

# OGP

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## **Material standards and committees for the international oil & gas industry**

*Report No. 421*

*June 2009*





# Publications

## Global experience

The International Association of Oil & Gas Producers has access to a wealth of technical knowledge and experience with its members operating around the world in many different terrains. We collate and distil this valuable knowledge for the industry to use as guidelines for good practice by individual members.

## Consistent high quality database and guidelines

Our overall aim is to ensure a consistent approach to training, management and best practice throughout the world.

The oil & gas exploration and production industry recognises the need to develop consistent databases and records in certain fields. The OGP's members are encouraged to use the guidelines as a starting point for their operations or to supplement their own policies and regulations which may apply locally.

## Internationally recognised source of industry information

Many of our guidelines have been recognised and used by international authorities and safety and environmental bodies. Requests come from governments and non-government organisations around the world as well as from non-member companies.

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# Material standards and committees for the international oil & gas industry

Report No: 421

June 2009

## **Acknowledgements**

This report has been compiled by the OGP Materials Sub-committee and approved by the OGP Standards Committee.

# Abbreviations

<b>API</b>	American Petroleum Institute
<b>ASTM</b>	American Society for Testing and Materials
<b>AWS</b>	American Welding Society
<b>BNIF</b>	Bureau de Normalisation des Industries de la Fonderie
<b>BS</b>	British Standard
<b>CD</b>	Committee Draft
<b>CEN</b>	European Committee for Standardization
<b>DIN</b>	Deutsches Institut für Normung
<b>DIS</b>	Draft International Standard
<b>DNV</b>	Det Norske Veritas
<b>EEMUA</b>	Engineering Equipment & Materials Users' Association
<b>EFC</b>	European Federation of Corrosion
<b>EN</b>	European Norm
<b>GOST</b>	Russian Standards Organisation
<b>GSO</b>	Gulf Standards Organization
<b>IEC</b>	International Electrotechnical Commission
<b>ISO</b>	International Organization for Standardization
<b>MERL</b>	Materials Engineering Research Laboratory
<b>MSS</b>	Manufacturers Standardization Society
<b>NACE</b>	National Association of Corrosion Engineers
<b>NORSOK</b>	Norwegian Competitive Position
<b>NP</b>	New Project
<b>OGP</b>	International Association of Oil & Gas Producers
<b>PGNI</b>	Petroleum and Natural Gas Industries
<b>SAC</b>	Standards Administration of China
<b>SC</b>	Subcommittee
<b>SFS</b>	Finnish Standards Association
<b>SSPC</b>	Society for Protective Coatings
<b>TC</b>	Technical Committee
<b>TWI</b>	The Welding Institute
<b>WD</b>	Working Draft
<b>WG</b>	Working Group

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# 1 – Introduction

The International Association of Oil & Gas Producers (OGP) organised a workshop meeting 7 – 8 February 2007, in London, for the materials specialists of OGP members with the objective of:

1. Arranging a global networking of the materials technology specialists of OGP members for the purpose of discussing the existing company and project specifications and available standards related to this discipline.
2. Evaluating the need for future materials standards work in the upstream oil & gas industry, for example in the ISO/TC 67 area.
3. Establishing a new work proposal(s) for development of a new international standard on Materials Selection or other subjects as agreed. Basis for the work should be Norsok standard M-001, Materials Selection (<http://www.standard.no/en/sectors/Petroleum/NORSOK-Standard-Categories/M-Material/M-0012>), any company specifications offered and other relevant standards or documents.
4. Determining further networking arrangements, if agreed.

OGP agreed subsequently to establish a Materials Sub-committee on the basis of this workshop. See chapter 15. OGP's position paper on development and use of standards is found in OGP Report N° 381 at <http://www.ogp.org.uk/pubs>.

## 2 – Purpose of report

The purpose of this report is twofold:

1. to provide a list of the available and relevant international, regional, national and industry standards for the oil & gas industries specifically focusing on materials related subjects as seen by the OGP members involved; and
2. to provide an overview of relevant technical committees and working groups and material standards work presently ongoing for this area.

## 3 – Available standards

### 3.1 General

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The primary and specific material standards for the oil & gas industry are singled out in paragraph 3.2 below, as these standards are the responsibility of the materials experts of the oil & gas industry community to develop and maintain, and normally nobody else.

Many of the references in 3.3 below are generally applicable material standards where the materials discipline has input and many of them are not specifically made for the oil & gas industry. However, they are frequently used by the materials discipline and hence listed to recognise these and to check if they are commonly referenced by the global oil & gas industry for their individual and specific purposes.

These lists will hardly ever be accurate or complete as there may be several other standards available and therefore comments are welcome. See chapter 18.

### 3.2 Materials oil & gas industry specific standards available and used

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<b>API 2B</b>	Fabricated structural steel pipe
<b>API 2H</b>	Carbon Manganese Steel Plate for Offshore Structures
<b>API 2MT1</b>	Carbon Manganese Steel Plate with Improved Toughness for Offshore Structures
<b>API 2MT2</b>	Rolled Shapes with Improved Notch Toughness
<b>API 2W</b>	Steel Plates for Offshore Structures, Produced by Thermo-Mechanical Control Processing (TMCP)
<b>API 2X</b>	Ultrasonic examination of offshore structural fabrications.
<b>API 2Y</b>	Steel Plates, Quenched-and-tempered, for Offshore Structures
<b>API 2Z</b>	Preproduction Qualification for Steel Plates for Offshore Structures
<b>API 5CT</b>	See also ISO 11960 PGNI – Steel pipes for use as casing or tubing for wells
<b>API 5 L</b>	See also ISO 3183 PGNI – Steel pipe for pipeline transportation systems
<b>API 15 HR</b>	High Pressure Fiberglass Line Pipe
<b>API 15 LR</b>	Low Pressure Fiberglass Line Pipe
<b>API 17J</b>	Unbonded Flexible Pipe
<b>ASTM A 694</b>	Standard Specification for Carbon and Alloy Steel Forgings for Pipe Flanges, Fittings, Valves, and Parts for High-Pressure Transmission Service
<b>ASTM A 703</b>	Steel Castings, General Requirements, for Pressure-Containing Parts
<b>ASTM A 707</b>	Standard Specification for Forged Carbon and Alloy Steel Flanges for Low – Temperature Service
<b>ASTM A 923</b>	Standard Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels
<b>AWS A5.xx</b>	Specification for Welding Electrodes & Rods (multiple standards)
<b>DNV OS C501</b>	Composite components.
<b>DNV OS F101</b>	Submarine Pipeline Systems
<b>DNV RP B201</b>	Metallic Materials in Drilling, Production and Process Systems
<b>DNV RP B401</b>	Cathodic Protection Design
<b>DNV RP D404</b>	Unstable fracture.
<b>DNV RP F103</b>	Cathodic Protection of Submarine Pipelines by Galvanic Anodes
<b>DNV RP O501</b>	Erosive wear in piping systems.
<b>EEMUA 144</b>	90/10 Copper Nickel Alloy Piping for Offshore Applications – Specification: Tubes Seamless and Welded
<b>EEMUA 145</b>	90/10 Copper Nickel Alloy Piping for Offshore Applications – Specification: Flanges Composite and Solid
<b>EEMUA 146</b>	90/10 Copper Nickel Alloy Piping for Offshore Applications – Specification: Fittings
<b>EEMUA 149</b>	Code of Practice for the Identification and Checking of Materials of Construction in Pressure Systems in Process Plants
<b>EEMUA 158</b>	Construction Specification for Fixed Offshore Structures in the North Sea
<b>EEMUA 176</b>	Specification for Structural Castings for Use Offshore
<b>EEMUA 179</b>	A Working Guide for Carbon Steel Equipment in Wet H <sub>2</sub> S Service
<b>EEMUA 192</b>	Guide for the Procurement of Valves for Low Temperature (Non-cryogenic) Service

<b>EEMUA 194</b>	Guidelines for Materials Selection and Corrosion Control for Subsea Oil & gas Production Equipment
<b>EEMUA 197</b>	Specification for the Fabrication of Non-Primary Structural Steelwork for Offshore Installations
<b>EEMUA 203</b>	Guide to the Application of ISO 3183 Parts 2 (1996) and 3 (1999) Petroleum and Natural Gas Industries – Steel Pipes for Pipelines – Technical Delivery Conditions
<b>EEMUA 204</b>	Piping and the European Pressure Equipment Directive: Guidance for Plant Owners/Operators
<b>EN 10225</b>	Weldable structural steels for fixed offshore structures
<b>EFC 16</b>	Guidelines on Material Requirements for Carbon and Low Alloy Steels for H <sub>2</sub> S Environments in Oil & Gas Production.
<b>EFC 17</b>	Corrosion Resistant Alloys for Oil & Gas Production. Guidance on General Requirements and Test Methods for H <sub>2</sub> S Service
<b>EFC 23</b>	CO <sub>2</sub> Corrosion Control in Oil & Gas Production – Design Considerations
<b>EFC 42</b>	Corrosion in refineries
<b>EFC 39</b>	The use of Corrosion Inhibitors in Oil & Gas Production
<b>ISO 11960</b>	PGNI – Steel pipes for use as casing or tubing for wells
<b>ISO 13680</b>	PGNI – Corrosion-resistant alloy seamless tubes for use as casing, tubing and coupling stock – Technical delivery conditions
<b>ISO 14692-1</b>	PGNI – Glass reinforced plastics (GRP) piping – Vocabulary, symbols, applications and materials.
<b>ISO 14692-2</b>	PGNI – Glass reinforced plastics (GRP) piping – Qualification and manufacture.
<b>ISO 14692-3</b>	PGNI – Glass reinforced plastics (GRP) piping – System design.
<b>ISO 14692-4</b>	PGNI – Glass reinforced plastics (GRP) piping – Fabrication, installation and operation.
<b>ISO 15156-1</b>	PGNI – Materials for use in H <sub>2</sub> S-containing environments in oil & gas production – General principles for selection of cracking-resistant materials
<b>ISO 15156-2</b>	PGNI – Materials for use in H <sub>2</sub> S-containing environments in oil & gas production – Cracking-resistant carbon and low alloy steels, and the use of cast irons
<b>ISO 15156-3</b>	PGNI – Materials for use in H <sub>2</sub> S-containing environments in oil & gas production – Cracking-resistant CRAs (corrosion resistant alloys) and other alloys
<b>ISO 15546</b>	PGNI – Aluminium alloy drill pipe
<b>ISO 15589-1</b>	PGNI – Cathodic protection of pipeline transportation systems – On-land pipelines
<b>ISO 15589-2</b>	PGNI – Cathodic protection of pipeline transportation systems – Offshore pipelines
<b>ISO 21809-2</b>	PGNI – External coatings for buried or submerged pipelines used in pipeline transportation systems – Part 2: Fusion-bonded epoxy coatings
<b>275ISO 21809-3</b>	PGNI – External coatings for buried or submerged pipelines used in pipeline transportation systems – Part 3: Field joint coatings
<b>ISO 23936-1</b>	PGNI – Non-metallic materials in contact with media related to oil & gas production – Part 1: Thermoplastics
<b>ISO 3183</b>	PGNI – Steel pipe for pipeline transportation systems
<b>MSS SP-44</b>	Steel Pipeline Flanges
<b>MSS SP-55</b>	Visual Inspection Guide For Steel Castings
<b>MSS SP-75</b>	Specification for High Test Wrought Butt Welding Fittings
<b>NACE MR 0175</b>	Standard Material Requirements, Metals for Sulfide Stress Cracking and Stress Corrosion Cracking Resistance in Sour Oilfield Environments
<b>NACE RP 0169</b>	Recommended Practice. Control of External Corrosion of Underground or Submerged Metallic Piping Systems.
<b>NACE RP 0170</b>	Protection of Austenitic Stainless Steel in Refineries against Stress Corrosion, Cracking by use of Naturalizing Solutions during shutdown
<b>NACE RP 0175</b>	Control of Internal Corrosion in Steel Pipelines and Piping Systems
<b>NACE RP 0176</b>	Standard Recommended Practice, Corrosion Control of Steel Fixed Offshore Structures Associated with Petroleum Production
<b>NACE RP 0192</b>	Monitoring Corrosion in oil & gas production with iron counts
<b>NACE RP 0194</b>	Field monitoring of bacterial growth in oil field system
<b>NACE RP 0675</b>	Control of external corrosion on offshore steel pipelines
<b>NACE RP 0775</b>	Preparation and installation of corrosion coupons and interpretation of test data in oil field operation
<b>NACE TM 0169</b>	Control of external corrosion on underground or sub merged metallic piping systems
<b>NACE TM 0177</b>	Testing of Metals for Resistance to Sulphide Stress Cracking at Ambient Temperatures

