SLOVENSKI STANDARD
oSIST prEN ISO 14692-4:2015

01-oktober-2015

Industrija za predelavo nafte in zemeljskega plina - S steklenimi vlakni ojačeni polimerni cevovodi (GRP) - 4. del: Izdelava, vgradnja in delovanje (ISO/DIS 14692-4:2015)

Petroleum and natural gas industries - Glass-reinforced plastics (GRP) piping - Part 4: Fabrication, installation and operation (ISO/DIS 14692-4:2015)

Erdöl- und Erdgasindustrie - Glasfaserverstärkte Kunststoffrohrleitungen (GFK) - Teil 4: Fertigung, Installation und Betrieb (ISO/DIS 14692-4:2015)

Industries du pétrole et du gaz naturel - Canalisations en plastique renforcé de verre (PRV) - Partie 4: Construction, installation et mise en œuvre (ISO/DIS 14692-4:2015)

Ta slovenski standard je istoveten z: **prEN ISO 14692-4**

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

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DRAFT INTERNATIONAL STANDARD

ISO/DIS 14692-4

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 4:
Fabrication, installation and operation

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

Partie 4: Construction, installation et mise en oeuvre

ICS: 75.200; 83.140.30

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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.

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Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
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Fax +41 22 749 09 47
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Foreword

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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 14692-4 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*.

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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.

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

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

— *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 maintenace*

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Introduction

The objective of this part of ISO 14692-4 is to ensure that installed GRP piping systems will meet the specified performance requirements throughout their service life. Main users of the document are envisaged to be the principal, fabrication/installation contractors, repair and maintenance contractors, certifying authorities and government agencies.

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Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping — Part 4: Fabrication, installation, inspection and maintenance

1 Scope

This part of ISO 14692 gives requirements and recommendations for the fabrication, installation, inspection and maintenance of GRP piping systems for use in oil and natural gas industry processing and utility service applications. The recommendations apply to delivery, inspection, handling, storage, installation, system pressure testing, maintenance and repair.

It is intended to be read in conjunction with ISO 14692-1.

2 Normative references

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

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ISO 9712, *Non-destructive testing — Qualification and certification of personnel*

ISO 14692-1, *Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping — Part 1: Vocabulary, symbols, applications and materials*

ISO 14692-2, *Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping — Part 2: Qualification and manufacture*

ISO 14692-3, *Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping — Part 3: System design*

API Spec 5B, 2008, *Gauging and inspection of casing, tubing, and line pipe threads*

ASTM D257, *Standard test methods for DC resistance or conductance of insulating materials*

ASTM D1599, *Standard test method for resistance to short-time hydraulic failure pressure of plastic pipe, tubing, and fittings*

ASTM D 2583, *Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor*

AWWA M45, *Fiberglass pipe design manual*

3 Terms and definitions

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

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4 Symbols and abbreviated terms

The symbols and abbreviated terms given in ISO 14692-1 apply.

5 Fabrication and installation

5.1 Delivery, inspection and documentation of GRP piping

The quantity, MSP, nominal dimensions, and relevant special requirements of all piping components and prefabricated spools shall be verified for compliance with the purchase order. Shipments of piping components not complying with the purchase order shall be reported to the responsible personnel and to the pipe producer for corrective actions.

All piping components shall be visually inspected in accordance with Annex A Table A.1 for damage that may have occurred during storage and shipment. Rejected components shall be replaced. If doubts concerning the extent of defects occur during inspection, a specialist approved by the principal shall perform a second inspection of the delivered items.

Adhesive bonding kits shall be inspected to ensure that the kits contain all necessary materials, are not leaking or visibly damaged, and that at least six months remains until the expiration of shelf-life.

All fire protection material shall be inspected to ensure that the original packaging is not damaged.

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5.2 Handling and storage

The handling of the GRP components shall follow the guidelines given in Annex B and the requirements of the pipe manufacturer.

