SLOVENSKI STANDARD
oSIST prEN ISO 14692-2:2015

01-oktober-2015

Industrija za predelavo nafte in zemeljskega plina - S steklenimi vlakni ojačeni polimerni cevovodi (GRP) - 2. del: Kvalificiranje in proizvodnja (ISO/DIS 14692-2:2015)

Petroleum and natural gas industries - Glass-reinforced plastics (GRP) piping - Part 2: Qualification and manufacture (ISO/DIS 14692-2:2015)

Erdöl- und Erdgasindustrie - Glasfaserverstärkte Kunstoffrohrleitungen (GFK) - Teil 2: Zulassung und Herstellung (ISO/DIS 14692-2:2015)

Industries du pétrole et du gaz naturel - Canalisations en plastique renforcé de verre (PRV) - Partie 2: Conformité aux exigences de performance et fabrication (ISO/DIS 14692-2:2015)

Ta slovenski standard je istoveten z: **prEN ISO 14692-2**

ICS:

75.200	Oprema za skladiščenje nafte, naftnih proizvodov in zemeljskega plina	Petroleum products and natural gas handling equipment
83.140.30	Cevi, fitingi in ventili iz polimernih materialov	Plastics pipes, fittings and valves

oSIST prEN ISO 14692-2:2015 **en**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 14692-2

ISO/TC **67**/SC **6**

Secretariat: **AFNOR**

Voting begins on:
2015-08-13

Voting terminates on:
2015-11-13

Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping —

Part 2:
Qualification and manufacture

Industries du pétrole et du gaz naturel — Canalisations en plastique renforcé de verre (PRV) —

Partie 2: Conformité aux exigences de performance et fabrication

ICS: 75.200; 83.140.30

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 14692-2:2015(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14692-2 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

ISO 14692 consists of the following parts, under the general title *Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping*:

— *Part 2: Qualification and manufacture*

— *Part [n]:*

— *Part [n+1]:*

— *Part 1: Vocabulary, symbols, applications and materials*

— *Part 2: Qualification and manufacture*

— *Part 3: System design*

— *Part 4: Fabrication, installation, inspection and maintenance*

Introduction

The objective of this part of ISO 14692 is to enable the purchase of GRP components with known and consistent properties from any source. Main users of the document will be the principal and the manufacturer, certifying authorities and government agencies.

The qualification programme and the quality programme are the most significant clauses in Part 2.

Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping — Part 2: Qualification and manufacture

1 Scope

This part of ISO 14692 gives requirements for the qualification and manufacture of GRP piping and fittings in order to enable the purchase of GRP components with known and consistent properties from any source.

It is applicable to qualification procedures, preferred dimensions, quality programmes, component marking and documentation.

This part of ISO 14692 is intended to be read in conjunction with ISO 14692-1.

2 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms, definitions, symbols and abbreviated terms given in ISO 14692-1 apply.

3 Manufacturer's declarations

Prior to the start of the qualification programme, the manufacturer shall declare 1) G_{xx}, 2) MPR_{xx}, 3) the long term envelope data points, 4) the threshold envelope data points, 5) dimensional data and 6) baseline values for degree of cure, barcol hardness (GRUP and GRVE only) and glass content, where applicable. The data shall be based on a standard design life of 20 years.

