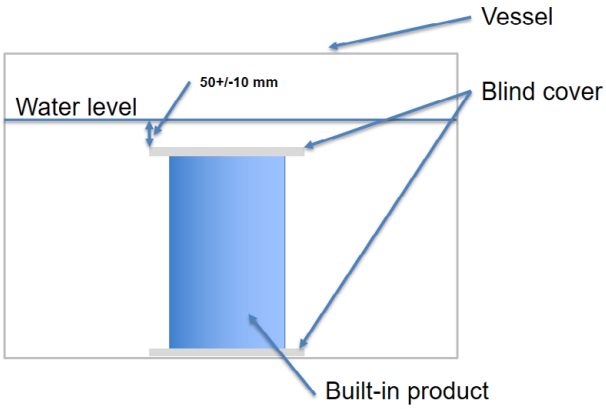


Figure 2.2.2.3: Test of watertightness

No water ingress - after completion of the test, no entry of the coloured water inside the product will be recorded.

The maximum axial load [N] of the test specimen that has passed the two tests of dimensional stability and watertightness shall be stated in the ETA in accordance with Annex A.

2.2.3 Impact load

When placed in formwork, the service penetration is subjected to mechanical and hydrostatic effects of the fresh concrete. The resistance of the service penetration against impacts and shock loads concerning dimensional stability (deformation) and watertightness shall be assessed as follows:

The test specimen consists of one service penetration of a built-in product (with or without sealing insert). The test conditions are specified in Annex C, Clause C.1 and the test specimen shall be stored under these conditions for at least 24 hours before the start of the test.

The impact and shock loads are applied without test pressure (according to delivery condition). The test specimen shall be fixed in the horizontal direction.

A flexible test weight consists of a paper or plastic bag whose bottom surface has an external dimension of not more than 150 mm at any point. The paper bag shall have a quality of minimum 170 g/m² and maximum 200 g/m². In the case of the plastic bag, the material shall correspond to a film of LDPE with a layer thickness of 60 µm with regarding to its tear resistance. The bottom surface of the bag shall withstand a weight of 4 kg. This bag is filled with 4 kg gravel (40 % 4-8 mm, 20 % 8-16 mm and 40 % (16-32 mm) and closed with a fabric adhesive tape.

The flexible test weight is dropped with a specified number of repetitions immediately onto the same apex of the test specimen in the centre according to the sketch below. The supports shall be placed as close as possible to both ends of the test specimen and shall be at least 230 mm apart. In the case of a test specimen with raised water barriers (e.g., wall/floor junction), the test can also be carried out without a water barrier.

Start drop height: 2000 mm (default). If failed, the drop height can be reduced in 100 mm steps. In addition, other (e.g., higher) drop height can be applied, according to Manufacturer's Product Installation Instructions (MPII).

Repetitions: 5x
Number of test specimen: 1

If failed, the procedure shall be repeated with a lower drop height until reaching the drop height (level) at which both tests (according to dimensional stability and watertightness) are passed. The performance shall be given in the ETA in accordance with Annex A.

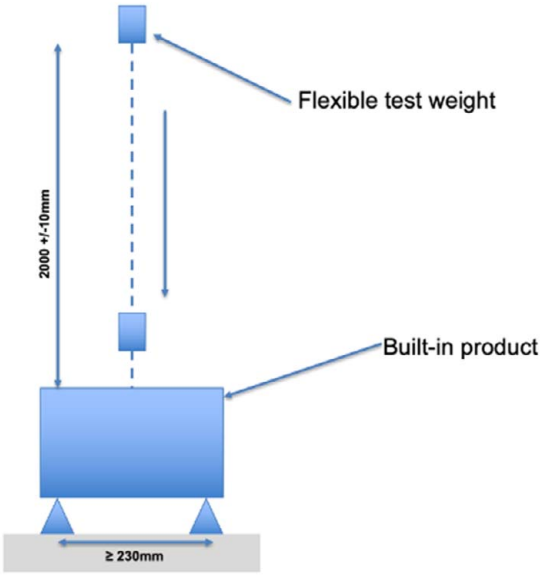


Figure 2.2.3.1: Test built-up for impact test

Dimensional stability (deformation):

The test is considered to be passed if the test mandrel slides through the test specimen by its own weight of 1 kg. The test mandrel for built-in products is a cylinder whose outer diameter is 2 mm (permissible tolerance on the outer diameter of the test mandrel -0,5 mm) smaller than the nominal inner diameter of the built-in product to be tested.

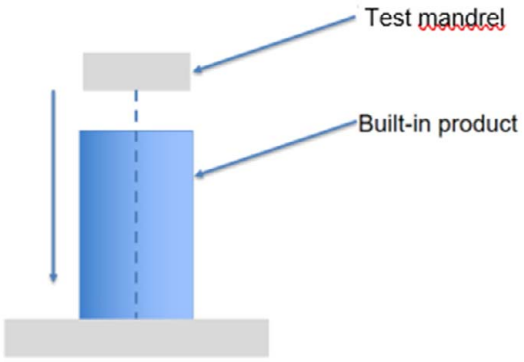


Figure 2.2.3.2: Test built-up with test mandrel

Watertightness:

After testing the dimensional stability, the watertightness test shall be performed by dipping the service penetration according to its installation position totally into coloured water. If the test specimen is not delivered with watertight closing caps, the end faces can be sealed watertight with the aid of suitable blanking plugs using sealing compounds.

Test duration: 20 minutes

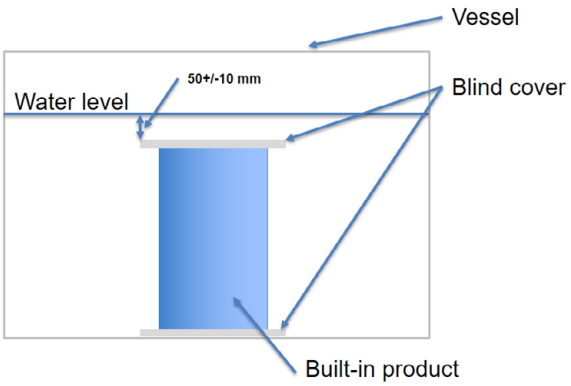


Figure 2.2.3.3: Test of watertightness

No water ingress - after completion of the test, no entry of the coloured water inside the product will be recorded.

The maximum impact load [drop height in mm] of the test specimen that has passed the two tests of dimensional stability and watertightness shall be stated in the ETA in accordance with Annex A.

2.2.4 Radial load

When placed in formwork, the service penetration is subjected to mechanical and hydrostatic effects of the fresh concrete. The resistance of the service penetration against radial loads concerning dimensional stability (deformation) and watertightness shall be assessed as follows:

The test specimen consists of one service penetration of a built-in product (with or without sealing insert). The test conditions are specified in Annex C, Clause C.1 and the test specimens shall be stored under these conditions for at least 24 hours before the start of the test.

The test specimen shall be fixed in horizontal direction (corresponds to formwork panels). Test load is set up at specified speed and contact is maintained for the required time.

