UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT GULF OF MEXICO OCS REGION

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NOTICE TO LESSEES AND OPERATORS OF FEDERAL OIL AND GAS LEASES IN THE OUTER CONTINENTAL SHELF, GULF OF MEXICO OCS REGION

Guidance for Information Submissions Regarding Proposed High Pressure and/or High Temperature (HPHT) Well Design, Completion, and Intervention Operations

This Notice to Lessees and Operators of Federal Oil and Gas Leases (NTL) provides guidance related to the process for requesting approval for well design, completion, and intervention operations for wells in a high pressure and/or high temperature (HPHT) environment.

Background

The guidance below provides recommendations and clarifications regarding operator HPHT well design, completion, and intervention operations information submittals that, if followed, facilitate Bureau of Safety and Environmental Enforcement (BSEE) review and approval. Pursuant to 30 CFR Part 250, operators must submit the Conceptual Plan, the Deepwater Operations Plan (DWOP), the Application for Permit to Drill (APD), and the Application for Permit to Modify (APM) at specified times for pertinent operations. The other plans discussed below may be submitted voluntarily to assist BSEE with its overall review of the HPHT well design, completion, and intervention operations. Through these voluntary submissions, operators may provide information earlier in the process than is required by the regulations. In a few instances, BSEE is providing the option to submit information not required by the regulations, but which facilitates BSEE's review. If an operator elects to voluntarily submit information early and/or voluntarily submit additional information, BSEE recommends that the operator follow the guidance below regarding the timing and formatting of its submissions to maximize BSEE's review efficiency.

Regulatory Authority

BSEE considers equipment used in an HPHT environment to be non-conventional technology. A request to design, complete, and potentially intervene in a well in an HPHT environment therefore requires the operator to submit and receive approval of a Conceptual Plan and a

DWOP, as described in 30 CFR 250.286 through 250.295. The regulations at 30 CFR 250.288 through 250.291 explain when and how to submit a Conceptual Plan and a DWOP. BSEE regulations specify that any equipment with an internal absolute pressure rating greater than 15,000 psia or with a temperature rating greater than 350 degrees Fahrenheit is HPHT equipment. Such equipment must comply with BSEE's HPHT regulations and guidance. Section 250.804 provides requirements regarding the information that operators must submit to obtain approval from BSEE to use HPHT equipment. In addition, 30 CFR 250.732(c) makes Independent Third Party (I3P) verification reports mandatory for HPHT blowout preventer (BOP) systems and related equipment. The I3P reports are required as part of the APD or APM pursuant to 30 CFR 250.731. Operators seeking permission to use HPHT equipment designed beyond the limits established in the API Standards incorporated into the regulations at 30 CFR 250.198 must obtain approval of a request for alternate procedures or equipment pursuant to 30 CFR 250.141.

Select DWOP and Conceptual Plan Regulations

§ 250.287: "You must submit a DWOP for each development project in which you will use non-conventional production or completion technology, regardless of water depth. If you are unsure whether BSEE considers the technology of your project non-conventional, you must contact the Regional Supervisor for guidance."

§ 250.290: "You may not complete any production well or install the subsea wellhead and well safety control system (often called the tree) before BSEE has approved the Conceptual Plan."

§ 250.292(a) and (e): "You must include…in your DWOP…[a] description and schematic of the typical wellbore, casing, and completion," and "[i]nformation concerning the drilling and completion systems."

§ 250.292(i): "You must include…in your DWOP…[i]nformation about subsea wells and associated systems that constitute all or part of a single project development covered by the DWOP."

Select HPHT Regulations

§ 250.804(a): "If you plan to install SSSVs and related equipment in an HPHT environment, you must submit detailed information with your Application for Permit to Drill (APD) or Application for Permit to Modify (APM), and Deepwater Operations Plan (DWOP) that demonstrates the SSSVs and related equipment are capable of performing in the applicable HPHT environment. Your detailed information must include the following:
(1) A discussion of the SSSVs' and related equipment's design verification analyses;
(2) A discussion of the SSSVs' and related equipment's design validation and functional testing processes and procedures used; and

(3) An explanation of why the analyses, processes, and procedures ensure that the SSSVs and related equipment are fit-for-service in the applicable HPHT environment."

§ 250.804(b): "For this section, HPHT environment means when one or more of the following well conditions exist:
(1) The completion of the well requires completion equipment or well control equipment assigned a pressure rating greater than 15,000 psia or a temperature rating greater than 350 degrees Fahrenheit;
(2) The maximum anticipated surface pressure or shut-in tubing pressure is greater than 15,000 psia on the seafloor for a well with a subsea wellhead or at the surface for a well with a surface wellhead; or
(3) The flowing temperature is equal to or greater than 350 degrees Fahrenheit on the seafloor for a well with a subsea wellhead or at the surface for a well with a surface wellhead."

§ 250.804(c): "For this section, related equipment includes wellheads, tubing heads, tubulars, packers, threaded connections, seals, seal assemblies, production trees, chokes, well control equipment, and any other equipment that will be exposed to the HPHT environment."

Select Drilling Operation Regulations

§ 250.420(a)(7)(i): "Your casing and cementing programs must…Include a certification signed by a registered professional engineer that the casing and cementing design is appropriate for the purpose for which it is intended under expected wellbore conditions, and is sufficient to satisfy the tests and requirements of this section and § 250.423. Submit this certification with your APD (Form BSEE-0123)."

§ 250.420(a)(7)(ii): "You must have the registered professional engineer involved in the casing and cementing design process."

§ 250.420(b)(1): "You must design casing (including liners) to withstand the anticipated stresses imposed by tensile, compressive, and buckling loads; burst and collapse pressures; thermal effects; and combinations thereof."

§ 250.420(b)(2): "The casing design must include safety measures that ensure well control during drilling and safe operations during the life of the well."

§ 250.462(c): "You must submit a description of your source control and containment capabilities to the Regional Supervisor and receive approval before BSEE will approve your APD, Form BSEE-0123. The description of your containment capabilities must contain the following: (1) Your source control and containment capabilities for controlling and containing a blowout event at the seafloor; (2) A discussion of the determination required in paragraph (a) of this section; and (3) Information showing that you have access to and the ability to deploy all equipment required by paragraph (b) of this section."

Select Well-Completion Regulations

§ 250.505: "No subsea well completion shall be commenced until the lessee obtains written approval from the District Manager in accordance with § 250.513 of this part. That approval shall be based upon a case-by-case determination that the proposed equipment and procedures will adequately control the well and permit safe production operations."

§ 250.513(b)(1): "You must submit the following … A brief description of the well-completion procedures to be followed, a statement of the expected surface pressure, and type and weight of completion fluids."

§ 250.514(a): "Well-control fluids, equipment, and operations shall be designed, utilized, maintained, and/or tested as necessary to control the well in foreseeable conditions and circumstances, including subfreezing conditions. The well shall be continuously monitored during well-completion operations and shall not be left unattended at any time unless the well is shut in and secured."

