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March 16, 2017

Doug Morris
Chief Office of Offshore Regulatory Programs
Bureau of Safety and Environmental Enforcement
U.S. Department of the Interior
1849 C Street, NW
Washington, DC 20240

Via email

Dear Mr. Morris:

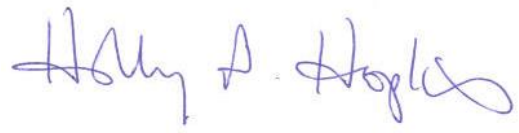
As part of the API and Industry commitment to improving training, operating procedures, technology and industry standards, attached is a detailed and comprehensive update to track the progress of implementation of the voluntary industry actions to address the issues related to subsea bolts and fasteners. As we have discussed, this is ongoing work that may evolve as new information becomes available.

The attachment tracks the following:

- Research sponsored by API related to this topic;
- Activity by the standards task groups and subcommittees to implement the recommendations in the API Multi Segment Task Group Report on Bolting Failures;
- Voluntary industry adoption of API 20 E/F for critical BOP bolting;
- Voluntary industry replacement of critical bolting having a hardness of >35 HRC;
- Enhanced QAQC of 3rd party manufactured bolting (i.e., sampling, 20 E/F requirements);
- Updated make-up procedures, with additional engineering rigor and oversight;
- Elimination of electroplated Zinc coatings for subsea/marine applications; and
- Enhanced failure reporting with wider distribution.

API appreciates the opportunity to work with BSEE to continue discussing our shared objective of safe operations. As can be seen by the significant progress we've made as an Industry in 2016, we believe that by working in a spirit of cooperation, we can better understand our common goals and implement actions to help achieve our shared safety objectives. We would be happy to meet with you and/or your staff to provide a detailed review of this work. If you have any questions or to further this discussion, please contact me by phone at (202)682-8439, or by e-mail at hopkinsh@api.org.

Sincerely,

A handwritten signature in blue ink that reads "Holly A. Hopkins". The signature is written in a cursive style with a large, looping "H" and "K".

Holly A. Hopkins

cc: Lars Herbst, GOM Regional Director

Attachment



AMERICAN PETROLEUM INSTITUTE

March 2017

API 4Q 2016 UPDATE ON INDUSTRY ACTIVITIES ON SUBSEA BOLTS AND CONNECTORS

Background

On August 11, 2014 the Bureau of Safety and Environmental Enforcement (BSEE) released a technical Review of Connector and Bolt Failures following the failure of connectors and bolts used in critical equipment. The technical review, entitled Evaluation of Connector and Bolt Failures, was completed by the bureau's Quality Control-Failure Incident Team (QC-FIT) and submitted to BSEE Director Brian Salerno. The objective of the technical assessment was to document and evaluate failures of the connectors, studs and other components used in critical equipment and determine if there were industry wide issues that need to be addressed by the industry or BSEE. This report addressed a December 2012 incident which prompted a global recall of the bolts associated with the H4 connector bolts.

In response to the QC-Fit Report, API held a Technical Session during the API Exploration and Production Winter Standards Meeting in New Orleans on January 27, 2015. BSEE was invited by API to present their report findings and recommendations. After the Technical Session, an API multi-segment task group was formed to review the detailed recommendations in the report and determine next steps. The final report of the task group was shared with BSEE in March of 2016 and is now being implemented.

An incident in February of 2014 involving a lower marine riser package (LMRP) connector leak prompted BSEE to issue an Addendum to the QC-FIT report, with the new information from this incident.

As a result of these ongoing incidents BSEE issued a Safety Alert regarding Connector and Bolt Failures on February 2, 2016. Additionally, BSEE held a public forum on offshore connector equipment failures, including connector bolt failures that have occurred on the OCS on August 29, 2016, in Washington, DC.

To address the February 2016 safety alert API formed a workgroup which has met with BSEE on March 31, June 22, September 20, and October 7, 2016 to improve safety offshore as it relates to bolts. This work focuses on subsea BOP bolting and 4 specific areas: 1) Materials/Standards; 2) QA/QC – API Monogram Program; 3) Operations; and 4) Research.

API provides this detailed and comprehensive update to track the progress and implementation of the voluntary industry actions to address the issues related to subsea bolts and connectors. This is ongoing work that may evolve as new information becomes available and this is the second of regular quarterly reports.

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
1	Research	API sponsored research	API has approved a 2017 project to perform testing to determine susceptibility to environmental hydrogen embrittlement of selected materials and coatings. In addition, API has conducted 4 projects related to hydrogen embrittlement and 21 projects related to corrosion resistant alloys.
2	Materials and Standards	API 20E 2nd Edition	Published February 2017
		API 20F 2nd Edition	TG to meet again in March.
		API 16A 4th Edition	Ballot complete and comments resolved. Final recirculation in progress with a due date of 2017FEB24. Will proceed with publication after this date.
		API 16AR 1st Edition	In publication process and requires API 20E and API 20F for pressure controlling bolting, closure bolting and pressure retaining bolting.
		API 16C 3rd Edition	Being drafted.
		API 16F 2nd Edition	Ballot closed (10/6/2016), in comment resolution and requires API 20E and API 20F.
		API 6A 21st Edition	Being drafted and will require API 20E bolts.
		API 6D 24th Edition	API 20E is a recommendation in published document.
		API 6DSS 3rd Edition	Out for ballot and requires API 20E and API 20F for pressure boundary bolts. Ballot closes 11/30/2016.
		API 53 5th Edition	Group developing changes for 5th edition. Goal to have document out for ballot 4Q17.
		API 64 3rd Edition	API S64 has completed ballot, re-ballot and comment resolution. The document is with API for final editorial changes.
		API Q1, 9th Edition, Addendum 2	Reballot of Addendum 2 closed 3/6/2017. In comment resolution.