Load application speed: 1,2 kN/min

Start test load F: 1200 N (default). If failed, the test load shall be reduced in 100 N steps. In addition, other (e.g., higher) loads can be applied, according to Manufacturer's Product Installation Instructions (MPII).

Load duration: 20 min.
Number of test specimen: 1

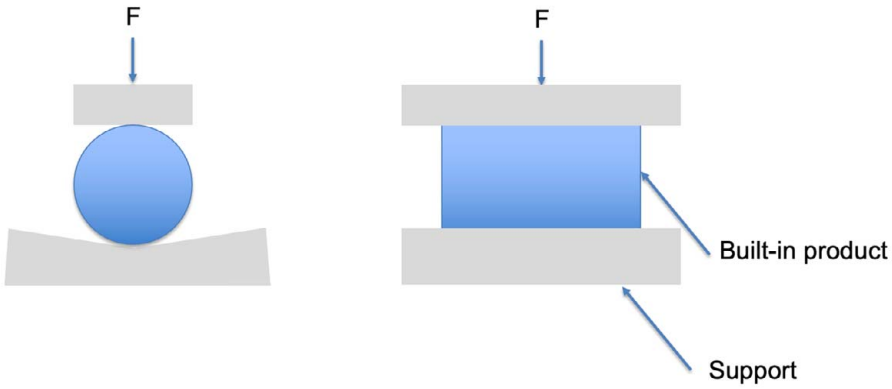


Figure 2.2.4.1: Test built-up for radial load test

If failed, the test load can be reduced in 100 N steps. In addition, other (e.g., higher) loads can be applied until reaching the load (level) at which both tests (according to dimensional stability and watertightness) are passed. The performance shall be given in the ETA in accordance with Annex A.

Dimensional stability (deformation):

The test is considered to be passed if the test mandrel slides through the test specimen under its own weight of 1 kg. The test mandrel for built-in products is a cylinder whose outer diameter is 2 mm (permissible tolerance on the outer diameter of the test mandrel -0,5 mm) smaller than the nominal inner diameter of the built-in product to be tested.

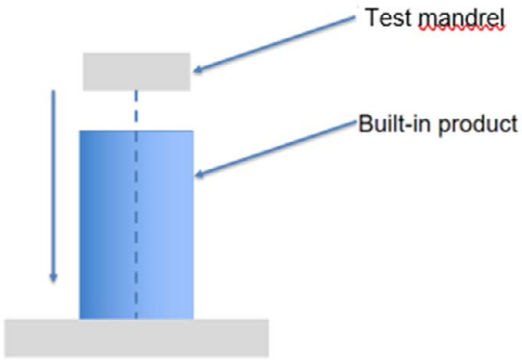


Figure 2.2.4.2: Test built-up with test mandrel

Watertightness:

After testing the dimensional stability, the tightness test shall be performed by totally dipping the test specimen according to its installation position into coloured water. If the test specimen is not delivered with watertight closing caps, the end faces shall be sealed watertight with the aid of suitable blanking plugs using sealing compounds.

Test duration: 20 minutes

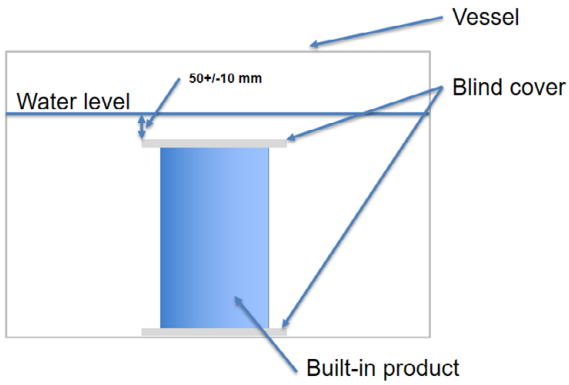


Figure 2.2.4.3: Test of watertightness

No water ingress - after completion of the test, no entry of the coloured water inside the product will be recorded.

The maximum radial load [N] of the test specimen that has passed the two tests of dimensional stability and watertightness shall be stated in the ETA in accordance with Annex A.

2.2.5 Temperature resistance

When placed in formwork, the service penetration is subjected to thermal effects of the curing concrete. The resistance of the service penetration against high temperatures concerning dimensional stability (deformation) and watertightness shall be assessed as follows:

The test specimen consists of one service penetration of a built-in product (with or without sealing insert).

Testing of the tightness in the non-concreted state under thermal stress. The evaluation takes place after completion of both test parts.

Part 1 – Tempering:

The test specimen shall be placed for the defined test duration in a water bath with coloured water that has been tempered to the test temperature. Care shall be taken to ensure that the test specimen is completely surrounded by water and that the temperature remains constant within the tolerance range. If the test specimen is not tightly sealed when delivered, the end faces can be sealed watertight with the aid of suitable blank caps using sealing compounds.

Start test temperature: 50 °C ± 3 °C (default). If failed, the test temperature can be reduced in 10 °C steps. In addition, other (e.g., higher) temperatures can be applied, according to Manufacturer's Product Installation Instructions (MPII).

Test duration: 24 hours
Number of test specimen: 1

Part 2 – Cooling:

After removal of the test specimen from the water bath, it is stored at room temperature until a surface temperature of 23 °C ± 3 °C is reached (measured by contact thermometer).

Test environment: Test laboratory

Test temperature: 23 °C ± 3 °C

Test duration: until a surface temperature of 23 °C ± 3 °C is reached.

If failed, the procedure is repeated with a lower temperature until reaching the temperature (level) at which both tests (according to "Dimensional stability (deformation)" and "Watertightness") are passed. The performance shall be given in the ETA in accordance with Annex A.

Dimensional stability (deformation):

The test is considered to be passed if the test mandrel slides through the test specimen under its own weight of 1 kg. The test mandrel for built-in products is a cylinder whose outer diameter is 2 mm (permissible tolerance on the outer diameter of the test mandrel -0.5 mm) smaller than the nominal inner diameter of the built-in product to be tested.

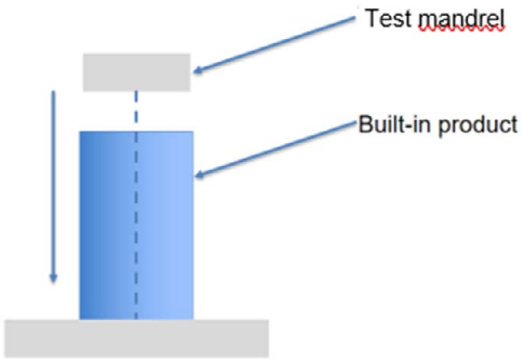


Figure 2.2.5.1: Test built-up with test mandrel

Watertightness:

After testing the dimensional stability, the tightness test shall be performed by totally dipping the test specimen according to its installation position into coloured water. If the test specimen is not delivered with watertight closing caps, the end faces shall be sealed watertight with the aid of suitable blanking plugs using sealing compounds.