§ 250.518(c): "Wellhead, tree, and related equipment shall have a pressure rating greater than the shut-in tubing pressure and shall be designed, installed, used, maintained, and tested so as to achieve and maintain pressure control. New wells completed as flowing or gas-lift wells shall be equipped with a minimum of one master valve and one surface safety valve, installed above the master valve, in the vertical run of the tree."

§ 250.518(d): "Subsurface safety equipment must be installed, maintained, and tested in compliance with the applicable sections in §§ 250.810 through 250.839."

§ 250.518(e)(1): "All permanently installed packers and bridge plugs must comply with API Spec. 11D1 (as incorporated by reference in § 250.198)."

§ 250.519: "Once you install your wellhead, you must meet the casing pressure management requirements of API RP 90 (as incorporated by reference in § 250.198) and the requirements of §§ 250.519 through 250.530. If there is a conflict between API RP 90 and the casing pressure requirements of this subpart, you must follow the requirements of this subpart."

Select Well-Workover Regulations

§ 250.605: "No subsea well-workover operation including routine operations shall be commenced until the lessee obtains written approval from the District Manager in accordance with § 250.613 of this part. That approval shall be based upon a case-by-case determination that the proposed equipment and procedures will maintain adequate control of the well and permit continued safe production operations."

§ 250.613(b)(1): "You must submit the following…A brief description of the well-workover procedures to be followed, a statement of the expected surface pressure, and type and weight of workover fluids."

§ 250.613(b)(2): "You must submit the following…When changes in existing subsurface equipment are proposed, a schematic drawing of the well showing the zone proposed for workover and the workover equipment to be used."

§ 250.614(a): "Well-control fluids, equipment, and operations shall be designed, utilized, maintained, and/or tested as necessary to control the well in foreseeable conditions and circumstances, including subfreezing conditions. The well shall be continuously monitored during well-workover operations and shall not be left unattended at any time unless the well is shut in and secured."

§ 250.619(a): "No tubing string shall be placed in service or continue to be used unless such tubing string has the necessary strength and pressure integrity and is otherwise suitable for its intended use."

The requirements in Subpart G, 30 CFR 250.700 through 30 CFR 250.746, cover operations and equipment associated with drilling, completions, workover, and decommissioning activities.

Guidance

For the purposes of assessing compliance with 30 CFR 250.732(c), BSEE considers "BOP systems and related equipment" to include all pressure controlling and pressure containing well control equipment that can or will be exposed to an HPHT environment during drilling, completion, or intervention (with or without the tree installed). Well control equipment includes equipment that is temporarily or permanently installed for the purpose of pressure control and containment when it becomes necessary to physically enter a well bore during drilling, completion, or workover modes of operation. Operator's must demonstrate that the BOP systems and related equipment must have the appropriate shearing capacity, pressure containment capacity, and well control and recovery capacity during all phases of operation (see 30 CFR 250.730-250.738).

Operators should ensure that there are redundant mechanical barriers between a source of hydrocarbons and people and/or the environment, also known as the "BSEE Barrier Philosophy." BSEE will only approve a plan if the required redundant mechanical barriers are testable and have a defined acceptance criteria. BSEE considers wellbore fluids to be a temporary conditional barrier.

The Appendices in this NTL provide specific guidance for operators' submissions related to well design, completion, and intervention operations for wells in an HPHT environment.

Appendix 1 provides a standard list of definitions to facilitate communications on HPHT submissions.
Appendices 2-4 provide guidance concerning information that an operator should submit concerning HPHT well design, completion, and intervention operations to facilitate BSEE's review and approval process.

Appendix 3 provides guidance on HPHT Well Completion Design and Operations Conceptual Plans.
Appendix 4 contains guidance on Independent Third Party (I3P) and Operator Reports.

Operators should refer to all other applicable BSEE regulations and guidance documents regarding the submission of DWOPs and new technology applications, in addition to the following guidance. In addition to complying with specific regulations, documents incorporated by reference, and guidance addressing comprehensive requirements for drilling, completion, workovers, and production in an HPHT environment, operators should utilize recognized engineering practices that reduce risks to the lowest level practicable, as described in 30 CFR 250.107(a)(3). The operator must demonstrate that risks are minimized to the greatest extent practicable.

Additional NTL Guidance

1. NTL No. 2009-G31, Hydrogen Sulfide. This NTL notes that concentrations of H_2S as low as 3 ppm at 20,000 psi will have a partial pressure greater than 0.05 psia and require materials compliant with National Association of Corrosion Engineers (NACE) standards. Unless the operator can accurately determine by direct measurements from a producing well that the concentration of H_2S is less than 0.05 psia, then NACE-compliant material will be required for any HPHT well completions. NACE MR0175 is incorporated into the regulations in 30 CFR 250.198 and referenced in 30 CFR 250.901 and 250.490.
2. NTL No. 2019-N04, Calculating Maximum Anticipated Surface Pressure and Expected Surface Pressure for the Completion Case and Estimated Shut-in Tubing Pressure Prior to Production. The calculation of the MASP for the Completion Case and the Estimated Shut-in Tubing Pressure are critical for determining whether the well is classified as a High Pressure well.

Guidance Document Statement

BSEE issues NTLs as guidance documents in accordance with 30 CFR 250.103 to clarify or provide more detail about certain BSEE regulatory requirements and to outline the information you provide in your various submittals. Under that authority, this NTL sets forth guidance and clarification regarding certain regulatory requirements and provides a clear and consistent approach to complying with those requirements.

Paperwork Reduction Act of 1995 Statement

The Office of Management and Budget (OMB) has approved the information collection requirements and assigned OMB Control Numbers 1014-0022, 1014-0024, 1014-0018, 1014-0004, 1014-0001, 1014-0028, 1014-0003, 1014-0025, and 1014-0026 for the subparts A, B, D,

E, F, G, H, APD, and APM regulations. This NTL does not impose any additional information collection requirements subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.).

Contacts

Please address any questions on the content of this NTL to BSEE Gulf of Mexico (GOM) Regional Field Operations, Technical Assessment Section (TAS) by e-mail at Russell.Hoshman@bsee.gov or Otho.Barnes@bsee.gov
Or
BSEE GOM District Field Operations by email at Frederick.Brink@bsee.gov.

/S/ Lars Herbst
Lars Herbst
Regional Director

Attachments

Appendix 1: Definitions and Acronyms

Appendix 2: Information Submission Guidance for HPHT Equipment Conceptual Plan and DWOP

Appendix 3: Additional Information Submission Guidance for HPHT Well Completion Design and Operations Conceptual Plan (Well Design C Plan)

Appendix 4: Guidance for Independent Third Party and/or Operator Reports

Appendix 1: Definitions and Acronyms

Definitions

The following definitions are provided to facilitate communication between operators and BSEE. Where the definitions of terms are inconsistent with those in BSEE regulations and documents incorporated therein, the definitions in the BSEE regulations and documents incorporated therein govern.

Acceptance Criteria, Design: The limits placed on characteristics of material, products, or service to achieve conformity of the product design to an appropriate standard.

Approval by BSEE: For the purpose of oil and natural gas operations, BSEE only approves requests, applications, permits, and plan information submitted in accordance with the Code of Federal Regulations, Title 30, Part 250. *See* 30 CFR 250.102 for a summary list of topics covered by the regulations.

