INTERNATIONAL STANDARD

ISO 14692-1

First edition
2002-12-15

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

Part 1: Vocabulary, symbols, applications and materials

Industries du pétrole et du gaz naturel — Canalisations en plastique renforcé de verre (PRV) —
Partie 1: Vocabulaire, symboles, applications et matériaux

Reference number
ISO 14692-1:2002(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 14692-1 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*.

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

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

— *Part 2: Qualification and manufacture*

— *Part 3: System design*

— *Part 4: Fabrication, installation and operation*

Introduction

ISO 14692 (all parts) for the use of glass-reinforced plastics (GRP) piping in oil and natural gas industries is based on the document *Specifications and recommended practice for the use of GRP piping offshore* published by the United Kingdom Offshore Operators Association (UKOOA) in 1994. The objective of ISO 14692 (all parts) is to provide the oil and gas industry, and the supporting engineering and manufacturing industry, with mutually agreed specifications and recommended practices for the design, purchase, manufacturing, qualification testing, handling, storage, installation, commissioning and operation of GRP piping systems.

ISO 14692-2, ISO 14692-3 and ISO 14692-4 follow the individual phases in the life cycle of a GRP piping system, i.e. from design through manufacture to operation. Each part is therefore aimed at the relevant parties involved in that particular phase. It is primarily intended for offshore applications on both fixed and floating topsides facilities, but it may also be used as guidance for the specification, manufacture, testing and installation of GRP piping systems in other similar applications found onshore, e.g. produced-water and firewater systems.

— *Part 1: Vocabulary, symbols applications and materials*. It defines terms and symbols, and identifies the applications that ISO 14692 (all parts) is intended to cover, together with anticipated end users. It also defines limits on the material used for the construction of components and describes the pressure terminology used throughout ISO 14692 (all parts). Main users are envisaged to include all parties in the life cycle of a typical GRP piping system. ISO 14692-1 should be used in conjunction with the part of specific relevance.

— *Part 2: Qualification and manufacture*. Its objective is to enable the purchase of GRP components with known and consistent properties from any source. Main users of the document are envisaged to be the principal and the manufacturer, certifying authorities and government agencies.

— *Part 3: System design.* Its objective is to ensure that piping systems, when designed using the components qualified in ISO 14692-2, meet the specified performance requirements. Main users of the document are envisaged to be the principal, design contractors, suppliers contracted to do the design, certifying authorities and government agencies.

— *Part 4*: *Fabrication, installation and operation.* Its objective is to ensure that installed piping systems meet the specified performance requirements throughout their operational life. Main users of the document are envisaged to be the principal, fabrication/installation contractors, repair and maintenance contractors, certifying authorities and government agencies.

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

Part 1: Vocabulary, symbols, applications and materials

1 Scope

This part of ISO 14692 gives the terms, definitions and symbols used in the specification, manufacture, testing and installation of glass-reinforced plastics (GRP) piping installations associated with offshore applications on both fixed and floating topsides facilities for oil and gas industry production and processing. It also describes the philosophy and provides guidance on the range of suitable applications for such piping, and defines limitations to the materials of construction for these applications.

It is intended to be used in conjunction with the other parts of ISO 14692.

This part of ISO 14692 also describes the pressure terminology used in ISO 14692 (all parts).

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1 General terms

2.1.1
authority having jurisdiction
third-party organization required to be satisfied with the standard of engineering proficiency and safety of a project

EXAMPLE A classification society, verification body or government regulatory body.

2.1.2
contractor
party which carries out all or part of the design, engineering, procurement, construction and commissioning for a project or operation of a facility

NOTE The **principal** (2.1.9) may undertake all or part of the duties of the contractor.

