SC20 MEETING MINUTES

Wednesday, June 27, 2007
API E&P Standardization Conference
Hyatt Regency San Francisco
San Francisco, California

API Subcommittee on Supply Chain Standards (SC20)

Gary Devlin, Chair
Time: 1:00 PM – 3:00 PM

1. Opening Remarks

Gary Devlin opened the meeting and welcomed those in attendance. An Attendance Roster was circulated and is included as Attachment 1.

2. Introduction of Members

Gary Devlin made a presentation on the membership of the subcommittee and activity since the last meeting (see Attachment 2).

- It was noted that Austin Freeman had replaced John Yonker as the Halliburton rep on SC20. Following is a list of new members:

Forging supplier members:	Companies:
Michael Henderson	Forgital
George Mochnal	Forging Industry Association
Paul Boeckman	Crosby Group
Tom Addison	Eastham Froge
	Ellwood Texas Forge
	Forged Products

Those in attendance were asked to provide the contact information of vendors who might be interested to Gary Devlin or Andy Radford. Gary will contact them and see if they are interested.

- Task Group 20C on Closed Die Forgings met twice, in October and May. Gary has received comments on Draft 3 and is incorporating them into Draft 4 (see Attachment 3).

- New Work Items have been approved for Task Groups on Heat Treatment and NDE. SC20 is currently looking for chairmen and participants for these activities.

  Jerry Longmire (Wood Group Pressure Control) volunteered to chair the NDE task group. D.C. Bartholomew (FMC) volunteered to participate on the group.

3. API Survey Results

Andy Radford gave abrief presentation on the results of the API survey conducted in 2006 (see Attachment 4).

4. SC20 Task Group Reports

A. Spec 20A – Forgings

Gary Devlin provided an overview of the draft document on closed die forgings (See Attachments 2 and 3):

- Currently the draft establishes 4 FSL levels with essential variables that could change and might require re-qualification of the forging.
- There are requirements for Forging Production Process Controls based on the following:
  - Mill supplier approval
  - Material specs
  - Receipt inspection
  - Manufacturing process control procedure
  - Forging reduction
- There are Forging Qualification procedures established for the following:
  - Inspection
  - Testing
  - Examination
  - Documentation
- Limits of Qualification are set based on the following:
  - Limits by FSL 1-4
  - Limits by Material Grade
  - Limits by Weight

B. Spec 20B – Heat Treatment – No activity/report

C. Spec 20C – NDE – No activity/report

5. New Business

- ISO Materials WG

  An ISO new work item was recently approved for a document on materials selection. It was assigned to ISO/TC67/WG8. The API Executive Committee on Standardization (ECS) has assigned this item to SC20 to monitor and facilitate US involvement in the activity of ISO/TC67/WG8. Sc20 is expected to provide updates to the other ECS subcommittees and the USTAG and recommendations on US input to the development process.

  Alf Reidar Johansen provided a brief update on the WG8 activities to date. Based on comments received during the NWI ballot, the project scope was reduced. The group met in Houston in June and resolved the comments received on the NWI ballot (see Attachment 5). It was clarified that this is not a purchasing standard, but is intended as an engineering standard. The next meeting is scheduled for Nov. 13/14 in Paris with follow up meetings in Rio (2/26-27) and Oslo (6/24-25).
- Castings

  Dave Corneilson, Chairman of Quality Committee for Manufacturers Standardization Society was asked to give an update on his group's activity on the development of a castings standard. The main focus of the group is equipment sold to the downstream segment of the industry based on the API 600-series standards. End users have concerns about the quality of castings that were being provided. The workgroup has started to write standard on castings, including criteria for evaluation of casting design.

Gary noted that castings were the next area that SC20 might address once the initial three standrds are developed. The work of Dave's work group could be beneficial as a starting point.

It was noted that API SC2/RG8 was also working on standard for castings such as pad ears, etc. Peter Marshall (MHPSYSENG@aol.com) is the chairman, and SC20 should review their work as well.

6. Adjourn

The meeting was then adjourned.

Attachment 1

RECORD OF MEETING ATTENDANCE

GROUP API SC-20 CHAIRMAN G. DEVLIN

MEETING SUMMER STDZN. CONF TIME 1:00 DATE 27 JUNE 07

COMMITTEE MEMBERS SHOULD MAKE CHANGES TO THEIR PERSONAL RECORD ON THE ATTACHED ROSTER. VISITORS ADDING NAMES TO ROSTER WILL NOT AUTOMATICALLY BECOME MEMBERS OF THE COMMITTEE.

Indicate BEFORE YOUR NAME if you are:
(M) Member of the Committee in session
(R) Representing a Committee Member (if so, state member's name)
(V) Visitor – ONLY voting members or their Representatives may vote
(S) Staff

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THIS FORM MUST BE RETURNED TO THE API STAFF

API standards meetings are open to all interested parties. By participating in the standardization process, you agree: (1) to fully comply with API's policies and procedures governing standards, (2) that once balloted and approved by API, API shall have the sole and exclusive right to use any materials that are submitted by the participant for use in the standard, (3) you will not provide any material that will violate the rights of any third parties including, but not limited to, patents, copyrights, trade secrets, and trademarks, and (4) to disclose the existence of any patented technologies in the material that you provide.

Indicate BEFORE YOUR NAME if you are:

(M) Member of the Committee in session
(R) Representing a Committee Member (if so, state member's name)
(V) Visitor – ONLY voting members or their Representatives may vote
(S) Staff

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Attachment 2

American Petroleum Institute

API SC-20

Committee on Supply Chain Management

API Summer Meeting, June 27, 2007
Gary Devlin

American Petroleum Institute

SC20 Membership

Member	Company	Email	Phone
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American Petroleum Institute

New Membership

- **Forgital**
  - Michael Henderson
- **Forging Industry Association**
  - George Mochnal
- **Crosby Group**
  - Paul Boeckman
- **Eastham Forge**
  - Tom Addison
- **Ellwood Texas Forge**
- **Forged Products**

American Petroleum Institute

New Membership

- **Task Group 20C – Closed Die Forgings**
  - Met 18 Oct 2006, Draft 2 Distributed
  - Met 07 May 2007, Draft 3 Distributed
- **Task groups pending:**
  - Heat Treatment
  - Nondestructive Testing
- **Future Work:**
  - Open Hammer Forgings

