INTERNATIONAL STANDARD

ISO 17824

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Petroleum and natural gas industries — Downhole equipment — Sand screens

Industries du pétrole et du gaz naturel — Equipement de fond de puits — Tamis de contrôle de sable

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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 17824 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*.

Introduction

This International Standard has been developed by user/purchasers and supplier/manufacturers of sand control screens intended for use in petroleum and natural gas wells. This International Standard provides requirements and information to both parties regarding the manufacture, mechanical properties and testing of sand control screens. Further, this International Standard addresses supplier/manufacturer requirements that set the minimum parameters with which it is necessary that supplier/manufacturers comply to claim conformity with this International Standard.

This International Standard is structured with grades of increased requirements for both design validation and quality control. Three design validation grades (V1, V2 and V3) and three quality grades (Q1, Q2 and Q3) provide the user/purchaser the choice of requirements to meet a specific preference or application. Design validation grade V3 and quality grade Q3 represent equipment designed and manufactured consistent with minimum industry practice.

Included within this International Standard are normative annexes A and B specifying test methods for determining the collapse and burst strength of sand control screens. Informative annexes C, D, E, F, G and H include measurement criteria for sand control screen filter media, illustrations of the three types of sand control screens, and increased wire-wrap slot size inspection requirements.

It is necessary that users of this International Standard be aware that requirements above those outlined in this International Standard can be needed for individual applications. This International Standard is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is the responsibility of the supplier/manufacturer to identify any variations from this International Standard and provide details.

Petroleum and natural gas industries — Downhole equipment — Sand screens

1 Scope

This International Standard provides the requirements and guidelines for sand control screens for use in the petroleum and natural gas industries. Included are the requirements for design, design validation, functional evaluation, manufacturing, storage and transport. The requirements of this International Standard are applicable to wire-wrap screens, pre-pack screens and metal-mesh screens as defined herein.

The following items are outside the scope of this International Standard:

— expandable sand screens, slotted liners or tubing and accessory items such as centralizers or bull plugs;

— shunt screen technology, inflow control devices, downhole sensors and selective isolation devices, even where they can be an integral part of the sand control screen;

— screen filtration performance criteria, including test methods or analysis for sand retention efficiency;

— end connections of the basepipe.

2 Normative references

The following referenced documents are indispensable for the application of this document. The way in which these referenced documents are cited determines the extent (in whole or part) to which they apply. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10414-1:2008, *Petroleum and natural gas industries — Field testing of drilling fluids — Part 1: Water-based fluids*

ISO 11960, *Petroleum and natural gas industries — Steel pipes for use as casing or tubing for wells*

NOTE ISO 11960 has been back adopted by API as API SPEC 5CT. Therefore, for the purposes of the provisions of this International Standard which cite ISO 11960, API SPEC 5CT is equivalent to ISO 11960.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 9000, *Quality management systems — Fundamentals and vocabulary*

ASME, *Boiler and Pressure Vessel Code BPVC — Section II: Materials: Part D: Properties*

ASME, *Boiler and Pressure Vessel Code BPVC — Section VIII: 1998, Div. 1, Appendix 8: Methods for Liquid Penetrant Examination (PT)*

ASME, *Boiler and Pressure Vessel Code BPVC — Section IX: Welding and Brazing Qualifications*

ASTM E11, *Standard Specification for Wire Cloth and Sieves for Testing Purposes*

ASTM E165, *Standard Test Method for Liquid Penetrant Examination*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9000 and the following apply.

3.1
annular gravel pack
sized sand or synthetic proppant placed in the annulus outside the sand control screen during gravel packing

3.2
basepipe
tubulars that have perforations or slots to allow fluid flow through the screen jacket

NOTE See Figures E.1, F.1 and G.1.

3.3
box handling length
axial length of blank basepipe on a sand control screen, measured between the end of the box connection and the nearest component along the basepipe

NOTE See Figures D.4 and D.5.

3.4
center break
axial length of blank pipe between two screen jackets on a sand control screen

NOTE See Figure D.5.

3.5
component
individual part of an assembly

3.6
design family
group of sand control screens wherein the configuration, materials, and functionality are the same and the design stress levels in relation to material mechanical properties are based on the same criteria

3.7
design validation
process of proving a design by testing to demonstrate conformity of the product to design requirements

[ISO/TS 29001]

3.8
design verification
process of examining the result of a given design or development activity to determine conformity with specified requirements

[ISO/TS 29001]

3.9
direct-wrap screen
sand screen in which the screen jacket rib wires are in direct contact with the base pipe along the axial length

NOTE See Annexes E and F.

3.10
direct-wrap pre-pack screen
pre-pack screen in which the inner screen, which may be wire-wrap or metal-mesh, is a direct-wrap screen

NOTE See Annex F.

3.11
downhole sensor
device incorporated into the sand control screen to measure various downhole conditions

3.12
drainage or support layer
component used in metal-mesh screens to provide structural support and/or to facilitate flow between the basepipe perforations and metal mesh

NOTE See Figure G.1.

3.13
drift OD
minimum ID of the drift tool utilized to verify screen assembly OD clearance

3.14
end ring
component used to seal the annular gap between the ends of the screen jacket and basepipe

3.15
filter media OD
⟨metal-mesh screens⟩ metal-mesh OD
⟨wire-wrap screens⟩ wrap-wire OD
⟨pre-pack screens⟩ outermost wrap-wire OD

NOTE See Figures D.1, D.2 and D.3.

3.16
fluid-loss control pill
fluid with a concentration of a wide array of sized particles that forms a filter cake that seals off a screen surface with little or no leak-off through the screen's slot openings or pores

3.17
gravel packing
well completion method used for the purpose of excluding formation sand from entering the well bore and including a sand control screen, sized sand or synthetic proppant

3.18
inflow control device
device incorporated into a sand control screen that regulates the flow into or along the basepipe

3.19
informative
information that is meant to enlighten the user/purchaser or supplier/manufacturer, without containing requirements

3.20
job-lot traceable
ability for parts to be identified as originating from a job lot which identifies the included heat(s)

3.21
joint overall length
maximum axial length of the screen measured from the outer end of the box connection to the end of the pin thread on the basepipe

NOTE See Figures D.4 and D.5.

3.22
metal-mesh
metal fabric designed to filter solids, provide structural support and/or distribute flow

NOTE See Figure G.1.

3.23
metal-mesh roll
single, continuous spooling of mesh by the woven mesh manufacturer

3.24
metal-mesh screen
sand control screen that consists of one or more layers of metal-mesh as the filter media

NOTE See Annex G.

3.25
normative
instructions or procedures that shall be implemented by the user/purchaser or supplier/manufacturer in order to comply with this International Standard

3.26
pin handling length
axial length of blank basepipe on a sand screen assembly, measured between the last scratch of the pin thread and the nearest component along the OD of basepipe

NOTE See Figures D.4 and D.5.