<b>NACE TM 0284</b>	Testing of Metals for Resistance to Stepwise Cracking
<b>NACE TM 0497</b>	Measurement technique related to criteria for cathodic protection on underground or submerged piping system
<b>NORSOK M-001</b>	Material selection
<b>NORSOK M-101</b>	Structural steel fabrication
<b>NORSOK M-102</b>	Structural aluminium fabrication
<b>NORSOK M-120</b>	Material data sheets for structural steel
<b>NORSOK M-121</b>	Aluminium structural materials
<b>NORSOK M-122</b>	Cast structural steel
<b>NORSOK M-123</b>	Forged structural steel
<b>NORSOK M-501</b>	Surface preparation and protective coating
<b>NORSOK M-503</b>	Cathodic protection
<b>NORSOK M-506</b>	CO <sub>2</sub> Corrosion rate calculation model
<b>NORSOK M-601</b>	Welding and inspection of piping
<b>NORSOK M-622</b>	Fabrication and installation of GRP piping systems (draft standard)
<b>NORSOK M-630</b>	Material data sheets for piping
<b>NORSOK M-650</b>	Qualification of manufacturers of special materials
<b>NORSOK M-710</b>	Qualification of non-metallic sealing materials and manufacturers

### 3.3 Non specific materials standards available and used by the oil & gas industry

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<b>API 6A</b>	Specification for Wellhead and Christmas Tree Equipment – See also ISO 10423
<b>API 6D</b>	Specification for Pipeline Valves – See also ISO 14313
<b>API 520</b>	Sizing, Selection, and Installation Of Pressure-Relieving Devices in Refineries, Part I and II.
<b>API 1104</b>	Welding of Pipelines and Related Facilities
<b>API 1111</b>	Design, Construction, Operation and Maintenance of Offshore Hydrocarbon Pipelines (Limit State Design)
<b>ANSI/ASME B 16.49</b>	Factory-Made, Wrought Steel, Buttwelding Induction Bends for Transportation and Distribution Systems
<b>ANSI/ASME B 31.3</b>	Process Piping
<b>ASME Section II</b>	Materials Part C – Specifications for Welding Rods, Electrodes and Filler Metals.
<b>ASME Section V</b>	Nondestructive Examination
<b>ASME Section VIII</b>	Rules for Construction of Pressure Vessels Division 1
<b>ASME Section IX</b>	Welding and Brazing Qualifications
<b>ASTM A 153</b>	Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
<b>ASTM A 193</b>	Specification for Alloy – Steel and Stainless Steel Bolting Materials for High – Temperature Service
<b>ASTM A 194</b>	Specification for Carbon and Alloy Steel Nuts for Bolts for High – Pressure and High-Temperature Service
<b>ASTM A 320</b>	Specification for Alloy Steel Bolting Materials for Low – Temperature Service
<b>ASTM A 388</b>	Standard Practice For Ultrasonic Examination Of Heavy Steel Forgings
<b>ASTM A 609</b>	Standard Practice For Castings, Carbon, Low-Alloy And Martensitic Stainless Steel, Ultrasonic Examination Thereof
<b>ASTM A 991</b>	Standard test method for conducting temperature uniformity surveys of furnaces used to heat treat steel products
<b>ASTM D 1414</b>	Methods of Testing Rubber O-rings
<b>ASTM D 1415</b>	Standard Test Method for Rubber property – International hardness (IRHD).
<b>ASTM D 1525</b>	Test Method for Vicat Softening Point for Plastics
<b>ASTM D 2240</b>	Test Method for Rubber Property – Durometer Hardness (Shore A/ D).
<b>ASTM D 2990</b>	Test methods for Tensile, Compressive and Flexural Creep and Creep. Rupture Test of Plastics.
<b>ASTM D 2992</b>	Practice for Obtaining Hydrostatic or Pressure Design Basis for Fibreglass Pipe and Fittings
<b>ASTM D 3032</b>	Method of testing hook-up wire insulation. Description of Arrhenius method
<b>ASTM D 395</b>	Standard Test Method for Rubber Property – Compression Set (method B).
<b>ASTM D 638</b>	Test Method for Tensile Properties of Plastics

<b>ASTM D 695</b>	Test Method for Compressive Properties of Rigid Plastics
<b>ASTM D 746</b>	Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
<b>ASTM D 790</b>	Test method for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
<b>ASTM D 792</b>	Test Methods for Specific Gravity and Density of Plastics by Displacement
<b>ASTM D 1141</b>	Specification for Substitute Ocean Water
<b>ASTM D 1599</b>	Standard Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe Tubing, and Fittings
<b>ASTM D 4752</b>	Standard Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub.
<b>ASTM E 112</b>	Standard Test Method for Determining Average Grain Size
<b>ASTM E 125</b>	Standard Reference Photographs For Magnetic Particle Indications On Ferrous Castings
<b>ASTM E 165</b>	Standard Test Method For Liquid Penetrant Examination.
<b>ASTM E 186</b>	Reference Radiographs For Heavy-Walled (51 to 112 mm) Steel Castings
<b>ASTM E 280</b>	Reference Radiographs For Heavy-Walled (112 to 305 mm) Steel Castings
<b>ASTM E 446</b>	Reference Radiographs For Steel Castings Up To 51 mm In Thickness
<b>ASTM E 562</b>	Practice for Determining Volume Fraction by Systematic Manual Point Count.
<b>ASTM E 709</b>	Standard Practice For Magnetic Particle Examination
<b>ASTM G 48</b>	Standard Test Method for Pitting and Crevice Corrosion Resistance of Stainless Steel and Related Alloys by the use of Ferric Chloride Solution
<b>AWS D1.1</b>	Structural Welding Code – Steel
<b>BNIF TR 341-02</b>	Characterisation of Surface Condition of Steel Castings
<b>BS 1806</b>	Standard Inch Sizes of O-rings.
<b>BS 4994</b>	Specification for design and construction of vessels and tanks in reinforced plastics
<b>BS 6442</b>	Specification for limits of surface imperfections on elastomeric toroidal sealing rings (O-rings).
<b>BS 7448</b>	Fracture mechanics toughness tests
<b>BS 7910</b>	Guide on methods for assessing the acceptability of flaws in fusion welded structures.
<b>BS MA 18</b>	Salt Water Piping in Ships
<b>DIN 16965-2</b>	Wound glass fibre reinforced polyester resin (UP-GF) pipes, Type B pipes, dimensions
<b>DIN 16966</b>	Glass fibre reinforced polyester resin (UP-GF) pipe fittings and joint – Part 1: Assemblies; fittings; general quality requirements and testing Part 2: Elbows, Dimensions Part 4: Tees, Nozzles, Dimensions Part 5: Reducers; Dimensions. Part 6: Collars, flanges, joint rings; Dimensions. Part 7: Bushings, flanges, flanged and butt joints; general quality requirements and test methods. Part 8: Laminated joints; Dimensions
<b>DIN 53453</b>	Testing of Plastics, Impact Flexural Test.
<b>DIN 8566-2</b>	Zusätze für das termische Spritzen; Massivdrähte zum Lichtbogenspritzen; Technische Lieferbedingungen.
<b>DNV CN 33.1</b>	Corrosion prevention of tanks and holds
<b>DNV RP F201</b>	Dynamic risers
<b>EN 473</b>	Nordtest Qualification of NDE operators
<b>EN 10002-1</b>	Metallic materials – Tensile testing – Part 1: Method of test at ambient temperature
<b>EN 1011-series</b>	Welding – Recommendation for welding of metallic materials, relevant parts
<b>EN 10204</b>	Metallic products – Types of inspection documents including
<b>EN 10225</b>	Weldable structural steels for fixed offshore structures – Technical delivery conditions
<b>EN 1043-1</b>	Destructive tests on welds in metallic materials – Hardness testing – Part 1: Hardness test on arc welded joints.
<b>EN 1289</b>	Non destructive examination of welds – Penetrant testing of welds – Acceptance levels.
<b>EN 1290</b>	NDT of welds – Magnetic particle examination of welds –
<b>EN 1291</b>	NDT of welds – Magnetic particle examination of welds – Acceptance levels
<b>EN 1418</b>	Welding personnel – Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanised and automatic welding of metallic materials
<b>EN 1435</b>	Non destructive examination of welds – Radiographic examination of welded joints
<b>EN 1597-1</b>	Welding consumables – Test methods – Part 1: Test piece for all weld metal test specimens in steel, nickel and nickel alloys.