American Petroleum Institute

Essential Variables

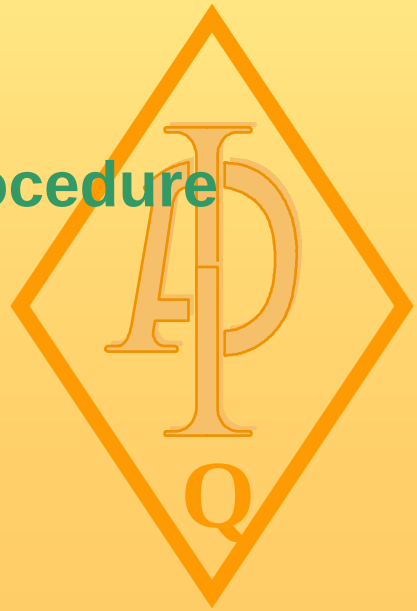
Closed Die Forging Variables
20 October 2006
Essential variable: A change in this variable requires re-qualification
Non-Essential variable: A change in this variable does not require re-qualification

	PSL-1	PSL-2	PSL-3	PSL-4
Mill supplier of starting material			Change in the named supplier of starting material	Change in the actual mill used to produce starting material
Material grade		Change from material grade 1 to 2 or 3. Change from material grade 2 to 3. (Note 1)	Same as PSL-2	Any change in material grade
Specified chemistry of starting material			Change in the allowable tolerance for any element greater than 10% of the specified minimum or maximum	Change in the reported value of the material qualified greater than 10%
Melt practice used in starting material	Change from any melt practice to BOF	Same as PSL-1	Any change to melt practice	Same as PSL-3
Grain size of starting material		Increase in grain size reported greater than 15%	Increase in grain size greater than 10%	Increase in grain size greater than 5%
Cleanliness of starting material			Reduction greater than 30% in the reported ASTM E45 cleanliness	Reduction greater than 10% in the reported ASTM E45 cleanliness

American Petroleum Institute

16 May Draft

- **Forging Specification Levels**
  - FSL 1-4
- **Forging Production Process Controls**
  - Mill Supplier Approval
  - Material Specifications
  - Receipt Inspection
  - Manufacturing Process Control Procedure
  - Forging Reduction
- **Forging Qualification Procedure**
- **Limits of Qualification**



American Petroleum Institute

16 May Draft

- **Forging Qualification Procedure**
  - Inspection
  - Testing
  - Examination
  - Documentation
- **Limits of Qualification**
  - Limits by FSL 1-4
  - Limits by Material Grade
  - Limits by Weight

US TAG - ISO Materials NWI

- NWI circulated to broad US interests including all ECS affected SCs
- US negative vote and comments based on concerns regarding proposed scope and resource requirements
- NWI approved (NP19910), WG8 reactivated
- Organizational meeting held last week. US invitees included representatives from Chevron, Shell, BP and ExxonMobil.

US TAG - ISO Materials NWI

- Preliminary meeting summary – no mention of scope / resource changes but agreement to address US comments.
- Upcoming meeting 11/13-14/07 (Paris); 2/26-27/08 (Rio); 6/24-25/08 (Oslo)
- Pending scope clarification need to form a US Subject Area TAG to provide input
  - Interim ECS policy direction to use SC20 as liaison with technical assistance from 6HP WG
  - Existing US interest group model for reliability standard (CRE)
- Discussion
  - Need for clarification on scope, informal communication indicates scope limited to topside equipment, excluding subsea, drilling, risers, etc.
  - Follow-on action – how US TAG participates and develops position on 19910

Attachment 3

Closed Die Forgings for use in the Petroleum and Natural Gas Industry

API Specification 20C

Draft 16 May 2007

1.0 Scope

1.1 Purpose

This API Standard specifies requirements and gives recommendations for the design, qualification and production of closed die forgings for use in API service components in the petroleum and natural gas industries

1.2 Applicability

This API Standard is applicable to equipment used in the oil and natural gas industries where service conditions warrant the use of closed die forgings. Examples include major pressure containing or load bearing components or assemblies.

1.3 Forging Specification Levels (FSL)

This API Standard establishes requirements for four forging specification levels. These four FSL designations define different levels of forged product technical, quality and qualification requirements.

2.0 Normative References

The following documents contain provisions which, through reference in this text, constitute provisions of this standard. For dated references, subsequent amendments to, or revisions or, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

API

Spec 6A	Specification for Wellhead and Christmas Tree Equipment
Spec Q1	specification for Quality Programs for the Petroleum, Petrochemical and Natural Gas Industry

ASME

Section VIII	Rules for Construction of Pressure Vessels

ASTM

A370	Standard test Methods and Definitions for mechanical testing of steel products
E10	Standard test method for Brinell hardness test of metallic materials

E118	Standard test method for Rockwell hardness test of metallic materials
E45	Standard Test Method for Determining the Inclusion Content of Steel
E112	Standard Test Method for Determining Average Grain Size

3.0 Terms and Definitions

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

Acceptance Criteria – defined limits placed on characteristics of materials, processes, products or services.

AMS — Aeronautical Materials Specification

As Forged — The condition of a forging as it comes out of the finisher cavity without any subsequent operations.

ASTM (Specifications) — The American Society for Testing and Materials.

Billet — A semi finished, cogged, hot-rolled, or continuous-cast metal product of uniform section, usually rectangular with radiused corners. Billets are relatively larger than bars. See Bloom.

Blank — Raw material or forging stock (also called a "slug" or "multiple") from which a forging is made.

Bloom — A semi finished product of square, rectangular, or even round cross section, hot rolled, or forged. For steel, the width of a bloom is not more than twice the thickness, and the cross sectional area is usually not less than about 36 sq. in. No invariable rule prevails for distinguishing between blooms and billets; the terms are frequently used interchangeably.

Brinell hardness — The hardness of a metal or part, as represented by the number obtained from the ratio between the load applied on and the spherical area of the impression made by a tungsten carbide ball forced into the surface of the material tested. The Brinell Hardness Number (BHN) is determined by measuring the diameter of the impression using a low power microscope or other optical measuring device, then matching this diameter with the load on a standard table.

Calibration — comparison and adjustment to a standard of known accuracy.

Charpy impact test — An impact test in which a specially V-notched specimen is broken by the impact of a falling pendulum. The energy absorbed in fracture is a measure of the impact strength or notch toughness of the sample.

Cleaning — The process of removing scale, oxides, or lubricant—acquired during heating for forging or heat treating—from the surface of the forging. (See also Blasting, Pickling, Tumbling.)

Closed die forging — The shaping of hot metal completely within the walls or cavities of two dies that come together to enclose the work piece on all sides. The impression for the forging can be entirely in either die or divided between the top and bottom dies. Impression-die forging, often used interchangeably with the term closed-die forging, refers to a closed-die operation in which the dies contain a provision for controlling the flow of excess material, or flash, that is generated.