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5.3 System design documentation

The principal shall provide the installer with the following information, which shall include but not be limited to

a) operating and design parameters:

   1) design pressure;

   2) design temperature (maximum and minimum);

   3) T_g of the resin used in component manufacture;

   4) T_g of the adhesive used in component manufacture (if appropriate);

   5) MSP of each component and MSOP of each piping system;

   6) mean and maximum velocity conditions in each piping system;

   7) chemical resistance limitations, if applicable;

   8) procedures to eliminate or control water hammer and cavitation, if applicable;

   9) fire classification and location of fire-rated pipe, if applicable;

   10) conductivity classification, location of conductive pipe, earth linkage/grounding requirements and location of earthing points;

   11) criticality rating;

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b) system drawings and support requirements for heavy equipment;

c) preferred locations for connection of final joint in pipe loops, if appropriate;

d) system criticality and minimum requirements for inspection during installation.

5.4 Installer requirements

5.4.1 Personnel qualification

All pipe, fittings and related items shall be installed by qualified GRP pipe fitters, bonders or spool-builders and thereafter approved by a qualified GRP piping inspector. GRP pipe fitters and GRP piping inspectors shall be qualified according to the minimum requirements detailed in Annex C.

5.4.2 Health and safety

In general, all safety precautions set forth by the manufacturer of pipes and fittings, chemicals, etc., shall be adopted. Materials safety data sheets should always be read before commencing work.

5.5 Installation

5.5.1 General requirements

All piping components shall be installed so that they are ideally stress free and at least not over-stressed:

a) bending of pipes to achieve changes in direction, or forcing misaligned flanges together by over-torquing bolts is not permitted;

b) the manufacturer's recommendations for bolt-torquing sequence, torque increments and maximum bolt torque shall be followed.

c) All supports shall be installed (location and function) as per system design.

Prefabricated pipework shall be fabricated in accordance with fully dimensioned piping isometrics. Overall spool dimensions shall be sized taking the following into consideration:

a) site transport and handling equipment limitations;

b) installation and erection limitations;

c) limitations caused by the necessity to allow a fitting tolerance for installation ("cut-to-fit" requirements).

If shown on isometric drawings, the fabrication shall include "cut-to-fit" lengths and field joints on fabricated pieces to allow for the setting up of pipework accurately on-site between fixed points. "Cut-to-fit" lengths shall be left square and plain.

The installer shall give due consideration to the following:

a) the need to avoid overstressing of GRP components by the forced pulling of GRP pipework to facilitate alignment at joints, and particularly at flanged joints;

b) the need to prevent damage to joints when handling small-diameter thick-walled pipe, e.g. due to fire protection;

NOTE This is because the high rigidity of the pipe concentrates loading at the thinner sections of pipe wall adjacent to the joint.

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c) the preferred location of the last site joint in a piping loop to ensure that necessary access is available, since this joint is often the most difficult to complete;

d) delays caused by the time required for adhesive or laminated joints to cure without being disturbed. The scheduling of surrounding construction activities shall take into account the risk of possible disturbances to such joints;

e) the need to provide temporary protection for installed GRP piping if risk of mechanical damage is high. The installer shall also consider correct sequencing of fabrication activities to minimize risk of damage;

f) the need to prevent overheating of the GRP pipe material by electric surface heating, if applied. Heat tracing should be loosely spirally wound onto GRP pipe in order to distribute the heat evenly around the pipe wall. Heat distribution can be improved if aluminium foil is first wrapped around the pipe.;

g) provision of suitable joints to facilitate isolation or access to the pipe for maintenance purposes.

5.5.2 Components fabricated on-site

All processes used to fabricate spoolpieces and components on-site, e.g. mitred elbows, tee pieces and laterals, shall have been qualified according to procedures given in 4.3 of ISO 14692-2.

5.5.3 Cutting

GRP pipe shall be cut according to the manufacturer's instructions.

For adhesive-bonded connections, the pipe end shall be machined with a pipe shaver according to the manufacturer's recommendations.

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5.5.4 Above ground application - supports

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GRP piping systems may be supported using the same principles as those for metallic piping systems. However, due to the proprietary nature of piping systems, standard-size supports may not necessarily match the pipe outside diameters. The use of saddles and elastomeric (neoprene) pads may allow the use of standard-size supports.