<b>EN 1714</b>	Non destructive examination of welds – Ultrasonic examination of welded joints
<b>EN 26847</b>	Covered electrodes for manual metal arc welding. Deposition of a weld pad for chemical analysis
<b>EN 287</b>	Approval testing of welders – Fusion welding
<b>EN 288</b>	Specification and approval of welding procedures for metallic materials
<b>EN 444</b>	NDT – General principles for radiographic examination of metallic materials by X-rays and gamma rays
<b>EN 462</b>	NDT – Image quality of radiographs
<b>EN 473</b>	Qualification and certification of NDT personnel – General principles
<b>EN 719</b>	Welding coordination – Tasks and responsibilities.
<b>EN 729</b>	Quality requirements for welding – Fusion welding of metallic materials.
<b>EN 875</b>	Welding – Welded joints in metallic materials – Specimen location and notch orientation for impact tests.
<b>EN 970</b>	Non-destructive examination of fusion welds – Visual examination.
<b>ISO 148–1</b>	Metallic materials – Charpy pendulum impact test – Part 1: Test method
<b>ISO 148–2</b>	Metallic materials – Charpy pendulum impact test – Part 2: Verification of test machine
<b>ISO 148–3</b>	Metallic materials – Charpy pendulum impact test – Part 3: Preparation and characterisation of Charpy V reference test pieces for verification of test machines
<b>ISO 377</b>	Steel and steel products – Location and preparation of samples and test pieces for mechanical testing
<b>ISO 404</b>	Steel and steel products – General technical delivery requirements
<b>ISO 630</b>	Structural steels – Plates, wide flats, bars, sections and profiles
<b>ISO 642</b>	Steel – Hardenability test by end quenching (Jominy test)
<b>ISO 643</b>	Steels – Micrographic determination of the apparent grain size
<b>ISO 657–1</b>	Hot-rolled steel sections – Part 1: Equal-leg angles – Dimensions
<b>ISO 657–14</b>	Hot-rolled steel sections – Part 14: Hot-finished structural hollow sections – Dimensions and sectional properties
<b>ISO 657–15</b>	Hot-rolled steel sections – Part 15: Sloping flange beam sections (Metric series) – Dimensions and sectional properties
<b>ISO 683–1</b>	Heat-treatable steels, alloy steels and free-cutting steels – Part 1: Direct-hardening unalloyed and low-alloyed wrought steel in form of different black products
<b>ISO 683–18</b>	Heat-treatable steels, alloy steels and free – cutting steels – Part 18: Bright products of unalloyed and low alloy steels
<b>ISO 783</b>	Metallic materials – Tensile testing at elevated temperature
<b>ISO 857–1</b>	Welding and allied processes – Vocabulary – Part 1: Metal welding processes
<b>ISO 868</b>	Determination of indentation hardness by means of a Durometer (Shore A/ D hardness).
<b>ISO 898</b>	Mechanical properties of fasteners
<b>ISO 1432</b>	Rubber vulcanised – low temperature stiffening (Gehman test)
<b>ISO 1461</b>	Metallic coatings – Hot-dip galvanised coating on fabricated ferrous products – Requirements
<b>ISO 1817</b>	Vulcanised rubbers – Resistance to liquids – methods of tests
<b>ISO 2503</b>	Gas welding equipment – Pressure regulators for gas cylinders used in welding, cutting and allied processes up to 300 bar
<b>ISO 2553</b>	Welded, brazed and soldered joints – Symbolic representation on drawings
<b>ISO 2566–1</b>	Steel – Conversion of elongation values – Part 1: Carbon and low alloy steels
<b>ISO 2566–2</b>	Steel – Conversion of elongation values – Part 2: Austenitic steels
<b>ISO 2604–1</b>	Steel products for pressure purposes – Quality requirements – Part 1: Forgings
<b>ISO 2604–3</b>	Steel products for pressure purposes – Quality requirements – Part 3: Electric resistance and induction-welded tubes
<b>ISO 2604–5</b>	Steel products for pressure purposes – Quality requirements – Part 5: Longitudinally welded austenitic stainless steel tubes
<b>ISO 2632</b>	Roughness Comparison Specimens, Cast Surfaces
<b>ISO 2814</b>	Paints and varnishes – Comparison of contrast ratio (hiding power) of paint of the same type and colour
<b>ISO 3506–1</b>	Mechanical properties of corrosion resistant stainless steel fasteners – Part 1: Bolts, screws and studs.
<b>ISO 3506–2</b>	Mechanical properties of corrosion resistant stainless steel fasteners – Part 2: Nuts.

<b>ISO 3545-1</b>	Steel tubes and fittings – Symbols for use in specifications – Part 1: Tubes and tubular accessories with circular cross-section
<b>ISO 3545-2</b>	Steel tubes and fittings – Symbols for use in specifications – Part 2: Square and rectangular hollow sections
<b>ISO 3690</b>	Welding and allied processes – Determination of hydrogen content in ferritic steel arc weld metal
<b>ISO 3834</b>	Quality requirements for fusion welding of metallic materials (5 parts)
<b>ISO 3834-2</b>	Quality requirements for welding – Fusion welding of metallic materials – Part 2: Comprehensive quality requirements
<b>ISO 4063</b>	Welding and allied processes – Nomenclature of processes and reference numbers
<b>ISO 4136</b>	Destructive tests on welds in metallic materials – Transverse tensile testing
<b>ISO 4624</b>	Paints and varnishes – Pull-off test for adhesion.
<b>ISO 4628-6</b>	Paints and varnishes – Evaluation of degradation of paint coatings – Designation of intensity, quantity and size of common types of defect – Part 6: Rating of degree of chalking by tape method.
<b>ISO 4885</b>	Ferrous products – Heat treatments – Vocabulary
<b>ISO 4948-1</b>	Steels – Classification – Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition
<b>ISO 4948-2</b>	Steels – Classification – Part 2: Classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics
<b>ISO 4954</b>	Steel for cold heading and cold extruding
<b>ISO 4967</b>	Steel – Determination of content of non metallic inclusions – Micrographic method using standard diagrams
<b>ISO 4986</b>	Steel castings – Magnetic particle inspection
<b>ISO 4991</b>	Steel castings for pressure purposes
<b>ISO 4998</b>	Continuous hot-dip zinc-coated carbon steel sheet of structural quality
<b>ISO 5173</b>	Destructive tests on welds in metallic materials – Bend tests
<b>ISO 5256</b>	Steel pipes and fittings for buried or submerged pipe lines – External and internal coating by bitumen or coal tar derived materials
<b>ISO 5817</b>	Arc welded joints in steel – Guidance on quality levels for imperfections. (identical to EN 25817)
<b>ISO 6506-1</b>	Metallic materials – Brinell hardness test – Part 1: Test method
<b>ISO 6506-2</b>	Metallic materials – Brinell hardness test – Part 2: Verification and calibration of testing machines
<b>ISO 6506-3</b>	Metallic materials – Brinell hardness test – Part 3: Calibration of reference blocks
<b>ISO 6507-1</b>	Metallic materials – Hardness test – Vickers test – Part 1: Test method
<b>ISO 6507-2</b>	Metallic materials – Vickers hardness test – Part 2: Verification of testing machines
<b>ISO 6507-3</b>	Metallic materials – Vickers hardness test – Part 3: Calibration of reference blocks
<b>ISO 6508-1</b>	Metallic materials – Rockwell hardness test – Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)
<b>ISO 6508-2</b>	Metallic materials – Rockwell hardness test – Part 2: Verification and calibration of testing machines (scales A, B, C, D, E, F, G, H, K, N, T)
<b>ISO 6508-3</b>	Metallic materials – Rockwell hardness test – Part 3: Calibration of reference blocks (scales A, B, C, D, E, F, G, H, K, N, T)
<b>ISO 6520-1</b>	Welding and allied processes – Classification of geometric imperfections in metallic materials – Part 1: Fusion welding
<b>ISO 6520-2</b>	Welding and allied processes – Classification of geometric imperfections in metallic materials – Part 2: Welding with pressure
<b>ISO 6761</b>	Steel tubes – Preparation of ends of tubes and fittings for welding
<b>ISO 6892</b>	Metallic material – Tensile testing at ambient temperature
<b>ISO 6929</b>	Steel products – Definitions and classification
<b>ISO 6947</b>	Welds – Working positions – Definitions of angles of slope and rotation
<b>ISO 7005-1</b>	Metallic flanges – Part 1: Steel flanges
<b>ISO 7005-2</b>	Metallic flanges – Part 2: Cast iron flanges
<b>ISO 7005-3</b>	Metallic flanges – Part 3: Copper alloy and composite flanges
<b>ISO 7438</b>	Metallic materials – Bend test
<b>ISO 7500-1</b>	Metallic materials – Verification of static uniaxial testing machines – Part 1: Tension/compression testing machines – Verification and calibration of the force-measuring system
<b>ISO 7963</b>	Welds in steel – Calibration block no. 2 for ultrasonic examination of welds
<b>ISO 8062</b>	Castings – System of dimensional tolerances and machining allowances