Ambient Pressure: The pressure exerted on an object by the surrounding medium, such as a gas or liquid, in contact with the object.

Assembly: An identifiable portion of a piece of equipment, composed of two or more sub-assemblies, components, or parts that can be isolated, installed, or removed.

BSEE Barrier Philosophy: A BSEE philosophy that there should be mechanical barrier systems between a source of hydrocarbons and people and/or the environment that are redundant, testable, and fully tested to a documented acceptance criteria.

Category 1 Equipment: Category 1 equipment includes all pressure containing and pressure controlling components from the production liner within the well through the last barrier in a subsea tree, BOP, or intervention system, or any equipment that acts as a primary barrier during any mode of operation including drilling, completion, production, injection, intervention, and abandonment.

Category 2 Equipment: Category 2 equipment includes: (1) pressure containing and pressure controlling components that are not critical to well control, (2) non-pressure containing and non-pressure controlling equipment whose failure could reasonably cause a piece of Category 1 HPHT equipment to fail, (3) non-HPHT equipment whose failure could reasonably cause a piece of HPHT Category 1 equipment to fail, or (4) temporarily installed equipment which acts as a secondary barrier during the period it is in the well.

Category 3 Equipment: Non-critical equipment and non-barrier equipment associated with the well.

NOTE: Any equipment that may have a barrier function at any time during the life of the well cannot be Category 3.

Closure Bolting: Threaded fasteners used to assemble wellbore pressure-containing components or join end or outlet connections.

Component or Part: For the purpose of this document, a component or part is an identifiable portion of a piece of equipment, assembly, or sub-assembly that cannot be dismantled further.

Conceptual Plan: The plan described in the regulations at 30 CFR 250.288 through 250.290, required as part of the DWOP process.

Critical Bolting: Threaded fasteners and closure bolting whose failure could lead to loss of structural integrity or pressure containment. Examples include studs, nuts, bolts, and cap screws.

Designated Operator: An entity identified as having control or management of operations on all or a given portion of a lease and any associated facilities pursuant to 30 CFR 550.143 and 550.144. This may be a lessee.

Deepwater Operations Plan (DWOP): The plan described in the regulations at 30 CFR 250.286 through 250.295 that provides sufficient information for BSEE to review a proposed deepwater development project and any other project that uses non-conventional production or completion technology.

External Hydrostatic Pressure: The pressure measured at depth in water in (psia) or estimated using External Hydrostatic Pressure in (psia) = 0.052 * (water density in #/gal) * (True Vertical Depth from Sea-level to depth of interest in feet).

Equipment: Any single completed unit that can be used for its intended purpose without further processing or assembly.

Equipment Diagrams: Sketches or diagrams that show the name(s) and location(s) of the components, assemblies, sub-assemblies, and sealing elements contained within the piece of equipment.

Fastener: Any device that mechanically joins two or more elements together, such as bolts, studs, connectors, nuts, and screws.

Fatigue Critical: When the factored fatigue life of a fatigue hot spot is less than or equal to the probable design service life.

Fatigue Sensitive: When fatigue failure has been identified as a potential failure mode.

Fit-for-Purpose: A determination made by an I3P and submitted to BSEE that a piece of equipment has been designed, tested, and built in conformance with recognized engineering standards and any additional project specific requirements; that the material selection, design verification analysis, validation testing, and quality control is appropriate to justify the technical specifications; and that the technical specifications meet or exceed a project's site specific functional specifications.

Fit-for-Service: Determination made by the operator and submitted to BSEE that the material selection, design verification analysis, design validation testing, and quality control of the manufactured equipment is appropriate to justify the technical specifications and that the technical specifications meet or exceed a project's site specific functional specifications. *See* 30 CFR 250.804(a)(3).

Functional Specifications: Project-specific requirements developed by the equipment end-user or operator typically contained in a document that describes the features, characteristics, process conditions, boundaries, and exclusions defining the performance and use requirements of a product, process, or service.

High Pressure High Temperature (HPHT) Environment:
As stated in 30 CFR 250.804(b), ***HPHT environment*** means when one or more of the following well conditions exist:

(1) The completion of the well requires completion equipment or well control equipment assigned a pressure rating greater than 15,000 psia or a temperature rating greater than 350 ºF;

(2) The maximum anticipated surface pressure or shut-in tubing pressure is greater than 15,000 psia on the seafloor for a well with a subsea wellhead or at the surface for a well with a surface wellhead; or

(3) The flowing temperature is equal to or greater than 350 ºF on the seafloor for a well with a subsea wellhead or at the surface for a well with a surface wellhead.

HPHT Equipment Conceptual Plan (Equipment C Plan): A site specific or non-site specific plan that typically includes the following elements (which may be split between initial and final plans): a list of proposed equipment, components, assemblies, and sub-assemblies and their categorization, a summary of the proposed basis of design, any I3P nomination, any I3P and/or OER review plan, any I3P and/or OER reports, and a statement that the HPHT equipment is Fit-For-Service in the applicable HPHT environment. Multiple pieces of equipment, components, assemblies, and sub-assemblies can be combined into one Equipment C Plan. For HPHT wells, operators may submit information required by 30 CFR 250.291, 250.292, 250.732, 250.804, and regulations regarding APDs and APMs, at the Conceptual Plan stage to ensure that the proposed well equipment is acceptable early in the process.

HPHT Well Design and Operations Conceptual Plan (Well Design C Plan):
A site specific plan that typically addresses all items needed before an HPHT well can be completed, including well completion procedures, well control procedures, intervention procedures, tubing design, casing design, liner design, cement design, qualification of threaded connections, packer qualification, and the design for trapped annular pressure. For HPHT wells, operators may submit information required by 30 CFR 250.291, 250.292, 250.732, 250.804, and regulations regarding APDs and APMs, at the Conceptual Plan stage to ensure that the proposed well design is acceptable early in the process.

Independent Third Party (I3P): Individual or organization that consists of a qualified expert or team of experts that reviews and verifies the material selection, design verification analysis, and design validation testing performed by either the Original Equipment Manufacturer (OEM) or the operator. The I3P must meet the requirements of 30 CFR 250.732(b).

Industry Collaboration Effort (such as a Joint Development Agreement (JDA)) Project: Project in which operators jointly develop HPHT equipment. Functional Specifications for HPHT equipment developed under an industry collaboration effort are generally the combined worst case loads so that the HPHT equipment's Technical Specification can meet the needs of several operators' HPHT projects.

Non-critical Equipment: Equipment that does not meet the definition of a primary barrier or a secondary barrier and does not provide structural support for a primary or secondary barrier.

Non-Site Specific HPHT Equipment: Equipment developed for use at multiple locations potentially by multiple different operators. Generally, the equipment's technical specifications exceed the maximum environmental and operational conditions to which the equipment may be exposed while in service.

Operator Expert Reviewer (OER): A recognized expert employed or retained by the operator or a third party and who is not acting as the I3P.