Cold lap — A flaw that results when a work piece fails to fill the die cavity during the first forging. A seam is formed as subsequent dies force metal over this gap to leave a seam on the work piece surface. See also Cold Shut.

Cold shut — Also known as lap or fold. A defect such as lap that forms whenever metal folds over itself during forging. This can occur where vertical and horizontal surfaces intersect.

Decarburization — The removal of carbon from the surface of steel as a result of heating in a medium that reacts with the carbon. Decarburization is usually present to a slight extent in steel forgings. Excessive decarburization can result in defective products.

Die lubricant — A material sprayed, swabbed, or otherwise applied during forging to reduce friction and/or provide thermal insulation between the work piece and the dies. Lubricants also facilitate release of the part from the dies and provide thermal insulation.

Dies (die blocks) — The metal blocks into which forging impressions are machined and from which forgings are produced.

Dies, forging — Forms for the making of forgings; generally consist of a top and bottom die. The simplest will form a completed forging in a single impression; the most complex, made up of several die inserts, may have a number of impressions for the progressive working of complicated shapes. Forging dies are

usually in pairs, with part of the impression in one of the blocks and the balance of the impression in the other block.

Discontinuities — Includes cracks, laps, folds, cold shuts, and flow-through, as well as internal defects such as inclusion, segregation, and porosity; internal discontinuities can be detected and evaluated using ultrasonic or radiographic testing equipment.

Flakes — Randomly oriented internal thermal cracks ("shatter cracks") in steels resulting from critical combinations of stress and hydrogen content. In a fracture surface, flakes appear as bright silvery areas; on an etched surface they appear as short discontinuous cracks.

Flash — Metal in excess of that required to fill completely the blocking or finishing forging impression of a set of dies. Flash extends out from the body of the forging as a thin plate at the line where the dies meet and is subsequently removed by trimming. Because it cools faster than the body of the component during forging, flash can serve to restrict metal flow at the line where dies meet, thus ensuring complete filling of the impression. See also Closed-Die Forging.

Flow lines — Patterns in a forging resulting from the elongation of non-homogeneous constituents and the grain structure of the material in the direction of working during forging; usually revealed by macroetching. See also Grain Flow.

Fold — A forging defect caused by folding the metal back on its own surface during its flow in the die cavity. See Lap.

Forging reduction — Ratio of the cross-sectional areas before and after forging; sometimes refers to percentage reduction in thickness.

Grain flow — Fiber-like lines appearing on polished and etched sections of forgings that are caused by orientation of the constituents of the metal in the direction of working during forging. Grain flow produced by proper die design can improves the mechanical properties of forgings.

Grain growth — An increase in the size of the grains of a metal with a proportional reduction of the number of grains.

Grain size — An expression that rates the number of grains per unit area of cross section as determined by metallographic examination.

Heat — A term used to identify the material produced from a single melting operation. Different heats of the same material can vary in chemical composition within prescribed limits. Stock from a single heat will have a consistent analysis and more uniform properties. Also known in the U.K. as "Cast".

Heat treatment — A sequence of controlled heating and cooling operations applied to a solid metal to impart desired properties.

Inclusions — Particles of nonmetallic compounds of metals and impurity elements that are present in ingots and are carried over in wrought products. The shape and distribution of inclusions are changed by plastic deformation and contribute to directionality in metals.

Ingot — A casting intended for subsequent rolling, forging, or extrusion.

Lap — A surface irregularity appearing as a fissure or opening, caused by the folding over of hot metal, fins or sharp corners and by subsequent rolling or forging (but not welding) of these into the surface.

Linear indication - surface NDE indication whose length is equal to or greater than three times its width.

Macroetch — A testing procedure for conditions such as porosity, inclusions, segregation, carburization, and flow lines from hot working. After applying a suitable etching solution to the polished metal surface, the structure revealed by the action of the reagent can be observed visually.

Serialization – assignment of a unique code to individual products to maintain records.

Shuts (cold) — Faults produced in a forging by incorrect tool design or incorrect flow of steel that results in the formation of a crack in the forging surface.

Starting material - The raw material used to produce a qualified forging. Starting materials may include billets, ingots, blooms and blanks.

Underfill — A portion of a forging that has insufficient metal to give it the true shape of the impression.

UNS — The Unified Numbering System. A system that provides a means of correlating many nationally used numbering systems currently administered by societies, trade associations, and individual users and producers of metals and alloys, thereby avoiding confusion caused by use of more than one identification number for the same material. It also avoids having the same number assigned to two or more entirely different materials.

Wrought structure – structure that contains no cast dendritic elements

4.0 Symbols and Abbreviated Terms

AOD	Argon Oxygen De-carburization
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASTM	ASTM International
BOF	Basic Oxygen Furnace
EAF	Electric Arc Furnace
ESR	Electroslag Re-melt
NDE	Non-destructive Examination
VAD	Vacuum Arc Degassing
VAR	Vacuum Arc Re-melt
VD	Vacuum Degassed
VIM	Vacuum Induction Melting

5.0 Limits of Forging Qualifications

5.1 FSL-1

5.1.1 A change from any melt practice used in the starting material to BOF melt practice requires re-qualification of the forging.

5.1.2 A change in material grade as shown in table 1 requires re-qualification of the forging.

5.1.3 A change in the weight range class as shown in Table 2 requires re-qualification of the forging.

Table 1 – Material Grades

Material Grade	Description	Examples
Grade 1	Carbon and Low Alloy Carbon Steels	4130, 8630, F22
Grade 2	Austenitic and Martensitic Stainless Steels	410, F6NM, 316
Grade 3	Corrosion Resistant Alloys	718, 625

Table 2 – Weight Range Classes

	<25 lbs	**25-75 lbs**	**75-150 lbs**	**150-300 lbs**	**300-600 lbs**	**600-1200 lbs**	**1200-2400 lbs**	**>2400 lbs**
FSL-1	1A			1B			1C	
FSL-2	2A		2B		2C		2D	2E
FSL-3	3A	3B	3C	3D	3E	3F	3G	3H

FSL-4	Weight Range Class not applicable for FSL-4

5.2 FSL-2

5.2.1 Qualification requirements specified for FSL-1 are required for FSL-2
5.2.2 The elimination of any ladle refining practice used in the in the starting material requires re-qualification of the forging.
5.2.3 An increase in the required hot work ratio (total forging reduction ratio) of the finished closed die forging requires re-qualification of the forging.
5.2.4 A change in the minimum or maximum forging temperature requires re-qualification of the forging.