<b>ISO 8491</b>	Metallic materials – Tube (in full section) – Bend test
<b>ISO 8492</b>	Metallic materials – Tube – Flattening test
<b>ISO 8501–1</b>	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings. Informative supplement to part 1: Representative photographic examples of the change of appearance imparted to steel when blast-cleaned with different abrasives
<b>ISO 8501–3</b>	Part 3: Assessment of dust on steel surfaces prepared for painting (pressure sensitive tape method).
<b>ISO 8501–6</b>	Part 6: Extraction of soluble contaminants for analysis – The Bresle method.
<b>ISO 8502–9</b>	Preparation of steel substrates before application of paints and related products – Test for the assessment of surface cleanliness – Part 9: Field method for the conductometric determination of water-soluble salts.
<b>ISO 8503</b>	Preparation of steel substrates before application of paints and related products – Surface roughness characteristics of blast cleaned substrates.
<b>ISO 8504–2</b>	Preparation of steel substrates before application of paints and related products – Surface preparation methods – Part 2: Abrasive blast cleaning.
<b>ISO 9015–1</b>	Destructive tests on welds in metallic materials – Hardness testing – Part 1: Hardness test on arc welded joints
<b>ISO 9015–2</b>	Destructive tests on welds in metallic materials – Hardness testing – Part 2: Microhardness testing of welded joints
<b>ISO 9303</b>	Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes – Full peripheral ultrasonic testing for the detection of longitudinal imperfections
<b>ISO 9304</b>	Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes – Eddy current testing for the detection of imperfections
<b>ISO 9305</b>	Seamless steel tubes for pressure purposes – Full peripheral ultrasonic testing for the detection of transverse imperfections
<b>ISO 9327–1</b>	Steel forgings and rolled or forged bars for pressure purposes – Technical delivery conditions – Part 1: General requirements
<b>ISO 9327–2</b>	Steel forgings and rolled or forged bars for pressure purposes – Technical delivery conditions – Part 2: Non-alloy and alloy (Mo, Cr and CrMo) steels with specified elevated temperature properties
<b>ISO 9327–3</b>	Steel forgings and rolled or forged bars for pressure purposes – Technical delivery conditions – Part 3: Nickel steels with specified low temperature properties
<b>ISO 9327–4</b>	Steel forgings and rolled or forged bars for pressure purposes – Technical delivery conditions – Part 4: Weldable fine grain steels with high proof strength
<b>ISO 9327–5</b>	Steel forgings and rolled or forged bars for pressure purposes – Technical delivery conditions – Part 5: Stainless steels
<b>ISO 9328–2</b>	Steel plates and strips for pressure purposes – Technical delivery conditions – Part 2: Unalloyed and low-alloyed steels with specified room temperature and elevated temperature properties
<b>ISO 9328–3</b>	Steel plates and strips for pressure purposes – Technical delivery conditions – Part 3: Nickel alloyed steels with specified low temperature properties
<b>ISO 9328–4</b>	Steel plates and strips for pressure purposes – Technical delivery conditions – Part 4: Weldable fine grain steels with high proof stress supplied in the normalized or quenched and tempered condition
<b>ISO 9328–5</b>	Steel plates and strips for pressure purposes – Technical delivery conditions – Part 5: Austenitic steels
<b>ISO 9329–1</b>	Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 1: Unalloyed steels with specified room temperature properties
<b>ISO 9329–2</b>	Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 2: Unalloyed and alloyed steels with specified elevated temperature properties
<b>ISO 9329–3</b>	Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 3: Unalloyed and alloyed steels with specified low temperature properties
<b>ISO 9329–4</b>	Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 4: Austenitic stainless steels
<b>ISO 9402</b>	Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes – Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of longitudinal imperfections
<b>ISO 9598</b>	Seamless steel tubes for pressure purposes – Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of transverse imperfections
<b>ISO 9606–1</b>	Approval testing of welders – Fusion welding – Part 1: Steels

<b>ISO 9606-2</b>	Qualification test of welders — Fusion welding — Part 2: Aluminium and aluminium alloys
<b>ISO 9606-3</b>	Approval testing of welders – Fusion welding – Approval testing of welders – Fusion welding – Copper and copper alloys.
<b>ISO 9606-4</b>	Approval testing of welders – Fusion welding – Nickel and nickel alloys.
<b>ISO 9606-5</b>	Approval testing of welders – Fusion welding – Titanium and titanium alloys, zirconium and zirconium alloys.
<b>ISO 9692-1</b>	Welding and allied processes — Recommendations for joint preparation — Part 1: Manual metal-arc welding, gas-shielded metal-arc welding, gas welding, TIG welding and beam welding of steels
<b>ISO 9692-2</b>	Welding and allied processes — Joint preparation — Part 2: Submerged arc welding of steels
<b>ISO 9692-3</b>	Welding and allied processes — Recommendations for joint preparation — Part 3: Metal inert gas welding and tungsten inert gas welding of aluminium and its alloys
<b>ISO 9692-4</b>	Welding and allied processes — Recommendations for joint preparation — Part 4: Clad steels
<b>ISO 9764</b>	Electric resistance and induction welded steel tubes for pressure purposes – Ultrasonic testing of the weld seam for the detection of longitudinal imperfections
<b>ISO 9765</b>	Submerged arc-welded steel tubes for pressure purposes – Ultrasonic testing of the weld seam for the detection of longitudinal and/or transverse imperfections
<b>ISO 9769</b>	Steel and iron – Review of available methods of analysis
<b>ISO 9956-1</b>	Specification and approval of welding procedures for metallic materials – Part 1: General rules for fusion welding
<b>ISO 9956-10</b>	Specification and approval of welding procedures for metallic materials – Part 10: Welding procedure specification for electron beam welding
<b>ISO 9956-11</b>	Specification and approval of welding procedures for metallic materials – Part 11: Welding procedure specification for laser beam welding
<b>ISO 9956-2</b>	Specification and approval of welding procedures for metallic materials – Part 2: Welding procedure specification for arc welding
<b>ISO 9956-3</b>	Specification and approval of welding procedures for metallic materials – Part 3: Welding procedure tests for arc welding of steels
<b>ISO 9956-4</b>	Specification and approval of welding procedures for metallic materials – Part 4: Welding procedure tests for the arc welding of aluminium and its alloys
<b>ISO 9956-7</b>	Specification and approval of welding procedures for metallic materials – Part 7: Approval by a standard welding procedure for arc welding
<b>ISO 9956-8</b>	Specification and approval of welding procedures for metallic materials – Part 8: Approval by a pre-production welding test
<b>ISO 10042</b>	Arc-welded joints in aluminium and its weldable alloys – Guidance on quality levels for imperfections
<b>ISO 10124</b>	Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes – Ultrasonic testing for the detection of laminar imperfections
<b>ISO 10474</b>	Steel and steel products – Inspection documents
<b>ISO 10543</b>	Seamless and hot-stretch-reduced welded steel tubes for pressure purposes – Full peripheral ultrasonic thickness testing
<b>ISO 11484</b>	Steel products — Employer’s qualification system for non-destructive testing (NDT) personnel
<b>ISO 11496</b>	Seamless and welded steel tubes for pressure purposes – Ultrasonic testing of tube ends for the detection of laminar imperfections
<b>ISO 11971</b>	Steel and iron castings – visual examination of surface quality
<b>ISO 11972</b>	Corrosion-resistant cast steels for general applications
<b>ISO 12094</b>	Welded steel tubes for pressure purposes – Ultrasonic testing for the detection of laminar imperfections in strips/plates used in the manufacture of welded tubes
<b>ISO 12095</b>	Seamless and welded steel tubes for pressure purposes – Liquid penetrant testing
<b>ISO 12096</b>	Submerged arc-welded steel tubes for pressure purposes – Radiographic testing of the weld seam for the detection of imperfections
<b>ISO 12135</b>	Metallic materials – Unified method of test for the determination of quasistatic fracture toughness
<b>ISO 12944-3</b>	Paints and Varnishes – Corrosion protection of steel structures by protective paint systems – Part 3: Design considerations.
<b>ISO 12944-5</b>	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 5: Protective paint systems.
<b>ISO 13623</b>	Petroleum and natural gas industries – Pipeline transportations systems

<b>ISO 13628-1</b>	PNGI– Design and operation of subsea production systems – General requirements and recommendations
<b>ISO 13628-2</b>	Unbonded flexible pipe systems for subsea and marine applications.
<b>ISO 13628-5</b>	Subsea control umbilicals.
<b>ISO 13628-7</b>	Work over/completion riser systems
<b>ISO 13628-11</b>	Flexible pipe systems for subsea and marine applications
<b>ISO 13663</b>	Welded steel tubes for pressure purposes – Ultrasonic testing of the area adjacent to the weld seam for the detection of laminar imperfections
<b>ISO 13664</b>	Seamless and welded steel tubes for pressure purposes – Magnetic particle inspection of the tube ends for the detection of laminar imperfections
<b>ISO 13665</b>	Seamless and welded steel tubes for pressure purposes – Magnetic particle inspection of the tube body for the detection of surface imperfections
<b>ISO 13916</b>	Welding – Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature
<b>ISO 13920</b>	Welding – General tolerances for welded constructions – Dimensions for lengths and angles – Shape and position
<b>ISO 14175</b>	Welding consumables – Shielding gases for arc welding and cutting
<b>ISO 14284</b>	Steel and iron – Sampling and preparation of samples for the determination of chemical composition
<b>ISO 14313</b>	PGNI – Specification for Pipeline Valves
<b>ISO 14731</b>	Welding coordination – Tasks and responsibilities
<b>ISO 14732</b>	Welding personnel – Approval testing of welding operators for fusion welding and of resistance weld setters for fully mechanized and automatic welding of metallic materials (I.Q.I.)
<b>ISO 15510</b>	Stainless steels – Chemical composition
<b>ISO 15607</b>	Specification and qualification of welding procedures for metallic materials – General rules
<b>ISO 15609-2</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 2: Gas welding
<b>ISO 15609-3</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 3: Electron beam welding
<b>ISO 15609-4</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 4: Laser beam welding
<b>ISO 15609-5</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 5: Resistance welding
<b>ISO 15610</b>	Specification and qualification of welding procedures for metallic materials – Qualification based on tested welding consumables.
<b>ISO 15611</b>	Specification and qualification of welding procedures for metallic materials – Qualification based on previous welding experience
<b>ISO 15612</b>	Specification and qualification of welding procedures for metallic materials – Qualification by adoption of a standard welding procedure
<b>ISO 15613</b>	Specification and qualification of welding procedures for metallic materials – Qualification based on pre-production welding test
<b>ISO 15614-1</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys
<b>ISO 15614-2</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 2: Arc welding of aluminium and its alloys
<b>ISO 15614-3</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 3: Fusion welding of non-alloyed and low-alloyed cast irons
<b>ISO 15614-4</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 4: Finishing welding of aluminium castings
<b>ISO 15614-5</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 5: Arc welding of titanium, zirconium and their alloys
<b>ISO 15614-6</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 6: Arc and gas welding of copper and its alloys
<b>ISO 15614-7</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 7: Overlay welding
<b>ISO 15614-8</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 8: Welding of tubes to tube-plate joints
<b>ISO 15614-10</b>	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 10: Hyperbaric dry welding