Operating Margin: The difference in pressure between the maximum anticipated surface pressure (MASP) for the completion case for completion operations, MASP for the drilling case for drilling operations, Shut-in Tubing Pressure (SITP) or Expected Surface Pressure (ESP) for an intervention operation, and the required injection pressure needed at the wellhead for kill weight fluid to be bull headed if necessary.

Pressure Containing: A description of a part exposed to wellbore fluids whose failure to function as intended would result in a release of wellbore fluid to the environment.

Pressure Controlling: A description of a part that controls or regulates the movement of pressurized fluids (Example: Valve-bore sealing mechanisms (ball or gate), choke trim, or BOP rams).

Primary Barrier: First piece of equipment or system that prevents flow from a source as defined in API 17TR8, or an alternate definition proposed by the operator and approved by BSEE.

NOTE: BSEE recognizes that equipment barrier functions may change with the mode of operations. The modes of operations are drilling, completion, production, injection, workover, and abandonment. BSEE created equipment categorization to recognize that during one or more of these modes of operation, a particular piece of equipment may have to function as a primary barrier.

Reviewed by BSEE: BSEE's denotation to an operator submittal that is not subject to BSEE approval (*e.g.,* if information is submitted for review before all the required information is ready to be submitted) indicating that BSEE considers the submittal complete and that BSEE requires no supplemental materials.

Secondary Barrier: Piece of equipment or system that prevents flow from a source in the event the primary barrier fails, as defined in API Technical Report 17TR8.

Sealing Element: A component or part of a pressure-containing or pressure-controlling component that prevents leakage at the intersection of two parts or components. A sealing element may be metallic, thermoplastic, or elastomeric.

Site Specific HPHT Equipment: Equipment developed for use at a specific location for a specific operator. The equipment's technical specifications will exceed the maximum environmental and operational conditions at the specific site.

Sub-assembly: For the purpose of this document, a sub-assembly is an identifiable portion of an assembly, composed of two or more components or parts, that can be isolated, installed, or removed.

Subcategory A, Alternate Analysis Methods: Equipment design methods not captured in published component API Standards, Specifications, or Recommended Practice documents. Examples of alternate analysis methods include, but are not limited to, ASME Boiler and Pressure Vessel Code (BPVC) Section VIII, Div 2 or Div 3, Article KD-4 of ASME Section VIII Div 3, API RP 579, British Standard (BS) 7910, Det Norske Veritas (DNV) C203, or API Technical Report 17TR8.

Subcategory SN, Standard Analysis Methods: Equipment, component, assembly, and sub-assembly design methods published in existing API Component Standards, Specifications, or Recommended Practices that BSEE has not incorporated into the BSEE Regulations at 30 CFR 250.198.

Subcategory SI, Standard Analysis Methods: Equipment, component, assembly, and sub-assembly design methods published in existing API Standards, Specifications, or Recommended Practices that BSEE has incorporated into the BSEE regulations at 30 CFR 250.198.

Subsea Production Equipment: All production equipment from the wing valve on the tree to the Boarding Shut-Down Valve on a production platform. Examples include flowline jumpers, PLETs, PLEMs, umbilicals, manifolds, pipelines, flowlines, risers, and HIPPS systems.

Survival: A rare condition in which equipment survives without leakage of wellbore fluid to the environment, but may be otherwise damaged. Any such damage should not lead to cascading failures in other equipment.

System: For the purpose of this document, a system is two or more pieces of equipment working together to perform an identifiable function.

Technical Specifications: Documented technical requirements for a piece of equipment developed by the OEM to be fulfilled by the product, process, or service, in order to comply with the Functional Specifications developed by the end user or operator of the equipment. Technical Specifications form an equipment's operating envelope. In addition to load capacity, the equipment's Technical Specification should include the Temperature Classification, the Material Class, the Product Specification level (PSL), and the Performance Requirements (PR).

Temporary Conditional Barrier: A non-permanent barrier to the environment consisting of wellbore fluids where the density of the fluid creates a bottom hole pressure exceeding that of the pressure source, the height of the wellbore fluid level is known, a tested mechanical barrier system that can be activated on command (such as a BOP) is installed on the well, and the wellbore is manned.

NOTE: In the case of well control on the OCS, manned refers to having a person dedicated to the well activity that is trained to recognize an abnormal condition or event and is trained, qualified, and authorized to take the appropriate action.

Acronyms

API: American Petroleum Institute
APD: Application for Permit to Drill
APM: Application for Permit to Modify
ASME: American Society of Mechanical Engineers
BOP: Blowout Preventer
BPVC: Boiler and Pressure Vessel Code
BS: British Standard
BSEE: Bureau of Safety and Environmental Enforcement
Cat 1: Category 1
Cat 2: Category 2
Cat 3: Category 3
CFR: Code of Federal Regulations
C Plan: Conceptual Plan
CVA: Certified Verification Agent
CWOR: Completion and Workover Riser
DWOP: Deepwater Operations Plan
DNV: Det Norske Veritas
FMEA: Failure Modes and Effects Analysis
FMECA: Failure Modes, Effects, and Criticality Analysis
HAZID: Hazard Identification Study
HAZOP: Hazard and Operability Study
HIPPS: High Integrity Pressure Protection System
HPHT: High Pressure High Temperature
JDA: Joint Development Agreement
I3P: Independent Third Party

PLEM: Pipeline End Manifold
PLET: Pipeline End Termination
OCS: Outer Continental Shelf
OEM: Original Equipment Manufacturer
OER: Operator Expert Reviewer
SCSSV: Surface Controlled Subsurface Safety Valve
TAS: Technical Assessment Section of BSEE
TR: Technical Report

Appendix 2: Information Submission Guidance for HPHT Equipment Conceptual Plan and DWOP

NTL 2019-G03*, Guidance for Information Submissions Regarding Site Specific and Non-Site Specific HPHT Equipment Verification Analysis and Design Validation Testing (HPHT Equipment NTL), contains additional information on Non-Site Specific and Site Specific Equipment Conceptual Plans*.

Operators may submit information in support of the Conceptual Plan and DWOP in the following order:

	Plan or Submittal	Additional Guidance	Submittal Requirement
1.	Initial Non-Site Specific Equipment Conceptual Plan (Equipment C Plan)	Contact BSEE Technical Assessment Section (TAS) for more details, if applicable	Voluntary Submission
2.	I3P and/or OER Reports corresponding to the Non-Site Specific Equipment C Plan	Contact BSEE TAS for more details, if applicable	Voluntary Submission
3.	Final Non-Site Specific Equipment C Plan	Contact BSEE TAS for more details, if applicable	Voluntary Submission
4.	Initial Conceptual Plan	This will always be for a Site Specific Project	Voluntary Early Submission of Required Information
5.	Initial Site Specific Equipment C Plan(s)	See Appendix 3 to the HPHT Equipment NTL	Voluntary Early Submission of Required Information and Voluntary Submission
6.	I3P and/or OER Reports corresponding to the Site Specific Equipment C Plan	See Appendix 4 to the HPHT Equipment NTL	Voluntary Early Submission of Required Information and Voluntary Submission
7.	Final Site Specific Equipment C Plan	See Appendix 3 to the HPHT Equipment NTL	Voluntary Early Submission of Required Information
8.	Well Design Conceptual Plan (Well Design C Plan)	See Appendix 3	Voluntary Early Submission of Required Information and Voluntary Submission
9.	I3P and/or operator reports corresponding to the Well Design C Plan	See Appendix 4	Voluntary Early Submission of Required Information and Voluntary Submission
10.	Conceptual Plan		Required Submission
11.	Application for Permit to Drill (APD), Application for Permit to Modify (APM), DWOP		Required Submissions

Note: After the plans are deemed complete and acceptable, all the plans and reports listed above will be marked "Reviewed by BSEE" with the exception of the Conceptual Plan, APD, APM, and DWOP. The Conceptual Plan, APD, APM, and DWOP will be marked "Approved by BSEE" upon successful completion of BSEE's review.