3.27
pore size
supplier/manufacturer determined metal-mesh filter opening; typically expressed in microns

NOTE See Figure G.1.

3.28
pre-pack screen
sand control screen consisting of two concentric screen jackets with the annulus in between containing a sized distribution of sand or synthetic proppant used as the filter media

NOTE See Annex F.

3.29
qualified person
individual with demonstrated skills or abilities gained through training or experience or both as measured against established requirements, such as standards or tests that enable the individual to perform a required function

3.30
sand control screen
mechanical filtration device used to retain the formation sand or annular gravel pack while allowing the passage of fluids into the production tubing

3.31
screen jacket
sub-assembly of the sand control screen that includes filter media and associated support components and which is secured to the basepipe

NOTE The screen jacket may include end rings, a drainage or support layer and/or a shroud.

3.32
screen jacket length
axial length of the screen jacket, including any end rings

NOTE See Figures D.4 and D.5.

3.33
screen size
OD designation of the basepipe

3.34
selective isolation device
device that controls flow into the production string from selected zone(s) in a well

3.35
shroud
perforated cylindrical component typically forming the outermost concentric layer of a screen and used to provide support and protection

NOTE See Figure G.1.

3.36
shunt screen technology
additional flow conduits assembled onto the sand control screen to allow the gravel packing slurry to bypass blockages in the annulus between the well bore and the screen OD during gravel packing operations

3.37
slip-on screen
sand screen where the screen jacket is manufactured separately and later installed over the perforated basepipe

NOTE See Annexes D and E.

3.38
slot
opening between two consecutive wrap-wires in a wire-wrap screen

NOTE See Figures E.1 and F.1.

3.39
slot size
width of the opening in a wire-wrap screen expressed in gage, with one gage equal to 25,4 µm (0,001 in)

3.40
support rib
several parallel, longitudinal supports in a wire-wrap screen jacket that are spaced apart to form the structure around which the wrap-wire is wrapped and welded

NOTE See Figures E.1 and F.1.

3.41
wire-wrap screen
sand control screen consisting of a wrap-wire helically wrapped and welded to a cylindrical array of internal support ribs positioned in the axial or long direction of the cylinder and used as the filter media

NOTE See Annex E.

3.42
wrap-wire
continuous wire in a wire-wrap screen jacket that is helically wrapped around and welded to longitudinal support ribs

NOTE See Figures E.1 and F.1.

3.43
wrap-wire reel
single continuous spooling of a formed wire

4 Abbreviated terms

— CB centre break

— COC certificate of compliance

— FEA finite element analysis

— FLC fluid loss control

— ga gage

— ID inside diameter

— LB box handling length

— LDP liquid dye penetrant

— LP pin handling length

— LS screen jacket length

— MTR material test report

— NDE non-destructive examination

— OD outside diameter

— ppf pounds per foot

— PSD particle size distribution

— QC quality control

5 Functional specification

5.1 General

The user/purchaser shall provide a functional specification to order products that conform to this International Standard. The specification shall include the following requirements and operating conditions as the user/purchaser deems appropriate, and/or may identify the supplier/manufacturer's specific product. These requirements and operating conditions may be conveyed by means of a dimensional drawing, data sheet, or other suitable documentation.

5.2 Product type

The user/purchaser shall specify the sand control screen type (wire-wrap screen, pre-pack screen or metal-mesh screen) as defined by the filter media. It is recognized that there are screens that utilize one or more of these screen types in their construction; however, the product type is defined by the primary filter media.

5.3 Sand screen parameters

The user/purchaser shall specify the following sand screen parameters, as applicable:

a) screen jacket length(s) and pin and box handling lengths;

b) required slot size or pore size for sand retention of the annular gravel pack and/or formation sand;

c) flow area of the screen for passage of fluids during well clean up, production and any stimulation activities;

d) nominal basepipe size, mass, grade, alloy and end connections;

e) drift OD;

f) metallurgy requirements of screen jacket, rings, shrouds or other components;

g) filter media type and size;

h) centralization: type, quantity, material, maximum OD and location;

i) joint length: R1, R2, R3 in accordance with ISO 11960, or other length as required;

j) required collapse, burst and tensile ratings.

5.4 Well parameters

The user/purchaser shall specify, as applicable, the following well parameters:

a) drift ID of the casing or open hole ID, and any minimum restrictions through which it is necessary for the sand control screen to pass;

b) IDs and ODs of tubing or casing sizes, the well's true vertical depth (TVD) and measured depth (MD), and a directional survey of the well, typically shown in a schematic;

c) producing or perforation interval length.

5.5 Operational parameters

The user/purchaser shall specify, as applicable, the following operational parameters:

a) chemical treatment, including the chemical components, pressure, temperature, pump rate and exposure time;

b) fracturing/gravel packing, including proppant/gravel description, pumping rate, annular fluid velocity, proppant/fluid ratio, maximum anticipated pressure;

c) fluid/mud type (chemical components, solids loading, solids size) and density that the screens can encounter;

d) well intervention service equipment, such as wash tools, electric line, slick line, braided line, coiled tubing or snubbing equipment;

e) installation methods and limitations;

f) loading conditions: anticipated loading conditions (pressure, temperature, collapse, burst, tensile, compression and compaction loads, etc.) that can be applied to the sand control screen during deployment, gravel packing process, well clean up and/or production.

5.6 Environmental compatibility

5.6.1 General

Where the user/purchaser has material selection and/or corrosion expertise, the user/purchaser shall state which material(s) have the ability to perform as required within the corrosive environment. Otherwise, material compatibility shall be specified in accordance with 5.6.2.

5.6.2 Well environment

The following shall be provided to ensure environmental compatibility, as applicable:

a) minimum and maximum anticipated values of the temperatures, flow rates (production and/or injection) and reservoir pressure;

b) production/injection fluid, density, chemical/physical composition and the condition of the fluid and/or its components, being solid (sand, scale, etc.), liquid and/or gaseous, to which the product is exposed during its full life cycle;

c) rock properties, such as particle size distribution, mineralogy and clay content;

d) scaling tendencies of reservoir fluids that result in inorganic and organic solid precipitates, such as scale, paraffin, asphaltenes, etc. that can plug the screen.

5.7 Compatibility with related well equipment

The following information shall be provided, as applicable:

a) size, type, material, configuration and interface dimensions of the connection between the product and other well equipment;

b) size, type and configuration of other products or tools that are passed through or over the product;

c) size, type and configuration of other products that are used in conjunction with this product.

5.8 Design validation grades

This International Standard specifies three grades of design validation (V1, V2, or V3 as detailed in 6.5) for which the product may be supplied. The user/purchaser shall select the design validation grade for each product to be provided.

5.9 Quality grades

The user/purchaser shall select the quality grade (Q1, Q2, or Q3 as detailed in 7.4) for each product that is provided.

5.10 Special quality requirements

The user/purchaser may select increased slot-size inspection requirements as covered in Annex H for applications that require additional slot inspection.