2.1.3
designer
party which carries out all or part of the design for a project or facility

2.1.4
installer
party which carries out all or part of the construction and commissioning of composite pipe installations and installation work for a project

2.1.5
installation inspector
person able to perform satisfactory and independent inspection of composite pipe installations and installation work

2.1.6
installation supervisor
tradesman able to perform practical supervision of the installation and joining of composite pipes

2.1.7
manufacturer
party which manufactures or supplies equipment to perform the duties specified by the contractor

2.1.8
operator
party which assumes ultimate responsibility for the operation and maintenance of the piping system

NOTE The operator may or may not be the same as the principal or principal's agent.

2.1.9
principal
party that initiates the project and ultimately pays for its design and construction

NOTE The principal generally specifies the technical requirements and is ultimately responsible for ensuring that safety and all other issues are addressed. The principal may also include an agent or consultant, authorized to act for the principal.

2.1.10
site
location where piping system is installed

2.2 Technical terms

2.2.1
accelerator
substance which, when mixed with a catalyst or a resin, will speed up the chemical reaction between catalyst and resin

2.2.2
active fire protection
method of extinguishing fire by application of substances such as halon, water, CO_2, foam, etc.

2.2.3
adhesive joint
adhesive bond
bonded joint
glued joint
socket joint
rigid type of joint between two components made using an adhesive

NOTE Generally consists of a slightly conical (tapered) bell end and a machined (cylindrical or tapered) spigot end.

2.2.4
anisotropic
exhibiting different properties when tested along axes in different directions

2.2.5
carbon fibre
fibre produced by the pyrolysis of organic precursor fibres, such as rayon, polyacrylonitrile or pitch, in an inert environment

2.2.6
cavitation
formation of pockets of vapour in a liquid that suddenly collapse, causing very high localized pressures which can lead to serious erosion of boundary surfaces

2.2.7
chemical-resistant glass
glass fibre or synthetic veil having a specific chemical resistance against acids

NOTE Such glass is used primarily as a reinforcement for the resin-rich internal liner of GRP pipe

2.2.8
collapse pressure
external pressure differential which causes buckling collapse of a component

2.2.9
component variant
individual component

2.2.10
composite
reinforcing fibres laid up in a resin matrix

2.2.11
composite pipe
pipe manufactured using fibre-reinforced thermoset plastics

NOTE Thermoplastic resins are excluded from ISO 14692 (all parts).

2.2.12
chopped strand mat
CSM
reinforcement structure in which short lengths of glass fibre tows, held together by an emulsion or powder binding agent, are dispersed in random directions within a single plane

2.2.13
cure
change irreversibly the properties of a thermosetting resin by chemical reaction

NOTE 1 Examples of such chemical reaction are condensation, ring closure and addition.

NOTE 2 Cure may be accomplished by the addition of a cross-linking agent, with or without heat and pressure.

2.2.14
cure cycle
time/temperature/pressure cycle used to cure a thermosetting resin system

2.2.15
curing agent
catalytic or reactive agent that, when added to a resin, causes polymerization

NOTE Also called hardener, for epoxies.

2.2.16
delamination
separation of two adjacent plies or layers of material in a laminate resulting from lack of adhesion

NOTE May occur either locally or covering a wide area.

2.2.17
design external pressure
maximum positive external pressure differential, i.e. external minus internal pressure, intended to be experienced by a component during its service life

2.2.18
design pressure
maximum positive internal pressure differential, i.e. internal minus external pressure, intended to be experienced by a component during its service life

2.2.19
design temperature
for each design condition, maximum fluid temperature that can be reached during service

2.2.20
differential scanning calorimetry
DSC
method for determining the glass transition temperature of a polymer

2.2.21
dynamic mechanical thermal analysis
DMTA
method for determining the glass transition temperature of a polymer or **FRP** (2.2.33) component

2.2.22
earth, verb, GB
ground, verb, US
provide electrical contact with earth

2.2.23
E-glass
glass fibre normally used to reinforce **GRP** (2.2.48) pipes, consisting mainly of SiO_2, Al_2O_3 and MgO

2.2.24
elastomeric bell-and-spigot seal lock joint
rubber seal lock joint
rubber sealed key lock joint
joint connection made up of a spigot end and a socket end with “O” or lip-sealing rings