<b>ISO 15614-11</b>	Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 11: Electron and laser beam welding
<b>ISO 15614-12</b>	Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 12: Spot, seam and projection welding
<b>ISO 15614-13</b>	Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 13: Resistance butt and flash welding
<b>ISO 15618-1</b>	Qualification testing of welders for underwater welding — Part 1: Diver-welders for hyperbaric wet welding
<b>ISO 15618-2</b>	Qualification testing of welders for underwater welding — Part 2: Diver-welders and welding operators for hyperbaric dry welding
<b>ISO 17636</b>	Non-destructive testing of welds – Radiographic testing of fusion-welded joints
<b>ISO 19840</b>	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Measurement of, and acceptance criteria for, the thickness of dry film on rough surfaces
<b>ISO 20340</b>	Paints and varnishes – Performance requirements for protective paint systems for offshore and related structures
<b>ISO D34</b>	Rubber, vulcanized or thermoplastic – Determination of tear strength
<b>ISO/TR 15608</b>	Welding – Guidelines for a metallic materials grouping system
<b>NACE RP0188</b>	Discontinuity (holiday) testing of protective coatings, nickel alloys
<b>NORSOK L-001</b>	Piping and Valves
<b>NORSOK N-001</b>	Structural design
<b>NORSOK N-004</b>	Design of steel structures
<b>NORSOK R-004</b>	Piping and Equipment Insulation
<b>NORSOK S-002</b>	Working environment
<b>NS 3420</b>	Beskrivelsestekster for bygg og anlegg (Specification texts for building and construction)
<b>NS 3472</b>	Prosjektering av stålkonstruksjoner. Beregnings og konstruksjonsregler. (Steel structures - Design rules)
<b>NS 3473</b>	Concrete Structures. Design Rules.
<b>NS 476</b>	Paints and coatings – Approval and certification of surface treatment inspectors
<b>NS 477</b>	Welding. Rules for approval of welding inspectors
<b>NTS-GRP-FJS/01</b>	Certification of personnel for installation of composite pipes
<b>NTS-GRP-INSP/01</b>	Certification of inspectors for installation of composite pipes
<b>SFS 8145</b>	Anticorrosive painting, surface preparation methods of blast cleaned and shop primer coated steel substrates and preparation grades for respective treatments.
<b>SSPC/SSPM Vol 2</b>	Systems and Specifications, Fourth Edition
<b>U.S. Mil. Spec. 18001</b>	Military Specification for Anodes, Corrosion preventive, Zinc; slab, disc and rod shaped.

### 3.4 OGP Catalogue of standards

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OGP Standards committee has developed a Catalogue of International IEC and ISO Standards used in the petroleum & natural gas industries. This report lists about 1,300 ISO standards and 700 IEC standards used by the OGP Standards committee member companies. For full catalogue ref. OGP Report 362, January 2005 available at <http://www.ogp.org.uk>.

## 4 – ISO/TC 67 “materials” related standards committees

### 4.1 General

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ISO/TC 67 “Materials, equipment and offshore structures for the petroleum, petrochemical and natural gas industry” is the main ISO committee for development of standards within the upstream oil & gas industry. API offered 88 of its specifications and recommended practices to start work in this committee in 1989. A number of the ISO standards developed are also applicable to the downstream industry. ISO/TC 67 enjoys good cooperation with API, CEN, GOST, GSO, SAC and other SDOs which adopts many of the ISO standards published. API have re-adopted about 6 ISO/TC 67 standards, whereas CEN/TC12 has adopted about 115 ISO/TC 67 standards as of April 2009. China, Gulf states, Russia and others also adopts the ISO/TC 67 standards.

ISO/TC 67 related websites:

- [http://www.iso.org/iso/standards\\_development/technical\\_committees/list\\_of\\_iso\\_technical\\_committees/iso\\_technical\\_committee.htm?commid=49506](http://www.iso.org/iso/standards_development/technical_committees/list_of_iso_technical_committees/iso_technical_committee.htm?commid=49506)
- <http://committees.api.org/standards/isotc67/index.html>
- <http://www.pngis.net>

### 4.2 ISO/TC 67/WG 5 Aluminium alloy pipes

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This is an active WG directly under the TC itself and it is presently convened by Russia. The WG is responsible for the development and maintenance of the following standards:

- ISO 15546** Aluminium alloy drill pipe
- DIS 20312** RP for design and operating limits of drill stem of aluminium drill string
- WD 27627** Aluminium alloy drill pipe thread connection gauging

### 4.3 ISO/TC 67/WG7 Materials for use in H<sub>2</sub>S containing environments in oil & gas production

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This is an active WG directly under the TC itself and it is presently convened by Germany. The WG is responsible for the development and maintenance of ISO 15156 Materials for use in H<sub>2</sub>S containing environments in oil & gas production, now published in three parts:

- Part 1: General principles for selection of cracking-resistant material
- Part 2: Cracking resistant carbon and low alloy steels
- Part 3: Cracking resistant CRAs (corrosion-resistant alloys) and other alloys

The ISO standards have been adopted by NACE as MR0175/ISO 15156 identically. A joint maintenance panel has been appointed to maintain the standards and provide interpretations. Ref <http://www.nace.org/NACE/Content/technical/MR0175/MaintenanceActivities.pdf> and <http://isotc.iso.org/livelink/livelink?func=ll&objId=3340364&objAction=browse&sort=name>.

Another project in this WG7 is ISO 23936–1 Petroleum and natural gas industries – Non-metallic materials in contact with media related to oil & gas production – in several parts:

- Part 1: Thermoplastics – published April 2009
- Part 2: Elastomers – work starting with assistance from MERL JIP
- Part 3: Thermosets
- Part 4: Fibre reinforced composites
- Part 5: Other nonmetallic materials

Further parts of this standard will be developed when time and resources are available.

#### **4.4 ISO/TC 67/WG8 Materials, corrosion, welding and joining and ndt**

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Following the OGP Materials Workshop 7-8 February 2007, it was proposed to reactivate this WG (disbanded in 2001). The reactivated WG held its first meeting 20-21 June 2007, hosted by Chevron in Houston, Texas with a Brazilian secretariat.

The global oil & gas industry now have an international material standards work group that can discuss and take the broad view on what is required in terms of general materials requirements and recommendations from a truly international point of view. The international materials standards work within many different work groups both at the international, national and at an industry level may be influenced. The present scope of WG8 is as follows:

- to provide advice to ISO/TC 67 subcommittees and work groups on the selection of Standards for materials, corrosion control, welding and joining and NDE, either ISO or others as appropriate at the time;
- to analyse the current and pending ISO/TC 67 design and equipment standards for references to materials, corrosion control, welding and joining and NDE requirements in order to determine the gaps and overlaps;
- to identify possible new work items to fill the gaps;
- to propose rationalisation where overlaps exist, for example by identifying possible new work items to harmonise the overlaps;
- to assist in the prioritisation of work items for materials, corrosion control, welding and joining and NDE;
- to propose the initiation of new work items that are directly relevant to ISO/TC 67 and that are specifically in the fields of materials, corrosion control, welding and joining and NDE, and to recommend where in ISO the work could be done most efficiently;
- to propose liaisons, on behalf of ISO/TC 67, with other ISO TCs covering materials, corrosion control, welding and joining and NDE, where it is necessary to ensure that the needs of ISO/TC 67 are met.

WG8 has one active new work item (21457): To develop an ISO for “PNGI – Materials selection and corrosion control for oil & gas production systems”.

#### **4.5 ISO/TC 67/SC2/WG 8 Welding of pipelines**

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This is an active WG under SC2 with the responsibility to maintain and revise ISO 13847 Welding of pipelines (based on API 1104). WG started revision May 2007.

#### **4.6 ISO/TC 67/SC2/WG 10 Induction bends, flanges, fittings**

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This is at present an inactive WG under SC2 with the responsibility to maintain and revise ISO 15590 Induction bends, flanges, fittings, part 1-3.

#### **4.7 ISO/TC 67/SC2/WG11 Cathodic Protection of land & offshore pipelines**

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This WG is responsible for ISO 15589 part 1 (land) issued in 2003 and part 2 (offshore) issued in 2004

#### **4.8 ISO/TC 67/SC2 WG 14 External pipeline protective coatings**

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This is a large and very active WG with five task groups with the responsibility to develop a new series of standards for External pipeline protective coatings, ISO 21809, in 5 parts:

- WG14-1 Polyolefin coatings (3-layer PE & 3-layer PP)
- WG14-2 Fusion bonded epoxy coatings – published 2007
- WG14-3 Field joint coatings – published 2008
- WG14-4 Polyethylene coatings (2-layer PE)
- WG14-5 External concrete coatings

#### **4.9 ISO/TC 67/SC2/WG16 Line pipe – ISO 3183 revision**

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This WG has successfully revised ISO 3183 (combined three parts to one part) and the new standard was published by ISO in March 2007. This work is done in cooperation with API committee revising their API Spec 5L for line pipe, with the intent that the new ISO 3183 standard will be adopted as the next revision of API Spec 5L. The adopted API spec 5L was published as its 44<sup>th</sup> Revision, dated October 2007. This is a major achievement.

It may be interesting to note that Russia has translated and formally adopted the former issue of ISO 3183:1999 standard in three parts and issued it as a GOST R/ISO standard. China has also adopted this three part ISO standard as GB/T 9711.

#### **4.10 ISO/TC 67/SC4/WG3 Wellhead and Christmas tree equipment**

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This WG is responsible for the maintenance of ISO 10423 Wellhead and Christmas tree equipment. This is done in close cooperation with API and with the clear intent that the new revision of ISO 10423 will be the next revision of API Spec 6A with same title. These two documents have been worked in parallel for some years, but there is some divergence in the API adoption of the ISO standard, which now hopefully will be resolved. The DIS 10423 ballot closed in November 2008.

This standard is a key documents as many other standards within the oil & gas industry makes references to ISO 10423 and API Spec 6A.

## 4.11 ISO/TC 67/SC4/WG6 Subsea equipment

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This WG has a large series of ISO 13628 standards currently issued in 11 parts, but work is underway to develop five more parts of this standards. Works closely with API/C1/SC17 Subsea. Materials requirements and recommendations are embedded in the individual standards, with more general material recommendations and requirements in ISO 13628, part 1 General recommendations and requirements.

In 2005 a materials task group was jointly formed by API SC17 and ISO/TC 67/SC4/WG6 to develop a new clause 6 for the materials requirements and recommendations in ISO 13628-1. This group is also developing a new Annex L for Materials and welding of manifold piping and jumpers. These updates will be published as amendments after a normal ISO ballot process. The drafts have now been completed by the task group and the DIS ballot was closed in March 2009.

In December of 2008, an SPE Applied Technology Workshop (ATW) on Subsea Standardization was held in Austin, Texas. The ATW was well attended and represented a wide cross section of the subsea industry for both operators and equipment manufacturers. The general consensus of the group was there is potentially room for some level of industry standardisation. The focus of this standardisation is likely to be material and welding qualification and quality assurance.