The following guidelines to GRP piping support should be followed;

a) Supports in all cases should have sufficient width to support the piping without causing damage and should be lined with an elastomer or other suitable soft material.

b) Clamping forces, if applied, should be such that crushing of the pipe does not occur. Local crushing can result from a poor fit and all-round crushing can result from over-tightening.

c) In all cases, support design should be in accordance with the manufacturer's guidelines.

d) Supports should preferably be located on plain pipe sections rather than at fittings or joints.

e) Supports shall be spaced to avoid sag (excessive displacement over time) and/or excessive vibration for the design life of the piping system.

f) Valves or other heavy attached equipment shall be adequately and if necessary (as determined from system design calculations) independently supported.

g) GRP pipe shall not be used to support other piping, unless agreed with the principal.

h) Consideration shall be given to the support conditions of fire-protected GRP piping. Supports placed on the outside of fire protection can result in loads irregularly transmitted through the coating, which can result in shear/crushing damage and consequent loss of support integrity.

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i) GRP piping should be adequately supported to ensure that the attachment of hoses at locations such as utility or loading stations does not result in the pipe being pulled in a manner that could overstress the material.

j) The anchor or linestop support shall be capable of transferring the required axial loads to the supporting structure without causing overstress of the GRP pipe material.

k) Anchor or linestop clamps are recommended to be placed between two double 180° saddles, adhesive-bonded or laminated to the outer surface of the pipe. The manufacturer's standard saddles are recommended and shall be bonded using standard procedures.

5.5.5 Buried piping

a) In-situ conditions – an appreciation of the local soil conditions and water table should be obtained prior to trench excavation.

b) Embedment materials – the local soil type should be identified in order to determine the support that can be provided to the buried GRP pipe system. Other issues to consider include moisture content and permeability which if inappropriately selected could lead to improper settlement.

c) Considerations for use of soil in backfill – the soil properties should be assessed in terms of potential compaction. Too high a required compaction load may damage the GRP pipe.

d) Trench excavation – the trench sides should be stable under all working conditions. Excavated soil material should not be placed near the edge of the trench. Ideally water should be removed from the trench prior to pipe laying and backfilling.

e) The minimum width of the bottom of the trench for a single pipe should be a least 1.5 times the pipe diameter. For multiple pipes, the distance between pipes should be at least 0.5 times the larger pipe diameter and the gap between the outer pipe and the trench wall should be at least the same width as for a single pipe.

f) Trench bottom – all rock, hard pan and sharp objects shall be removed.

g) Preparation of the trench – the bedding material on the trench bottom should be a least 100 mm thick and provide the correct gradation and pipe support. All localised loading should be minimised e.g. through the presence of other subsurface structures by providing at least a 300 mm bedding or compacted backfill layer.

h) Placing and joining pipe – the GRP pipe shall be placed in the trench such that it is uniformly supported. Extra backfill or bedding material should not be added or extra backfill forced in to provide this support. All joints should be installed according to the manufacturer's installation guideline.

i) Placing and compacting backfill materials – backfill materials should be placed around the GRP pipe such that they will not disturb or damage the pipe. The backfill material should be worked into the underside of the pipe before backfilling the trench

j) Compacting the backfill material – the backfill material should be compacted in the trench but it should be ensured that the compacting loads will not damage the buried pipe. The minimum cover of backfill material should be such that no damage to the buried pipe is caused by surface loads, e.g. vehicle weight. Design guidance on burial depth is provided in AWWA M45 Chapter 5.7.3

k) Thrust blocks, if required, shall be capable of transferring the axial loads to the supporting structure without causing overstress of the GRP pipe system.

Further guidance on GRP buried pipe installation is provided in AWWA M45 Chapter 6 and design of thrust blocks in AWWA M45 Chapter 7.

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5.5.6 Tolerances

Global tolerances shall be within ± 6 mm in all directions, unless otherwise shown on the approved drawings. Dimensional tolerances for finished piping are given in Table 1. The dimension numbers are shown in Figure 1.

The acceptable tolerances for misalignment of flanges during installation are given in Table 2. It is common practice for some flanges to be manufactured with bolt holes larger than the size of bolt being used with the flange. Typically, the hole will be 3 mm larger. This should be taken into account when assessing the flange misalignment tolerance in Tables 1 and 2.