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-4 - SC21</p> <p align="center">TG recommends consideration of an overarching document issued by API through SC21 in cooperation with product SCs covering selection of proper bolting materials for different environments (including subsea) would be helpful.</p>	<p>Circulate the developed Materials Selection Draft starting March 1, 2017 with comments due April 1, 2017.</p> <p>Review, update and provide updated draft by May 1, 2017 for final circulation and comments to be updated and provide to SC 21 for summer meeting in Calgary.</p> <p>(Note: The TGR-1 request for a possible API coating document will be addressed by this document.)</p>
		<p align="center">TGR-8 - SC21</p> <p align="center">Do not allow use of B7 or L7 grades above 2.5" in diameter.TG recommends that this be included as part of the overarching document under SC21.</p>	<p>Done for SC21.</p> <p>Do not allow the use of ASTM A320 L7/ASTM A193 B7 bolting for diameters above 2 ½ inches unless the Di of the material is intentionally modified.</p>
		<p align="center">TGR-18 - SC21</p> <p align="center">Product subcommittees should review and consider incorporating 20E and 20F requirements (resolve existing conflicting properties specified in product specifications such as hardness).</p>	<p>*Ties into TGR-1* (This work is in response to the TGR-1 request to establish maximum hardness for bolting material.)Objective is to identify hardness and associated yield limit to prevent HISC in subsea fasteners.</p> <p>API 20E BSL-2 Continuous Cast and BSL-3 Bolts 5 Yield strength/hardness levels/ (105ksi/28HRC, 120ksi/30 HRC, 135ksi/32 HRC, and 150 ksi/35HRC, and 165ksi/38 HRC)</p> <p>ASTM 1694 (Rising Step Load) Test Method will be used to evaluate resistance to hydrogen induced-stress cracking (HISC)Testing will be conducted in air and under synthetic seawater with 1200mV applied.</p>
		<p align="center">TGR-2 - SC20</p> <p align="center">TG recommends that API expand 20E to more adequately cover the requirements of plating and coating as well as move the supplemental requirements for plating and coating into the body of the document, making them standard requirements.</p>	<p>Done.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-9 - SC20 TG recommends that volumetric examination where bolt diameter exceeds 2.5" should be added as a requirement to 20E, 20F, BSL-2, and BSL-3.</p>	<p>Done for API 20E. Will be considered by the API 20F TG.</p>
		<p align="center">TGR-11 - SC20 Revise 20F to restrict use of sulfur based lubricants during manufacture of bolting.</p>	<p>Will be considered by the API 20F TG.</p>
		<p align="center">TGR-17 - SC20 Strengthen heat treating and furnace loading requirements in 20E and 20F (more prescriptive requirements related to: spacing, QTC location, and thermocouple placement). Include requirements for oven calibration for pre and post bake operations.</p>	<p>Done for API 20E. Will be considered by the API 20F TG.</p>
		<p align="center">TGR-20 - SC20 SC20 review the supplier controls in 20E and 20F to ensure these adequately cover required controls for subcontracted processes. SC 20 should also monitor the API Q1 revisions.</p>	<p>Done for API 20E. Will be considered by the API 20F TG.</p>
		<p align="center">TGR-19 - SC18 SC18 to form a TG to review the BSEE FIT-QC Report on connector bolt failures to determine if the current requirements of API Spec Q1 has the provisions needed to ensure that system control features are in place, and clearly stated, to eliminate these type of failures in the future.</p>	<p>Done, TG formed.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-3 - SC17</p> <p>TG recommends prohibiting Zinc electroplating for Subsea/Marine application. TG further recommends that an investigation be conducted under the direction of SC21 to determine a better short term (storage) corrosion protection system that would not create hydrogen in service. The results of this study would then need to be adopted into product standards.</p>	<p>SC17 (17D, 17G) to consider results of investigation</p>
		<p align="center">TGR-5/TGR-12 - SC17</p> <p>-TG recommends that the product specifications require equipment manufacturers to specify acceptable thread compounds for bolting applications based on material, plating and service.</p> <p>-TG recommends adding requirements to API product specifications to restrict combining these elements in thread compounds.</p>	<p>SC17 (17D, 17G) to consider results of investigation</p>
		<p align="center">TGR-6 - SC17</p> <p>Torqueing requirements should be reviewed to determine if standardization among product specifications is needed.</p>	<p>SC17 (17D, 17G) to consider results of investigation</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-13 - SC17 Guidance should be issued by API on when and how to perform fatigue sensitivity analysis on bolting.</p>	<p>Workgroup completed a comprehensive report to address TGR-13 and TGR-14. The topics for the reports are:</p> <ul style="list-style-type: none"> a. Issue to address: Fatigue sensitive bolting b. Bolting fatigue analysis procedures (address TGR-13) c. Bolting material/fatigue properties testing requirements (address TGR-13) d. Material environmental effects e. Propose manufacturing practices to progress current industry practices (address TGR-14) <ul style="list-style-type: none"> 1. Requirements to meet BSL-3 of API 20E and 20F 2. Material manufacturing process: threading (rolled, machined), surface coating, recommendation of CRA bolting for subsea applications) 3. Vickers vs. HRC / Locations of testing 4. First article qualifications e. Bolting material testing program for fatigue properties (eventual request to SC21)
		<p align="center">TGR-14 - SC17 Involved API SC's should address guidance issued in the product specs to require use of BSL-3 in fatigue sensitive applications.</p>	<p>Workgroup completed a comprehensive report to address TGR-13 and TGR-14. The topics for the reports are:</p> <ul style="list-style-type: none"> a. Issue to address: Fatigue sensitive bolting b. Bolting fatigue analysis procedures (address TGR-13) c. Bolting material/fatigue properties testing requirements (address TGR-13) d. Material environmental effects e. Propose manufacturing practices to progress current industry practices (address TGR-14) <ul style="list-style-type: none"> 1. Requirements to meet BSL-3 of API 20E and 20F 2. Material manufacturing process: threading (rolled, machined), surface coating, recommendation of CRA bolting for subsea applications) 3. Vickers vs. HRC / Locations of testing 4. First article qualifications e. Bolting material testing program for fatigue properties (eventual request to SC21)