## 4.12 ISO/TC 67/SC5 Casing, tubing and drill pipe

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This Subcommittee deals with all the OCTG which is one of the large commodity items in the oil & gas industry. There are three main ISO standards in this area from a materials point of view:

- **ISO 11960** Casing & tubing (API 5CT)
- **ISO 11961** Drill pipe (API 5D)
- **ISO 13980** Corrosion resistant alloy seamless tubes for use as casing, tubing, and coupling stock (API 5CRA).

These have been established on the basis of the API Specifications and now there is good cooperation between ISO and API on these matters with the ISO standards being back-adopted by API. The ISO work is handled by two working groups under SC5:

- WG 1 Casing, tubing and drill pipe
- WG 3 Corrosion resistant alloy seamless tubes for use as casing, tubing and coupling stock.

### 4.13 ISO/TC 67/SC6/WG5 Piping systems

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WG 5 Piping systems is responsible for the following standards which includes more or less material related topics:

- 13703 Offshore piping
- 14692 GRP piping – 4 parts; in revision.
- 15649 Piping

ISO 13703 is an international adoption of API Spec 14E which again is largely based on ANSI B31.3 for piping on the offshore installations. ISO 15649 is an adoption of ISO 13703 to comply with the EU Pressure Equipment Directive. ISO 13703 may – together with ISO 15649 – be revised to carry the necessary international supplements, including material requirements and recommendations for the use of ANSI B 31.3 for piping on offshore installations. Norway has supplementary requirements in NORSOK L-001 Piping and valves, M-601 Welding and inspection of piping and M-630 and Material data sheets for piping and EEMUA also have some documents in this area.

ISO 13703 was reconfirmed in 2005 with no revision. If there is support for revising ISO 13703 Offshore piping to carry the necessary international supplements a New Work Item Proposal is required to be positively balloted to open this for further work. In the present form the document does not suitably cover material requirements.

### 4.14 ISO/TC 67/SC7 Offshore structures

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This SC which is under British leadership has a WG3 which have been working for many years on developing ISO 19902 “Fixed offshore steel structures”, now at 645 pages (!). This standard was published in November 2007. It includes a large clause on materials and one on fabrication of steel structures. Present thinking is that these two sections should become a separate standard at next revision. API is closely following and participating in this work and has made plans for the adoption of the ISO 19900-series of standards within the next few years.

ISO 19902 was adopted by CEN as EN ISO 19902 shortly after ISO publication and within six months all European countries are obliged to adopt this standard as their national standard for “Fixed offshore steel structures”. Denmark has already included this new standard in their revised offshore regulations.

Another important standard within this committee is ISO 19901-3 Topside structures. The same materials and fabrication clauses basically applies here. This standard is still in its development stages, with DIS ballot closed in November of 2007.

Finally SC7 has a WG8 under Canadian leadership that works on an ISO 19906 standard for arctic offshore structures. This standard is presently at DIS ballot.

## 5 – Other ISO material relevant committees

### 5.1 ISO/TC 17 Steel

ISO/TC17 covers standardisation in the field of cast, wrought and cold-formed steel, including technical delivery conditions for steel tubes for pressure purposes. Excluded:

- steel tubes within the scope of ISO/TC 5;
- line pipe, casing, tubing and drill pipe within the scope of ISO/TC 67;
- methods of mechanical testing of metals within the scope of ISO/TC 164.

The current main subject in the development of ISO standards in ISO/TC17 is to improve the market relevancy of ISO standards developed or to be developed within ISO/TC17. To make ISO standards more usable in the market, international trade will be further promoted. The benefits of standardisation, such as cost reduction and a speedier distribution of products can be expected. Basic attitude of the ISO TC17 for the preparation of ISO standards is follows,

1. ISO/TC17 esteems the spirit of the WTO/TBT Agreement and devotes all efforts toward the preparation of ISO standards usable in the market of its member nations, either directly or indirectly through national or regional standards.
2. Each nation already has its own national or regional standards reflecting market needs based on individual climatic and geological environments, historical backgrounds of technologies, Laws and technological regulations. To make ISO standards acceptable to the markets of different nations, the coverage and contents of their national or regional standards should be respected in their preparation, especially in the early stage of their preparation.
3. All nations should aim at keeping the difference between their national standards and ISO standards, at least, at the level a) or b) of “Modified” specified in the ISO/IEC Guide 21:1999.
4. The P-members of ISO/TC17 or ISO/TC17/SCs should ensure to let all members joining early development work of an ISO standard within ISO/TC17 act along the guideline.

#### Subcommittee/Working Group of ISO/TC17 relevant for oil & gas:

TC 17/AG	Advisory group
TC 17/WG 15	Steel – Basic rules for specifying impact strength in specifications
TC 17/WG 16	Magnetic steels
TC 17/WG 17	Steel names based on principal symbols
TC 17/SC 1	Methods of determination of chemical composition
TC 17/SC 3	Steels for structural purposes
TC 17/SC 4	Heat treatable and alloy steels
TC 17/SC 7	Methods of testing (other than mechanical tests and chemical analysis)
TC 17/SC 10	Steel for pressure purposes
TC 17/SC 11	Steel castings
TC 17/SC 12	Continuous mill flat rolled products
TC 17/SC 16	Steels for the reinforcement and prestressing of concrete
TC 17/SC 19	Technical delivery conditions for steel tubes for pressure purposes
TC 17/SC 20	General technical delivery conditions, sampling

ISO/TC17 has chairman and secretariat held by Japan. It appears to be an active committee. There are many other WGs under some of the SCs.

Total number of published ISO standards related to the TC and its SCs:	306
Participating countries:	30
Observing countries:	34

#### Examples of standards in ISO/TC17 under development:

- ISO/CD 9328-1** Steel flat products for pressure purposes — Technical delivery conditions — Part 1: General requirements
- ISO/CD 9328-2** Steel flat products for pressure purposes — Technical delivery conditions — Part 2: Non-alloy and alloy steels with specified elevated temperature properties
- ISO/DIS 10332** Non-destructive testing of steel tubes — Automated ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for verification of hydraulic leak-tightness as a substitution for the hydraulic test
- ISO/DIS 10893-x** Non-destructive testing of steel tubes – Many parts
- ISO/DIS 4986** Steel and iron castings — Magnetic particle inspection
- ISO/DIS 4987** Steel and iron castings — Liquid penetrant inspection
- ISO/NP 10474** Steel and steel products — Inspection documents
- ISO/WD 630-1** Structural steels — Part 1: General delivery conditions for hot rolled products
- ISO/WD 630-2** Structural steels — Part 2: Technical delivery conditions for non alloy structural steels for general purpose.

## 5.2 ISO/TC35 Paints and varnishes

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This committee develops ISO standards of interest to the oil & gas industry:

- ISO 12944** Paints and varnishes
- ISO 15741:2001** Paints and varnishes – Friction-reduction coatings for the interior of on – and offshore steel pipelines for non-corrosive gases
- ISO 20340:2003** Paints and varnishes – Performance requirements for protective paint systems for offshore and related structures

### 5.3 ISO/TC44 Welding and allied processes

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ISO/TC 44 produces standards in the field of welding, by all processes, as well as allied processes; these standards include terminology, definitions and the symbolic representation of welds on drawings, apparatus and equipment for welding, raw materials (gas, parent and filler metals) welding processes and rules, methods of test and control, calculations and design of welded assemblies, welders' qualifications as well as safety and health.

Total number of published ISO standards related to the TC and its SCs:	276
Participating countries:	34
Observing countries:	37

This committee develops a number of ISO standards of general interest also to the oil & gas industry.

### 5.4 ISO/TC156 Corrosion of metals and alloys

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ISO/TC 156 is responsible for standardisation in the field of corrosion of metals and alloys including corrosion test methods and corrosion prevention methods. It also deals with the coordination of these activities within ISO.

Total number of published ISO standards related to the TC and its SCs:	54
Participating countries:	20
Observing countries:	27

This committee develops ISO standards of interest to the oil & gas industry.

## 6 – API standards committees

API has been working on standards for the oil & gas industry since 1923 and materials issues are integrated and covered in many of its subcommittees and work groups, which are normally split on component level, such as:

- **SC2** – Subcommittee on Offshore Structures
- **SC5** – Subcommittee on Tubular Goods
- **SC6** – Subcommittee on Valves & Wellhead Equipment
- **SC8** – Subcommittee on Drilling Structures & Equipment
- **SC15** – Subcommittee on Fibreglas & Plastic Tubulars
- **SC16** – Subcommittee on Drilling Well Control Equipment
- **SC17** – Subcommittee on Subsea Production Equipment
- **SC18** – Subcommittee on Quality
- **SC19** – Subcommittee on Completion Equipment
- **SC20** – Subcommittee on Supply Chain Management

Many of the standards developed by API have been offered to ISO for internationalisation and about 60% of the ISO/TC 67 standards now published are based on previous API documents. API is recognised by the American National Standards Institute (ANSI) as the national US standards development organisation for the oil & gas industry. Some of the key API standards which are important as regards material requirements are:

<b>API RP 2A-WSD</b>	Planning, Designing and Constructing Fixed Offshore Platforms — Working Stress Design
<b>API Spec 2W</b>	Steel Plates for Offshore Structures, Produced by Thermo-Mechanical Control Processing (TMCP)
<b>API Spec 2Y</b>	Steel Plates, Quenched-and-tempered, for Offshore Structures
<b>API RP 2Z</b>	Preproduction Qualification for Steel Plates for Offshore Structures
<b>API Spec 2B</b>	Fabrication of Structural Steel Pipe
<b>API Spec 5CT</b>	Casing and tubing
<b>API Spec 6A</b>	Wellhead and christmas tree equipment
<b>API RP 14E</b>	Offshore piping
<b>API TR 17TR1</b>	Evaluation Standard for Internal Pressure Sheath Polymers for High Temperature Flexible Pipes
<b>API TR 17TR2</b>	The Ageing of PA-11 in Flexible Pipes
<b>API RP 49</b>	Recommended Practice for Drilling and Well Servicing Operations Involving Hydrogen Sulfide
<b>API RP 571</b>	Damage Mechanisms Affecting Fixed Equipment in the Refining Industry
<b>API TR 938-C</b>	Use of Duplex Stainless Steels in the Oil Refining Industry
<b>API Std 1104</b>	Welding of Pipelines and Related Facilities
<b>API RP 1111</b>	Design, Construction, Operation, and Maintenance of Off-shore Hydrocarbon Pipeline and Risers

The new API SC20 for “Supply chain management” looks into some materials issues related to critical forgings, heat treatment and NDT:

<b>API Spec 20A</b>	Closed-die forgings for critical services
<b>API Spec 20B</b>	Heat treatment
<b>API Spec 20C</b>	NDT

API committee documents are available at: <http://committees.api.org/standards/ecs/index.html>.