Test duration: 20 minutes

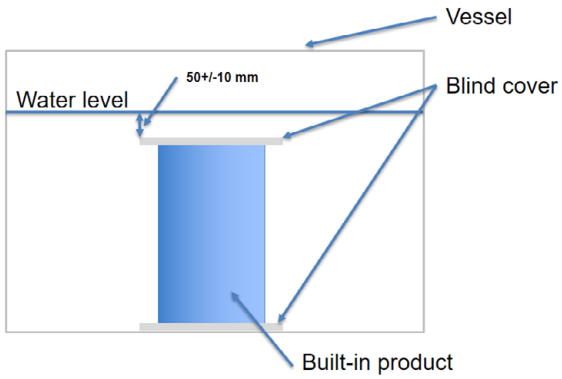


Figure 2.2.5.2: Test of watertightness

No water ingress - after completion of the test, no entry of the coloured water inside the product will be recorded.

The maximum temperature resistance [°C] of the test specimen that has passed the two tests of dimensional stability and watertightness shall be stated in the ETA in accordance with Annex A.

2.2.6 Watertightness

The service penetration shall be sufficiently stable against torsional forces. Likewise, the service penetration shall be sufficiently stable against shear forces in the course of compaction and settlement and shall remain tight.

The test shall be performed on one test specimen which shall be the test specimen with the highest number of pipe penetrations (aged in accordance with Clause 2.2.8). The test conditions are specified in Annex C, Clause C.1 and the test specimen shall be stored under these conditions for at least 24 hours before the start of the test.

A test bell in accordance with Annex C, Clause C.3 is attached to a waterproof concrete test block in accordance with Annex C, Clause C.2 with an installed test specimen built-in or add-on product otherwise

a test cylinder in accordance with Annex C, Clause C.4, attached to a waterproofing concrete test block in accordance with Annex C, Clause C.2 with an installed test specimen as sealing inserts and a mounted sealing cap is subjected to the intended test pressure in accordance with Annex B.

If the product is not intended to resist shear forces or torque, the shear force shall be set to 0 N and/or torque shall be set at 0 Nm and the 96 h leak test is performed without shear and/or torque application. In case the product is neither intended to resist shear forces nor torque, parts 1 and 2 of this assessment method shall be omitted.

Part 1: Application of torque

If the product is meant to absorb torque, the watertightness shall be tested with torque. The applied torque could be selected from Figure 2.2.6.1 depending on the inside diameter of the product, higher or lower torque can be chosen, according to Manufacturer's Product Installation Instructions (MPII).

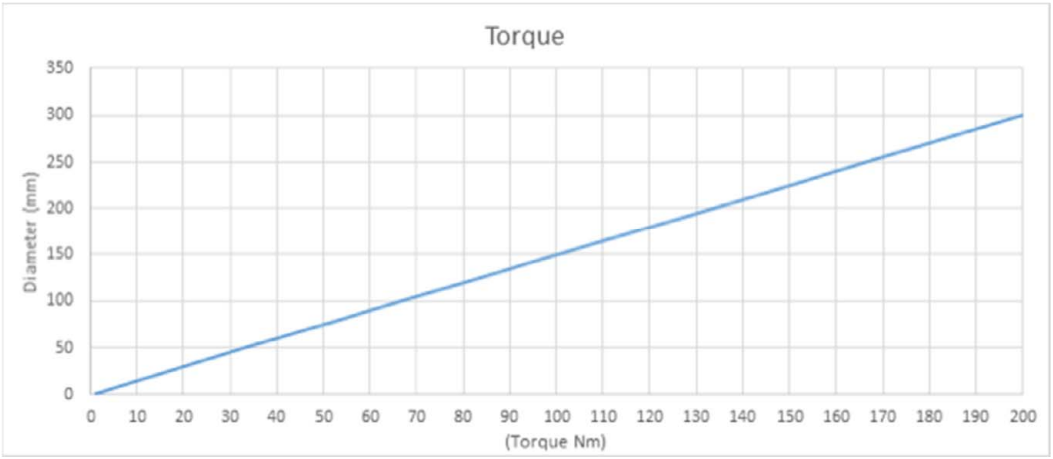
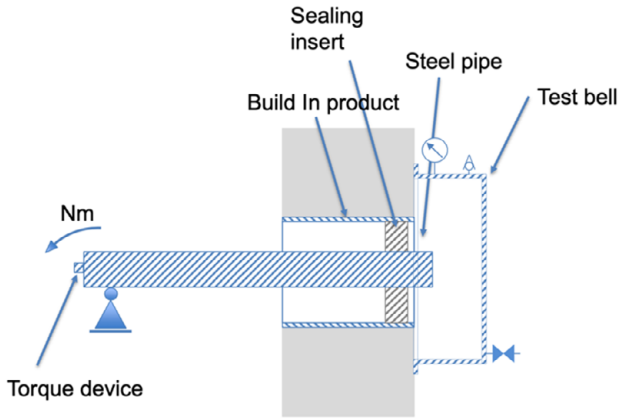
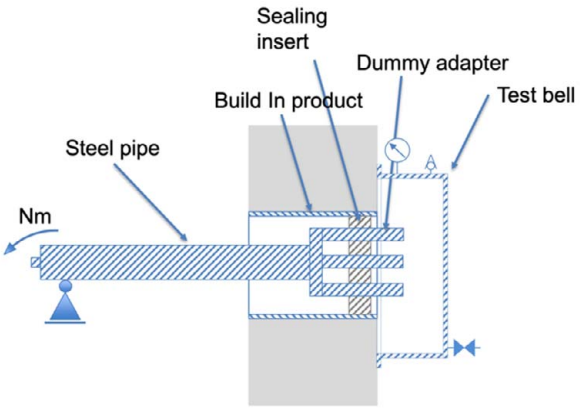


Figure 2.2.6.1: Torque according to diameter

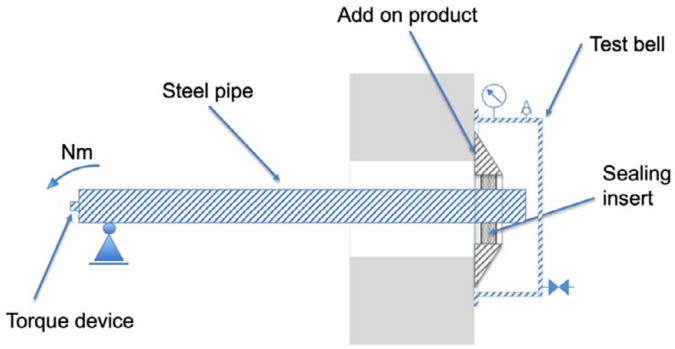
The test specimen shall be loaded once clockwise and once counterclockwise with the specified torque for the appropriate test duration. If diameter is bigger than 300 mm, 2 Nm of torque for 3 mm additional diameter shall be added.