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-16 - SC17</p> <p>TG recommends API issue a document to provide guidance on derating of bolting. There are several specifications on material derating due to elevated temperature.</p>	<p>SC17 (17D, 17G) to consider results of investigation</p>
		<p align="center">TGR-18 - SC17</p> <p>Product subcommittees should review and consider incorporating 20E and 20F requirements (resolve existing conflicting properties specified in product specifications such as hardness).</p>	<p>SC17 (17D, 17G) to consider results of investigation</p>
		<p align="center">TGR-3 - SC16</p> <p>TG recommends prohibiting Zinc electroplating for Subsea/Marine application. TG further recommends that an investigation be conducted under the direction of SC21 to determine a better short term (storage) corrosion protection system that would not create hydrogen in service. The results of this study would then need to be adopted into product standards.</p>	<p>16C - For subsea bolting, the draft document requires BSL3 as per 20E or 20F as applicable; however, the document is silent on zinc electroplating.</p> <p>16A - The soon to be released 4th edition of 16A has comprehensively required bolting to meet 20E or 20F. Zinc Plating is not used on 20F bolting (inconel and grade 660). The soon to be published 2nd edition of 20 contains the following: 5.4.8.3 Zinc electroplating is not permitted for splash zone or subsea service.</p> <p>16ST - The 2nd Edition of API RP 16ST is currently under development and will adopt the TGR-3 bolting recommendations and text to meet 20E or 20F.</p> <p>16B - The 1st Edition of API Spec 16B is currently under development and will adopt the TGR-3 bolting recommendations and text to meet 20E or 20F.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-5/TGR-12 - SC16-TG recommends that the product specifications require equipment manufacturers to specify acceptable thread compounds for bolting applications based on material, plating and service.-TG recommends adding requirements to API product specifications to restrict combining these elements in thread compounds.</p>	<p>16C - Currently there is no requirement to require thread compound; will be addressed in the 4th edition (next revision).</p> <p>16A - The soon to be released 4th edition of 16A contains the following requirement for all operating manuals of 16A equipment: assembly and disassembly information, that includes flange make-up procedure that includes requirements for lubricant, torque, tightening pattern, percentage increments for torque, etc.</p> <p>16ST - The 2nd Edition of API RP 16ST is currently under development and will reference the recommendations to be contained in operating manuals of Spec 16B equipment, including assembly and disassembly information, as well as flange make-up procedure (requirements for lubricant, torque, tightening pattern, percentage increments for torque, etc.)</p> <p>16B - The 1st Edition of API Spec 16B is currently under development and will contain the following requirement for all operating manuals of 16B equipment: assembly and disassembly information, that includes flange make-up procedure that includes requirements for lubricant, torque, tightening pattern, percentage increments for torque, etc.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center"> TGR-6 - SC16 Torqueing requirements should be reviewed to determine if standardization among product specifications is needed. </p> <p align="center"> TGR-13 - SC16 Guidance should be issued by API on when and how to perform fatigue sensitivity analysis on bolting. </p>	<p>16C - Will be addressed in the 4th edition (next revision).</p> <p>16A - The soon to be released 4th edition of 16A contains the following requirement for all operating manuals of 16A equipment: assembly and disassembly information, that includes flange make-up procedure that includes requirements for lubricant, torque, tightening pattern, percentage increments for torque, etc.</p> <p>16ST - The 2nd Edition of API RP 16ST is currently under development and will reference the recommendations to be contained in operating manuals of Spec 16B equipment, including assembly and disassembly information, as well as flange make-up procedure (requirements for lubricant, torque, tightening pattern, percentage increments for torque, etc.)</p> <p>16B - The 1st Edition of API Spec 16B is currently under development and will contain the following requirement for all operating manuals of 16B equipment: assembly and disassembly information, that includes flange make-up procedure that includes requirements for lubricant, torque, tightening pattern, percentage increments for torque, etc.</p> <p>16A - API 16A 4th edition does not currently contain requirements for fatigue analysis. The HPHT sub-group may consider this requirement.</p> <p>16ST - The 2nd Edition of API RP 16ST is currently evaluating the specific locations within the assembly of well control components where fatigue analysis of bolting is needed, especially in assembly of coiled tubing and snubbing well control components.</p> <p>16B - The 1st Edition of API Spec 16B is currently evaluating the need for fatigue analysis of bolting, especially in assembly of coiled tubing and snubbing well control components.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-14 - SC16 Involved API SC's should address guidance issued in the product specs to require use of BSL-3 in fatigue sensitive applications.</p>	<p>16C - BSL3 requirement for subsea bolting; however, for sensitive bolting that is in serviceable areas such as rig floor or on land, a BSL2 or BSL1 is required.</p> <p>16A - BSL-3 will be required in the 4th edition of 16A for all closure bolting and pressure retaining bolting intended for offshore applications.</p> <p>16ST - BSL-3 will be required in the 1st Edition of API Spec 16B for all closure bolting and pressure retaining bolting intended for offshore applications.</p> <p>16B - BSL-3 will be required in the 1st Edition of API Spec 16B for all closure bolting and pressure retaining bolting intended for offshore applications.</p>
		<p align="center">TGR-15 - SC16 TG recommends revision to API S53 to define a standard method for calculating watch circle.</p>	<p>S53 - TG has not addressed this recommendation to date. Will be on the agenda for the next general session beginning of March 2017.</p>