6 Technical specification

6.1 General

The supplier/manufacturer shall prepare a technical specification that conforms to the requirements defined in the functional specification. If the technical specification does not fully meet the functional requirements, the supplier/manufacturer shall identify the differences to the user/purchaser.

6.2 Technical characteristics

The sand control screen shall perform in accordance with the functional specification as stated in Clause 5 and/or within the specifications defined in the product-specific data sheet.

6.3 Design criteria

6.3.1 Materials

Materials shall be stated by the supplier/manufacturer and shall be suitable for the operational parameters and the environment specified in the functional specification. The supplier/manufacturer shall have documented specifications for all materials used in the manufacture of sand control screens.

The user/purchaser may specify materials for the specific corrosion environment in the functional specification. If the supplier/manufacturer proposes to use another material, the supplier/manufacturer shall provide documented certification to the user/purchaser for acceptance that this material has performance characteristics suitable for all requirements specified for the well, including any production/injection parameters.

Basepipe material shall conform to the requirements of ISO 11960 unless otherwise specified in the functional specifications.

6.3.2 Performance rating

The supplier/manufacturer shall establish ratings for the collapse, burst and tensile strength of each screen design, considering any temperature effects and excluding end connections. As applicable, the performance ratings shall be based on the minimum specified yield strength and minimum specified material conditions, and the values shall be based on results of the validation tests in accordance with Annex A and/or Annex B.

Within each design family, the supplier/manufacturer may utilize finite element analysis (FEA), mechanical strength calculations or other proven methods to determine performance ratings for sizes and similar configurations not tested within the limitations of scaling as outlined in 6.7.

The material's minimum specified yield strength and minimum specified material conditions shall be used in the calculations, and the calculations shall include consideration of temperature effects. De-rating of metal mechanical properties shall be in accordance with ASME BPVC, Section II, Part D.

6.4 Design verification

Design verification shall be performed to ensure that each sand control screen design meets the supplier/manufacturer's technical specifications. Design verification examines the design by evaluating activities such as design reviews, design calculations, physical tests, comparison with similar designs and historical records of defined operating conditions.

6.5 Design validation

6.5.1 General

Products shall be supplied to at least the design validation grade specified in the functional specification.

The supplier/manufacturer shall document the test procedure and results and shall maintain on file material certifications and drawings that show all the applicable dimensions, materials and tolerances of parts contained in the tested product. Pre- and post-test dimensional inspections of critical operational areas, as determined by the supplier/manufacturer, shall be conducted, documented and maintained by the supplier/manufacturer.

The supplier/manufacturer is responsible to ensure that all aspects of the test procedure, including materials and equipment used, are in compliance with applicable health, safety, environmental and regulatory requirements. Validation tests shall be conducted according to the requirements specified in the respective annexes of this International Standard.

6.5.2 Design validation grades

This International Standard specifies three grades of design validation for sand control screens. These are listed below with a summary in Table 1.

— Design validation grade V3 shall meet the supplier/manufacturer's documented validation requirements.

— Design validation grade V2 shall meet the requirements in Table 1, and Annex A. All V2 screens meet the requirements of V3.

— Design validation grade V1 shall meet the requirements in Table 1, and Annexes A and B. All V1 screens meet the requirements of V2 and V3.

Table 1 — Summary of design validation grade requirements

Validation test	Design validation grade		
	V3	V2	V1
Collapse resistance (See Annex A)	no	yes	yes
Burst resistance (See Annex B)	no	no	yes

6.6 Design changes

All design changes shall be documented and reviewed against the design verification and design validation to determine if the change is a significant change. A significant change is any change in form, fit or function to the design identified by the supplier/manufacturer that can affect the performance of the sand control screen during the validation tests in accordance with 6.5. A design that undergoes a significant change becomes a new design requiring design verification in accordance with 6.4 and design validation in accordance with 6.5. Design changes identified as non-significant shall include documented justification and be approved by a qualified person.

The supplier/manufacturer shall, as a minimum, consider the following for each design change:

— stress levels of the modified or changed components;

— material changes;

— functional changes;

— dimensional changes.

6.7 Design validation by scaling

6.7.1 General

Scaling is the process by which the performance ratings of untested screen designs may be determined based on the results of validation tested screen designs within a design family. The supplier/manufacturer may use documented methods, such as analytical calculations or FEA, to determine the performance ratings of any untested screen sizes between two tested screen sizes of the same design family.

6.7.2 Design families

6.7.2.1 Wire-wrap screens

Separate design families are required for any of the following variations:

— slip-on or direct-wrap designs;

— wrap-wire size, shape or reduced minimum specified yield strength;

— support rib size, shape, count per basepipe size or reduced minimum specified yield strength;

— screen jacket end ring design;

— nominal basepipe wall thickness, minimum specified yield strength or perforation pattern, where the rating depends on the pipe's characteristics.

A separate design family is not required for changes in the screen slot size.

6.7.2.2 Pre-pack screens

Separate design families are required for any of the following variations:

— type of outer or inner screen jacket;

— slip-on or direct-wrap design of inner screen;

— wrap-wire size, shape, or reduced minimum specified yield strength of either screen jacket;

— support rib size, shape, count per basepipe size, or reduced minimum specified yield strength of either screen jacket;

— screen jacket end ring design;

— nominal basepipe wall thickness, minimum specified yield strength or perforation pattern, where rating depends on the pipe's characteristics;

If either the outer or inner screen jacket is metal mesh, then 6.7.2.3 applies.

A separate design family is not required for changes in screen slot size or changes to the type of size of proppant.

6.7.2.3 Metal-mesh screens

Separate design families are required for any of the following variations:

— single layer or multiple layered metal-mesh designs;

— weave pattern of any layer;

— wire diameter or count of any layer;

— material composition or minimum specified yield strength of metal-mesh;

— change in the direction of the warp or weft wires of any layer;

— drainage or support layer(s) configuration;

— post-weaving processes, such as heat treating, calandering, forming or welding, that change its mechanical properties;

— radial clearances between metal-mesh and drainage or support layer, or protective shroud or basepipe;

— protective shroud type, wall thickness, flow area, aperture or reduced specified yield strength;

— screen jacket end ring design;

— nominal basepipe wall thickness, metallurgy, minimum specified yield strength or perforation pattern, where rating depends on the pipe's characteristics;

A separate design family is not required for changes in the metallurgy of the drainage or support layer(s) as long as these layers are not metal mesh.

6.7.3 Limitations of size scaling

The supplier/manufacturer may apply collapse or burst ratings for different screen sizes within a design family, as defined in 6.7.2, as follows:

— Collapse test rating: The rating for a validation tested screen size may be applied as the rating for smaller, untested screen sizes within a design family, but shall not be applied or extrapolated to larger screen sizes, or to any screen size that has a lower collapse resistance rating for its basepipe.