Examples test arrangements of built-in product (type 1):





Example test arrangements of add-on product (type 2):



Example test arrangements of sealing insert (type 3):

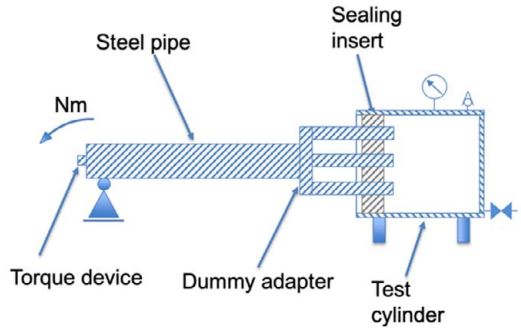


Figure 2.2.6.2: Examples of various test arrangements of the torque tests for product types 1, 2 and 3

Test duration: 60 seconds per direction of rotation (once each)
Number of test specimen: 1

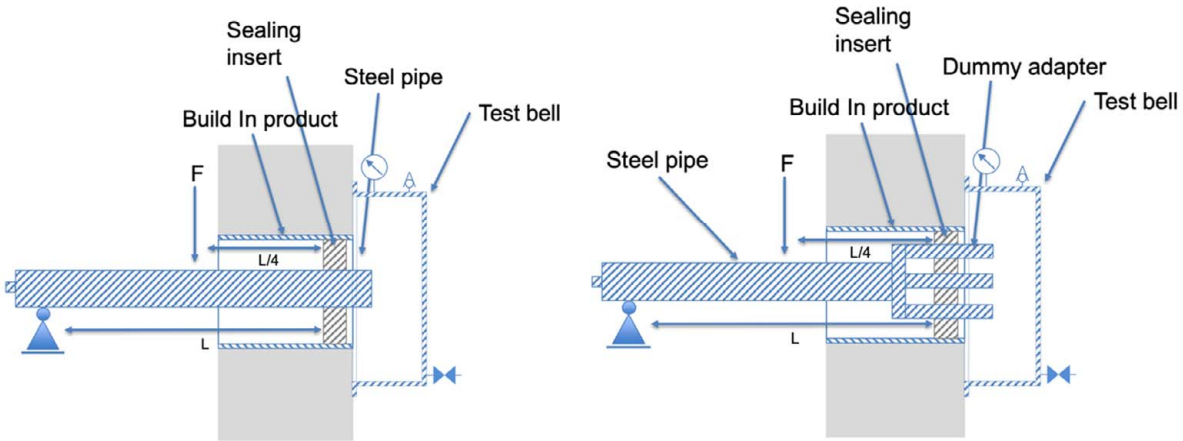
Evaluation:

Determine the angle of rotation of the steel pipe caused by the applied torque. The larger rotation angle (clockwise and counterclockwise) is specified. Determine applied torque [Nm] in Table 2.2.6.1.

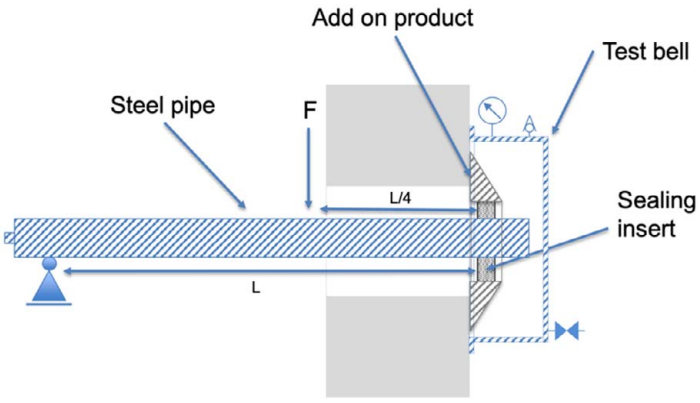
Part 2: Subsequent leak test with vertical load F

After the application of torque, the watertightness shall be tested.

Examples test arrangements of built-in product (type 1):



Example test arrangements of add-on product (type 2):



Example test arrangements of sealing insert (type 3):

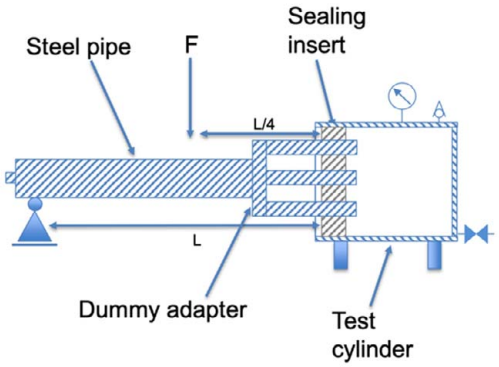


Figure 2.2.6.3: Examples of various test arrangements of load after torque tests for product types 1, 2 and 3

If the product is meant to absorb a shear force, the watertightness shall be tested with a vertical test load F (creates shear force in sealing insert) applied to the point defined in the sketch (e.g., using a tensioning strap and a ballast weight). The test load F could be selected from Figure 2.2.6.4 depending on the inside diameter of the product. Higher or lower load can be chosen, according to Manufacturer's Product Installation Instructions (MPII). The test specimen shall be then subjected to the test pressure.

By mounting the test bell (placed on a concrete block) or the test cylinder (which can take the sealing insert) in a watertight manner, the test pressure in accordance with Annex B shall be applied over the specified test duration by filling the test bell to the top with coloured water and then loading it with the test pressure.

Test sequence:

- Watertightness test: Apply torque and determine torsion - remove torque and then apply vertical force F and check tightness at specified pressure for 96 h - remove vertical force F and check tightness at specified pressure Long-term test (28 days) of tightness without force F.
- Then start next pressure stage with same service penetration possible or select new service penetration.

If only one pressure stage is specified by the Manufacturer's Product Installation Instructions (MPII). as the highest value, only this shall be tested and no subsequent tests are necessary. If the result is positive, the result is valid for this pressure stage and all lower ones.

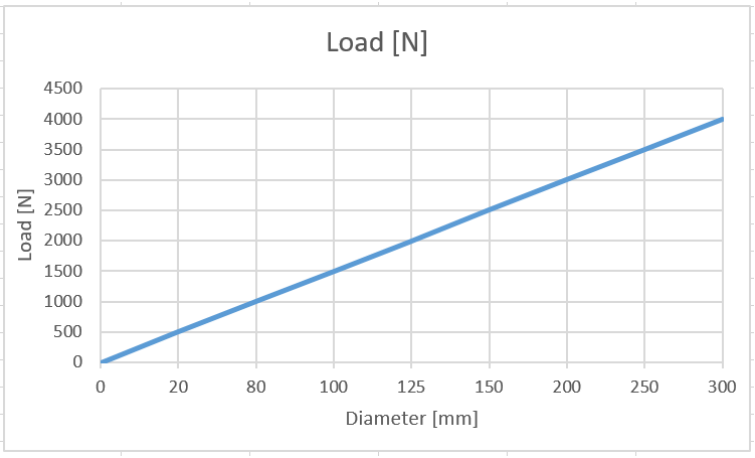


Figure 2.2.6.4: Vertical test load F according to diameter

Speed of load application: < 1,2 kN/min

Number of test specimen: 1

Test pressure: Shall be specified in accordance with Table B.1 in Annex B, permanently external.