		<p align="center">TGR-16 - SC16 recommends API issue a document to provide guidance on derating of bolting. There are several specifications on material derating due to elevated temperature.</p>	<p>16A - Currently, this is only addressed in: API TR 6AF1 Technical Report on Temperature Derating on API Flanges Under Combination of Loading. Note: 16A, 3rd edition only has temperature ratings up to 250F. The referenced 6AF1 provides guidance for derating based on temperature beginning at 350F. Temperature derating is primarily a concern in HPHT applications. This will be addressed in the new 16A HPHT annex.</p> <p>16ST - The 2nd Edition of API RP 16ST is currently evaluating the need for derating of bolting due to bending stresses and temperature, especially in assembly of coiled tubing and snubbing well control components.</p> <p>16B - The 1st Edition of API Spec 16B is currently evaluating the need for derating of bolting due to bending stresses and temperature, especially in assembly of coiled tubing and snubbing well control components.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-18 - SC16</p> <p align="center">Product subcommittees should review and consider incorporating 20E and 20F requirements (resolve existing conflicting properties specified in product specifications such as hardness).</p>	<p>16C - BSL3 requirement for subsea bolting; however, for sensitive bolting that is in serviceable areas such as rig floor or on land, a BSL2 or BSL1 is required.</p> <p>16A - 16A has implemented this in the 4th edition.</p> <p>16ST - The 2nd Edition of API RP 16ST will incorporate 20E and 20F requirements.</p> <p>16B - The 1st Edition of API Spec 16B will incorporate 20E and 20F requirements.</p>
		<p align="center">TGR-3 - SC6</p> <p align="center">TG recommends prohibiting Zinc electroplating for Subsea/Marine application. TG further recommends that an investigation be conducted under the direction of SC21 to determine a better short term (storage) corrosion protection system that would not create hydrogen in service. The results of this study would then need to be adopted into product standards.</p>	<p>API 6A 21st to consider results of investigation</p> <p>API 6DSS 3rd 6.8 Pressure boundary carbon steel bolting in cathodic protection system shall not be zinc plated. Other coating or plating shall be by agreement.</p>
		<p align="center">TGR-5/TGR-12 - SC6-TG</p> <p align="center">recommends that the product specifications require equipment manufacturers to specify acceptable thread compounds for bolting applications based on material, plating and service.-TG recommends adding requirements to API product specifications to restrict combining these elements in thread compounds.</p>	<p>API 6A 21st Annex E Recommended Flange Bolt Torque E.2 Basis of Tables ...Lubricants, surface finishes, etc., may influence the accuracy of the actual bolt tension when measuring torque. Therefore, the torque values listed in Tables E.1 and E.2 are provided only as an informative guide. The torque and the make-up practices should be verified by the manufacturer.</p> <p>API 6A 21st Annex E Recommended flange bolt torqueFor applications above 500°F (260°C), lubrication shall not contain lead, tin, antimony or bismuth.</p> <p>API 6DSS 3rd — Assembly thread compound application above 500 °F (260 °C) that includes any of the following elements, (Antimony, Bismuth, Lead or Tin) shall not be permitted.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-6 - SC6 Torqueing requirements should be reviewed to determine if standardization among product specifications is needed.</p>	<p>API 6A 21st Annex E Recommended Flange Bolt Torque E.1.3 Bolt tightening pattern Flange bolting shall be tightened gradually, repeatedly working around the bolt pattern in a “crisscross” or “star” pattern. As an alternative, multi-head tools may be used per the manufacturer's procedure. Examples of bolt makeup sequence are shown in Figure E.1. Other examples can be found in ASME PCC-1.</p> <p>E.2 Basis of Tables It should be recognized that torque applied to a nut is only one of several ways to approximate the tension and stress in a fastener. The tables in this annex are for the convenience of the user only, and are based on calculations that assume certain friction coefficients for the friction between the studs and nuts, and between the nuts and the flange face.</p> <p>Some factors that affect the relationship between nut torque and stud stress are</p> <ul style="list-style-type: none"> - thread dimensions and form; - surface finish of studs, nuts, and flange face; - degree of parallelism between nut face and flange face; - type of lubrication and coatings of the threads and nut bearing surface areas <p>....Lubricants, surface finishes, etc., may influence the accuracy of the actual bolt tension when measuring torque. Therefore, the torque values listed in Tables E.1 and E.2 are provided only as an informative guide. The torque and the make-up practices should be verified by the manufacturer.</p> <p>API 6DSS section 9 Pressure boundary bolting loading and tightening sequences for pressure boundary bolting shall be controlled in accordance with manufacturer's written procedure.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center">TGR-7/TGR-10 - SC6 TG recommends modification of 6A to require impact testing at or below design temperature w/ acceptance criteria for larger cross section bolting (over 2.5").</p>	<p>API 6A 21st 10.3.1.2.3 Exposed bolting (low-strength) The following apply: a) for ASTM A193/A193M grade B7M: ASTM A 193/A193M grade B7M is acceptable at a minimum 0,2 % offset yield strength of 550 MPa (80 000 psi) for the flanges listed in Table 62 for NACE MR0175 / ISO 15156 exposed bolting (low-strength) only with bolt diameters $\leq 2,5"$.</p> <p>for ASTM A320/A320M grade L7M: ASTM A320/A320M grade L7M is acceptable at a minimum 0,2 % offset yield strength of 550 MPa (80 000 psi) for the flanges listed in Table 56 for NACE MR0175 / ISO 15156 exposed bolting (low-strength) only.</p> <p>10.3.1.2.4 Non-exposed bolting The following apply: a) for ASTM A193/A193M Grade B7: ASTM A193/A193M grade B7 is acceptable for non-exposed service for all flanges with bolt diameters $\leq 2,5"$.</p> <p>for ASTM A 320/A320M grade L7 or L43: ASTM A 320/A320M grade L7 or L43 is acceptable for non-exposed service for all flanges. NOTE: For bolting diameters greater than 1.50 inches (38 mm), consideration should be given to matching the strength of the nut to the strength of the bolt.</p> <p>API 6DSS 3rd 6.8 When low temperature bolting is required, they shall be provided in accordance with ASTM A320 for the specific grade of material. Subsea and splash-zone bolting 2-1/2 in. (62.5mm) and larger on pressure boundary bolting shall conform the ASTM A320 Grade L43.</p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center"> TGR-16 - SC6 TG recommends API issue a document to provide guidance on derating of bolting. There are several specifications on material derating due to elevated temperature. </p>	<p> API 6A 21st 4.2.2.2 Design Considerations The design shall consider the effects of differential thermal expansion from temperature changes and temperature gradients which the equipment can experience in service. Design for high-temperature rating, e.g. classifications X and Y (see Table G.1), shall take into consideration the effects of temperature on strength levels; see Annex G for guidelines. </p> <p> G.4.2.3.1 API 17TR8 For HPHT fatigue sensitive applications recommendations API 17TR8. </p> <p> 6DSS 3rd 5.2 Pressure-temperature ratings for valves shall be in accordance with the applicable rating table for the appropriate material group in ASME B16.34. Pressure-temperature ratings for valves made from materials not covered by ASME B16.34 shall be determined from the material properties in accordance with the applicable design standard. </p>