Additional Guidance for the Non-Site Specific Equipment C Plan(s) and I3P and/or OER reports:

1. BSEE does not require Non-Site Specific Equipment C Plans (Initial or Final) or the corresponding I3P and/or OER reports; they are an option available for the operator or operator representative of a joint collaboration effort (operator representative) to facilitate HPHT equipment development and to expedite the review process.
2. If an operator or operator representative elects to submit a Non-Site Specific Equipment C Plan, they may submit I3P verification reports for HPHT BOP systems and related equipment, and for all other HPHT equipment, to expedite the review process.
3. The I3P and/or OER should state that they reviewed appropriate documentation to support the defined Technical Specifications.
4. The I3P and/or OER should list the equipment's final, verified, and validated Technical Specifications in their report.
5. An operator who plans to submit Non-Site Specific Equipment C Plans (Initial and Final) and the corresponding I3P and/or OER reports should contact BSEE TAS for additional information.

Note: The purpose of a Non-Site Specific Equipment C Plan is to qualify HPHT equipment relative to its own Technical Specification. The purpose of a Site Specific Equipment C Plan is to qualify HPHT equipment relative to the site specific project's Functional Specification. If the operator chooses not to submit a Non-Site Specific Equipment C Plan, then the Technical Specification and the Functional Specification both will need to be qualified in the Site Specific Equipment C Plan (voluntary early submittal) or the Conceptual Plan (required).

Additional Guidance for the Initial Conceptual Plan:

1. The Initial Conceptual Plan should include the information required by 30 CFR 250.289.
2. The operator should provide information in its Initial Conceptual Plan sufficient for the BSEE reviewer's use when reviewing the Site Specific Equipment C Plan(s).
3. After BSEE deems the plan complete and acceptable, the Initial Conceptual Plan will be marked "Reviewed by BSEE."

Additional Guidance for the Site Specific Equipment C Plan(s) and I3P and/or OER reports:

1. Operators may submit Site Specific Equipment C Plans (Initial and Final) for well equipment prior to Conceptual Plan approval. Site Specific Equipment C Plans (Initial and Final) for Subsea Production Equipment may be submitted prior to Conceptual Plan approval or prior to DWOP approval.

2. To help maximize the efficiency of BSEE review of voluntary early information submission, operators should submit an I3P report when the regulations would require submission of such a report prior to operations. 30 CFR 250.732 makes I3P verification reports mandatory for HPHT BOP systems and related equipment, and these reports may be submitted for all other HPHT equipment to facilitate the review process.
3. If a Non-Site Specific Equipment C Plan (Initial and Final) was submitted to BSEE and marked "Reviewed by BSEE," the operator should ensure in the Site Specific Equipment C Plan that the I3P and/or OER reports confirm that the Site Specific Functional Specifications fit within the previously verified and validated equipment Technical Specifications from the Non-Site Specific Equipment C Plan and I3P and OER reports.
4. In the I3P and/or OER reports, the I3P or OER should make sure that there is appropriate documentation to support the defined Technical Specifications and ensure that the Functional Specification fit within the defined Technical Specifications.
5. In the I3P and/or OER reports, the I3P or OER should list the equipment's final, verified, and validated Technical Specifications. The I3P or OER may reference the fact that this information was included in a Non-Site Specific Equipment C Plan that has been previously marked "Reviewed by BSEE," if applicable.
6. The I3P or OER should document when the Site Specific Functional Specifications are outside of the Technical Specifications. This should be re-evaluated or justified.
7. The I3P or OER should state that the HPHT equipment is Fit-for-Purpose as a barrier for the site specific environment.
8. The operator may reference any plan or document that was previously marked "Reviewed by BSEE." The operator may only reference plans or document that they have legal rights to use.
9. In the Final Site Specific Equipment C Plan, the operator should include a letter stating that the I3P or OER reports are intended to 1) demonstrate that the plan addresses the requirements of 30 CFR 250.804 and 2) verify that the plan complies with 30 CFR 250.732 for HPHT equipment. The operator may submit a statement that the proposed equipment is Fit-for-Service as a barrier for the Site Specific HPHT Environment. If this statement is not submitted with the Final Site Specific Equipment C Plan or the Conceptual Plan, it must be submitted as part of the APD, APM, or DWOP pursuant to 30 CFR 250.804(a)(3).
10. Additional guidance for the Site Specific Equipment C Plans is provided in Appendix 3, and additional guidance for the I3P and OER reports is provided in Appendix 4.

Additional Guidance for the Well Design C Plan and I3P and/or Operator Reports:

1. Well Design C Plans are always Site Specific.
2. BSEE will not review the Well Design C Plan until the Site Specific HPHT equipment Design has been finalized. The HPHT equipment Design and the HPHT Well Design are interdependent and highly interrelated. An operator may reference any Equipment C Plans and I3P and/or OER or Operator Reports in future submittals once they have been marked as "Reviewed by BSEE."
3. To help maximize the efficiency of BSEE review of voluntary early information submissions, operators should submit an I3P report when the regulations would require submission of such a report prior to operations. 30 CFR 250.732 makes I3P verification

reports mandatory for HPHT BOP systems and related equipment, and these reports may be submitted for all other HPHT equipment to facilitate the review process.

4. An operator may employ an I3P to facilitate BSEE's review process for well equipment and tubular design. An operator is not required to submit I3P reports for well drilling, completion, and intervention operations (procedures) that are normally reviewed by BSEE as part of the permit approval process.
5. The I3P and/or operator may submit their reports to BSEE as they are available or combine into one final report.
6. An operator may reference all previous letters or documents marked as "Reviewed by BSEE."