Test medium: coloured water

Load duration: 96 hours

Evaluation:

No water ingress on the non-pressurized side – after completion of the test, entry of the coloured water through the product will be recorded. Determine applied water pressure [kPa] and test load [N] in Table 2.2.6.1.

Part 3: Subsequent long-term leak test

After the 96 hours pressure test with vertical test load, the force shall be removed, and the pressure test shall be performed for another 28 days.

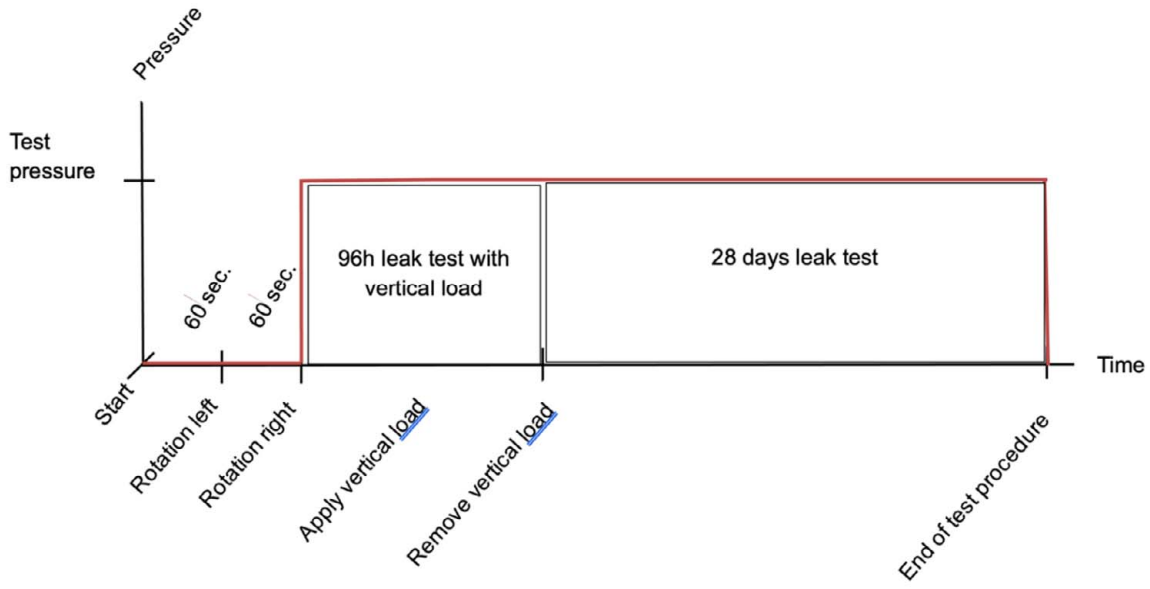


Figure 2.2.6.5: Timing of the tests shown graphically

Evaluation:

No water ingress - after completion of the test, no entry of the coloured water inside the product will be recorded. Determine applied water pressure [kPa] in Table 2.2.6.1.

The aged (in accordance with Clause 2.2.8) test specimen is sufficiently resistant to torque at the penetrations (Test part 1: Application of torque) with indication of the applied torque [Nm], is watertight with vertical load (Test part 2: Leak test with vertical load) with indication of the maximum vertical load [N] and watertight in the long-term test after the load tests (Test part 3). The results shall be stated in the ETA in accordance with Annex A.

Table 2.2.6.1: Evaluation table of watertightness (example):

Part		Testing period	Water pressure [kPa]	Applied torque (part 1)		Applied shear (part 2)	Performance
				angle of rotation [°]	torque[Nm]	vertical load [N]	
1	Application of torque	2 x 60 s	---	xx	xx	---	resistance against torque
2	Watertightness with shear force after torque	96 h	xxx	(see part 1)		xxx	watertight
3	Long-term leak test (if applicable, after torque and/or shear)	28 d	xxx	(see part 1)		(see part 2)	watertight

2.2.7 Gastightness

The service penetration shall be sufficiently stable against torsional forces. Likewise, the service penetration shall be sufficiently stable against shear forces in the course of compaction and settlement and shall remain tight.

The test shall be performed on one test specimen which shall be the test specimen with the highest number of pipe penetrations (aged in accordance with Clause 2.2.8). The test conditions are specified in Annex C, Clause C.1 and the service penetrations shall be stored under these conditions for at least 24 hours before the start of the test.

A test bell in accordance with Annex C, Clause C.3 is attached to a waterproof concrete test block in accordance with Annex C, Clause C.2 with an installed test specimen built-in or add-on product otherwise a test cylinder in accordance with Annex C, Clause C.4, attached to a waterproofing concrete test block in accordance with Annex C, Clause C.2 with an installed test specimen as sealing inserts and a mounted sealing cap and is subjected to the intended test pressure.

If the product is not intended to resist shear forces or torque, the shear force shall be set to 0 N and/or torque shall be set at 0 Nm and the leak test is performed without shear and/or torque application. In case

the product is neither intended to resist shear forces nor torque, parts 1 and 2 of this assessment method shall be omitted.

Part 1: Application of torque

If the product is meant to absorb a torque, the gastightness has to be tested with torque. The required torque could be selected from Figure 2.2.7.1 depending on the inside diameter of the product. Higher or lower torque can be chosen, according to Manufacturer's Product Installation Instructions (MPII).

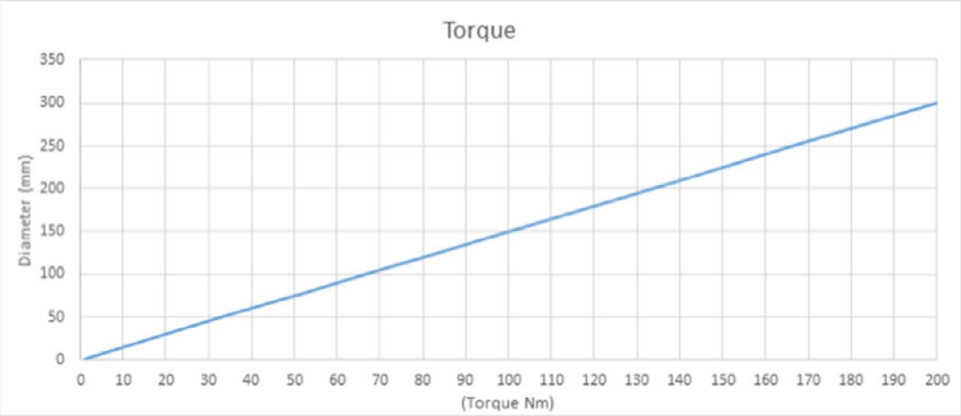


Figure 2.2.7.1: Torque depending on diameter

The test specimen shall be loaded both clockwise and counter clockwise with the specified torque for the appropriate test duration. If diameter is bigger than 300 mm, 2 Nm of torque for 3 mm additional diameter shall be added.

Test duration:	60 seconds per direction of rotation
Number of test specimen:	1

Evaluation:

Determine the angle of rotation of the steel pipe caused by the applied torque. The larger rotation angle (clockwise and counter clockwise) is specified. Determine applied torque [Nm] in Table 2.2.7.1.