Progress on Research, Materials/Standards and QA/QC

		Topic	Discussion
		<p align="center"> TGR-18 - SC6 Product subcommittees should review and consider incorporating 20E and 20F requirements (resolve existing conflicting properties specified in product specifications such as hardness). </p>	<p>6A 21st Same as TGR-14</p> <p>6D 24th API 20E is a recommendation in published document. 20E and 20F are in an informative annex that provides guidance to the manufacturer to use if requested. Plans are to make 20E BSL-1 mandatory for class rating 900 and higher on the next revision in late 2018.</p> <p>6DSS 3rd 6.8 Pressure boundary bolting shall conform to the requirements of API 20E or API 20F in accordance with Annex H.</p> <p>6.8 Carbon and low-alloy steel bolting material, with a hardness exceeding HRC 34 (HBW 319), shall not be used for valve applications where hydrogen embrittlement can occur.</p> <p>NOTE Carbon and low-alloy steel bolting material with HRC 32 (HBW 301) or less may provide additional resistance to for hydrogen embrittlement.</p> <p>Hardness limits for bolting other than carbon and low-alloy bolting material materials shall be by agreement. See Annex J for CRA materials API 20F.</p>

Progress on Equipment Manufactures Operations

Topic	Discussion	OEM 1	OEM 2	OEM 3	OEM 1 Comments	OEM 2 Comments	OEM 3 Comments	
Near Term Deliverables								
1	Bulletin Identifying critical BOP bolting > 35 HRC	Attach any EB/PNI identifying critical bolting > 35 HRC	Completed - February 2016	Completed - February 24, 2016	Completed - October 2016	Product Notification & Improvement 16-008 issued 9/2016 Product Notification & Improvement 16-009 issued 9/2016 Product Notification & Improvement 16-010 issued 10/2016	Product Information Bulletin D4516545916 Released February 24, 2016	PA 40832 was generated in response to BSEE Safety Alert 318. Company does not provide bolts for pressure containing/pressure controlling with hardness greater than 35 HRC. See attachment. Revision 2 of PA 40832 was released in 12/2016 to communicate that Engineering Bulletin 962D (Torque guidance for critical bolting) was released and Company uses FPR to investigate field issues and uses Product Advisory or Product Safety Alerts to communicate issues to Company equipment owners.
2	Part Numbers for API 20 E/F replacement Bolting for critical BOP bolting > 35 HRC	Attach any EB/PNI identifying part numbers for critical bolting > 35 HRC	Completed - NA	Completed - 2016	Completed - October 2016	Product Notification & Improvement 16-008 issued 9/2016 Product Notification & Improvement 16-009 issued 9/2016 Product Notification & Improvement 16-010 issued 10/2016	All replacement bolting for critical BOP bolting meet API 20E BSL-3	Company has generated critical bolting part numbers for compliance to API 20E, BSL-3. These are available to our customers and more are being generated as needed. A few part numbers have been set up for 20F at this moment as CRA bolting is not normally provided in BOP equipment for critical bolting. See attachment with sample bolting part numbers.
3	Bulletin updating Torque Application	Attach any EB/PNI identifying updated Torque guidance for critical bolting	Completed - March 2016	Completed - February 24, 2016	In-progress	Estimated 70% complete and issued.	D4516545916 Released February 24, 2016. Torque requirements called out in PIB	EB-962D, released on March 2016. See attachment.
4	Internal process for enhanced failure reporting of critical bolting	Attach any example of updated failure reporting process. Attach any example of enhanced failure reporting related to critical BOP bolting	Completed - 1990's	Completed	In-progress	Estimated 80% complete; website active.	We have fairly robust lines of communication on failures as is. Attached is an excerpt from PIB D4516545916. Customers should also refer to previous Company Product Information Bulletins and Safety Alerts for any additional information related to this issue and information regarding safe operation, maintenance, and inspection criteria by signing in to your MYCompany account and then searching with the Product Bulletin Search available below the heading 'Application Groups'. For information on registering, please visit company website. Please contact your local Service Center if you have any questions regarding this bulletin.	Company has internal procedure called Field Performance Report (FPR) for capturing field performance failures of Company equipment. This FPR is the mechanism used to initiate an investigation and determine the Root Cause of the failure. In addition, Company has a system to communicate Product Advisories (PA) and Safety Alerts (SA) as well as Engineering Bulletins (EB) to our customers if deemed necessary resulting from an FPR investigation or internal reviews. The guidelines for these procedures are outlined in Company Engineering Procedure EP-307 (FPRs), CEP-030 (SAs/PAs) and EP-204 (EBs). These procedures are considered "Confidential" and cannot be distributed outside of Company.
5	Updated QAQC standards for bolt manufacturing	Attach any example of updated QA process	Completed - August 2015	Completed	Completed - October 2016		Bolts specified to API 20E BSL-3. All our BSL bolting is only manufactured by vendors our QA department has physically audited and approved for critical fasteners. Per API 20E the manufacture of the finished part has to audit the mill producing the material for BSL. The documentation required of these vendors are as follows: Full Dimensional Inspection Report, Manufactures Material Test Report (Chemical and Mechanical), MPI Test Report, Ultrasonic Test Report, 100% Hardness Testing (If Serialized), Steel Certificate of Test from the Mill, Mechanical Testing by independent Lab to ensure the product from the mill meets the BSL Requirements (Only if manufacture did not buy direct from mill), Heat Treat Certification, Micro-Structure Examination with Photo, Macro-Structure Examination with Photo, and Plating Certification.	Quality Plans (QP-000112-09) have been created for Pressure Containing and Primary Load Bearing Oil and Gas Equipment Used in Subsea Applications: API 6A, API 17D and API 20E. Bolting Specification BSL-3. QP-000112-09 is considered "Confidential" and cannot be distributed outside of Company.
Longer Term Deliverables								
A1	Part numbers for API 20 E/F replacement bolting for all critical BOP bolting	Attach any EB/PNI identifying part numbers for critical bolting	Completed - December 2016	Completed	Completed - October 2016	Product Notification & Improvement 16-008 issued 9/2016 Product Notification & Improvement 16-009 issued 9/2016 Product Notification & Improvement 16-010 issued 10/2016	16543557-001, 16569565-001, 16569606-001, 165004, 16587680-001, 16587681-001, 16587682-001. All part numbers referenced in PIB D4516545196	Company has generated critical bolting part numbers for compliance to API 20E, BSL-3. These are available to our customers and more are being generated as needed. A few part numbers have been set up for 20F at this moment as CRA bolting is not normally provided in BOP equipment for critical bolting. See attachment with sample bolting part numbers. PA 40832 Rev 02 addresses this item.
A2	Replacement bolting coating specified	Attach any EB/PNI identifying replacement coating	In-Progress	Completed	Completed - October 2016	Product Notification & Improvement 16-010 issued 10/2016	Zinc-Nickel Plate - Plate to ASTM F1941	Company is engaging different vendors to find alternatives to electrodeposited zinc plating.

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 1 BOP 1	Rig 2 BOP 1	Rig 3 BOP 1	Rig 4 BOP 1
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	no bolts greater than 35 HRC	0%	no bolts greater than 35 Rc	Completed
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	no bolts greater than 35 HRC	0%	no bolts greater than 35 Rc	Not Started
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	In-progress	Completed - July 15, 2014	In-progress	Completed
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	2015 Training in Rig maint. Sys. 100% participation in GOM	Completed - July 20, 2016	2015 Training in Rig maint. Sys. 100% participation in GOM	Completed
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit		Completed - July 15, 2014		
			PA 40832 from OEM	Completed - July 15, 2014	PA 40832 from OEM	Completed
			Completed - October 2016	Completed - July 15, 2014	Completed - October 2016	Not Started
			Completed - October 2016	Completed - July 15, 2014	Completed - October 2016	Not Started
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	In place since 2015	Completed - March 15, 2016	In place since 2015	Completed
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	Being Quoted	0%	Being Quoted	In-progress
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	0%	0%	0%	In-progress

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 4 BOP 2	Rig 5 BOP 1	Rig 5 BOP 2	Rig 6 BOP 1
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	Completed	0%	0%	0%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	Not Started	0%	0%	0%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	Completed	Completed - March 9, 2015	Completed - March 9, 2015	In-progress
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	Completed	Completed - July 20, 2016	Completed - July 20, 2016	We use OEM failure reporting system
5	MTR review for installed critical bolting:	Can include letter from OEM, example of MTR audit		In-progress	In-progress	In-progress
	- OEM SOF critical bolting per relevant specification		Completed	In-progress	In-progress	
	- MTRs per relevant specification		Not Started	In-progress	In-progress	
	- Bolting audit to verify MTR information		Not Started	Not Started	Not Started	
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	Completed	Completed - March 15, 2016	Completed - March 15, 2016	PMs are setup within our maintenance program for the required inspections.
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	In-progress	0%	0%	0%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	In-progress	0%	0%	0%