2.2.25
electrically conductive
conductive
having a volume resistivity equal to or lower than 10^4 Ω·m

2.2.26
electrostatic dissipative
conductive
having a volume resistivity higher than 10^4 Ω·m but lower than 10^9 Ω·m or a surface resistivity less than 10^{10} Ω measured at ambient temperature and 50 % relative humidity

2.2.27
environmental stress cracking
ESC
formation of cracks in a polymer or composite caused by exposure to a chemical or environment under stress

2.2.28
epoxide
epoxy
compound containing at least two epoxy or oxirane rings

NOTE 1 Chemically, an epoxy ring is a three-membered ring containing two carbon atoms and one oxygen atom.

NOTE 2 The most widely used epoxy resin is termed DGEBA (diglycidyl ether of bisphenol A). Epoxy resins are always used in conjunction with curing agents or hardeners, i.e. substances that react with the epoxy rings, producing hydroxyl groups and other products, and linking the originally linear molecules into a rigid three-dimensional network.

2.2.29
factored qualified pressure
pressure to be used in determining the safe operating envelope of the GRP pipe or piping system

NOTE Factored qualified pressure is based on the qualified pressure and takes account of specific service conditions that could not be considered in the qualification programme, e.g. temperatures other than 65 °C and the effect of exposure to chemical environments other than water.

2.2.30
factored stress
hoop stress based on the **factored qualified pressure** (2.2.29)

2.2.31
failure
loss of structural integrity and/or transmission of fluid through the wall of a component or a joint

2.2.32
fibre
filamentary material with a finite length that is at least 100 times its diameter and prepared by drawing from a molten bath, spinning or deposition on a substrate

NOTE Filaments are usually of extreme length and very small diameter, usually less than 25 µm. Normally, filaments are assembled as twisted (yarn) or untwisted (tow) bundles comprising hundreds of filaments.

2.2.33
fibre-reinforced plastic
FRP
plastic-based composite that is reinforced with any type of fibre, not necessarily glass

2.2.34
filament winding
process for fabricating a composite structure in which continuous reinforcements, e.g. fibre tows, are either previously impregnated with a matrix material or impregnated during the winding

2.2.35
fire classification code
code designation of the fire performance of pipe component in terms of fire endurance and fire reaction properties

2.2.36
fire endurance
fire resistance
ability to maintain functional performance in a fire

2.2.37
fire-reaction property
material property which contributes to spread of fire, heat release and smoke/toxic emissions

2.2.38
fitter
jointer
pipe bonder
tradesman able to perform satisfactory and independent work in the installation and joining of composite pipes

2.2.39
fitting
pressure-tight fluid-containing components with a geometry different from straight pipe.

EXAMPLES Flanges, tees, elbows, reducers and fabricated branch.

2.2.40
flame retardant
chemical that is used to reduce or eliminate the tendency of a resin to burn

2.2.41
flange joint
mechanical joint with face flanges for which the bolt circle and face dimensions conform to a recognized standard

2.2.42
flexibility factor
ratio of the flexibility in bending of a component/fitting to that of the flexibility of a straight pipe of the same lamination, Young's modulus and thickness having a length corresponding to the developed length of the fitting

2.2.43
free-end testing
pressure-testing arrangement using pipe end closures of a type such that internal pressure produces axial, as well as hoop and radial, stresses in the component wall

cf. **axial load-free testing** (2.2.110)

2.2.44
function
ability of the piping system to perform its primary purpose, i.e. to deliver a minimum quantity of fluid above a minimum pressure

2.2.45
furnace test
test in a compartment furnace where the time-temperature curve to be followed is to a defined standard

2.2.46
gel coat
quick-setting resin applied to the surface of a mould and gelled before lay-up

NOTE The gel coat becomes an integral part of the finished laminate, and is usually used to provide specific service characteristics (see **liner**, 2.2.69).

2.2.47
glass-fibre-reinforced epoxy
GRE
epoxy resin-based composite that is reinforced with glass fibre