Additional Guidance for the Conceptual Plan:

1. If operators submit a Final Site Specific Equipment C Plan for well equipment, Well Design C Plan, and Well Design I3P or operator reports, they should do so before submitting the Conceptual Plan.
2. In accordance with 30 CFR 250.290, an operator must submit and BSEE must review and approve the Conceptual Plan before an operator may complete a production well or install a subsea tree.
3. The Conceptual Plan should consist of: a letter from the operator submitted to BSEE referencing the date BSEE marked the Well Design C Plan as "Reviewed by BSEE"; any modifications or revisions to the plan; a full listing of any Well Design I3P and/or operator reports that have been marked "Reviewed by BSEE"; and the date the Final Site Specific Equipment C Plan(s) were marked "Reviewed by BSEE." If it was not already submitted with the Final Site Specific Equipment C Plan, the operator may submit a statement that the proposed equipment is Fit-for-Service as a barrier for the Site Specific HPHT Environment. If this statement is not submitted with the Conceptual Plan, it must be submitted as part of the APD, APM, or DWOP pursuant to 30 CFR 250.804(a)(3).
4. If an operator has elected not to voluntarily submit the plans outlined above, the operator must submit the information required by 30 CFR 250.289.
5. The operator may submit the Final Site Specific Equipment C Plans for Subsea Production Equipment before BSEE approval of the Conceptual Plan, or as a revision to the Conceptual Plan, or before BSEE approval of the DWOP.
6. In the APM and APD, operators should state that all the HPHT components in the well design have been "Approved by BSEE" in the Conceptual Plan.

Additional Guidance for the DWOP:

1. BSEE's DWOP review process assesses two plans, a Conceptual Plan and a DWOP.
2. The Final Site Specific Equipment C Plans for the Subsea Production Equipment may be submitted before or after the Conceptual Plan approval. The Final Site Specific Equipment C Plans for the Subsea Production Equipment must be submitted before the DWOP can be approved.
3. If the Final Site Specific Equipment C Plan for the Subsea Production Equipment was submitted prior to the DWOP phase in the Conceptual Plans phase, the DWOP should consist of: a letter from the operator submitted to BSEE referencing the date the Final

Site Specific Equipment C Plan for the Subsea Production Equipment was marked "Reviewed by BSEE" and the date the Conceptual Plan was approved by BSEE.

4. If an operator has elected not to voluntarily submit the plans outlined above, the operator must submit the information required by 30 CFR 250.292. Operators should also include a statement that the proposed equipment is Fit-for-Service as a barrier for the Site Specific HPHT Environment pursuant to 30 CFR 250.804(a)(3) if not previously submitted.
5. BSEE must review and approve the DWOP prior to an operator commencing production.

Appendix 3: Additional Information Submission Guidance for HPHT Well Completion Design and Operations Conceptual Plan (Well Design C Plan)

NTL 2019-G03*, Guidance for Information Submissions Regarding Site Specific and Non-Site Specific HPHT Equipment Verification Analysis and Design Validation Testing (HPHT Equipment NTL), contains additional information on Non-Site Specific and Site Specific Equipment Conceptual Plans*.

Guidance for Information Included in a Well Design C Plan

(A) Information about an I3P

An I3P is required for BOP systems and related equipment per 30 CFR 250.732. For other equipment, an operator may employ an I3P to help facilitate BSEE's review of the well equipment and tubular design. An operator is not required to submit I3P reports for well drilling, completion, and intervention procedures that are normally reviewed by BSEE as part of the permit approval process.

If an I3P is required by 30 CFR 250.732 or the operator chooses to use an I3P to facilitate BSEE's review for other equipment, the operator should provide information to BSEE regarding the proposed I3P's qualifications (see 30 CFR 250.732(b) for I3P qualification requirements). If the operator chooses to have an I3P report address each piece of HPHT Equipment, the operator should demonstrate that the I3P is a qualified expert (or team of experts) for each piece of HPHT Equipment, component, assembly, or sub-assembly that they will review. The operator should address the specific qualifications, technical capabilities, and previous experience of the individual(s) who will review the design verification and validation work of the OEM or the operator. I3Ps should not have, or appear to have, an organizational conflict of interest with the operator. If they do, the operator should disclose this information and explain why it does not impair the I3P's independence.

The operator is required, per 30 CFR 250.420, to have a registered professional engineer certify that the casing and cementing design is appropriate.

(B) Well Schematics

Well schematics showing the final configuration of a completed well for this Site Specific project (early submission of information required by 30 CFR 250.292(a) and 250.513(b)(2)).

(C) Identification of Equipment

Identification of all HPHT equipment that is required for the initial completion, well intervention, well control, and well control operations, loss of well control recovery operations, and relief well operations (early submission of information required by 30 CFR 240.462(c), 250.505, 250.514(a), 250.518(c), 250.518(d), 250.518(e)(1), 250.605, and 250.614(a)).

(D) Procedures for Initial Operations

Procedures for initial operations include planned completion operations, a minimum of two different well intervention methods for likely failure scenarios, and two different well kill scenarios (early submission of information required by 30 CFR 240.462(c), 250.505, 250.513(b)(1), 250.605, and 250.613(b)(1)). The procedures include: identification of the specific equipment to be utilized and the manpower needed; a discussion of any specialized training needed for the completion, intervention, or kill operations for HPHT wells; and schematics of the completion and intervention well control equipment such as the BOPs, risers systems, Completion Workover Riser System (CWOR), subsea test trees, well heads, wireline BOPs, and coiled tubing BOPs showing how this equipment is stacked up and arranged.

(E) Capping Stack and Relief Well Operations

Procedures for loss of well control addressing HPHT source control operations, which include relief well activities such as ranging, intersection, and dynamic kill operations (early submission of information required by 30 CFR 250.462(c), including a description of the source control and containment (capping stack) capacity).

(F) Plans for the Project Specific Evaluation

Plans including detailed design documents and description of anticipated loads, design factors, and assumptions (e.g., metal loss, fatigue, additional bending, cycle life limits, corrosion, installed compressional forces) for the verification and validation of the production tubing, production casing, and production liner (Category 1 Equipment) to verify that this equipment will not fail due to burst, collapse, compression, tension, or bending stresses (early submission of information required by 30 CFR 250.518(a), 250.420(a)(7)(i), 250.420(a)(7)(ii), 250.420(b)(1), and 250.420(b)(2)) (see the HPHT Equipment NTL, Appendix 3, for information on equipment categorization). Operators should not consider additional support pressures (e.g., annular pressure build-up, applied trapped pressure) to manage tubing forces and movement or casing collapse. The design margin against failure should be documented for all potential modes of failure. The plans should include the following analyses:

1. The operator should perform a production tubing force analysis for all load cases including, but not limited to, the completion case, the shut-in case (hot and cold), the producing case (hot and cold), and the kill injection case (hot and cold).

2. The operator should perform a force analysis for the production casing and liner for all load cases including, but not limited to, the shut-in case with and without a tubing leak (hot and cold), the producing case with and without a tubing leak (hot and cold), and the kill injection case with and without a tubing leak (hot and cold). Please note that 30 CFR 250.420(a)(7)(i) requires that a registered professional engineer certify the casing design and that the operator must submit the certification with the APD.

(G) Cementing

Procedures for cementing the production casing and production liner, which may include plans for verifying and validating that the cementing materials proposed to be utilized meet the Functional Specifications for the Site Specific project (early submission of information required by 30 CFR 240.415(c), 250.420(a)(7)(i), 250.420(a)(7)(ii), 250.420(c), and 250.421). Please note that 30 CFR 250.420(a)(7)(i) requires that a registered professional engineer certify the cementing design and that the operator must submit the certification with the APD.