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 7 BOP 1	Rig 7 BOP 2	Rig 8 BOP 1	Rig 9 BOP 1
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	Not Started	Not Started	being quoted	0%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	Not Started	Not Started	being quoted	0%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	Completed - November 1, 2016	Completed - November 1, 2016	In-progress	Completed - Oct 4, 2016
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	Completed - November 1, 2016	Completed - November 1, 2016	2015 Training in Rig maint. Sys. 100% participation in GOM	IOGP Failure reporting
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit	Completed - November 1, 2016	Completed - November 1, 2016	Completed - October 2016 Completed - October 2016	PIB Issued YES Completed
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	In-progress (50%)	In-progress (50%)	In place since 2014	Complete phased array inspection on 90% of all critical bolting
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	Not Started	Not Started	0%	0%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	Not Started	Not Started	0%	0%

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 9 BOP 2	Rig 10 BOP 1	Rig 10 BOP 2	Rig 11 BOP 1
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	0%	0%	0%	0%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	0%	0%	0%	0%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	Completed - Oct 5, 2016	Completed - March 9, 2015	Completed - March 9, 2015	Completed - Oct 3, 2016
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	IOGP Failure reporting	Completed - July 20, 2016	Completed - July 20, 2016	IOGP Failure reporting
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit		Not Started	Not Started	
			PIB Issued	In-progress	In-progress	PIB Issued
			YES	In-progress	In-progress	YES
			Completed	Not Started	Not Started	Completed
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	Complete phased array inspection on 90% of all critical bolting	Completed - March 15, 2016	Completed - March 15, 2016	Complete phased array inspection on all critical bolting
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	0%	0%	0%	0%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	0%	0%	0%	0%

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 12 BOP 1	Rig 12 BOP 2	Rig 13 BOP 1	Rig 14 BOP 1
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	NA	NA	0%	100%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	NA	NA	0%	100%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	NA	NA	In-progress	In-progress
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	NA	NA	Completed - May 8, 2015	IOGP BOP Reliability Database
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit	NA	NA	In-progress	Completed - December 2016
			NA	NA	Completed - February 24, 2016	
			NA	NA	Completed - May 4, 2016	
			NA	NA	In-progress	
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	NA	NA	Completed - December 9, 2015	Completed
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	NA	NA	0%	88%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	NA	NA	0%	0%

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 14 BOP 2	Rig 15 BOP 1	Rig 15 BOP 2	Rig 16 BOP 1
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	100%	0%	0%	100%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	100%	0%	0%	0%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	In-progress	In-progress	In-progress	In-Progress
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	IOGP BOP Reliability Database	Using OEM Failure Reporting Methods. IOGP Reporting Process in development	Using OEM Failure Reporting Methods. IOGP Reporting Process in development	IOGP BOP Reliability Database
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit	Completed - December 2016	In-progress In-progress Done In-progress	In-progress In-progress Done In-progress	Completed - December 2016
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	Completed	In-progress	In-progress	Completed
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	88%	0%	0%	93%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	0%	0%	0%	0%

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 17 BOP 1	Rig 17 BOP 2	Rig 18 BOP 1	Rig 18 BOP 2
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	0%	0%	Completed - February 16, 2017	Completed - February 16, 2017
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	0%	0%	Not Started	Not Started
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	Completed - March 9, 2015	Completed - March 9, 2015	Completed - November 1, 2016	Completed - November 1, 2016
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	Completed - July 20, 2016	Completed - July 20, 2016	Completed - November 1, 2016	Completed - November 1, 2016
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit	In-progress	In-progress	Completed - November 1, 2016	Completed - November 1, 2016
			In-progress	In-progress		
			In-progress	In-progress		
			Not Started	Not Started		
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	Completed - March 15, 2016	Completed - March 15, 2016	In-progress (50%)	In-progress (50%)
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	0%	0%	Completed - February 16, 2017	Completed - February 16, 2017
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	0%	0%	Not Started	Not Started

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 19 BOP 1	Rig 20 BOP 1	Rig 21 BOP 1	Rig 21 BOP 2
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	100%	100%	Not Started	Not Started
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	100%	100%	Not Started	Not Started
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	In-progress	Completed March 29, 2016	Completed - November 1, 2016	Completed - November 1, 2016
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	IOGP BOP Reliability Database	Completed July 28, 2016	Completed - November 1, 2016	Completed - November 1, 2016
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit	Completed - December 2016	Completed April 1, 2016 Completed February 18, 2016 Completed April 1, 2016	Completed - November 1, 2016	Completed - November 1, 2016
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	Completed	Completed April 1, 2016	In-progress (50%)	In-progress (50%)
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	0%	30%	Not Started	Not Started
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	0%	0%	Not Started	Not Started

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 22 BOP 1	Rig 23 BOP 1	Rig 23 BOP 2	Rig 24 BOP 1
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	100%	100%	100%	0%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	100%	100%	100%	0%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	In-progress	In-progress	In-progress	In-progress
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	IOGP BOP Reliability Database	IOGP BOP Reliability Database	IOGP BOP Reliability Database	Using OEM Failure Reporting Methods. IOGP Reporting Process in development
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit	Completed - December 2016	Completed - December 2016	Completed - December 2016	In-progress In-progress Done In-progress
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	Completed	Completed	Completed	In-progress
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	81%	88%	88%	0%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	20%	0%	0%	0%

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 24 BOP 2	Rig 25 BOP 1	Rig 26 BOP 1	Rig 26 BOP 2
			Status	Status	Status	Status
Near Term Deliverables						
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	0%	0%	Not Started	Not Started
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	0%	0%	Not Started	Not Started
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	In-progress	In-progress	Completed - November 1, 2016	Completed - November 1, 2016
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	Using OEM Failure Reporting Methods. IOGP Reporting Process in development	Completed	Completed - November 1, 2016	Completed - November 1, 2016
5	MTR review for installed critical bolting: - OEM SOF critical bolting per relevant specification - MTRs per relevant specification - Bolting audit to verify MTR information	Can include letter from OEM, example of MTR audit	In-progress In-progress Done In-progress	In-progress	Completed - November 1, 2016	Completed - November 1, 2016
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	In-progress	Critical bolting section added to PM Structure in the PM system and new PM tasks added to cover.	In-progress (50%)	In-progress (50%)
Longer Term Deliverables						
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	0%	waiting quote	Not Started	Not Started
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	0%	waiting quote	Not Started	Not Started