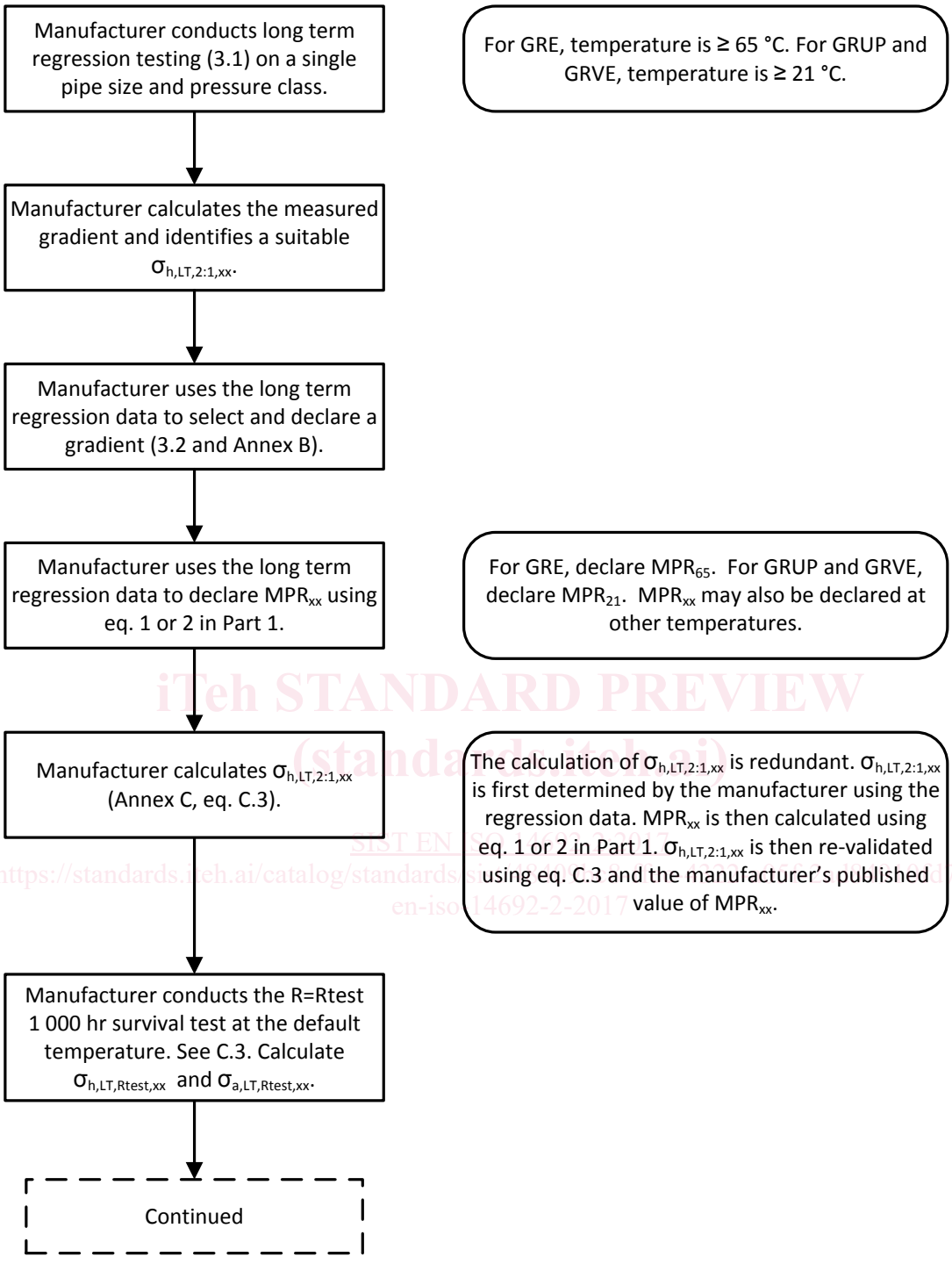

Figure 1 – Procedure for declaring manufacturer's data

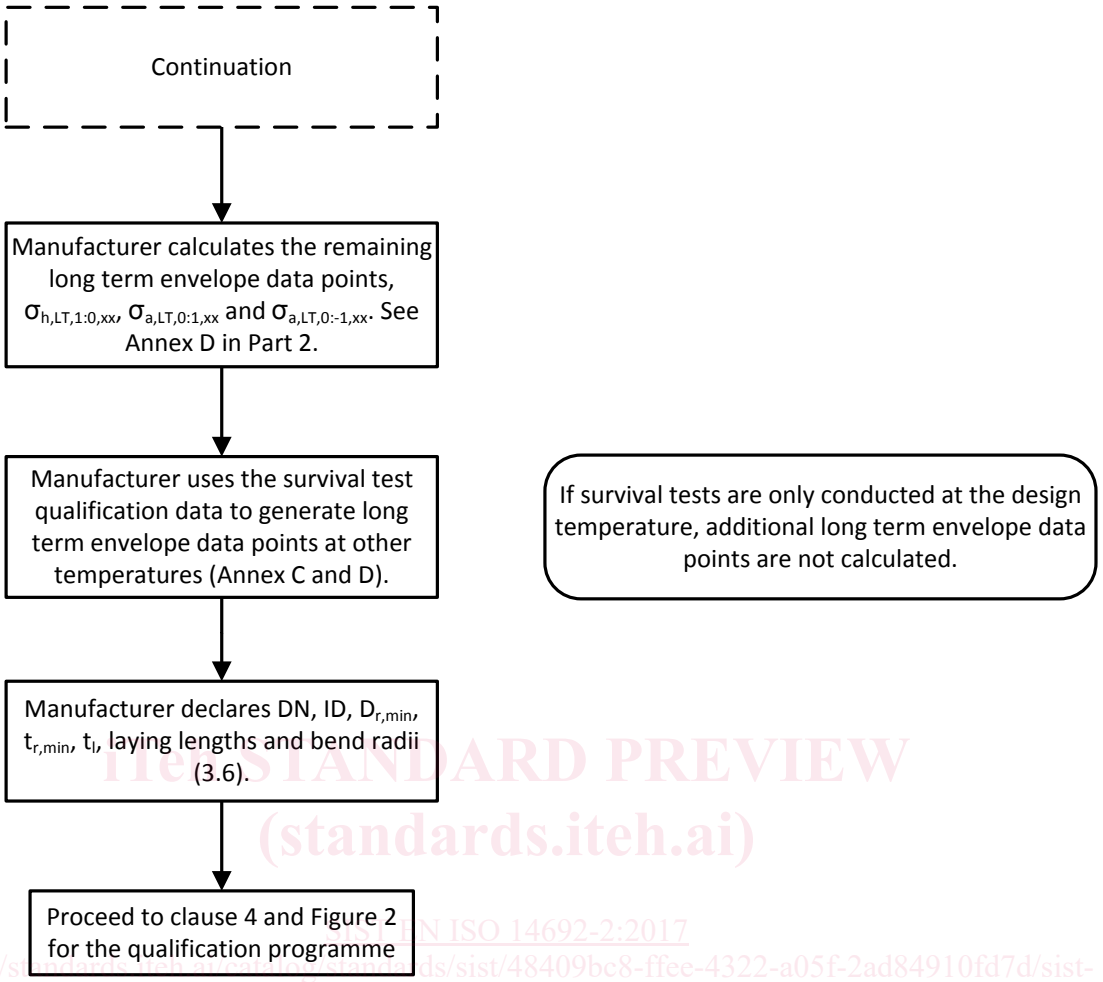

Figure 1 (continued) – Procedure for declaring manufacturer's data

3.1 Long term regression testing

The manufacturer shall provide at least one full regression curve (as per ASTM D2992 as modified in this clause and in clause 4.1. The regression curve shall be at 65 °C or higher for GRE and 21 °C or higher for GRUP or GRVE.

NOTE 1 The one full regression curve does not have to be at or above the design temperature of the project. For example, the Enquiry sheet specifies a design temperature of 93 °C and the manufacturer has a full regression curve at 85 °C for GRE-Aliphatic Amine. Since the resin matrix is GRE and the temperature of the full regression curve is above 65 °C, the data is acceptable. The manufacturer's gradient from the full regression curve can be compared to the values in Table B.1 and a gradient can be selected per the process in Annex B. On the other hand, validation of the long term envelope via survial tests would have to be performed at the design temperature of the project.

The manufacturer shall conduct the long term regression on either a plain pipe or a pipe+joint, in a single pipe size, the size to be determined by the manufacturer.

NOTE 2 For economical and practical reasons, long term regression testing is typically conducted on small diameters. The recomended minimum pipe size is DN50. Data seems to be more consistent as the size increases (i.e. DN100 test results seem to be more consistent than DN50 test results).