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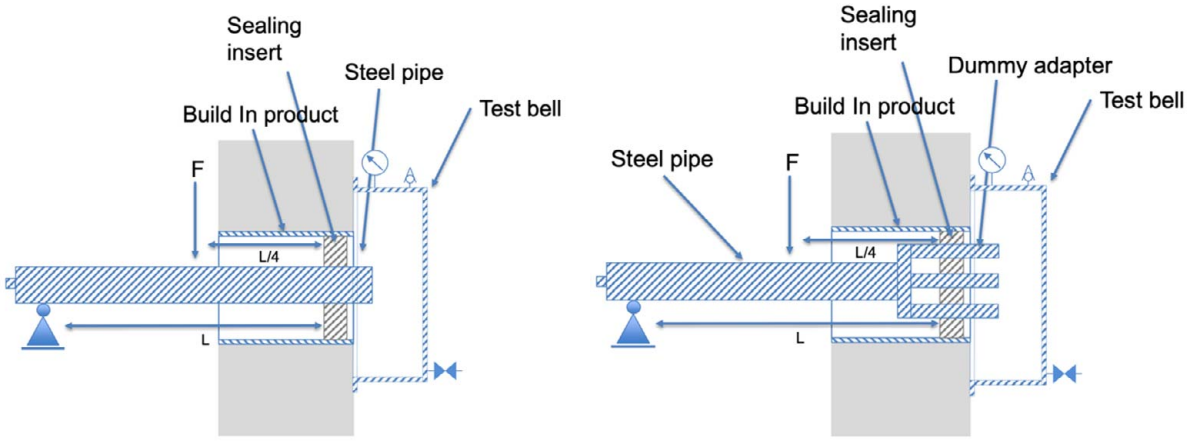
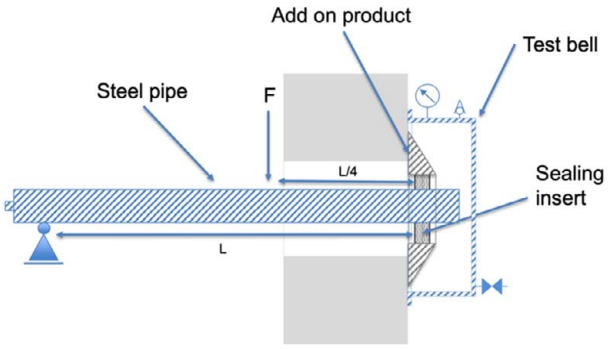
Part 2: Subsequent leak test with vertical load

After the application of torque, the gastightness shall be tested.

Examples test arrangements of built-in product (type 1):



Example test arrangements of add-on product (type 2):



Example test arrangements of sealing insert (type 3):

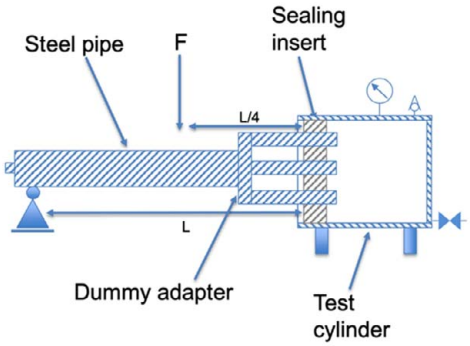


Figure 2.2.7.2: Various test arrangements of application of load after torque tests for product types 1, 2 and 3

If the product is meant to absorb a shear force, the gastightness shall be tested with a vertical test load F (creates shear force in sealing insert) applied to the point defined in the sketch (e.g., using a tensioning strap and a ballast weight). The test load F could be selected from Figure 2.2.7.3 depending on the inside diameter of the product. Higher or lower load can be chosen, according to Manufacturer's Product Installation Instructions (MPII). The service penetration shall be then subjected to the test pressure.

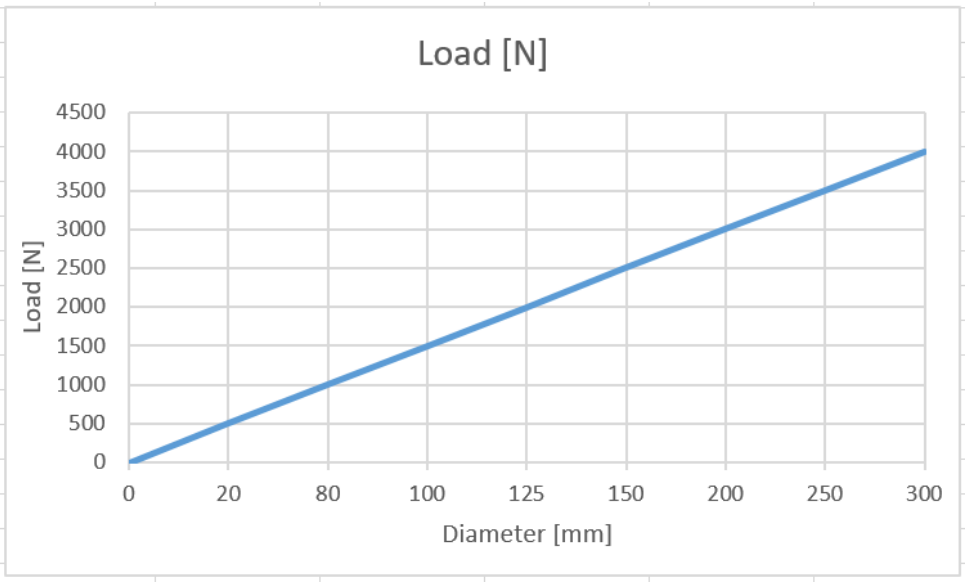


Figure 2.2.7.3: Proposal of vertical test load F according to diameter

By mounting the test bell in accordance with Annex C, Clause C.3 (placed on a concrete block) or the test cylinder (which can take the sealing insert) in a gas tight manner, the test pressure in accordance with Annex B is applied over the specified test duration.

Speed of load application: < 1,2 kN/min.

Test pressure: Shall be specified in accordance with Table B.1 in Annex B, permanently external

Test medium: air

Load duration: 20 minutes

Number of test specimen: 1

Evaluation:

After a waiting period of 5 minutes, in which the pressure conditions are stabilized at the test pressure, the leakage rate is determined by measuring the air volume supplied, which ensures stable pressure conditions (Note: Experience has shown that a leakage rate of approx. 16 ml/min can result from this Annex C, Clause C.2 prepared concrete).

The aged (in accordance with Clause 2.2.8), service penetration has the following torque stability (test part 1: specification of the angle of rotation [°] with applied torque [Nm]) and has the following leak rate under vertical load (test part 2: leak test with vertical load) with determination on the leak rate [ml/min] at maximum vertical load [N]. The results shall be stated in the ETA in accordance with Annex A. Determine applied vertical load [N] in Table 2.2.7.1.