Progress on Equipment Owner Operations

Item	Topic	Discussion	Rig 27 BOP 1	Rig 28 BOP 1
			Comments	Status
Near Term Deliverables				
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	0%	0%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	0%	0%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	Completed - July 15, 2014	In-progress
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	Completed - July 20, 2016	Completed - May 8, 2015
5	MTR review for installed critical bolting:	Can include letter from OEM, example of MTR audit	Not Started	In-progress
	- OEM SOF critical bolting per relevant specification		Completed - September 15, 2016	Completed - February 24, 2016
	- MTRs per relevant specification		In-Progress	Completed - May 4, 2016
	- Bolting audit to verify MTR information		Not Started	In-progress
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	Completed - March 15, 2016	Completed - December 9, 2015
Longer Term Deliverables				
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	0%	0%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	0%	0%

Summary of Progress on Equipment Owner Operations

Total Number of Active BOPs = 40			Not Started		In-Progress		Completed		Blank (No Answer)	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
Item	Topic	Discussion								
Near Term Deliverables										
1	Replacement 20 E/F bolts for all > 35 HRC critical bolting ordered	List by rig the % of API 20 E replacement bolts ordered	26	65%	0	0%	14	35%	0	0%
2	Replacement 20 E/F bolts for all > 35 HRC critical bolting installed	List by rig the % of API 20 E bolts installed on the BOP	31	78%	0	0%	9	23%	0	0%
3	Rig Procedure for torquing of critical bolting	Can include example rig procedure	0	0%	18	45%	22	55%	0	0%
4	Internal process for enhanced failure reporting of critical bolts (IOGP Failure reporting procedure)	Can include example procedure for compliance with IOGP Failure reporting	0	0%	4	10%	36	90%	0	0%
5	MTR review for installed critical bolting:	Can include letter from OEM, example of MTR audit	3	8%	12	30%	17	43%	8	20%
	- OEM SOF critical bolting per relevant specification		0	0%	10	25%	12	30%	18	45%
	- MTRs per relevant specification		2	5%	7	18%	13	33%	18	45%
	- Bolting audit to verify MTR information		9	23%	6	15%	8	20%	17	43%
6	Preventative maintenance (PM) for BOP bolting API Std 53	Can include PM for BOP bolting maintenance. Example of NDE performed on BOP bolts	0	0%	14	35%	26	65%	0	0%
Longer Term Deliverables										
A1	Critical bolting API 20 E/F replacement bolts ordered	List by rig % of bolts ordered	29	73%	9	23%	2	5%	0	0%
A2	Critical bolting API 20 E/F replacement bolts installed	List by rig % of bolts installed/replaced	37	93%	3	8%	0	0%	0	0%

PRODUCT INFORMATION

Product Bulletin No.: D4516596732-PIB-001

Rev 01

Bolting Hardness

Date: March 03, 2016

Subject: Bolt failures

Product: Subsea BOPs, Annular BOPs and BOP stacks

Affected

Assemblies: Annular BOPs, Ram BOPs and BOP stack structures used subsea

Objective: To advise customers to replace certain bolts on Subsea BOPs, Annular BOPs and BOP stacks that may be susceptible to hydrogen embrittlement.

Issue: In the past 4 years the industry has experienced bolt failures related to hydrogen embrittlement that could affect the safe operation of subsea equipment. COMPANY has reviewed the current material industry standards and has identified bolts manufactured to certain material specifications that may be manufactured from harder materials that may be more susceptible to hydrogen embrittlement. The current material industry standards that COMPANY has reviewed are:

ASTM A574

ASTM A354

ASTM A540

SAE J429 (Grade 8 only)

Bolts manufactured from AISI 4340 or 8630 that exceed 35 HRC

Solution: COMPANY has reviewed each Subsea stack, annular BOP, and Ram BOP to identify bolting material that may be manufactured from harder materials that may be more susceptible to hydrogen embrittlement. As a precautionary measure COMPANY recommends that the identified bolting material be replaced. Contact [website](#) for the list of bolts that need to be replaced

for your stack. Parts (but not installation) will be supplied by COMPANY Incoterms FCA, for all equipment defined by COMPANY to be affected by the above described issue for one year from the date of this revision of this bulletin.

Drill through flange bolts, closure bolts and choke and kill line and valve flange bolts are not manufactured to any of the above specifications and therefore are not affected by this bulletin.

Pressure containing and pressure retaining fasteners including included API flange bolting, BOP side outlet bolting, door or bonnet bolting and connector body bolts have already been addressed in previous bulletins.

Bolting affected by this bulletin is not classified as critical bolting and is classified as utility bolting. Critical bolting is bolting that the failure of which would result in the loss of containment of wellbore fluids to the environment. Examples include API drill through flange bolts, BOP side outlet API flange bolts, bonnet or door bolts, wellhead and LMRP connector primary load path bolts, blind shear ram primary load path bolting, and riser primary load path bolting. Utility bolting is all other bolting that is not critical bolting.

Failure to follow the recommendations and/or guidance in COMPANY Manuals and Product Bulletins may result in death, bodily injury or property damage.

Operators should also refer to previous COMPANY Product Information Bulletins and Safety Alerts for additional information related to this issue and information regarding safe operation, maintenance, and inspection criteria by signing in to your MYCOMPANY account at [website](#) and then searching with the Product Bulletin Search available below the heading 'Application Groups'. For information on registering, please visit [website](#).

Please contact your local Service Center if you have any questions regarding this bulletin.

Revision History:

Rev	Date (mm/dd/yyyy)	Change Description
01	03/03/2016	Initial Release

Connection type: **18-3/4-15M**

Bolt part number: **10898090-001**

Part description: **STUD, TE, 3"-8UN X 16-3/4" LG, HI STRGTH, ZINC-NICKEL**

Bolt material/yield: **NS43/130Ksi**

Bolt pattern/hex size: **20 bolt / 4-5/8" hex**

Lubricant to be used/coefficient of friction: **Moly 503/0.067**

Ensure correct lubricant stated above is applied to both the bolt thread, and the mating face of the nut, prior to assembly.