The $D_{r,min}$ / $t_{r,min}$ ratio of the pipe size shall be within the range of published $D_{r,min}$ / $t_{r,min}$ ratios that are to be qualified.

NOTE 3 Ideally, the $D_{r,min}$ / $t_{r,min}$ ratio of the pipe size should be close to the average $D_{r,min}$ / $t_{r,min}$ ratio of all of the pipe sizes to be qualified. It is not desirable to have the $D_{r,min}$ / $t_{r,min}$ ratio of the pipe size at either extreme.

The test fluid shall be potable water.

NOTE 4 For testing completed prior to the publication of this standard, the test fluid may be salt water. In this case, the salt content must be specified and it must not be greater than 35 g/L. The intention of this requirement is to allow validation of existing test data completed before the publication of this document, but to require potable water for future testing. Potable water is a more aggressive test media than salt water. Test data using mineral oil should be rejected since mineral oil is not a degrading agent to the bond between the glass fibres and the resin matrix.

All tests shall be conducted with unrestrained (i.e. "free") ends.

3.2 Gradient, G_{xx}

The manufacturer shall declare gradient, G_{xx}, in accordance with Annex B.

3.3 MPR_{xx}

MPR_{xx} is the maximum pressure rating at sustained conditions for a 20 year design at the temperature of xx °C. MPR_{xx} shall be the maximum catalogue value published by the manufacturer.

MPR_{xx} shall be defined at 65 °C for GRE (MPR_{65}) and 21 °C for GRUP and GRVE (MPR_{21}). For design temperatures in excess of 65 °C for GRE and 21 °C for GRUP and GRVE, the manufacturer shall also publish MPR_{xx} at the design temperature or higher.

The following shall be noted:

a) Default temperatures are 65 °C (MPR_{65}) for GRE and 21 °C (MPR_{21}) for GRVE and GRUP. For clarity, MPR shall always be published with a temperature subscript (e.g. MPR_{65} or MPR_{21}, not MPR).

b) The default temperature for GRE is established at 65 °C since this temperature is at or above the design temperature for many typical GRE applications and since many manufacturers have conducted qualification testing for pressure at this temperature.

c) The default temperature for GRUP is established at 21 °C since there are many applications for GRUP near ambient temperature and the amount of qualification testing for pressure by manufacturers at 65 °C is less than that at 21 °C to 50 °C.

d) While GRVE may be suitable for applications at temperatures above 65 °C, the amount of qualification testing for pressure above 65 °C by manufacturers is very small. Like GRUP, there is more qualification data between 21 °C to 50 °C, thus the default temperature for GRVE is established at 21 °C.

e) The manufacturer uses the survival tests to validate MPR_{xx} (clause 4.3.1).

3.4 Partial factors

3.4.1 Partial factor for design lifetime, A_0

A_0 is specified in clause 5.1.1 of ISO 14692-3.

3.4.2 Partial factor for chemical degradation, A_2

A_2 shall be 1,0.

NOTE 1 It is the resin rich liner, not the structural cage, that is designed to prevent chemical degradation. A partial factor applied to the reinforced wall thickness would provide little to no value in preventing chemical degradation.

NOTE 2 Water permeates thermoset resins quite quickly. The silane coupling agent is the key component providing resistance to breakdown from water attack. Without the silane coupling agent, water permeation would occur followed by a breakdown of the bond between the glass and resin followed by etching of the fibers and finally fiber failure.

NOTE 3 While the silane coupling agent provides resistance to breakdown from water attack, other chemicals may attack the bond between the resin and the glass reinforcement. Some of these chemicals include strong acids and bases such as sodium hydroxide. It is these chemicals that require a resin-rich, reinforced liner of sufficient thickness to protect the structural layers from permeation of these chemicals and attack of the bond between the glass and the resin. Fortunately, most of these chemicals do not permeate quickly, so practical liners are possible. Other standards, such as ASTM D3681 or EN 13121-2, may be suitable as a qualification programme to predict the thickness of the liner based on exposure to various chemicals in a stressed condition.

3.4.3 Partial factor for cyclic loading, A_3

A_3 is specified in clause 5.1.3 of ISO 14692-3.