## 7 – ASTM standards committees

Numerous ASTM standards are being used in the oil & gas industry as reference documents, however, no active participation by the global oil & gas industry in ASTM work well is known.

The ASTM standards are used in many instances by the upstream oil & gas community and in particular in Europe with additional requirements.

## 8 – AWS standards committees

American Welding Society has been developing standards used by the oil & gas industry for many years. One of the best known standards may be:

**AWS D1.1** Structural welding code steel

## 9 – CEN Materials related committees

### 9.1 CEN/TC12

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This committee mainly adopts the standards developed by ISO/TC 67 as EN-ISO standards. These in turn are adopted by all members of CEN, which are basically all the 30+ member countries of EU and EEA. As of end 2008, CEN/TC12 has adopted about 120 of the ISO/TC 67 published standards. This implies that these standards will have been adopted – or will be adopted within six months of their CEN approval – as national standards for the subjects in question by all European countries, with the competing national standards to be withdrawn.

### 9.2 CEN/TC 219 cathodic protection

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This committee have developed standards of relevance for the oil & gas industry, mainly from a European perspective. Liaison with this committee is in discussion by ISO/TC 67/SC2/WG11

**EN 12473:2000** General principles of cathodic protection in sea water

**EN 12474:2001** Cathodic protection of submarine pipelines

**EN 12495:2000** Cathodic protection for fixed steel offshore structures

**EN 12954:2001** Cathodic protection of buried or immersed metallic structures – General principles and application for pipelines

**EN 13173:2001** Cathodic protection for steel offshore floating structures

**EN 15112:2006** External cathodic protection of well casings

Some of these standards were in the process of being adopted by ISO/TC 156, but ISO/TC 67 have commented this and requested some reconsiderations in view of having issued ISO 15589, part 1 and 2.

### 9.3 CEN/TC234 Gas infrastructure

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The WG3 of this committee has developed an extensive package of standards for gas pipelines used in Europe, including material standards. Discussions have been held with ISO/TC 67/SC2 to harmonise its standards, but so far with little success. Hence, when CEN/TC12 adopted the ISO/TC 67 standard 13623 for pipelines it had to be restricted to exclude onland gas pipelines. So also with the accompanying welding and component standards. However, work is underway to study the differences in these standards, which will hopefully lead to new efforts in the harmonisation work.

## 10 – ECISS

ECISS (European Committee for Iron and Steel Standardization) has taken over the standardisation activities of COCOR, the Coordinating Committee on the nomenclature of iron and steel products, a committee originally set up under the ECSC (European Coal and Steel Community) Treaty. It develops draft standards which are then submitted for the formal approval of the CEN National Members. ECISS became an Associated Body of CEN in 1986. The CEN Management Centre provides its Secretariat. ECISS has until now the following technical committees:

- ECISS/TC 1** Steel – Mechanical testing
- ECISS/TC 2** Steel – Physico-chemical and non-destructive testing
- ECISS/TC 6** Steels – Definition and classification
- ECISS/TC 7** Conventional designation of steel
- ECISS/TC 9** Technical conditions of delivery and quality control
- ECISS/TC 10** Structural steels – Grades and qualities
- ECISS/TC 11** Structural steel sections and hot rolled steel bars for engineering use – Dimensions and tolerances
- ECISS/TC 12** Structural steels and steels for pressure purposes, flat products – Dimensions and tolerances
- ECISS/TC 13** Flat products for cold working – Qualities, dimensions, tolerances and specific tests
- ECISS/TC 15** Wire-rod – Qualities, dimensions, tolerances and specific tests
- ECISS/TC 19** Concrete reinforcing and prestressing steels – Properties, dimensions, tolerances and specific tests
- ECISS/TC 20** Methods of chemical analysis of ferrous products
- ECISS/TC 21** Vocabulary of heat treatment terms
- ECISS/TC 22** Steels for pressure purposes – Qualities
- ECISS/TC 23** Steels for heat treatment, alloy steels and free-cutting steels – Qualities and dimensions
- ECISS/TC 24** Electrical steel sheet and strip qualities – Qualities, dimensions, tolerances and specific tests
- ECISS/TC 26** Tinmill products – Qualities, dimensions, tolerances and specific tests
- ECISS/TC 27** Surface coated flat products – Qualities, dimensions, tolerances and specific tests
- ECISS/TC 29** Steel tubes and fittings for steel tubes
- ECISS/TC 30** Steel wires
- ECISS/TC 31** Steel castings

ECISS/TC 10 has among many others, developed the following standard:

- EN 10225:2001** Weldable structural steels for fixed offshore structures – Technical delivery conditions (which is under development and approval, targeted for August 2009)

ECISS/TC 29 has among many others, developed the following standard:

- EN 10208-1:1997** Steel pipes for pipelines for combustible fluids – Technical delivery conditions – Part 1: Pipes of requirement class A
- EN 10208-2:1996** Steel pipes for pipelines for combustible fluids – Technical delivery conditions – Part 2: Pipes of requirement class B
- EN 10288:2002** Steel tubes and fittings for onshore and offshore pipelines – External two layer extruded polyethylene based coatings
- EN 10289:2002** Steel tubes and fittings for onshore and offshore pipelines – External liquid applied epoxy and epoxy-modified coatings
- EN 10290:2002** Steel tubes and fittings for onshore and offshore pipelines – External liquid applied polyurethane and polyurethane-modified coatings
- EN 10298:2005** Steel tubes and fittings for on shore and offshore pipelines – Internal lining with cement mortar
- EN 10300:2005** Steel tubes and fittings for onshore and offshore pipelines – Bituminous hot applied materials for external coating
- EN 10301:2003** Steel tubes and fittings for on and offshore pipelines – Internal coating for the reduction of friction for conveyance of non corrosive gas
- EN 10310:2003** Steel tubes and fittings for onshore and offshore pipelines – Internal and external polyamide powder based coatings
- EN 10329:2006** Steel tubes and fittings for onshore and offshore pipelines – External field joint coatings
- EN 10339:2007** Steel tubes for onshore and offshore water pipelines – Internal liquid applied epoxy linings for corrosion protection

ECISS/TC29/SC4 works with ISO/TC 67/SC2 on pipeline coating standards and their adoption into the European sphere.

A new organisation of ECISS was decided in Vienna end of 2008 and will be put in place beginning of 2010. Numbers have not yet been given to the new Technical Committees. The new list of TCs is given below:

<b>New title</b>	<b>Former ECISS TCs</b>	<b>Secr.</b>
General issues	ECISS/TC 5 (disbanded), 6, 7, 9, 21	UK
Tests other than chemical analysis	ECISS/TC 1 and 2	FR
Chemical analysis	ECISS/TC 20	SE
Structural steels other than reinforcements	ECISS/TC 10 (+ SC1 and 4), 11, 12	DE
Reinforcing and prestressing steels	ECISS/TC 19 (+ SC 1 and 2)	DE
Steels for heat treatment, alloy steels, free-cutting steels and stainless steels	ECISS/TC 23 (+SC 1)	DE
Wire rod and wire	ECISS/TC 15 and 30	FR
Steels for pressure purposes	ECISS/TC 22	DE
Electrical steel sheet and strip	ECISS/TC 24	DE
Coated and uncoated flat products for cold working and construction	ECISS/TC 13, 26, 27 (+SC 1)	FR
Tubes	ECISS/TC 29 + SCs	IT
Castings and Forgings	ECISS/TC 31 + ECISS/TC 28	FR

## 11 – EFC standards work

The European Federation of Corrosion (EFC) is a voluntary association of non-profit-making scientific and technical societies and association. The purpose of the Federation is to contribute to the general advancement of the science of corrosion and of the protection of materials by promoting cooperation in Europe between scientific and technical societies and associations devoted to these areas of activity and by collaborating with similar associations throughout the world. EFC has a cooperation agreement with NACE. EFC organises an annual corrosion conference, EUROCORR, somewhere in Europe.

EFC has published two standards used by the European oil & gas industry:

- EFC 16 Corrosion Resistant Alloys for Oil & Gas Production: Guidance on General Requirements and Test Methods for H<sub>2</sub>S Service (EFC 17, 2nd Edition) May 2002. A revised and updated set of guidelines applicable to stainless steels, nickel alloys and titanium alloys covering: SSC/SCC test procedures; reference environments for SSC and SCC testing; guidance on autoclave testing of CRAs; procedures for testing CRAs exposed to sulphur and H<sub>2</sub>S.
- EFC 17 Materials Requirements for Carbon and Low Alloy Steels for H<sub>2</sub>S-Containing Environments in Oil & Gas Production (EFC 16, 2<sup>nd</sup> Edition) March 2002. This is a revised and updated version of an EFC report on the possible types of H<sub>2</sub>S cracking that can occur in an oilfield. It covers all items of equipment used, from the well to the export pipelines and also recommends test methods for evaluating materials performance. A key reference document for materials engineers and product suppliers working in the oil & gas industry.

However, the new parts of ISO 15156 standards are now taking over as reference for the subject.

# 12 – EEMUA Materials technology committee (MTC)

## 12.1 General introduction to EEMUA

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EEMUA (Engineering Equipment & Materials Users' Association) was founded in 1983 by amalgamating the Engineering Equipment Users Association (EEUA) founded in 1950 with the Oil Companies Materials Association (OCMA), also founded in the early 1950s. EEMUA has its head office in London and most of its members are British companies.

EEMUA's mission is to improve quality and safety, and to reduce the cost of operating industrial facilities by sharing experience and expertise, and by the active, enlightened promotion of the distinct interests of engineering users. This mission is achieved by:

- Providing the organisation within which networking, information sharing and collaboration among users on non-competitive technical matters can take place
- Influencing the way written regulations are interpreted and applied in practice
- Promoting and presenting the users' views, and encouraging the application of good sound engineering practice
- Developing and publishing user standards, specifications, and training materials
- Facilitating members' participation in national, European and international standards making
- Influencing relevant national and European legislation and regulations.