5.3 FSL-3

5.3.1 Qualification requirements specified for FSL-1 and FSL-2 are required for FSL-3.
5.3.2 A change in the allowable minimum or maximum tolerance for any chemical element of the starting material greater than 15% requires re-qualification of the forging.
5.3.3 Any change to the melt practice used to produce the starting material requires re-qualification of the forging.
5.3.4 An increase in the required minimum ASTM E45 cleanliness of the finished closed die forging requires re-qualification of the forging.
5.3.5 A change in the basic type of forge equipment used (mechanical, press, hammer etc.) requires re-qualification of the forging.
5.3.6 An increase in the minimum acceptable yield strength or ultimate tensile strength of greater than 20% required in the final product required re-qualification of the forging.

5.4 FSL-4

5.4.1 Qualification requirements for FSL-1, FSL-2 and FSL-3 are required for FSL-4.
5.4.2 A change in the actual mill used to supply the starting material requires re-qualification of the forging.
5.4.3 A change in the specific material UNS designation requires re-qualification of the forging.
5.4.4 Any change to ladle refining practices used on the starting material requires re-qualification of the forging.
5.4.5 A change in the immediate post-forge thermal process used re-qualification of the forging.

6.0 Forging Qualification Testing

6.1 Qualification Sample Product

A sample product shall be produced, tested and evaluated by the forging supplier in order to establish qualification for a range of products described in Section 5.0. Sample products are to be in their competed forged form, with the addition of full heat treatment to establish final mechanical properties required of the finished product.

6.2 Examination Procedure

6.2.1 Brinell and/or Rockwell hardness testing shall be performed on the external surfaces of the sample to ensure the sample product is within the specified limits for the finished product. Results shall be documented.

6.2.2 Photographs of the qualification sample product shall be taken to document the surface finish, configuration and general appearance.

6.2.3 Visual inspection of the forging shall be performed for cracks, voids, blisters, laps and other anomalies. Results shall be documented.

6.2.4 The forging sample shall be volumetrically inspected in accordance with the requirements of API 6A PSL-3. Results shall be documented. Samples failing to meet these requirements must be re-qualified.

6.2.5 The forging shall be sectioned into four quadrants centered on the location of the heaviest cross section. Each quadrant shall be visually inspected and photographed for signs of cracks, voids, blisters, laps, etc. Results shall be documented.

6.2.6 Each quadrant of the sample product shall be liquid penetrant inspected in accordance with the requirements of API 6A FSL-3. Results shall be documented. Samples failing to meet these requirements must be re-qualified.

6.2.7 One quadrant of the sample shall be macro-etched to show the grain flow and internal quality. The surface of the sample closest to the centerline shall be chosen for etching. Photographs of the etched section demonstrating the structure and grain flow with accompanying linear scale shall be documented.

6.3 Mechanical Testing

6.3.1 Hardness testing (HBN or HRC) shall be performed on the sample traversing the entire cross section in two directions. Results shall be documented

6.3.2 Tensile test specimens shall be removed and tested from the sample at the following locations: a) at or near the surface of the forging, b) at 1/4T thickness of the heaviest cross section as defined in API 6A and b) at the location closest to the centerline of the heaviest cross section of the forging. In both areas above, specimens shall be removed in two directions, in the direction of the grain flow identified 6.2.6 and in the direction oriented 90 degrees from the grain flow.

6.3.3 Mechanical properties test results for Elongation and Reduction in Area from in each area shall not vary from each other by more than 20%. Results shall be documented.

6.3.4 Charpy (CVN) impact specimens shall be removed at the 1/4T and mid section areas and tested at 0°F. Orientation of the mid-section specimens shall be 90 degrees from the grain flow identified in 6.2.6. Results shall be documented

6.4 Metallographic Examination

6.4.1 A metallographic sample shall be removed from the centerline of the heaviest cross section of the sample forging. This sample may be taken from the grip end of the centerline tensile specimen describe in 6.3.

6.4.2 For Grade 1 and 2 materials, steel cleanliness shall be determined in accordance with ASTM E45 Modified JK Inclusion Method as shown in Table 3. Photomicrographs at 100x magnification showing average and worst case field views. Results shall be documented.

6.4.3 Grain size is to be determined per ASTM E112 for the sample following etching with a suitable reagent. Photomicrographs of grain size shall be documented

Table 3
Modified JK Inclusion Rating Limits

Inclusion Type	Thin	Heavy
Type A Sulfide	1	½
Type B Sulfide	1	1/2
Type C Silicate	1	½
Type D Oxide	1-½	1

6.5 Records of qualification

The following records are required to document the qualification of the forging:

6.5.1 Starting material: grade, heat number, material specification, supplier name, supplier mill, size, hot work ratio, cut weight, melt practice and ladle refinements, cleanliness, actual chemistry and minimum/maximum element tolerance, incoming material inspection/evaluation method

6.5.2 Forging parameters: Hot work temperature range, description of each forging operation including product configuration at start and finish of each operation and hot wok ration for each step, forge equipment used

6.5.3 Post forging parameters: time, temperature and media of cooling / bake-out, heat treatment specification and actual times & temperatures, cooling media, heat treat equipment used,

6.5.4 Test records: records of the examination, mechanical testing and metallographic evaluations as described in 6.2, 6.3 and 6.4.

7.0 Production of qualified forgings

7.1 Qualification of procurement sources for starting material

7.1.1 Only steel mills that are approved by the forging supplier are to be used to supply starting material such as billet or ingot material. The forging supplier shall have a documented procedure fully implemented for qualifying starting material suppliers for each specific size and grade of starting material. The approval process shall be based on both a quality assurance and a technical evaluation. The approval process shall establish the methodology by which the starting material supplier will be evaluated on an ongoing basis to maintain their status as an approved supplier.

7.1.2 The maintenance of an acceptable quality program, such as an ISO accreditation, is not sufficient by itself to satisfy the requirements of 7.1.1. Documented evidence that a starting material supplier has a historical and ongoing technical capability of producing materials meeting this specification and who has proven, implemented procedures and capabilities in place to consistently produce acceptable product is a minimum requirement. Options for the technical approval of a starting material supplier include one or more of the following:

a. Starting material receipt inspection that includes NDE, chemistry check, macroetch, etc. on a routine basis.

b. Starting material first article cut up evaluation

c. Supplier experience over an extended period of time. Demonstration of successful experience shall include tests/inspections, volumes of material received, nonconformance analysis etc.