3.5 Long term envelope data points

The manufacturer shall declare and demonstrate the long term envelope data points ($\sigma_{h,LT,2:1,xx}$, $\sigma_{a,LT,2:1,xx}$, $\sigma_{h,LT,0:1,xx}$, $\sigma_{a,LT,0:1,xx}$, $\sigma_{h,LT,Rtest,xx}$, $\sigma_{a,LT,Rtest,xx}$, $\sigma_{a,LT,0:-1,xx}$, and $\sigma_{h,LT,1:0,xx}$) and the threshold envelope data points ($\sigma_{h,thr,2:1,}$, $\sigma_{a,thr,2:1,}$, $\sigma_{h,thr,Rtest,}$, $\sigma_{a,thr,Rtest,}$, $\sigma_{a,thr,0:-1,}$, and $\sigma_{h,thr,1:0,}$) by testing in accordance with Annex D. The threshold envelope data points do not have a temperature subscript as the threshold is defined, by default, at 65 °C for GRE and 21 °C for GRUP and GRVE.

Long term envelope data points are defined at temperatures. To calculate a long term envelope data point, survival tests on pipe(s), joint(s) and fitting(s) are required at the design temperature (or higher). Refer to Annex D for calculations.

3.6 Dimensions

The manufacturer shall declare the following dimensions:

a) DN

b) ID

c) $D_{r,min}$ and $t_{r,min}$

d) t_l

e) Laying lengths

f) Bend radii (for elbows)

The nominal diameter should be chosen from the sizes listed in Table 1 of ISO 7370:1983 or should be agreed between the manufacturer and principal.

3.7 Baseline values

The manufacturer shall declare basline values for quality control puposes for the following:

a) degree of cure

b) barcol hardness (GRUP and GRVE only)

c) glass content

The manufacturer shall select samples from standard production to determine the baseline values.

NOTE Samples for baseline testing should not be limited to the 1000 hr qualification samples since these samples may be anywhere within the standard deviation of the population. Samples should be taken from standard production to ensure that results are being obtained across the entire standard deviation of the population.

3.8 Flexibility factors and SIFs

The manufacturer shall declare flexibility factors for bends per clause 6.4 of Part 3. The manufacturer shall declare SIFs for bends and tees per clause 6.5 of Part 3.

3.9 Production processes and jointing instructions

The manufacturer shall declare general production processes and jointing instructions sufficient to verify that the scaling rules in Annex G have been met. Proprietary processes need not be disclosed.

4 Qualification programme

4.1 General

The qualification programme is a one-time process. If the manufacturer has test data from a previous project, the manufacturer shall have the option to use this data on other projects. However, the principal shall also have the option to require one or more of the tests in Table 1 to be conducted for their particular project. These tests shall be specified on the Enquiry Sheet (ref. ISO 14692-1 Annex D). The principal shall also have the option, via the Enquiry Sheet in ISO 14692-1 Annex D, to specify which tests, if any, shall be conducted by an independent third party laboratory.

The qualification programme shall be based on a standard design life of 20 years. A_0 shall be used to scale the design envelope to other design lives. A_0 shall not be greater than 1,0.

The test fluid for the qualification procedure for pressure and temperature shall be potable water.

NOTE 1 For testing completed prior to the publication of this standard, the test fluid may be salt water. In this case, the salt content must be specified and it must not be greater than 35 g/L. The intention of this requirement is to allow validation of existing test data completed before the publication of this document, but to require potable water for future testing. Potable water is a more aggressive test media than salt water. Test data using mineral oil should be rejected since mineral oil is not a degrading agent to the bond between the glass fibres and the resin matrix.

All tests involving internal pressure shall be conducted with unrestrained (i.e. "free") ends.

Refer to Table 1 for a summary of the qualification programme. Refer to Figure 2 for a flowchart of the procedure for product qualification. Refer to Figure 3 for a flowchart of the procedure for determining elastic properties.

Permanent repair procedures shall be qualified according to this qualification programme.

NOTE 2 Manufacturer's repair procedures that only involve qualified components would not need any additional qualification.