EXAMPLE The collapse test rating for 139,70 mm, 25,30 kg/m (5-1/2”, 17 ppf) screen can be applied to larger masses of the same screen size or to 60,32 mm (2-3/8") through 127,00 mm (5”) screen sizes of the same design family. It cannot be applied to 168,28 mm (6-5/8”) through 193,68 mm (7-5/8”) screen sizes or to smaller masses of 25,30 mm (5-1/2”) screens.

— Burst test rating: The rating for a validation tested screen size may be applied as the rating for smaller untested screen sizes within a design family, but shall not be applied or extrapolated to larger screen sizes.

EXAMPLE The burst test rating for 139,70 mm (5-1/2”) screen can be applied to 60,32 mm (2-3/8”) through 127,00 mm (5”) screen sizes of the same design family. It cannot be applied to 168,28 mm (6-5/8”) through 193,68 mm (7-5/8”) screen sizes.

— Slot sizes: Collapse and burst ratings shall be de-rated for slot sizes larger than 304,8 µm (12 ga) based on supplier/manufacturer's documented methodology. Ratings shall not be increased for slot sizes smaller than 304,8 µm (12 ga).

7 Supplier/manufacturer requirements

7.1 General

Clause 7 contains the detailed requirements to verify that each product manufactured meets the requirements of the functional and technical specifications. All testing and inspections for final acceptance and approval of test reports shall be performed by a qualified person. These include requirements for documentation and data control, product identification and quality control.

7.2 Documentation and data control

7.2.1 General

The supplier/manufacturer shall establish, implement and maintain documented procedures to control all documents and data that relate to the requirements of this International Standard. These documents and data shall be legible and maintained to demonstrate conformance to specified requirements. These documents, include, but are not limited to functional and technical specifications, production orders and quality records; see 7.4.8.

All documents and data shall be retained in facilities designed to provide an environment that prevents damage, deterioration or loss. They shall be available upon documented request to the user/purchaser.

Documents and data may be in the form of any type of media, such as hard copy or electronic media and shall be retained for a minimum of five years from the date of manufacture.

7.2.2 Design documentation

Documentation of designs shall include product drawings and specifications, methods, assumptions, calculations and design requirements. Product test records shall be maintained throughout the life of a design family, and shall be kept for at least five years after the design family is no longer manufactured.

7.2.3 Product data sheet

Product data sheets shall be supplied if they are requested by the user/purchaser and shall contain the following information, as applicable:

— name and address of supplier/manufacturer;

— supplier/manufacturer assembly or part number;

— supplier/manufacturer product name;

— product type;

— materials description;

— drift OD;

— filter OD;

— joint overall length;

— screen jacket length;

— basepipe nominal size (screen size), material, grade, mass and drift diameter;

— basepipe end connections;

— ratings for collapse, burst and tensile strength, as applicable;

— design validation grade: V1, V2, or V3;

— quality grade: Q1, Q2, or Q3.

7.3 Product identification

Each product shall be permanently identified according to the supplier/manufacturer's documented specifications. The supplier/manufacturer's documented specifications shall define the type, method of application, and location of the identification. The following information shall be included as a minimum:

— part and/or assembly number;

— identifying number traceable to quality records;

— supplier/manufacturer's identification.

7.4 Quality control

7.4.1 General

This International Standard provides for three grades of quality control requirements, which allows the user/purchaser to select the grade that is required for a specific application. Quality grade Q3 is the minimum level of quality offered by the specification and is consistent with quality grades that are minimum industry practice. Quality grade Q2 provides additional inspection and verification steps, and quality grade Q1 is the highest grade provided by this specification.

Quality control requirements are summarized in Tables 2 through 4 and detailed in 7.4.2 through 7.4.11.

Table 2 — Summary of wire-wrap screen quality requirements

Parameter	Q3	Q2	Q1
Certification			
Material certification	COC or MTR	COC or MTR	MTR
Basepipe thread certification	COC	COC	COC
Component traceability			
Screen jacket (wrap/rib)	Job lot	Job lot	Serialized
Basepipe	Job lot	Job lot	Serialized
All other components	Job lot	Job lot	Job lot
Component inspection			
ID drift basepipe after perforating	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
Visually inspect perforation pattern		10 % min. sampling	100 %
Visually inspect perforations for burrs		10 % min. sampling	100 %
All other components		10 % min. sampling	100 %
Wire-wrap inspection			
Wrap-wire dimensions	Supplier/manufacturer's documented specifications	One measurement per job lot	Measured at the start of each reel
Screen weld strength - wrap/rib		Load test at start and end of job lot	Load test at one end of each screen jacket
Screen slot size		For each jacket, measure 40 slots total, 10 slots each interval, rotating 90° in 4 approx. equal intervals over full screen length	For each jacket, measure 200 slots total, 50 slots each interval, rotating 90° in 4 approx. equal intervals over the full screen length
Wrap-wire/rib wire hardness		One measurement per job lot	Each change in heat number
Inspection of welds or brazing (screen jackets to basepipe)	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
Assembly verification			
Dimensions (LS, LP, LB)	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
ID drift, OD drift		10 % min. sampling	100 %
Thread damage (visual inspection)		10 % min. sampling	100 %
Assembly tracebility	Job lot	Job lot	Serialized
QC documentation	Retained by supplier/manufacturer	Retained by supplier/manufacturer	Retained by supplier/manufacturer

Table 3 — Summary of pre-pack screen quality requirements

Parameter	Q3	Q2	Q1
Certification			
Material certification	COC or MTR	COC or MTR	MTR
Basepipe thread certification	COC	COC	COC
Component traceability			
Screen jacket (wrap/rib)	Job lot	Job lot	Serialized
Basepipe	Job lot	Job lot	Serialized
Pre-pack materials	Job lot	Job lot	Job lot
All other components	Job lot	Job lot	Job lot
Component inspection			
ID drift basepipe after perforating	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
Visually inspect perforation pattern		10 % min. sampling	100 %
Visually inspect perforations for burrs		10 % min. sampling	100 %
All other components		10 % min. sampling	100 %
Wire-wrap inspection			
Wrap-wire dimensions	Supplier/manufacturer's documented specifications	One measurement per job lot	Measured at the start of each reel
Screen weld strength - wrap/rib		Load test at start and end of job lot	Load test at one end of each screen jacket
Screen slot size		For each jacket, measure 40 slots total, 10 slots each interval, rotating 90° in 4 approx. equal intervals over full screen length	For each jacket, measure 200 slots total, 50 slots each interval, rotating 90° in 4 approx. equal intervals over the full screen length
Wrap-wire/rib wire hardness		One measurement per job lot	Each change in heat number
Inspection of welds or brazing (screen jackets to basepipe)	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
Assembly verification			
Dimensions (LS, LP, LB)	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
ID drift, OD drift		10 % min. sampling	100 %
Thread damage (visual inspection)		10 % min. sampling	100 %
Proppant packing		10 % min. sampling	100 %
Assembly tracebility	Job lot	Job lot	Serialized
QC documentation	Retained by supplier/manufacturer	Retained by supplier/manufacturer	Retained by supplier/manufacturer