One of the EEMUA committees focus on Material Technology (EEMUA MTC)

## 12.2 Relevant EEMUA Publications

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<b>144:87</b>	90/10 Copper Nickel Alloy Piping for Offshore Applications – Specification: Tubes Seamless and Welded
<b>145:87</b>	90/10 Copper Nickel Alloy Piping for Offshore Applications – Specification: Flanges Composite and Solid
<b>146:87</b>	90/10 Copper Nickel Alloy Piping for Offshore Applications – Specification: Fittings
<b>149:97</b>	Code of Practice for the Identification and Checking of Materials of Construction in Pressure Systems in Process Plants
<b>158:94</b>	Construction Specification for Fixed Offshore Structures in the North Sea
<b>176:98</b>	Specification for Structural Castings for Use Offshore
<b>179:96</b>	A Working Guide for Carbon Steel Equipment in Wet H <sub>2</sub> S Service
<b>194:04</b>	Guidelines for Materials Selection and Corrosion Control for Subsea Oil & Gas Production Equipment
<b>197:99</b>	Specification for the Fabrication of Non-Primary Structural Steelwork for Offshore Installations
<b>203:04</b>	Guide to the Application of ISO 3183 Parts 2 (1996) and 3 (1999) Petroleum and Natural Gas Industries – Steel Pipes for Pipelines – Technical Delivery Conditions
<b>204:05</b>	Piping and the European Pressure Equipment Directive: Guidance for Plant Owners/Operators

## 13 – NACE standards committees

Since 1943 NACE have been dedicated to a single mission – to protect people, assets, and environment from the effects of corrosion. NACE have members in 92 countries. Built upon decades of knowledge and expertise from dedicated members all around the world, NACE International is involved in every industry and area of corrosion prevention and control, from chemical processing and water systems to transportation and infrastructure protection. NACE International is a track to the corrosion engineering and science community, and is recognised around the world as an authority for corrosion control solutions.

NACE International serves its members by:

- Setting standards for the corrosion industry
- Disseminating the latest technology worldwide through peer-reviewed journals and technical papers
- Hosting and managing the most important international conferences, exhibits and topical meetings in the corrosion industry
- Recognising distinguished achievement in corrosion through the presentation of well-respected awards
- Linking you to colleagues and important career information
- Enhancing programs, services and connections with the corporate community
- Promoting the interests of the corrosion science and engineering industry through government relation activities in Washington, D.C.

The consequences of sudden failures of metallic components used in the oil & gas field, and associated with their exposure to H<sub>2</sub>S-containing production fluids, led to the preparation of the first edition of NACE Standard MR0175. This standard was published in 1975 by the National Association of Corrosion Engineers, now known as NACE International.

In separate developments, the European Federation of Corrosion issued EFC Publication 16 in 1995 and EFC Publication 17 in 1996. These documents are generally complementary to those of NACE though they differ in scope and detail.

With the cooperation of NACE and EFC, ISO/TC 67 formed Working Group 7 to prepare ISO 15156. The Working Group are to promote the collection, review and, where appropriate, publication of field experience and laboratory test data related to the cracking resistance of metallic materials in H<sub>2</sub>S-containing environments. NACE MR0175/ISO 15156 utilises the above sources to provide requirements and recommendations for materials qualification and selection for safe application in environments containing wet H<sub>2</sub>S in oil & gas production systems.

Four Technical Corrigenda (addenda) providing revisions to NACE MR0175/ISO 15156, are the results of ballot items approved during 2004 and 2005. The ISO Maintenance Panel is the group responsible for interpretations and ballots for change related to NACE MR0175/ISO 15156. This group reports up through ISO TC 67 WG7.

NACE Specific Technology Group (STG) 32 is the committee responsible for Oil & Gas Production Metallurgy. Under this STG, there are several Task Groups and Technology Exchange Groups. Relevant task groups are as follows:

1. TG 299 – NACE MR0175/ISO 15156: Oversight of Maintenance Panel. Assignment: Review and vote on revisions or addenda proposed for NACE MR0175/ISO 15156, and technical reports or other data published by the maintenance panel.
2. TG 328 – Welding and Fabrication of Corrosion-Resistant Alloys (CRAs) – Corrosion Issues in Oil & Gas Production. Assignment: Produce a state-of-the-art technical committee report reviewing current corrosion issues related to the welding, fabrication, and assessment of corrosion-resistant alloys (CRAs) for successful operation in oil & gas production environments with specific consideration of corrosion and environmentally assisted cracking.

## 14 – Norsok standards committee – Standards Norway

The Norsok standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness –for petroleum industry developments and operations. Furthermore, Norsok standards are as far as possible intended to replace oil company specifications and serve as references in the authorities regulations.

The Norsok standards are normally based on recognised international standards, adding the provisions deemed necessary to fill the broad needs of the Norwegian petroleum industry. Where relevant Norsok standards will be used to provide the Norwegian industry input to the international standardisation process. Subject to development and publication of international standards, the relevant Norsok standard will be withdrawn.

The Norsok standards are developed according to the consensus principle generally applicable standards work and according to established procedures defined in Norsok A-001.

The Norsok standards are prepared and published with support by OLF (The Norwegian Oil Industry Association) and TBL (Federation of Norwegian Manufacturing Industries). Norsok standards are now administered and published by SN (Standards Norway).

Expert Group Materials (SN/K114/EgM) is active, meets regularly and is responsible for the publication and maintenance of following Norsok standards:

<b>M-001</b>	Materials selection (Rev. 4, August 2004)
<b>M-101</b>	Structural steel fabrication (Rev. 4, Dec. 2000)
<b>M-102</b>	Structural aluminium fabrication (Rev. 1, Sept. 1997)
<b>M-120</b>	Material data sheets for structural steel (Rev. 5, Nov. 2008)
<b>M-121</b>	Aluminium structural material (Rev. 1, Sept. 1997)
<b>M-122</b>	Cast structural steel (Rev. 1, June 2003)
<b>M-123</b>	Forged structural steel (Rev. 1, June 2003)
<b>M-501</b>	Surface preparation and protective coating (Rev. 5, June 2004)
<b>M-503</b>	Cathodic protection (Rev. 3, May 2007)
<b>M-506</b>	CO <sub>2</sub> corrosion rate calculation model (Rev. 2, June 2005)
<b>M-601</b>	Welding and inspection of piping (Rev. 5, April 2008)
<b>M-622</b>	Fabrication and installation of GRP piping systems (Rev 1 April 2005)
<b>M-630</b>	Material data sheets for piping (Rev. 4, January 2004)
<b>M-650</b>	Qualification of manufacturers of special materials (Rev. 3, April 2004)
<b>M-710</b>	Qualification of non-metallic sealing materials and manufacturers (Rev. 2, Oct. 2001)

## 15 – OGP Materials Subcommittee

This committee was established after the OGP workshop in 2007 with the following terms of reference:

- a. To arrange for global networking of the materials technology specialists from within the OGP membership.
- b. Share experience and company/project specifications and seek harmonisation at the level of international standards for the benefit of members and industry.
- c. To evaluate and monitor material standards, including codes or guidelines and to identify those which are out of date or inadequate and need revision, and identify those areas in which new standards may be required, but do not presently exist.
- d. To support ISO/TC 67/WG8 and other relevant materials related international standards work groups or developing work.
- e. Assist OGP Standards Committee with executing its terms of reference within the field of materials.

## 16 – TWI standards activities

The Welding Institute, Cambridge, UK plays a key role in the development of many standards which are important to the oil, gas and chemicals industries and is represented on the following committees:

<b>CEN</b>	<b>TC121</b>	Welding (several working groups and subcommittees)
	<b>TC54</b>	Pressure vessels
	<b>TC249/SC5</b>	Welding of thermoplastic materials
<b>ISO</b>	<b>TC44</b>	Testing of welds and welding quality
	<b>TC67/SC2/WG8</b>	Welding of pipelines
	<b>TC67/SC7/WG3</b>	Offshore tubular structures
<b>EFC</b>		Oil & Gas and Refinery Working Parties
<b>NACE</b>	<b>STG32</b>	Oil & Gas Production – Metallurgy
	<b>STG34</b>	Petroleum Refining and Gas Processing
	<b>TG299</b>	Materials for use in H <sub>2</sub> S containing environments in oil & gas production

## 17 – Company specification

All of the international operators have their own in-house technical specifications in order to specify exactly what is considered required for their plants, installations and operations. These specifications (frequently called company standards, design & engineering practices, best practices, supplementary technical specifications *etc*) also carry their operator's valuable experience and they may be supplemented by individual project specifications to cover specific project needs. These documents are normally based on, but include various degrees of supplements and amendments to international, national and industry standards.

At the workshop in February 2007, the operating companies present agreed to share their specifications in the OGP environment, for review by the other participants to see if there was scope for harmonisation, standardisation or improvement in some areas. The operating company technical specifications are made available at a password protected OGP website for information and review by the OGP Materials Subcommittee.

## 18 – Observations and comments

Observation, comments or other input to this report are welcome to be sent to OGP, London by email to [reception@ogp.org.uk](mailto:reception@ogp.org.uk) for consideration of the OGP Materials Sub-committee for the revision of this report.

## What is OGP?

The International Association of Oil & Gas Producers encompasses the world's leading private and state-owned oil & gas companies, their national and regional associations, and major upstream contractors and suppliers.

## Vision

- To work on behalf of the world's oil & gas producing companies to promote responsible and profitable operations

## Mission

- To represent the interests of oil & gas producing companies to international regulators and legislative bodies
- To liaise with other industry associations globally and provide a forum for sharing experiences, debating emerging issues and establishing common ground to promote cooperation, consistency and effectiveness
- To facilitate continuous improvement in HSE, CSR, engineering and operations

## Objectives

- To improve understanding of our industry by being visible, accessible and a reliable source of information
- To represent and advocate industry views by developing effective proposals
- To improve the collection, analysis and dissemination of data on HSE performance
- To develop and disseminate best practice in HSE, engineering and operations
- To promote CSR awareness and best practice



**International  
Association  
of Oil & Gas  
Producers**

209-215 Blackfriars Road  
London SE1 8NL  
United Kingdom  
Telephone: +44 (0)20 7633 0272  
Fax: +44 (0)20 7633 2350

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165 Bd du Souverain  
4th Floor  
B-1160 Brussels, Belgium  
Telephone: +32 (0)2 566 9150  
Fax: +32 (0)2 566 9159

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Internet site: [www.ogp.org.uk](http://www.ogp.org.uk)  
e-mail: [reception@ogp.org.uk](mailto:reception@ogp.org.uk)