(H) Packers

Plans for the packer qualification analysis, including verification and validation of the analysis (early submission of information required by 30 CFR 250.514-250.518, 250.619, and API Spec 11D1 incorporated therein). The packer should undergo the project specific qualification analysis to verify that the forces are within the packer design parameters and limitations. Seal life analysis based on anticipated conditions and wellbore fluids should be included with the packer assessment.

BSEE considers the packer to be Category 1 Equipment (see the HPHT Equipment NTL, Appendix 3, for information on equipment categorization). If the packer was previously qualified for the Site Specific Project in the Final Site Specific Equipment C Plan that BSEE marked as "Reviewed by BSEE," then the operator may reference it.

(I) Threaded Connections

Plans to qualify the tubular threaded connections for the Site Specific well design to an appropriate standard (company internal standards or industry published standards) (early submission of information required by 30 CFR 250.415(a)(3) and 250.420(b)). The threaded connection is an integral part of the production tubing, production casing, and the production liner. If the threaded connectors have a lower strength than the tubing, casing, or liner, then the threaded connector will define the rated capacity of the tubing, casing, or liner. If the operator previously qualified the threaded connections for the Site Specific Project in the Final Site Specific Equipment C Plan that BSEE marked "Reviewed by BSEE," then the operator may reference it. If the operator previously verified and validated the operational envelope for tubular threaded connections, the operator should conduct an analysis to show the Site Specific Functional Specifications fit within that operational envelope.

(J) Trapped Annular Pressure

Plan(s) for the management of trapped annular pressure created by the thermal effects of production and the management of annular casing pressure in the production casing (early submission of information required by 30 CFR 250.519- 250.531 and API RP 90 incorporated therein).

(K) B-Annulus Monitoring

Evaluation of the possibility of monitoring the B-annulus based on the operator's proposed casing program and associated annuli clearances on HPHT wells, including availability of technology for monitoring without a penetration in the high pressure housing or casing, or justification for why monitoring without a penetration in the high pressure housing or the casings is not feasible for the operator's well design (voluntary).

(L) Shut-In Tubing Pressure and MASP

Justification of the estimated Shut-in Tubing Pressure (SITP) and the MASP for the completion case (early submission of information required by 30 CFR 250.513(b)(1), 250.518(c), and 250.730). See NTL No. 2019-N04 *Calculating Maximum Anticipated Surface Pressure and Expected Surface Pressure for the Completion Case and Estimated Shut-in Tubing Pressure Prior to Production*, for guidance on when an oil gradient may be used instead of a gas gradient.

(M) Environmental Conditions and Materials

Discussion of the environmental conditions and material requirements for tubulars for the well completion that were not addressed in the Final Site Specific Equipment C Plan (early submission of information required by 30 CFR 250.490(a)(1), 250.490(p), and NACE Standard MR0175-2003 incorporated therein). If the Final Site Specific Equipment C Plan previously addressed the tubular material selection, the operator may reference the previous document.

The operator should consult NTL No. 2009-G31, *Hydrogen Sulfide*, for guidance on when NACE-compliant materials are required and when an H_2S Contingency Plan is required. BSEE expects all completion and production equipment to be NACE compliant for HPHT wells, unless the operator demonstrates the absence of H_2S in a direct measurement.

Operators should note that high temperatures may chemically alter production fluids, inhibitors, and tracer materials. An operator should consider this when selecting materials for all wetted surfaces, including packers, casings, tubing, and seals.

(N) Document Control Process

Documentation referenced in the I3P and/or operator report(s) should be made available to BSEE upon request after the equipment is placed in service and should be retained for the life of the project (voluntary, but see, e.g., 30 CFR 250.730, 250.740, 250.741, 250.801 and documents incorporated therein regarding document retention requirements). The operator should describe the document control process, including the company that is responsible for maintaining the documents and where the documents will be retained, document numbering, etc., such that the documents can be retrieved in the future if necessary. BSEE may want to review these reports in the future, especially if there is an unanticipated failure.

Appendix 4: Guidance for Independent Third Party and/or Operator Reports

BSEE regulations at 30 CFR 250.732 require completion and submission of verification reports prepared by an I3P for HPHT BOP systems and related equipment. BSEE recommends completion and submission of such reports, or operator reports, for HPHT well equipment and tubular design. The following guidance is provided for circumstances where the operator chooses to use an I3P or operator report, as well as where I3P reports are required. An operator is not required to submit I3P reports for well drilling, completion, and intervention procedures that are normally reviewed by BSEE as part of the permit approval process.

(A) General Guidance for Operators Concerning I3Ps and Operator Reports

The I3P and/or operator reports should:

(1) Identify and document the Functional Specifications (Requirements) established by the operator for the various pieces of equipment for all the potential modes of operation, including the basis for determining well loads.

(2) Identify and document the acceptance criteria established to meet the Functional Specifications, including design factors and assumptions used for degradation of strength such as age, fatigue, metal loss, corrosion, and temperatures.

(3) Identify and document the standards, practices, and processes (internal to the company or published in the industry) used by the operator and/or OEM for each stage of the design verification and validation process for each report.

(4) Identify and document the various engineering analyses and validation tests performed by the operator and/or OEM. Identify and document that the analysis or test methods used provided the necessary verification and validation for establishment of the equipment's Technical Specifications. Ensure all the loads and wear assumptions have been addressed.

(5) Identify and document that the Technical Specifications meet or exceed the Functional Specifications for the Site Specific Project.

(6) Consider the material selection and fluid compatibility, including changes to chemical composition and/or rheology due to thermal and pressure effects.

(7) Capture the results of the review in a report that is clear, concise, and complete.

The I3P should review the analysis and documentation created by the OEM and/or the operator, but not participate in the design or analysis of the equipment, component, assembly, or sub-assembly.

(B) Format and Guidance for I3P's and/or Operator's HPHT Well Design Reports

(1) The reports generated by the I3P and/or operator will become a BSEE record and will be an integral part of the approval process. The report submitters should arrange them in a consistent format, such as the format described below. The I3P or operator should summarize any analysis and documentation in a standalone document.

The I3P and/or operator reports should generally follow the following format:
(a) Transmittal Letter
(b) Title Page
(c) Executive Summary
(d) Table of Contents
(e) List of Figures and Tables
(f) Report Body
(g) Conclusion
(h) Complete list of acronyms used in the design verification, validation, and review plan.
(i) Reference Section
(j) List of Comments or Questions and responses between the I3P and the operator or OEM (for well equipment and tubular design reports only)
(k) Appendix

(2) In the Reference Section of the report, an operator should include a brief summary of the document control process, including who is responsible and where the documents and test records will be retained for the life of the project.

(3) A complete list of referenced documents, data books, and test records should be included in the report. At a minimum, the list should contain the following:
(a) Reference Number
(b) Submitter
(c) Document Number
(d) Revision Number (or Original)
(e) Title
(f) Brief Description or Executive Summary of the Document
(g) Brief Description of the Conclusion

An I3P or operator should not attach or include the referenced documents, data books, and test records.

(4) During the review process for the well equipment and tubular design, the I3P may develop a list of clarifying comments or questions on the documents for the operator or the OEM. Before the I3P writes a report, the operator or OEM should clarify or resolve any issues that the I3P has raised. The questions and answers developed and discussed during the review process should be attached as an Appendix to the report. The questions and the response/resolution may aid in BSEE's level of understanding of the project.