Table 4 — Summary of metal-mesh screen quality requirements

Parameter	Q3	Q2	Q1
Certification			
Material certification	COC or MTR	COC or MTR	MTR
Basepipe thread certification	COC	COC	COC
Component traceability			
Screen Jacket (metal-mesh)	Job lot	Job lot	Serialized
Basepipe	Job lot	Job lot	Serialized
All other components	Job lot	Job lot	Job lot
Component inspection			
ID drift after perforating	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
Visually inspect perforation pattern		10 % min. sampling	100 %
Visually inspect perforations for burrs		10 % min. sampling	100 %
All other components		10 % min. sampling	100 %
Metal-mesh inspection			
Metal-mesh weave pattern	Supplier/manufacturer's documented specifications	Once per job lot	Once per roll
Metal-mesh visual inspection		10 % min. sampling	100 %
Metal-mesh tensile strength		At start and end of each job lot	At start and end of each job lot
Metal-mesh weld strength		At start and end of each job lot	At start and end of each job lot
Metal-mesh pore size		Determine pore size once per job lot	Determine pore size once per roll
Inspection of welds or brazing (screen jackets to basepipe)	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
Assembly verification			
Dimensions (LS, LP, LB)	Supplier/manufacturer's documented specifications	10 % min. sampling	100 %
ID drift, OD drift		10 % min. sampling	100 %
Thread damage (visual inspection)		10 % min. sampling	100 %
Assembly tracebility	Job lot	Job lot	Serialized
QC documentation	Retained by supplier/manufacturer	Retained by supplier/manufacturer	Retained by supplier/manufacturer

7.4.2 Certifications

7.4.2.1 Material certification

Material used in the manufacture of components shall meet the following requirements:

— Q2 and Q3: COC stating that the material meets the supplier/manufacturer's documented specifications or MTR so that the supplier/manufacturer can verify that the material meets the supplier/manufacturer's documented specifications;

— Q1: MTR so that the supplier/manufacturer can verify that the material meets the supplier/manufacturer's documented specifications.

7.4.2.2 Thread certification

Basepipe threads shall be provided with a COC stating that each thread conforms to the thread manufacturer's specifications.

7.4.2.3 Component traceability

Component traceability shall meet the following requirements.

— Q2 and Q3: All components shall be job-lot traceable.

— Q1: All components shall be job-lot traceable and screen jackets and basepipes shall be serialized.

7.4.2.4 Component inspection

Component inspection shall meet the following requirements.

— For Q3, components shall be inspected in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— For Q2:

  — ID drift inspected on 10 % (minimum 1 for lot sizes of fewer than 10) of the basepipes in each basepipe job lot after perforation in accordance with the requirements of ISO 11960.

  — Visually inspect 10 % (minimum 1 for lot sizes of fewer than 10) of the basepipes in each basepipe job lot in accordance with the supplier/manufacturer's documented specifications and acceptance criteria to verify the perforation pattern and that all perforations are clear of burrs.

  — Inspect a minimum of 10 % (minimum 1 for lot sizes of fewer than 10) of all other components in each component job lot in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— For Q1:

  — ID drift inspected on 100 % of the basepipes after perforation in accordance with the requirements of ISO 11960.

  — Visually inspect 100 % of the basepipes in accordance with the supplier/manufacturer's documented specifications and acceptance criteria to verify the perforation pattern and that all perforations are clear of burrs.

  — Inspect 100 % of all other components in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

7.4.3 Wire-wrap inspection

7.4.3.1 Wrap-wire dimensional inspection

Wrap-wire dimensional inspection shall meet the following requirements.

— Q3: Wrap-wire dimensions shall be verified in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2: Wrap-wire dimensions shall be verified in accordance with the supplier/manufacturer's documented specifications and acceptance criteria at least once per wrap-wire job lot.

— Q1: Wrap-wire dimensions shall be verified in accordance with the supplier/manufacturer's documented specifications and acceptance criteria at least at the start of each wrap-wire reel.

7.4.3.2 Wrap-wire to support rib weld

The weld between the wrap-wire and the support rib shall meet the following requirements.

— Q3: The strength of the weld shall be verified in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2: The strength of the weld shall be validated by a load test in accordance with the supplier/manufacturer's documented specifications and acceptance criteria at the start and end of each screen jacket job lot.

— Q1: The strength of the weld shall be validated by a load test in accordance with the supplier/manufacturer's documented specifications and acceptance criteria at one end of each screen jacket.

7.4.3.3 Wrap-wire/rib wire hardness

The hardness inspection of the wrap wire and rib wire shall meet the following requirements.

— Q3: The hardness of the wrap wire and rib wire shall be verified in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2: The hardness of the wrap wire and rib shall be verified at least once per job lot.

— Q1: The hardness of the wrap wire and rib shall be verified at least once in accordance with change in material heat number of the wrap wire or rib wire material.

7.4.3.4 Wire-wrap slot size

7.4.3.4.1 General

The supplier/manufacturer shall use one of the following methods to measure wire-wrap slot size:

— hand held feeler (thickness) gages with resolution of 25,4 µm (1 ga); the supplier/manufacturer shall document the inspection procedure and acceptance criteria for use of feeler gages in slot size inspection;

— automated slot measurement systems that measure slots along screen length with a validated resolution of at least 25,4 µm (1 ga).

7.4.3.4.2 Inspection

Slot size inspection shall meet the following requirements.

— Q3: Slot inspection shall be performed according to the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2: Divide each screen jacket into four approximately equal lengths, and assign each length a linear path along the screen in an orientation approximately of 0,90°, 180° and 270°. Measure 10 adjacent slots in the linear path in each quadrant.

— Q1: Divide each screen jacket into four approximately equal lengths, and assign each length a linear path along the screen in an orientation approximately of 0°, 90°, 180° and 270°. Measure 50 adjacent slots in the linear path in each quadrant.

NOTE Increased slot size inspection requirements are included in Annex H for applications that require additional slot inspection.

7.4.4 Metal-mesh inspection

7.4.4.1.1 General

The three-dimensional nature of metal mesh makes direct measurement of the mesh and/or openings problematic. Therefore, the quality control methods described in 7.4.4.1.2 to 7.4.4.1.5 shall be used to characterize the metal-mesh.

7.4.4.1.2 Weave pattern

Metal-mesh weave pattern inspection shall meet the following requirements.

— Q3: Weave pattern shall be verified in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2: Wire diameter and wire counts shall be verified in accordance with supplier/manufacturer's documented specifications and acceptance criteria at least once per metal-mesh job lot.

— Q1: Wire diameter and wire counts shall be verified in accordance with supplier/manufacturer's documented specifications and acceptance criteria a minimum of once per each metal-mesh roll.

NOTE ISO 9044 and ASTM E2016 are recommended informative references.