7.1.3 The forging supplier is responsible for ensuring that a starting material supplier has implemented controls addressing the following for each size and grade of starting material ordered:

a. Chemistry controls
b. Hydrogen controls
c. Melting practice controls
d. Pouring practice and ingot mold controls
e. Hot work practice controls (method of forging, amount of reduction, forging temperature, etc.)
f. Cooling rate and method controls
g. Billet cropping controls
h. Starting material inspection and acceptance criteria (cleanliness requirements, limitations on porosity or inclusions, grain size, secondary phases, microstructure, macrostructure, etc. as applicable)

7.2 Material specifications: the forging supplier shall document starting material requirements in the form of material specifications. Material specifications shall include as a minimum:

Material grade including element chemistry tolerances
Acceptable melt practices and ladle refinements
Acceptable forging reduction range
Acceptable cleanliness level range
Acceptable size, tolerances and configuration of starting material
Acceptable cleanliness level range

7.3 The forging supplier shall document acceptance of incoming starting material to the requirements of the material specification prior to use for production of forgings.

7.4 Design and maintenance of forging dies and equipment
TBA

7.5 Manufacturing Process Specification: The forging supplier shall prepare a Manufacturing Procedure Specification (MPS) as minimum to include allowable levels for all forging parameters including the process control variables listed in 7.6 and the heat treat parameters listed in 7.7. Full traceability of forgings shall be maintained with respect to material heat, manufacturing process specification and heat treat loads.

7.6 Process Control Variables:

- 7.6.1 Size of starting material, cut weight and tolerances
- 7.6.2 Evaluation process used for incoming material and for determining cropped length of starting material.
- 7.6.3 Hydrogen flake-control method (bake-out, slow cool, etc.)
- 7.6.4 Hot-working temperature range
- 7.6.5 Overall hot-work ratio from ingot or continuous-cast bloom.
- 7.6.6 Description of each forging operation, including product configuration at the beginning and end of each different type of hot-work or forging operation and hot-work ratio for each step.
- 7.6.7 Acceptable forging equipment for production

7.7 Heat treat parameters as applicable including:

- 7.7.1 Furnace loading diagram and orientation of production parts
- 7.7.2 Normalizing temperature and time
- 7.7.3 Forging configuration and dimensions at time of heat treatment
- 7.7.4 Austenitizing temperature and time
- 7.7.5 Quenching medium and type of agitation (water/polymer, forced, horizontal; or vertical quench, ID/OD, etc.)
- 7.7.6 Tempering temperature and time

7.8 Forging production

Forgings are to be produced by closed die forging according to the written procedure specified in 7.5. The total hot work ratio of all hot work practices is defined as the product of the hot work ratio for each hot working operation. The total forging reduction shall be the product of all forging sequences using the original starting material reduction as the starting point and the final result of subsequent hot work operations including the closed die work. The overall hot-work ratio shall be sufficient to produce a wrought material structure throughout all sections of the forging as defined in 7.8.1. The overall hot-work ratio from ingot or continuous-cast bloom to product in designated critical sections shall be greater than or equal to 4 to 1. As part of the Manufacturing Plan Specification, the forging steps shall be shown detailing initial and final dimensions during forging for each step. This will also include the heat or reheat temperature ranges required for each hot work reduction step by drawing and written documentation.

The minimum acceptable hot work ratio is 4 to1. Hot work shall be sufficient to guarantee a fully wrought structure as defined in 7.6.1, but in no case less than 4 to 1. Forgings that met or exceed a hot work ratio of 4 to 1 minimum do not necessarily mean that the forging meets the requirements of having a wrought material structure per 7.6.1 below.

7.8.1` Wrought Material Structure

All forgings produced shall be of pressure vessel quality and shall have a wrought structure throughout. A fully-wrought structure is defined as one that:

1. Is free from piping and harmful segregation (the presence of which would indicate insufficient discard from the starting ingot).

2. Is free from burst, flakes, cracks, seams, laps, or other injurious defects detrimental to the end use of the part.

3. Is free from any open discontinuities (porosity, shrinkage, piping, cracks, etc.) when macroetched or viewed under a light microscope at 250X.

4. Has a homogenous microstructure in any given area. Note: Some banding may be present in heavy sections. This is normal and will not be cause for rejection unless it can be shown to be detrimental to the end use of the part.

5. Shows no evidence of macro segregation (ingotism)

7.9 Inspection, quality control, marking and documentation
Furnace calibration 25 deg
Visual inspection
Hardness testing
Dimensional inspection
No welding
Record retention

7.8 Handling, storage and shipping

Attachment 4

API's Special Programs Needs Assessment and Customer Satisfaction Survey

API's Special Programs Needs Assessment and Customer Satisfaction Survey

Presentation will cover:

- Survey background
- Survey design and population
- General and program-specific survey results
- Next steps and initial proposed recommendations

Survey Background

- Draft survey approved by GCSP on March 31, 2006:
  - Survey initiated as part of API special programs' strategic plans approved during October 2005 GCSP meeting
  - Survey's intent was to ensure that API's Special Programs align with industry priorities and to seek information on ways to increase participation and support

Survey Design and Population

- Survey developed internally as a web-based application with 14,500 individuals identified as survey recipients:
  - 4,000 committee members
  - 10,500 customers
  - Survey launched June 1, 2006 with two-week response duration

General Survey Response

- 93% of 14,500 e-mail addresses verified as valid
- 10% (1447) of total population responded to survey:
  - Typical industry response for these types of surveys is between 3% and 5%
  - Company type breakout:
    - 41% owner-operator – O/O
    - 28% service-supply/manufacturer – S-S/M
    - 31% engineering/consulting and other – E/C
- Follow-up qualitative data collected via telephone interviews with nine Special Program committee chairs

- NOTE: At the October 15th GCSP Meeting "raw" data was presented and the GCSP asked that demographic break-outs of the Standards Results be presented. During the break-out analysis a calculation error was found that revises some of the results. Revised text is shown in bold.

Standards Program Results

- Survey respondents prefer industry over both international and company internal standards
- **71%*** of survey respondents report they can use API standards "as is", without the need to include additional technical requirements
  - Can improvements be made to API standards to increase their use without additional technical requirements?

*O/O – 71%, S-S/M – 68%, E/C – 73%

NOTE: The Committee Member only data indicates 67% as opposed to 71%.

Standards Program Results

- **88%*** of survey respondents report they incorporate API standards into their operations
  - Are there emerging technologies that API can develop standards for that would assist industry operations?
- **70%**** of survey respondents have management support for their API standards development work
  - What steps can be taken to improve this percentage?