Table 1 — Maximum dimensional tolerances

Internal pipe diameter	**Tolerances** (relative) **Dimension number** (see Figure 1)					
	1	**2**	**3**	**4**	**5**	**6**
Mm	Mm	mm	degrees	mm	mm	degrees
25 to 200	± 5	± 3	± 0,5	± 3	± 1	± 0,5
250 to 300	± 5	± 3	± 0,4	± 3	± 1	± 0,5
350 to 400	± 5	± 3	± 0,3	± 3	± 2	± 0,5
450 to 600	± 10	± 5	± 0,3	± 3	± 2	± 0,5
700 to 900	± 10	± 5	± 0,2	± 5	± 3	± 0,5
1,000 to 1,200	± 10	± 5	± 0,15	± 6	± 3	± 0,5
1,200 to 4,000	± 15	± 10	± 0,15	± 10	± 5	± 1
The maximum gap shall be limited to 6 mm.						

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Table 2 — Acceptable tolerances for misalignment of flanges during installation

Misalignment	**Tolerances**		
	Diameter range		
	50 to 300 mm	**300 to 1,200 mm**	**1,200 to 4,000 mm**
Flange misalignment (mm)	± 1,6	± 3,2	± 5
Separation between spools (mm)	± 2	± 5	± 10

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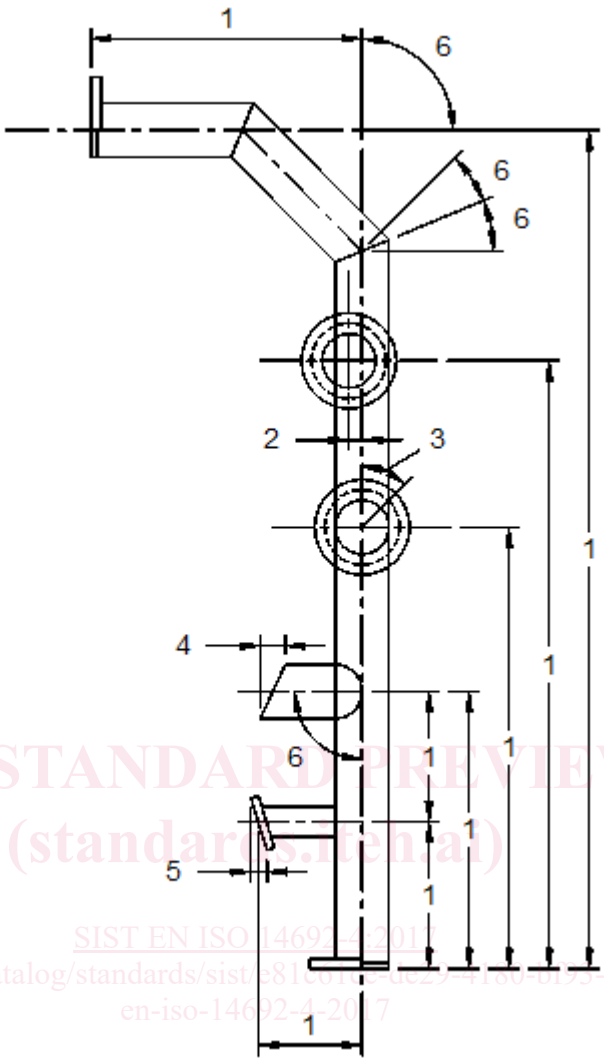

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Key

1 face-to-face dimensions, or centre-to-face dimensions, or location of attachments, or centre-to-centre dimensions
2 lateral translation of branches or connections
3 rotation of flanges, from the indicated position
4 end preparations
5 cut of alignment of flanges from the indicated position, measured across the full gasket face
6 angular deflection

Figure 1 — Tolerance dimensions

5.5.7 Jointing

5.5.7.1 General requirements

All jointing shall be performed in accordance with the manufacturer's recommendations. The selection of joint type shall take into account the following:

— the ease of access required by fitters to assemble the connection correctly;

— the need to accommodate possible minor misalignments.

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