7.4.4.1.3 Tensile and weld strength

Tensile and weld strength inspection shall meet the following requirements.

— Q3: Tensile and weld strength shall be verified in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2 and Q1: Tensile tests on the metal mesh, and any axial weld seams in formed and welded metal-mesh screen jackets, shall be conducted in accordance with the supplier/manufacturer's documented specifications and acceptance criteria. These tests shall be performed at a minimum at the start and end of each metal-mesh job lot.

7.4.4.1.4 Visual inspection

Visual inspection of the metal mesh to verify weave pattern uniformity shall meet the following requirements.

— Q3: Visual inspection of the metal mesh shall be in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2: Visual inspect 10 % of metal-mesh area per mesh job lot using a light test conducted in accordance with supplier/manufacturer's documented specifications and acceptance criteria to compare light patterns to known metal-mesh patterns and to visually detect any weaving flaws.

— Q1: Visual inspect 100 % of metal-mesh area using a light test conducted in accordance with supplier/manufacturer's documented specifications and acceptance criteria to compare light patterns to known metal-mesh patterns and to visually detect any weaving flaws.

7.4.4.1.5 Metal-mesh pore size

Metal-mesh pore size inspection shall meet the following requirements.

— Q3: Metal-mesh pore size inspection shall meet the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2 and Q1: Metal-mesh pore size inspection shall be determined by a sized bead test in accordance with the supplier/manufacturer's documented specifications, which include acceptance criteria.

NOTE Annex C describes sized bead test methods and is a recommended informative reference.

— Q2: Metal-mesh pore size shall be determined at least once per metal-mesh job lot.

— Q1: Metal-mesh pore size shall be determined at least once per metal-mesh roll.

7.4.5 Welding and brazing

7.4.5.1 General

Welding shall conform to the supplier/manufacturer's documented specifications.

Welding and brazing used for securing screen jackets to basepipe shall meet the following requirements:

— Welding and brazing procedure and personnel qualification shall be in accordance with ASME BPVC, Section IX.

— Material and practices not listed in the ASME BPVC, Section IX shall be applied using weld procedures qualified in accordance with the methods of ASME BPVC, Section IX.

7.4.5.2 Inspection

Inspection of welding and brazing used for securing screen jackets to basepipe shall meet the following requirements.

— Q3: Welds (brazing) shall be inspected to the supplier/manufacturer's documented specifications and acceptance criteria.

— Q2: A minimum of 10 % of welds (brazing) per screen assembly job lot (minimum 1 for lot sizes of fewer than 10) shall be penetrant (LDP) inspected.

— Q1: 100 % of welds (brazing) shall be penetrant (LDP) inspected.

— Penetrant (LDP) inspection shall be performed in accordance with ASTM E165.

— The evaluation and acceptance of indications determined by LDP inspection shall be in accordance with ASME BPVC, Section VIII, Division 1, Appendix 8.

— All LDP instructions shall be approved by a Level III examiner qualified in accordance with an International Standard such as ISO 9712 or a national standard such as SNT-TC-1A.

7.4.6 Assembly verification

Assembly verification shall meet the following requirements.

— Q3: Assembly verification shall be in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.

— For Q2:

  — Verify the screen length (LS), pin and box handling lengths (LP and LB) on 10 % of the screen assemblies (minimum 1 for lot sizes of fewer than 10).

- ID drift the basepipe on 10 % of the screen assemblies (minimum 1 for lot sizes of fewer than 10) in accordance with ISO 11960 to verify ID clearance.
- OD drift 10 % of screen assemblies (minimum 1 for lot sizes of fewer than 10) in accordance with the supplier/manufacturer's documented specifications and acceptance criteria to verify OD clearance.
- Visually inspect 10 % of screen-assembly threaded ends (minimum 1 for lot sizes of fewer than 10) in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.
- For pre-pack screens, verify the uniformity and completeness of the pre-pack placement in accordance with the supplier/manufacturer's documented specifications and acceptance criteria on 10 % of screen assemblies (minimum 1 for lot sizes of fewer than 10).

— For Q1:

- Verify the screen length (LS), pin and box handling lengths (LP and LB) on 100 % of screen assemblies.
- ID drift the basepipe on 100 % of screen assemblies in accordance with ISO 11960 to verify ID clearance.
- OD drift 100 % of screen assemblies in accordance with the supplier/manufacturer's documented specifications and acceptance criteria to verify OD clearance.
- Visually inspect 100 % of screen assembly threaded ends in accordance with the supplier/manufacturer's documented specifications and acceptance criteria.
- For pre-pack screens, verify the uniformity and completeness of the pre-pack placement in accordance with the supplier/manufacturer's documented specifications and acceptance criteria on 100 % of screen assemblies.

7.4.7 Assembly traceability

Assembly traceability shall meet the following requirements.

— Q2 and Q3: Screen assemblies shall be job lot traceable.

— Q1: Screen assemblies shall be serialized.

7.4.8 Quality control documentation

Quality control documentation includes all documents and data necessary to demonstrate conformance to 7.4.2 through 7.4.11. Quality control documentation shall be retained by the supplier/manufacturer and shall be available and auditable by the user/purchaser as defined in 7.2.1.

7.4.9 Calibration systems

Inspection, measuring and testing equipment used for acceptance shall be identified, inspected, calibrated and adjusted at specific intervals in accordance with supplier/manufacturer's documented specifications and ISO/IEC 17025. Inspection, measuring and testing equipment shall be used only within the calibrated range.

Technologies for measuring and testing with verifiable accuracies equal to or better than those listed in this International Standard may be applied with appropriate documentation and when approved by a qualified person.

Calibration intervals for measuring and testing equipment shall be established based on repeatability and degree of usage. Calibration intervals shall be a maximum of three months until recorded calibration history can be established. Intervals may be lengthened or shortened based on documented repeatability, amount of

usage and calibration history. The calibration interval shall not be increased by more than twice the previous interval, with the maximum interval not to exceed one year.

Calibration standards used to calibrate measuring equipment shall be checked and approved at least once a year by an independent outside agency with traceability to the applicable national or international standards agency.

7.4.10 Personnel qualification

Personnel performing NDE shall be qualified to at least level II for evaluation and interpretation in accordance with an International Standard such as ISO 9712 or a national standard such as SNT-TC-1A.

Personnel performing all other inspections for acceptance shall be qualified in accordance with supplier/manufacturer's documented specifications.

7.4.11 Manufacturing non-conformities

The supplier/manufacturer shall establish and maintain documented procedures to ensure that an assembly or component that does not conform to specified requirements is prevented from unintended use or installation. This control shall provide for the identification, documentation, evaluation, segregation (when applicable) and disposition of nonconforming components or assemblies.

8 Storage and transport

8.1 Storage

Sand control screens shall be stored in accordance with the documented specifications of the supplier/manufacturer to prevent deterioration (for example, caused by atmospheric conditions, debris, etc.) prior to transport.