*O/O –97%, S-S/M – 89%, E/C – 79%

**O/O – 65%, S-S/M – 74%, E/C – 72%

NOTE: The Committee Member only data indicates 93% as opposed to 88% for the first data point, and 84% as opposed to 70% for the second data point.

Standards Program Results

- **37%*** of survey respondents report that conference registration fees influence their decision to participate in the API standards development process
- **48%**** of survey respondents report that free or substantially reduced standards would influence their decision to participate in the API standards development process

*O/O –30%, S-S/M – 36%, E/C – 48%

**O/O – 40%, S-S/M – 51%, E/C – 56%

NOTE: The Committee Member only data indicates 36% as opposed to 37% for the first data point, and 51% as opposed to 48% for the second data point.

Standards Program Results

- **28%*** of survey respondents report that API's standards process is too slow
  - What improvements can be made to accelerate the process?
- Survey respondents report that they reference API over ISO standards by a roughly 2:1 ratio even though a slight majority identify ISO standards as "technically more robust"
  - What steps can API take to address this gap?

*O/O –25%, S-S/M – 32%, E/C – 28%

NOTE: The Committee Member only data indicates 32% as opposed to 28% for the first data point, and roughly a 3:1 ration as opposed to 2:1 ration for the second data point.

Certification Programs Results

- 30% turn to API first for their quality, safety or training needs
- 75% feel API's Certification Programs provide good customer service
  - What steps can be taken to improve this percentage?

Certification Programs Results

- 60% believe API's Certification Programs are cost-effective
  - How do we provide more value for the cost?
- 90% feel API's Certification Programs are valuable to the industry
- 75% are likely to recommend one or more of API's Certification Programs
  - What steps can be taken to improve this percentage?

Certification Programs Results

- 60% value stricter certification program requirements
- 50% see value in API provide a third-party inspection service
- 55% see value in API provide a consulting service
- 60% see value in having a API customer service representative in close proximity to their operations

Attachment 5

RESULT OF VOTING ON NEW WORK ITEM PROPOSAL		
Date **2007-25-05**	**ISO/TC 67 / WG 8**	N 980
Title of TC/SC concerned **Materials, corosion control, welding and joining and non-destructive exmination**		

To be completed by the secretariat and sent to the ISO Central Secretariat and to all P- and O-members of the TC or SC concerned, with a copy to the TC secretariat in the case of a subcommittee.

Proposal ISO/TC **67**/WG **8** N **977c** Circulation **2007-02-23** Deadline **20007-05-23**

Title (new title if appropriate; French title to be indicated in all cases, even when no French version is envisaged)

English title **Petroleum, petrochemical and natural gas industries - Materials selection for upstream operations**

French title

Results (the compilation of results is given as an annex)

The following criteria for acceptance have been met:

☒ Approval by a simple majority of the voting P-members

☒ 5 or more P-members voting approval have agreed to participate in the development of the project and have nominated an expert

Average points (y/x) awarded by P-members for market relevance (score as calculated in annex) NA

Note: This SVAT score is not intended to be the principle criterion upon which a decision is based, but rather is additional support for determining the best action. Nevertheless, if the average points scored is less than 15 consideration should be given to disapproval.

In the light of results, the proposal is therefore:

☒ **Approved** (all approval criteria met)

☐ **Not approved** (one or more approval criteria not met)

Associated draft

☐ no draft was associated with this ballot. A first draft is expected by (give date)

☐ the associated draft is adopted as a working draft (WD)

☐ the associated draft is approved as a Committee draft (CD)

☐ the associated draft is approved as the proposed Draft International Standard (DIS)

Further procedures (attribution to TC/SC/WG, Project Leader, development procedure, meetings, etc.)

☐ The project is to be first registered as a Preliminary Work Item (stage 00.60)

☐ The project is to be immediately registered as an active work item

Other:

Experts (give details below, or as a separate annex)

See Annex A

Documents to be considered (give details below, or as a separate annex)

Proposed development track ☐ 1 (24 months) ☒ 2 (36 months - default) ☐ 3 (48 months)

Note: Selection of a development track will automatically associate default target dates with critical stages. If you envisage that you can advance a project quicker than the default target dates you may indicate your preferred earlier target dates in the field "Target date for submission'. ***Important!*** *Quoting earlier target dates implies a commitment to meeting these dates* ***If you do not want to change the defaults to earlier dates do not put anything in the "Target date for submission" fields.***

Target date for submission:	as a CD:	as a FDIS:
	as a DIS:	for publication:

Secretariat	**Secretary**
API for ANSI	**David Miller**

Registration by the Central Secretariat

Date Allocated project number

☐ **Other information, comments, etc. appended**

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Compilation of the results of voting on ISO/NP

Member body	Member status	Evaluation	Justification	Vote			Participation	Expert(s) nominated	Approval + Part.+Nomin.	Accepted as CD	Accepted as DIS	Comments enclosed	no reply (optional)
			Q. 2	Q. 3.1			Q. 3.2		3.1+ 3.2	Q. 3.3			
	P/O	Points	Y/N	Yes	No	Abst.	Y/N	Y/N	Y/N	Y/N	Y/N		
Argentina	P			X			N	N	N				
Brazil	P			X			Y	Y	Y		X		
Canada	P			X			N	N	N				
China	P												X
Denmark	P					X	N	N	N				
Finland	P												X
France	P			X			Y	Y	Y				
Germany	P			X			N	N	N				
Indonesia	P												X
Italy	P			X			Y	Y	Y				
Japan	P												X
Kazakhstan	P												X
Korea, Republic of	P												X
Mexico	P												X
Netherlands	P			X			Y	Y	Y				
Nigeria	P												X
Norway	P			X			Y	Y	Y				
Oman	P												X
Portugal	P												X
Qatar	P			X			Y	Y	Y				
Romania	P			X			N	N	N				
Russian Federation	P												X
South Africa	P												X
Spain	P			X			N	N	N	X			
Ukraine	P												X
United Kingdom	P					X	Y	Y	Y			X	
United States	P				X		Y	Y	Y			X	
Venezuela	P												X
Totals (P-members only)	28			11	1	2	8	8	8	1	1	2	14

Abstentions and incomplete votes are not counted

Total number of points awarded by voting P-members (y): NA

Total of P-members voting (x): 14

Average points per P-member voting (y/x): NA

Annex B- Comments

Date: 3 April, 2007	Document: **NWI – Materials selection for Upstream Operations**