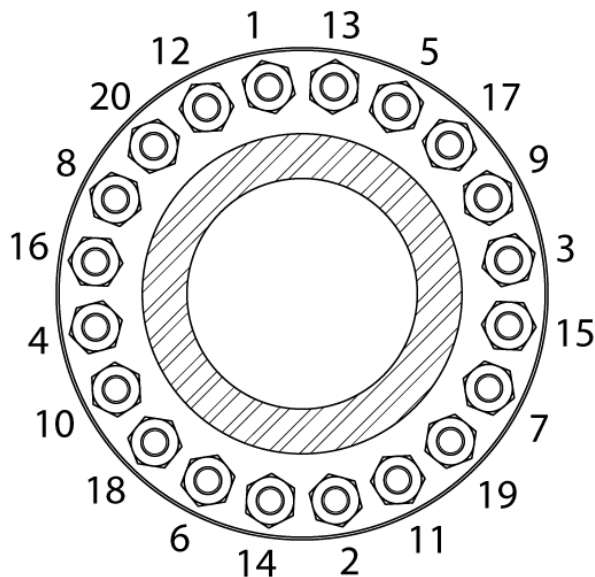
In any bolted assembly, the bolts must never be torqued to full torque on the first time through the torque sequence. This is even more important for raised face flanges where the bolts are outside the contact surface. The procedure below highlights the steps required to torque large flanges with high bolt torque values.

After flange assembly and all nuts have been run down by hand, start wrench tightening following the sequence of the numbers indicated (marking the number on the flange aids in keeping track of the tightening process).

Confirm that the hydraulic power unit for the torque wrench has valid gauge calibration in effect and monitor the pressure reading throughout the process to ensure correct torque is applied.

Assign one person as a task monitor to ensure make-up procedure is followed correctly.

During all of the following steps, keep any gap between flanges even all around the circumference, and nuts made up approximately the same amount on each end of the bolt.



- First time around just snug the nuts with a hand wrench.
- Second time around tighten the nuts firmly with the same wrench.
- Third time around apply **2404ft/lbs** (approximately 25% recommended torque).
- Fourth time apply **7212ft/lbs** (approximately 75% of recommended torque).
- Fifth time around, apply **9616ft/lbs** (100% of recommended torque). During the 100% torque sequence EVERY nut must move. If not, loosen the nut 1/4 turn and re-torque.
- Continue tightening nuts in the tightening sequence until nuts do not move under 100% recommended torque.

If possible, re-torque after 24 hours or after the first pressure test. Most of any bolt preload loss occurs within 24 hours or after the first pressure test.

Referenced document: AX050091RevF.

PRODUCT ADVISORY

PA 40832, Rev 02

12/16/2016

Authorized Use Only

Company Response to BSEE Safety Alert No. 318 - Connector and Bolt Failures

UPDATE:

Company originally issued Product Advisory 40832 on February 18, 2016. This Product Advisory has been updated to provide additional Company information in response to BSEE Safety Alert No. 318. This revision amends and replaces the original version in its entirety. Changes can be identified by revision lines marked along the right side of the page.

SCOPE:

This Product Advisory is Company's response to *BSEE Safety Alert No. 318 Connector and Bolt Failures* dated February 02, 2016 (the Safety Alert). In particular, this Product Advisory addresses the concern regarding maximum hardness of bolting material used by Company in our Subsea Drilling Equipment, bolt torque and reporting of field failures.

ISSUE:

On February 02, 2016 Company received the Safety Alert which expressed concern for bolt failures in connectors, risers, and subsea blowout preventers. The Safety Alert states, in part, *"...operators should work with the Original Equipment Manufacturer (OEM) to:*

- *Verify that there is complete documentation that demonstrates that all components that are currently in service satisfy the metallurgical properties specified by the OEM and the latest industry standards.*
- *Verify that all installation and maintenance procedures (including torque processes and values) satisfy OEM requirements and ensure that these practices are effectively implemented.*
- *Report any failures to OEMs and appropriate industry organizations in a timely manner to ensure the prompt transmission of relevant data to the industry."*

REQUIREMENTS/RECOMMENDATIONS:

Company manufactures connectors, risers and subsea blowout preventers in conformance with the relevant API standards in place at the time of the manufacture of the product. Company supplies bolting materials that are in accordance with relevant and current API standards at the time of manufacture. The material hardness is less than or equal to 35 HRC on the critical bolting for Company's Subsea Drilling equipment subjected to cathodic protection. In addition, Company has generated critical bolting part numbers in compliance to API 20E, BSL-3 and are available to our customers.

Company provides customers with installation and maintenance procedures, including bolt torque information in conformance with applicable API standards for all Company drill-thru products. This information can be found in Company's Installation, Operation and Maintenance

Manuals (IOMs), Rig Books and Engineering Bulletins (EB). Company issued EB 9620 to provide torque guidance for critical bolting.

Company has an internal system called Field Performance Reports (FPRs) which is used to document information associated with field issues, the investigation and to verify conformance with API Q1, 9th Edition requirements. Upon completion of the FPR, a Product Advisory (PA), Product Safety Alert (PSA) or Engineering Bulletin (EB) may be issued to communicate relevant information to our customers as deemed necessary.

CONCLUSION:

It is our intention that this Company Product Advisory provides our customers and regulatory bodies with information responsive to the Safety Alert.

COMPANY CONTACTS:

For questions or comments please contact your local Company representative .

ATTACHMENT:

BSEE Safety Alert No.318 – Connector and Bolt Failures

SAFETY ALERT



Safety Alert No. 318
02 February 2016

Contact: Douglas Morris
Phone: (202) 208-3974
Email: Douglas.Morris@bsee.gov

Connector and Bolt Failures

Overview: BSEE is aware of a recurring problem of connector and bolt failures in various components used in risers and subsea blowout preventers used in offshore operations. These failures are of great concern to BSEE due to their frequency and the potential for a catastrophic event. A previous occurrence of bolt failures in December 2012 prompted a global recall of the bolts associated and a temporary cessation of drilling activities. The fact that these failures involved equipment from three primary manufacturers suggests that this may be a systemic industry problem that requires immediate attention.

Recommendations: At a minimum, operators should work with the original equipment manufacturer (OEM) to:

- Verify that there is complete documentation that demonstrates that all components that are currently in service satisfy the metallurgical properties specified by the OEM and the latest industry standards.
- Verify that all installation and maintenance procedures (including torque processes and values) satisfy OEM requirements and ensure that these practices are effectively implemented.
- Report any failures to OEMs and appropriate industry organizations in a timely manner to ensure the prompt transmission of relevant data to the industry.

BSEE is continuing to work with various organizations to evaluate these failures and determine if additional long-term action is needed to prevent additional failures. Additional information will be provided as it becomes available on bsee.gov/bolts.

A Safety Alert is a tool used by BSEE to inform the offshore oil and gas industry of the circumstances surrounding an accident or a near miss. It also contains recommendations that should help prevent the recurrence of such an incident on the Outer Continental Shelf.