8.2 Product protection

All threaded connections and screen jackets shall be protected as specified in the supplier/manufacturer's documented procedures.

8.3 Transport

Sand control screens shall be packaged for transport in accordance with the documented specifications of the supplier/manufacturer to prevent normal handling loads and contamination from harming the equipment. These specifications shall address the protection of the screen surface and exposed threaded connections, and shall provide protection to prevent contamination, fouling or plugging from fluids, debris and/or solid particulates.

Annex A
(normative)

Collapse pressure test

A.1 General

This annex provides test requirements for validating the rated collapse pressure as specified by the supplier/manufacturer or establishing the collapse pressure at which sand control capability is lost on complete screen assemblies. The supplier/manufacturer shall establish the nominal collapse pressure rating as no greater than the lowest value achieved in at least two tests.

A.2 Method

Install the screen assembly in a test chamber; see Figure A.1. The test screen has one end closed and the other end is connected to the outlet. Pump a fluid loss control pill in accordance with Clause A.4 into the chamber annulus and through the screen until the screen plugs off. Continue pumping to increase pressure until the desired collapse rating is achieved or loss of sand control is observed.

A.3 Test requirements

Validation test shall meet the following requirements.

a) Screen length: The minimum screen jacket length is 2,4 m (7,8 ft). The basepipe shall provide additional length to accommodate end connections and to allow for mounting in the test setup.

b) The test screen assembly shall be manufactured to Q1 quality grade.

c) Testing shall be performed at ambient temperature.

d) For wire-wrap and pre-pack screens, a 304,8 µm (12 ga) slot shall be used with tolerances consistent with supplier/manufacturer's specifications.

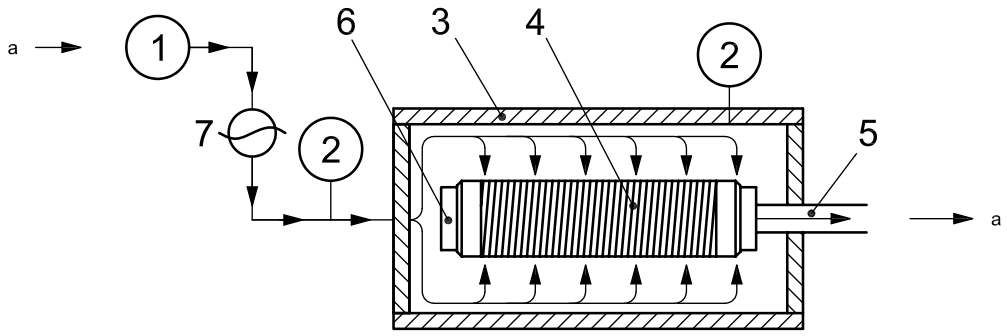
e) For metal-mesh screens, the pore size and method of pore size determination shall be specified by the supplier/manufacturer and within the requirements of this International Standard.

f) Pressure readings: The test setup (see Figure A.1) shall have two pressure-reading devices to ensure that the fluid loss control pill does not bridge inside the test fixture.

g) Minimum annulus: The test chamber shall have at least 25 mm (0,98 in) radial clearance between its ID and the screen/product OD.

h) A conduit may be used between the chamber outlet and the FLC pill container. The back pressure on the conduit shall be less than 345 kPa (50 psi).

i) Monitor and record the pump rate and pressure throughout the test.



Key

1	FLC pill container	5	outlet
2	pressure gauge	6	closed end
3	test chamber	7	pump
4	screen		

[a] Flow direction.

Figure A.1 — Collapse test setup

A.4 Fluid loss control pill

The fluid loss control (FLC) pill shall be prepared as follows.

— Prepare a blend of calcium carbonate grind sizes with the following range of particle sizes.

  — Approximately 33 % mass fraction of the particles are larger than the specified pore size or slot size.

  — Approximately 33 % mass fraction of the particles are smaller than the specified pore size or slot size, but are not less than one third of the specified pore size or slot size.

  — Approximately 33 % mass fraction of the particles are smaller than one third of the specified pore size or slot size. The smallest size may be 1 µm or less.

— Solids loading shall be 5 kg/m ^{3} to 7,5 kg/m ^{3} (69 lbs/bbl to 104 lbs/bbl) based on clean fluid volume.

— Utilize fresh water, or a water-soluble polymer to obtain a maximum apparent viscosity of 0,4 P·s (400 cP) at 511 s^{-1}.

— A biocide may be added to extend the shelf life of the formulation.

— The FLC pill formulation shall be checked for maximum leak off. The leak-off test shall be conducted using ISO 10414-1:2008, 7.2, with the following exceptions.

  — The cell can be 5,0 cm (2 in) or larger.

  — Applied pressure shall be a minimum of 1 380 kPa (200 psi).

  — The maximum leak off allowed is 1,5 ml/cm^2 of filter area after 1 h.

  NOTE For the purposes of this requirement, API RP 13B-1 is equivalent to ISO 10414-1.

— The pill provider shall document the viscosity of the blended FLC pill, its PSD analysis and leak-off test results. These shall be included in the design validation documentation.

A.5 Test procedure

Validation test procedures shall meet the following requirements.

— Perform the viscosity and leak-off test on the blended FLC pill within 48 h prior to the start of the test.

— The pumping rate shall not exceed 0,038 m^3/min (10 gpm).

— Slowly pump (or circulate) the fluid loss control pill into the chamber while leaving the outlet valve open for circulation. When pumping pressure begins to increase, at about 690 kPa (100 psi), check that the annulus is open by observing that the pressure gauges are within 138 kPa (20 psi) of each other.

— Continue pumping to slowly increase the applied pressure outside the screen. The pumping rate may be increased after it has been verified the screen is completely sealed by the FLC pill.

— An alternate approach is to use a stop-and-hold process with several hold points at about 3 450 kPa (500 psi) intervals. Increase pressure in approximately 3 450 kPa (500 psi) increments from its previous hold point using a maximum rate of 6 900 kPa/min (1 000 psi/min). Cease pumping and record the pressure drop across the screen after 1 min of hold time. Record the pressure drop at each 3 450 kPa (500 psi) interval.

— Observe and record any sudden changes in pressure during the pressure buildup.

— Continue to pump the fluid loss control pill until the desired rating or loss of sand control is observed.

— Observe and record the results of the test, including the pressure build-up curve, changes in dimensions, and location and description of the loss of sand control; see Clause A.6.

— Record pump rate and pressure throughout the test on time-based equipment.

A.6 Loss of sand control

For the purposes of this test, loss of sand control is considered to occur when, during pumping into the test chamber, the pressure drops 1 725 kPa (250 psi) or more in 2 s, and the pressure does not fully recover within 2 min at the 0,038 m^3/min (10 gpm) maximum pump rate.

A.7 Reporting

The minimum required test data shall include the fluid loss pill test results, supplier/manufacturer's collapse rating, graph of applied pressure vs. time and applicable photographs of the tested screen. Reporting shall also meet the requirements of 7.2.