1	2	(3)	4	5	(6)	(7)
MB[1]	**Clause No./ Subclause No./ Annex** (e.g. 3.1)	**Paragraph/ Figure/Table/ Note** (e.g. Table 1)	**Type of com-ment[2]**	**Comment (justification for change) by the MB**	**Proposed change by the MB**	**Comment given by/ Secretariat observations**
1 UK	Entire Document		ge	The value of the proposed standard is unclear given the present development of materials selection documents for specific areas, where and when appropriate (e.g. API 17/ISO 13628 for subsea equipment). However, the UK would recommend that if this NWI does go ahead that it is as a 'guide' (i.e. a Technical Specification) that describes the philosophy of undertaking materials selection but does NOT contain any mandatory requirements, such as limitations on applicability of individual materials (unfortunately the NORSOK document that is proposed as a basis contains many such mandatory requirements). This would avoid any conflicts with other ISO documents (e.g. API 17/ISO 13628 for subsea equipment; ISO 15156 on materials for sour service) or 'application/company/country/region specific' guidelines that already exist.		The comment is noted. The possible implementations of this comment left for later evaluation. Left open. Conflicts with other ISO standards such as ISO 15156 has to be avoided. How to deal with regional governmental requirements such as the European Pressure Equipment Directive has to be evaluated.
2 UK	General		ge	Also the UK would recommend that the first meeting of the WG is NOT called until the vote has been completed and experts from various countries taking part have been identified so their availability can be assessed. The first meeting of a WG is one of the most important as it sets the scene for how the WG will undertake its charge so it is critical that as many of the WG members as possible are present. The proposal for a June 2007 meeting would not enable this to be achieved.		Concluded.
3 US	Entire Document	See Comments	ge	The scope of application for this standard is unclear. Is it to be used in the procurement process by operators when they purchase equipment from a supplier or is it to be used beforehand by operators as guidance when selecting/specifying equipment?	Clarify the scope of application for this document. Consider changing it to a Publicly Available Specification instead of an International Standard. Alternatively, if the industry as a whole agrees that the content of this	The scope needs to be amended to clarify that the standard is a guideline/requirement as to how the selection is to be made. Disagreed to publish a publicly available specification. Has been approved as an ISO standard. There is a need for a materials selection

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2 **Type of comment:** **ge** = general **te** = technical **ed** = editorial

NOTE Columns 1, 2, 4, 5 are compulsory.

1	2	(3)	4	5	(6)	(7)
MB[1]	**Clause No./ Subclause No./ Annex** (e.g. 3.1)	**Paragraph/ Figure/Table/ Note** (e.g. Table 1)	**Type of com-ment[2]**	**Comment (justification for change) by the MB**	**Proposed change by the MB**	**Comment given by/ Secretariat observations**
					document is so much better than anything existing, the relevant parts of the document should be added to the product specifications in the course of their normal review process.	standard. The document is not intended as a material procurement standard. Users are both oil companies and engineering contractors.
4 US				The document does not state the manner in which its contents are to be applied in conjunction with the existing product specifications.	Include in the document scope the pecking order for the application of this standard versus the product standards.	Agreed.
5 US				The document has numerous examples where "teaching" is performed versus setting forth requirements. An example is clause 4.5 where the statement is made "Chemicals can affect each other".	Due to the extent of this teaching practice, the proposed move straight to DIS ballot is not recommended. A working committee draft should be required to allow time for these issues to be worked.	The workgroup will consider to prepare a CD before DIS, as recommended by ISO TC/67 secretariat.
6 US				The document has numerous instances where instructions are given to conduct a specific activity for acceptance but no guidance is given as to method or acceptance criteria. See 5.3 on fluid compatibilities.	All requirements for testing or evaluation should include methods and acceptance criteria to enable determination of when a requirement has been met.	In context with the proposed scope this document is not intended to be a procurement specification. Left open.
7 US				The document uses NORSOK standards extensively for normative references. See 5.4.1.	Equivalency of NORSOK standards against ISO standards should be a major work item of the task group assigned to develop this document.	Agreed. Already incorporated in the new draft standard.
8 US				The document has numerous instances where a requirement is stated then exceptions are allowed with documentation showing acceptable performance. See 4.3.2 (page 9, 7th paragraph up from the bottom)	If the document is indeed a specification, the instances where the requirements can be met by other means need to be clearly identified with methods, acceptance criteria, etc. so that demonstration of compliance with the document will be possible and repeatable.	Agreed. It is not a material procurement specification.
9				The document refers to activities that take place	Edit the document to remove these	Left open.

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US				at significantly different time intervals than is the case with most specifications. For example, corrosion monitoring is listed as a requirement in clause 4.6. However, this activity will likely be carried out by organizations other than those who were contracted to supply the materials.	sections and place them either in an informative annex or as a Part 2 document to facilitate the interchange between the user and purchaser.	To be discussed by the work group. The main users are oil companies and engineering contractors. Design of corrosion monitoring is an integral part of the engineering work.
10 US				This document (M-001) is narrowly focused on the Norwegian sector with its particular set of operating conditions. For example, Table 2 in section 5.3 on well completion metallurgy provides for 13Cr as "base case" for the service conditions for equipment that is run in the North Sea, but does not provide criteria for selection of this material so that it could be applied to other parts of the world.	In this sense, the document would not even serve well as a recommended practice without very major overhaul.	Left open. To be discussed by the work group.
11 US				M-001 appears to be a guideline for operators, not a manufacturing or purchasing Standard for equipment suppliers.	Put purchasing guidelines in an informative annex.	To be evaluated later. There is no intention to develop purchase requirements.
12 US				If it is released as (or converted into) an ISO standard that can be listed as a controlling document for purchase of completion equipment, it will present problems for manufacturers as presented.	Overhaul document.	Agreed.
13 US				The NORSOK terminology should be eliminated and ISO nomenclature should be used.	Use ISO Terminology	Agreed. Already implemented in draft standard.
14 US				The interconnecting reference to other NORSOK documents should be deleted. The requirements should be placed into this ISO document.	Place requirements in ISO document.	Agreed. Already implemented in draft standard.
15 US				The ISO document should represent international standards etc. The reference to the PED and North Sea practices in the "splash zone" appears that the spec only applies in this part of the world. North Sea should be removed or other	Make the document applicable on an "International" basis.	Agreed.

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NOTE Columns 1, 2, 4, 5 are compulsory.