Table 2.2.7.1: Evaluation table of gastightness (example):

Part		Testing period	Gas pressure [kPa]	Applied torque (part 1)		Applied shear (part 2)	Performance
				angle of rotation [°]	torque [Nm]	vertical load [N]	
1	Application of torque	2 x 60 s	xx	xx	xx	---	resistance against torque
2	Gastightness with shear force after torque	20 min	xx	(see part 1)		xxx	gas tight if ≤16 ml/min

2.2.8 Aging

Aging of the products shall take place in the not installed condition.

The aging of products made of polymers is carried out according to Arrhenius. Artificial aging shall correspond to a period of at least 8 years of real aging. The selected aging temperature depends on the properties (permissible use temperature) of the product materials and shall be determined accordingly.

The application temperatures of the products in the soil are set at +10 °C. This corresponds to the average temperature at an installation depth of about 1 m.

Using van't Hoff's rule as a rule of thumb, which states that chemical reactions occur approximately twice to four times as fast at a temperature increased by 10 K (corresponding to 10 °C), it is conservatively assumed that the rate of aging doubles compared to normal climatic conditions, quadruples at 20 K, increases eightfold at 30 K, and so on.

Service penetration made of polymers shall be placed in an oven with air circulation at defined temperature with a maximum tolerance of +\- 3 K for the time period calculated from figure 2.2.8.1. Different polymers shall not be placed in same oven.

After aging, the built-in products shall be concreted in or sealing inserts and add-on products shall be mounted. Subsequently, tests in accordance with Clauses 2.2.6 and 2.2.7 shall be carried out with these artificially aged products.

The time to achieve the required aging depends on the heat compatibility of the product, e.g., 365 days at 40 °C or 45.6 days at 70 °C. At the request of the manufacturer, longer aging time as predicted can also be used.

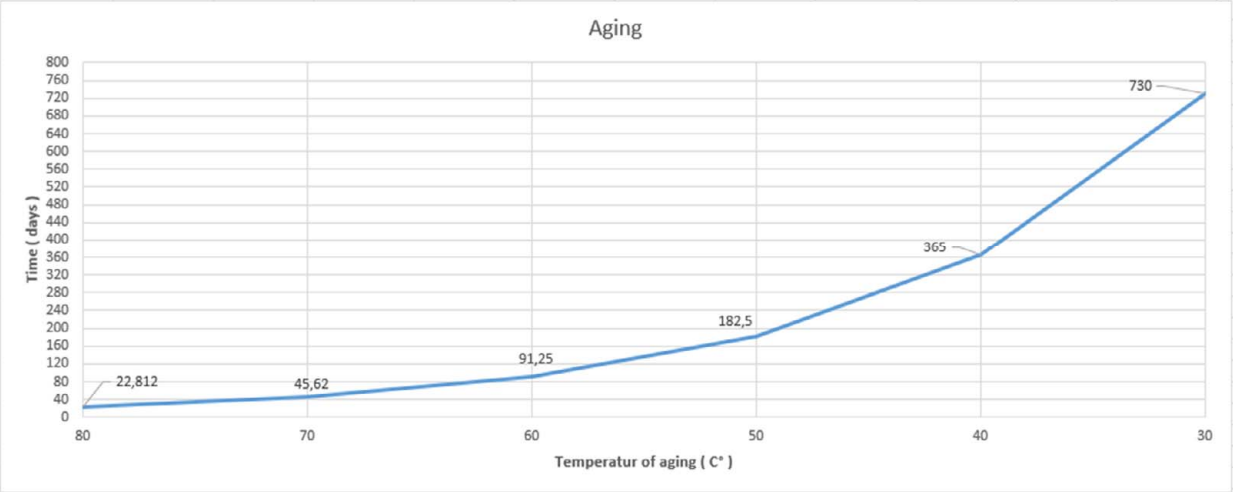


Figure 2.2.8.1: Aging time depending on temperature of aging

Evaluation:

Specify the aging time and aging temperature.

If aging of the service penetration at a temperature has resulted in visual changes, these changes shall be described in the ETA in accordance with Annex A.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is Commission Decision 1999/472/EC as amended by Commission Decision 2001/596/EC.

In case the products are used for sealing of service penetrations for gas:

The system is 3 except for uses subject to regulations on reaction to fire.

For uses subject to regulations on reaction to fire the applicable AVCP system regarding reaction to fire is 1.

In case the products are used for sealing of service penetrations for water not intended for human consumption:

The system is 4 except for uses subject to regulations on reaction to fire.

For uses subject to regulations on reaction to fire the applicable AVCP systems regarding reaction to fire are 1, or 3, or 4 depending on the conditions defined in the said Decision.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

Table 3.2.1 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Testing of delivered raw materials according to the test plan for material characteristics	As defined in control plan	As defined in control plan	As defined in control plan	Every 5 years
2	Testing of functionally relevant dimensions	As defined in control plan	As defined in control plan	As defined in control plan	Annual
3	Checking all dimensions of the components	As defined in control plan	As defined in control plan	As defined in control plan	Every 5 years
4	Reaction to fire	2.2.1	Class E or better	As defined in test report	At least once per 5 years or after modification of the product / product parameters (the higher frequency shall apply)
5	Axial load	2.2.2	As defined in control plan	As defined in control plan	Every 5 years
6	Impact load	2.2.3	As defined in control plan	As defined in control plan	Every 5 years
7	Radial load	2.2.4	As defined in control plan	As defined in control plan	Every 5 years
8	Temperature resistance	2.2.5	As defined in control plan	As defined in control plan	Every 5 years
9	Watertightness	2.2.6	As defined in control plan	As defined in test report	Every 5 years
10	Gastightness	2.2.7	As defined in control plan	As defined in test report	Every 5 years

3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for the product are laid down in Table 3.3.1.

Table 3.3.1 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	The notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control					
2	The notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	According to Control plan	According to Control plan	once a year

4 REFERENCE DOCUMENTS

EN 206:2013+A2:2021	Concrete – Specification, performance, production and conformity
EN 12390-2:2019	Testing hardened concrete - Part 2: Making and curing specimens for strength tests
EN 13238:2010	Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates
EN 13501-1:2018	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests
EN 13823:2020+A1:2022	Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item
EN ISO 11925-2:2020	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)
ISO 2768-1:1989	General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications

ANNEX A CALCULATION OF FRACTILES

The three types of service penetrations are intended to be placed on the market and CE marked also individually. Which essential characteristic is relevant to the respective product type and which information shall be provided as a result of the test is shown in Tables A.1 to A.3.