When joints are qualified, the joint shall be made in accordance with the manufacturer's declared joint instructions. This qualifies both the joint and it's joint instructions.

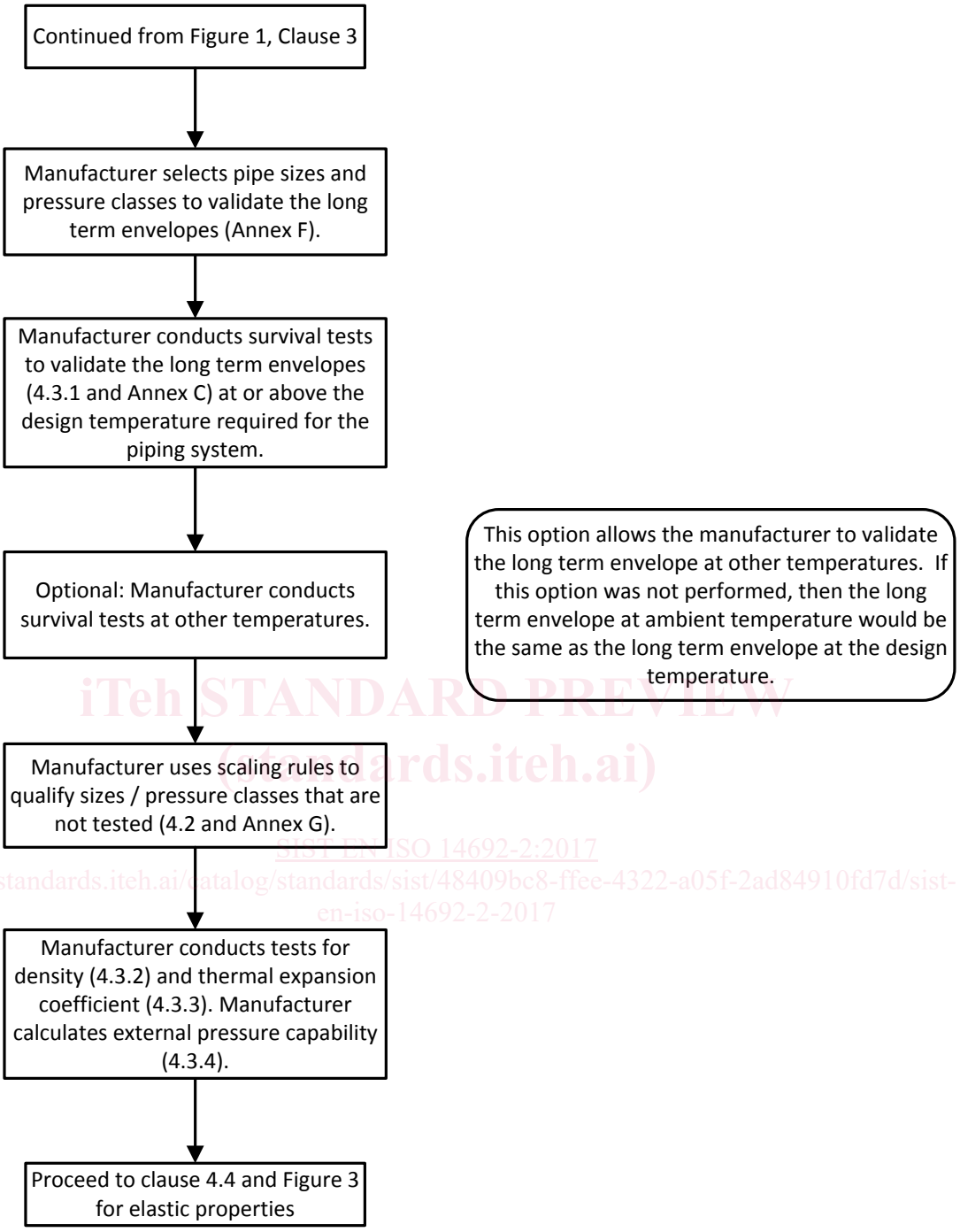

Figure 2 – Procedure for the product qualification portion of the qualification programme