Annex B
(normative)

Burst pressure test

B.1 General

This annex provides test requirements for validating the rated burst pressure as specified by the supplier/manufacturer or establishing the burst pressure at which sand control capability is lost on complete screen assemblies. The supplier/manufacturer shall establish the nominal burst pressure rating as no greater than the lowest value achieved in at least two tests.

B.2 Method

Install screen assembly in a test chamber or test area; see Figure B.1. The test screen has one end closed and the other end is connected to the inlet. Pump a fluid loss control pill in accordance with Clause B.4 into the inside of the screen until the screen plugs off. Continue pumping to increase pressure until the desired burst rating is achieved or loss of sand control is observed.

B.3 Test requirements

Validation test shall meet the following requirements.

a) Screen length: The minimum jacket length is 2,4 m (7,8 ft). The basepipe shall provide additional length to accommodate end connections and to allow for mounting in the test setup.

b) The test screen assembly shall be manufactured to Q1 quality grade.

c) Testing shall be performed at ambient temperature.

d) For wire-wrap and pre-pack screens, a 304,8 µm (12 ga) slot shall be used with tolerances consistent with supplier/manufacturer's specifications.

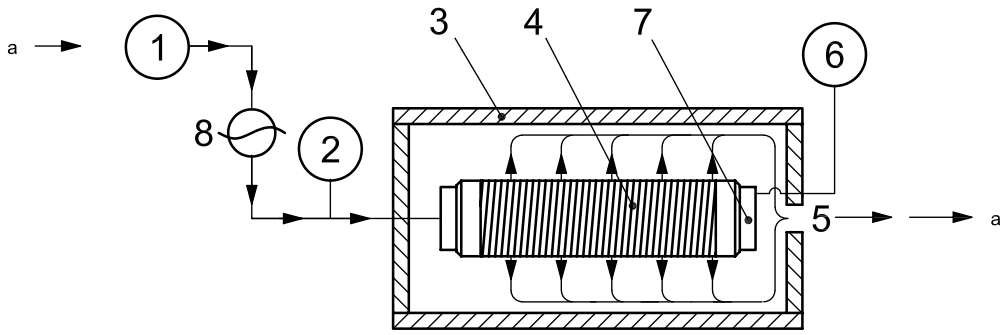
e) For metal-mesh screens, the pore size and method of pore size determination shall be specified by the supplier/manufacturer and within the requirements of this International Standard.

f) Pressure readings: The test setup (see Figure B.1) shall have two pressure reading devices to ensure the fluid loss control pill does not bridge inside the test sample.

g) Minimum annulus: The test set up shall have at least 25 mm (0,98 in) radial clearance around the screen/product OD to prevent structural support of the screen during testing.

h) A conduit may be used between the chamber outlet and the FLC pill container. The back pressure on the circulation line shall be less than 345 kPa (50 psi).

i) Monitor and record the pump rate and pressure throughout the test.



Key

1	fluid loss control pill container	6	pressure gauge measuring inside screen
2	pressure gauge	7	closed end
3	test chamber (optional)	8	pump
4	screen		
5	outlet		

[a] Flow direction.

Figure B.1 — Burst test setup with optional test chamber

B.4 Fluid loss control pill

The fluid loss control (FLC) pill shall be prepared in accordance with Clause A.4.

B.5 Test procedure

Validation test procedures shall meet the following requirements.

— Perform the viscosity and leak off test on the blended FLC pill within 48 h prior to the start of the test.

— The pumping rate shall not exceed 0,038 kg/m ^{3} (10 gpm).

— Slowly pump (or circulate) the fluid loss control pill into the ID of the screen while closing the outlet valve to circulate pill from inside the screen to the test chamber or area. When pumping pressure begins to increase, at about 690 kPa (100 psi), check that the ID is open by observing that the pressure gauges are within 138 kPa (20 psi) of each other.

— Continue pumping to slowly increase the applied pressure on the screen. The pumping rate may be increased after it is verified the screen is completely sealed by the FLC pill.

— An alternate approach is to use a stop-and-hold process with several hold points at about 1 725 kPa (250 psi) intervals. Increase pressure in 1 725 kPa (250 psi) increments from its previous hold point using a maximum rate of 3 450 kPa/min (500 psi/min). Cease pumping and measure the pressure drop across the screen after 1 min of hold time. Record the pressure drop versus hold pressure at each 1 725 kPa (250 psi) interval.

— Observe and record any sudden changes in pressure during the pressure buildup.

— Continue to pump the fluid loss control pill until the desired rating or loss of sand control is observed.

— Observe and record the results of the test, including the pressure build-up curve, changes in dimensions, and location and description of the loss of sand control; see Clause B.6.

— Record pump rate and pressure throughout the test on time-based equipment.

B.6 Loss of sand control

For the purposes of this test, loss of sand control is considered to occur when, during pumping into the test chamber, the pressure drops 1 725 kPa (250 psi) or more in 2 s, and the pressure does not fully recover within 2 min at the 0,038 kg/m ^{3} (10 gpm) maximum pump rate.

B.7 Reporting

The minimum required test data shall include the fluid loss pill test results, supplier/manufacturer's burst rating, graph of applied pressure vs. time and applicable photographs of the tested screen. Reporting shall also meet the requirements of 7.2.

Annex C
(informative)

Sized-bead test method

C.1 General

The purpose of this informative annex is to provide recommendations and guidance on the methods used to measure the maximum pore size in metal mesh.

C.2 Requirements for the test method

The test methods incorporate the following requirements.

— Use a narrow, uniform distribution of precisely sized beads that are both larger than (± 20 % to 30 %) and smaller than (± 20 % to 30 %) the metal-mesh expected maximum pore size.

— The beads may be sized using sieves in accordance with ASTM E11.

— The bead's roundness factor (ratio between the beads maximum and minimum OD) should not exceed 1,2.

— New beads should be used for each test, but some beads may be irregular in shape due to handling or agitation in the test cell.

— The beads should be thoroughly mixed to ensure beads contact individual pores in the media.

— The mixer's disc surface should be at least 5,0 cm (2 in.) in diameter, or larger. The filter media is mounted and sealed in the disc.

— A fine filter paper (< 10 micron) should be used below the mixer to catch any passed beads.

— A small concentration of beads is recommended to promote individual contact with the media's pores and to ensure that no more than a single layer of beads individually contacts the entire metal-mesh surface.

C.3 Sized-bead test methods

C.3.1 General

The test method should use either the microscopy method described in the C.3.2 or the particle-size analyser method described in C.3.3 to determine the maximum pore size.

C.3.2 Microscopy method

a) With calipers set at the mesh's indicated pore size, scan all of the passed beads. Identify and measure any bead that exceeds the mesh's indicated pore size. If a bead has two dimensions, record the smallest one.

b) Based on the largest bead found, record the mesh's maximum detected pore size.