A.1: Built-in products

Table A.1.1: Built-in products

Assessment method	Essential characteristic	Result
2.2.1	Reaction to fire	Class/Description
2.2.2	Axial load	Maximum axial load [kg] of the service penetration that has passed the tests of dimensional stability and watertightness test
2.2.3	Impact load	Maximum impact load [drop height in mm] of the service penetration that has passed the tests of dimensional stability and watertightness
2.2.4	Radial load	Maximum radial load [kg] of the service penetration that has passed the tests of dimensional stability and watertightness
2.2.5	Temperature resistance	Maximum temperature resistance [°C] of the service penetration that has passed the tests of dimensional stability and watertightness
2.2.6 (after 2.2.8)	Watertightness	Angle of rotation [level] ° with torque applied at [level] Nm; watertight with applied vertical load at [level] N and applied pressure at [level] kPa; watertight at long-term leak test
2.2.7 (after 2.2.8)	Gastightness	Angle of rotation [level] ° with torque applied at [level] Nm; gastight with applied vertical load at [level] N and applied pressure at [level] N
2.2.8	Aging	Describe visual changes; note aging time and temperature of aging

A.2: Add-on products

Table A.2.1: Add-on products

Assessment method	Essential characteristic	Result
2.2.1	Reaction to fire	Class/Description
2.2.6 (after 2.2.8)	Watertightness	Angle of rotation [level] ° with torque applied at [level] Nm; watertight with applied vertical load at [level] N and applied pressure at [level] kPa; watertight at long-term leak test
2.2.7 (after 2.2.8)	Gastightness	Angle of rotation [level] ° with torque applied at [level] Nm; gastight with applied vertical load at [level] N and applied pressure at [level] N
2.2.8	Aging	Describe visual changes; note aging time and temperature of aging

A.3: Sealing inserts

Table A.3.1: Sealing inserts:

Assessment method	Essential characteristic	Result
2.2.1	Reaction to fire	Class/Description
2.2.6 (after 2.2.8)	Watertightness	Angle of rotation [level] ° with torque applied at [level] Nm; watertight with applied vertical load at [level] N and applied pressure at [level] kPa; watertight at long-term leak test
2.2.7 (after 2.2.8)	Gastightness	Angle of rotation [level] ° with torque applied at [level] Nm; gastight with vertical load at [level] N and applied pressure at [level] N
2.2.8	Aging	Describe visual changes; note aging time and temperature of aging

ANNEX B PRESSURE RATING

The pressure rating shall be specified in accordance with Table B.1. Any safety factors are not included in the test pressure and shall be considered separately by the designer.

Compulsory to test stepwise increasing until failure and the step before then valid for the rating. It is also possible to start directly with the test pressure you are aiming to achieve. Specific (one) pressure stage can only be used when other (e.g., higher) stages are explicitly excluded in MPII (performance shall be established unless MPII sets otherwise).

Table B.1

Test pressure [kPa]	50	100	150	200	250
Scope of Application/ Water column [m]	5	10	15	20	25

ANNEX C DEFINITIONS

C.1 Test conditions

The tests given in Clauses 2.2.2 “Axial load”, 2.2.3 “Impact load”, 2.2.4 “Radial load”, 2.2.6 “Watertightness (after torque)” and 2.2.7 “Gastightness (after torque) shall be performed under the following test conditions:

- Room temperature: (23 ± 3) °C
  The temperature shall be recorded and documented over the course of the test.
- Measurement accuracy: ± 1 %.

C.2 Waterproof concrete test block

The dimensions of the waterproof concrete test block are minimum 500 x 500 mm; wall thickness 250 mm with a tolerance of maximum + 20 mm. A test block shall be made of concrete class C25/30 in accordance with EN 206 and a product shall be installed in accordance with the Manufacturer’s Product Installation Instructions. The curing time of the waterproof concrete test block shall be at least 4 weeks. Making and curing of concrete specimens are described in EN 12390-2.

A possible external waterproofing layer shall be applied subsequently in accordance with the manufacturer’s specifications. Any specifications of the manufacturer of the external waterproofing layer for processing or similar shall also be observed.

For all tests performed with waterproof concrete test blocks, an activation pressure of 0,1 bar with water shall be applied for 24 h before the test pressure is applied to ensure the functionality of the waterproof concrete.

C.3 Test bell

Pressure-tight, bell-shaped container that withstands at least the required test pressure including a safety factor of 2. The vessel shall have an inner diameter which is at least 10 mm larger at every point than the visible outer contour of the lining tube. Test bell is placed on waterproof concrete test block.

The blank cap is a cap which closes the open ends of a built-in product in a watertight and gas-tight manner without damage. This can be done in the form of a steel cover with the aid of sealant.

The following sketch is intended to illustrate the structure:

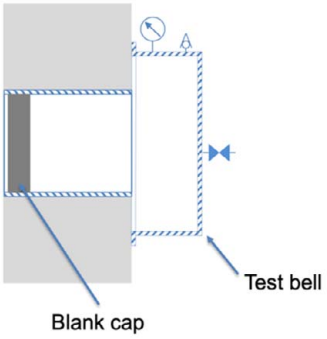


Figure C.3.1: Test bell

C.4 Test cylinder

The steel test cylinder can take sealing inserts (Type 3) in his inner diameter. His inner diameter corresponding to the nominal diameter of the tested product and a test pipe made of steel with an outside diameter corresponding to a common line size or a dummy adapter is needed.

The inner diameters of the steel test cylinder shall have a general tolerance in accordance with ISO 2768-1 m (medium). The surface roughness shall have a roughness depth of maximum Rz = 63 µm. Existing

weld seams in the area of the sealing surfaces shall be executed in such a way that a homogeneous sealing surface is obtained. These areas shall not have any indentation (gap, longitudinal grooves etc.) in the inner pipe. A slight (1-2 mm, e.g., longitudinal weld seam) increase with a continuous transition can be accepted. The test lines and test specimens shall be able to withstand the contact pressure of the sealing inserts and the corresponding test values.

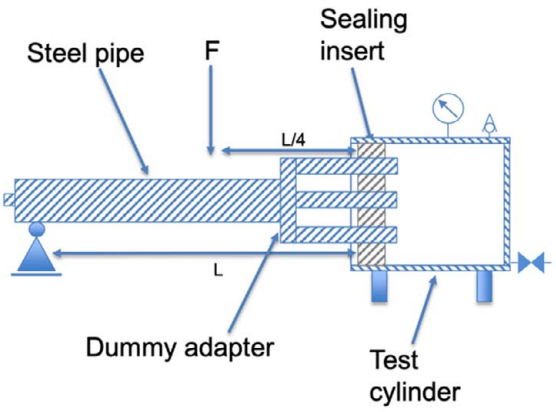


Figure C.4.1: Test cylinder

C.5 Dummy adapter for torque test

The dummy adapter is used to transmit the torque defined into the openings provided for media line. To introduce the torque into adapter connected with the steel pipe, a square opening shall be provided on one end of steel pipe, which is used to accommodate a torque device. Furthermore, the adapter shall seal the openings for the media lines gas- and water-tight. The dummy adapter as well as the steel pipe shall be stiff in torsion and smaller in diameter than the test cylinder.

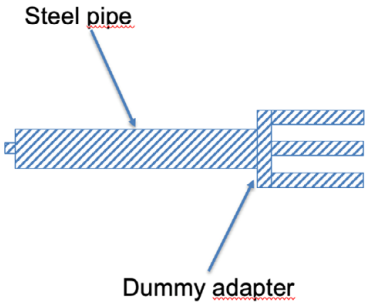


Figure C.5.1: Dummy adapter for torque test