Note: The I3P should be allowed to ask questions seeking clarity and completeness. The prudent operator should be able to answer any question for clarification or completeness to satisfy the reviewer's comments or questions.

(C) Description of the I3P and/or Operator Reports for the Well Design C Plan for the Site Specific Project

The following is a description of the items the I3P and/or operator may review and report relating to well design, completion, and intervention operations. The reports do not have to be submitted in the order listed below and can be combined into a single report, if desired. An operator may reference all relevant submissions that BSEE previously reviewed.

(1) ***Report (2A)*** Completion, Intervention, and Kill Procedures

The operator should submit proposed procedures for the initial completion, well control, two methods of intervention, and two methods for kill operations. The process of developing these procedures ensures that all of the HPHT equipment for the initial completion, well control, well intervention, and well killing operations, including dynamic kill operations, has been identified to perform the procedures proposed. Report 1G for each piece of equipment identified in these procedures should be submitted before BSEE approves the Conceptual Plan. An operator may reference existing Report 1Gs previously marked "Reviewed by BSEE."

Note: If the operator previously submitted these procedures and identified equipment for the Site Specific Project in the Well Design C Plan, the operator may reference its previous submittal. Report 2A should be submitted and reviewed by BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE will approve the Conceptual Plan.

(2) ***Report (2B)*** Tubular Force Analysis

The I3P should review the force analysis for the production tubing, production casing, and production liner for each possible load case for a representative well in the Site Specific Project. This should include internal and external load assumptions, considerations for wear, metal loss, corrosion, fatigue, and/or manufacturing flaws, and initial installed state assumptions. Each well is unique and will have different tubing and casing force analysis and, therefore, this review and report will be for a well representative of the Site Specific Project. The I3P must meet the qualification requirements for a registered professional engineer set forth in 30 CFR 250.420(a)(7).

Note: The HPHT equipment design requires a complete understanding of the tubing and casing force analysis to determine its functional specifications. Therefore, it is likely that the tubing and casing force analysis will be completed and submitted prior to the Well Design C Plan, in connection with the Final Site Specific Equipment C Plan. If I3P reports have previously been submitted in the Final Site Specific Equipment C Plan, the operator may

reference those reports. If a revision to the tubing and casing force analysis is needed, it should be submitted as Report 2B. The revised Report 2B, if applicable, will be reviewed before BSEE approves the Conceptual Plan.

(3) ***Report (2C)*** Cementing Materials and Procedures

An I3P should review and certify the casing and cementing design. The I3P should verify that the operator's cement material analysis accounts for the HPHT Environment, including possible changes in chemical composition and rheology. The operator may submit the associated procedures. The operator should submit for BSEE's review the proposed cementing procedures and cement design for the production casing and liner for BSEE to evaluate whether cementing best practices and proper cementing design considerations to isolate potential flow zones are addressed according to API ST 65 Part 2. The I3P must meet the qualification requirements for a registered professional engineer set forth in 30 CFR 250.420(a)(7).

Note: If the operator previously submitted their planned cementing procedures in the Well Design C Plan, this report may be referenced. If an I3P report was previously submitted in the Final Site Specific Equipment C Plan for the cementing materials for the HPHT Environment, this report may be referenced. Report 2C should be submitted to BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE approves the Conceptual Plan.

(4) ***Report (2D)*** Packer Qualification Analysis

The I3P should review the packer qualification analysis for pressure, temperature, and force(s) for the site specific HPHT Environment. The I3P may include an analysis of the packer seals in the report.

Note: If the packer qualification analysis, including packer seals, was previously submitted in a Final Site Specific Equipment C Plan, the report may be referenced. Report 2D should be submitted and reviewed by BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE approves the Conceptual Plan.

(5) ***Report (2E)*** Threaded Connections

The I3P should review the qualification analysis of the threaded connections for the production tubing, production casing, and production liner. The operator should qualify the threaded connections by test in accordance with ISO 13679/API RP 5C5 "Recommended Practice on the Procedures for Testing Casing and Tubing Connections." BSEE considers connections exposed to production fluid to be integral to the primary and secondary barrier system. The operator should test these connections to a Connection Assessment Level (CAL) IV or similar protocol.

Note: If the threaded connection qualification was previously submitted in the Final Site Specific Equipment C Plan, then the previously submitted report may be referenced. Report

2E should be submitted and reviewed by BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE approves the Conceptual Plan.

(6) ***Report (2F)*** Annular Pressure Management Plans

The operator's plans to manage trapped annular pressure and production casing pressure must meet the requirements in 30 CFR 250.519-250.531 and in API RP 90 "Annular Casing Pressure Management for Offshore Wells" (incorporated by referenced in 30 CFR 250.519). The operator should submit an evaluation of the possibility of monitoring the pressure in the B annulus.

Note: If the Annular Pressure Management Plan was previously submitted in the Well Design C Plan, it may be referenced. Report 2F should be submitted and reviewed by BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE approves the Conceptual Plan.

(7) ***Report (2G)*** Relief Well Capacity and HPHT Capping Stack Analysis

The operator should submit plans for relief well capacity and confirm that the HPHT capping stack analysis has met the requirements in 30 CFR 250.462(c) before submitting Form BSEE-0123 to BSEE for approval.

The I3P should complete equipment design reports for the HPHT Capping Stack Design Verification Analysis and Validation Testing and the BOP Survival Case Analysis.

Note: If the source control, containment, and collection equipment reporting requirements have been previously met by the operator, these documents can be referenced. Also, if the I3P report(s) has been previously submitted to BSEE for the HPHT Capping Stack and the BOP Survival case in a Final Site Specific Equipment C Plan, these reports may be referenced. Report 2G should be submitted and reviewed by BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE approves the Conceptual Plan.

(8) ***Report (2H)*** Discussion of Environmental Conditions and Tubular Material Requirements

All HPHT projects will require NACE-compliant materials. NTL No. 2009-G31 "Hydrogen Sulfide" provides guidance regarding the requirements for NACE-compliant materials in an HPHT environment. The I3P should review the operator's NACE analysis for tubular material selected for the completion of the Site Specific wells. All other well equipment should have previously been reviewed in the appropriate Final Site Specific Equipment C Plan(s). If the operator previously addressed environmental conditions, including a NACE analysis for tubular materials, in its Final Site Specific Equipment C Plan for tubulars, the operator may reference those reports.

Note: Report 2H should be submitted and reviewed by BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE approves the Conceptual Plan.

(9) ***Report (2I)*** Packer/Completion Fluid Compatibility and Stability Report

The operator should submit a summary of the testing on the compatibility of the completion fluid and stability with the packer and other wetted surfaces. Because this is not specifically an HPHT mechanical design issue, the operator may document the packer/completion fluid compatibility and stability.

Note: If this report has been previously submitted to BSEE for review, it may be referenced. Report 2I should be submitted to BSEE if this work was not previously submitted or if the previous plan requires revision before BSEE approves the Conceptual Plan.