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MB[1]	**Clause No./ Subclause No./ Annex** (e.g. 3.1)	**Paragraph/ Figure/Table/ Note** (e.g. Table 1)	**Type of com-ment[2]**	**Comment (justification for change) by the MB**	**Proposed change by the MB**	**Comment given by/ Secretariat observations**
				worldwide locations added.		
16 US				Other International standards (i.e. ASTM, ASME etc) shall also be referenced in addition to European documents.	Place European standards in Bibliography.	All references will be included in accordance with ISO directives.
17 US				Both English and Metric units should be integrated into the document similar to other ISO documents.	Integrate fully the use of the dual units.	Agreed.
18 US				Section 5.7.4: "For drilling risers a total erosion/corrosion allowance of minimum 6 mm shall be included for accumulated design lives exceeding 10 years." .	This level of corrosion allowance conflicts with existing API standards	To be evaluated.
19 US				Section 7.3: "welding/joining of bimetallic (clad) pipes;"	The recommendations of joining weld-clad pipe highlighted in EEMUA Pub 194: 2004 should be referenced / followed.	To be evaluated.
20 US				The NORSOK Standard covers everything from drilling equipment to production equipment to process facilities to chains and mooring lines and even more. The preference would be to see the applicable recommendations from NORSOK M-001 integrated into the specific API / ISO specifications to which they apply.	For example, put the requirements that apply to surface valves and wellhead equipment into API 6A / ISO 10423 and the requirements that apply to subsea valves and wellhead equipment into API 17D / ISO 13628-4.	Agreed. This standard is not intended to include product standards specific requirements. The exact scope of the document needs to be further evaluated.
21 US				While it may not present a problem to create the first edition of a document with such a far reaching scope, staffing a task group to update and maintain it will be a problem. It covers too many types of equipment.	Narrow the focus of the document by sub-dividing the document around the subject equipment.	Noted. Needs to be considered.
22 US				This Materials Selection topic should be left up to the individual standards writing committees, particularly with regard to the subsea suite of standards. This would avoid potential conflicts, that are sure to occur, between such a newly generated materials standard and the existing		Within the subsea area there is work ongoing to revise ISO13628-1, Clause 6. The work group will ensure that there are no conflicts with existing API/ISO standards.

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NOTE Columns 1, 2, 4, 5 are compulsory.

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				product specifications and standards. The preferred *performance* standards for the materials used are better addressed within the specific standards covering the equipment to which they apply.		
23 US				It was felt that although there could be substantial benefits for such a document, the proposed NWI was too broad in its scope and would be, therefore, difficult to achieve a clear, concise document in a reasonable timeframe		The scope of this standard will be reviewed by the work group and amended as necessary.
24 US	4.3.1			The corrosion allowance of 3 mm recommended for carbon steel: Coiled tubing carbon steel supply in offshore installations has been below 3mm actual wall thickness in a number of projects.	Maybe some comment about smaller corrosion allowances can be made based on actual well/product conditions or for smaller OD/WT carbon steel pipelines?	The requirement applies to piping only, and is used in order to achieve standardization through limiting the number of varieties/grades. It does not apply to temporary equipment such as coiled tubing and temporary drilling equipment. The magnitude of corrosion allowances to be evaluated.
25 US	4.3.10			This suggests the weld procedure for installations include corrosion testing. There is no reference to any requirement. Should there be a requirement? Does ASME Section IX or DNV-OS-F101 refer to a welding qualification with corrosion testing as an option or supplementary requirement?		To be evaluated. (Corrosion inhibitor testing.)
26 US	6.1			The yield to tensile strength ratio for carbon and low alloy steels states it shall not exceed 0.9; however, this doesn't match DNV-OS-F101 for pipeline systems. C-Mn steel linepipe for some grades have a maximum of 0.92 Y:T ratio in the transverse and 0.94 in the longitudinal direction. Potentially up to 0.95 if sour service tubing.	See Section 6 Table 6.3 of OS-F101 for reference.	To be evaluated.
27 US				**Scope of Proposed Project-** The stated scope is "...to provide an international standard that offers general principles,		Noted. The scope of this standard will be reviewed by

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				engineering guidance and requirements for materials selection and corrosion protection for all parts of on- and offshore hydrocarbon drilling, production, transmission, and processing facilities...". * Many of the issues (see below) taken with the proposal, and the draft attachment in particular, are the result of such a broad scope, resulting in a "one size fits none" solution. For example, many design specifics that are reasonable and cost-effective in marine and other corrosive environments are not so in other severe, but different environs. Attempting to cover all equipment, systems, structures, etc. in all applications, both onshore and offshore is prone to deficiencies in some, and inefficiencies in others.		the work group and amended as necessary.
28 US				**Purpose and Justification-** The NWI notes that the OGP Standards committee survey indicated a number of OGP members were in favor of the NWI. However, there is no mention of the actual *purpose* of the proposed standard in terms of realized or potential problem(s) to be solved by such a standard, nor economy to be gained, nor does there appear to be a *justification* for either the dedication of resources to create and maintain the standard, nor the costs to industry for compliance (including restraint of innovation from a potentially excessively prescriptive standard).		The NWIP included purpose and justification.
29 US				Some specific concerns- - The document is largely prescriptive (vs.		Noted. The scope of this standard will be reviewed by

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NOTE Columns 1, 2, 4, 5 are compulsory.

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				performance based). For such a large scope, this is an inefficient means to achieve the fundamental goal of *performance*. - The document seems to be more applicable to process and production equipment that is in normal contact with produced fluids - Many of the requirements are not cost effective for mobile equipment that does not remain in an offshore environment. - Some of the requirements are not justifiable, or even ill-advised for conventional fluid power components (e.g. 4.3.9). - Some requirements are unnecessary or cumbersome (e.g. 6.1) as appropriate methods of proper application/use of other materials are well established in the current standards). - Some requirements are in conflict with and/or redundant to current API/ISO equipment standards (e.g. 6.2.1).		the work group and amended as necessary. Propose to clarify that temporary equipment is outside scope of the standard. Noted. Noted. Care will be taken to avoid conflicts with other API/ISO standards.
30 US	5.2			The one paragraph (5.2) in NORSOK M-001 concerning drilling equipment materials is not adequate in addressing materials standardization for drilling equipment.		Agreed. Propose that temporary equipment and drilling equipment is outside the scope for the standard.
31 US				The NORSOK document gives little or no weight to the wide range of service conditions or applications that exist in the worldwide oil and gas industry.		Agreed. This will be addressed.
32 US				Most requirements in NORSOK M-001 assume production environments with 20- or 30-year lifetimes. That assumption is not applicable to most drilling equipment, which will typically		Agreed. Propose that temporary equipment and drilling equipment is outside the scope for the standard.

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				experience occasional exposure of short duration to well fluids.		

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