

Supplier Quality Requirements

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Supplier Quality Requirements

Purpose

Baker Hughes is committed to drive Quality Excellence and Customer Satisfaction with products manufactured and services provided by Baker Hughes or through its Suppliers and Sub-Suppliers. The purpose of this document is to establish a set of requirements, procedures and practices pertaining to the quality of products, processes and services purchased by Baker Hughes. The requirements set forth herein will ensure a consistent and quality-based relationship between Baker Hughes and its Suppliers.

This document can be found at the following website: <https://www.bakerhughes.com/suppliers>.

Scope

This document is part of Baker Hughes' purchase orders and it is fully applicable to Suppliers of direct products, processes and services used in Baker Hughes delivered goods and services. All Quality requirements in this document, excluding Section 3 are applicable to Suppliers providing indirect goods and services to Baker Hughes

Description of Activity

1. Communication

- 1.1. The Baker Hughes Sourcing Representative is the primary contact with the Supplier. Baker Hughes Supplier Quality Engineer (SQE) is the quality and technical contact and will be assigned as appropriate.
- 1.2. Changes to purchase order requirements shall not be accepted without a formal purchase order change, a change in the purchasing specification and/or applicable documents approved by Baker Hughes, an approved Supplier Deviation Request (SDR) or through cleared nonconforming material reports.
- 1.3. All process or procedure forms (e.g. SDR forms, frozen process change request forms, etc.) referenced in this document may be obtained from the appropriate Baker Hughes Sourcing Representative.

2. Purchase Orders

2.1. Approved Supplier

- 2.2. To receive a Baker Hughes' production purchase order, a Supplier must be on boarded per Baker Hughes Quality Management System procedures. Direct Suppliers are approved specifically for the products, processes and services they will provide to Baker Hughes, as well as the site/location from which those products and/or processes/services will be provided.

2.3. Document Review

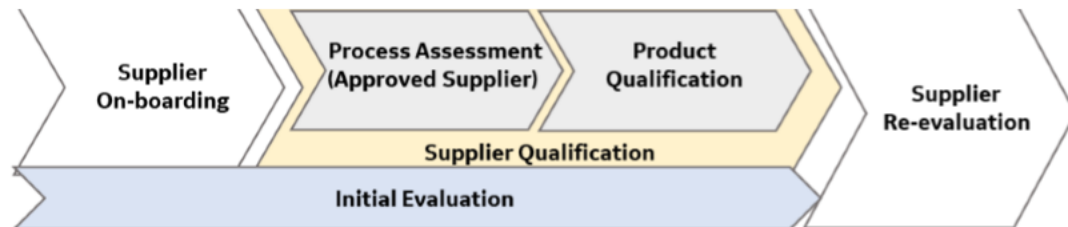
- 2.3.1. Baker Hughes expects Suppliers to review ordering documents to ensure that they know exactly what Baker Hughes asking of them, and that they can meet the specific requirements before they commit to delivering a product, process or service.

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- 2.3.2.** If the information is incomplete or there is ever any doubt or confusion, the Supplier shall contact the Baker Hughes Sourcing Representative to resolve these issues before committing to deliver.

3. Specific Requirements for Direct Material Product, Process & Services Suppliers

- 3.1.** The diagram below outlines the process of Baker Hughes Supplier Quality Management.



3.1.1. Supplier Onboarding

- 3.1.1.1 All Baker Hughes Suppliers need to go through the onboarding process - as required by Baker Hughes Quality Management System procedures - to be issued a Baker Hughes Global Supplier Number.
- 3.1.1.2 Supplier On Boarding requirements include the following :
- Non-Disclosure Agreement (NDA) (where required);
 - Evidence of Supplier Integrity Letter sent to Supplier (where required);
 - Tax Documentation;
 - Record of Approvals by authorized delegates;
 - Supplier Social Responsibility Program (SSRP) Audit (where required).

3.2. Supplier Approval

- 3.2.1.** Once a Supplier is on boarded, the evaluation of the Supplier will require Process Assessment and Product Qualification, as applicable, based on Baker Hughes defined criteria. This process will assess the Supplier's processes and capabilities to meet Baker Hughes requirements as defined by our Process Quality Requirements (PQR), Supplier Requirement Specification (SRS), Quality Management System (QMS), Technical Regulations and Standards (TRS), Product Specifications, Product Safety and Health Safety and Environmental (HSE) requirements.
- 3.2.2.** Based on Baker Hughes criteria, Process Assessment and, when required, a Product Qualification shall be required in the following circumstances:
- a new Supplier / Supplier location is to provide products, processes or services;
 - a Supplier is to provide a product, process or service for which it is not yet qualified, or the qualification is expired;
 - a Supplier changes a key element of their qualified product, process or service provision (e.g. manufacturing location, critical processes, etc.);

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- d. a new process assessment or product qualification is required for a disqualified Supplier (When requalifying a previously disqualified Supplier, the Qualification Team shall ensure that the issues that resulted in the Supplier's disqualification have been corrected prior to requalification).

3.2.3. Quality Management System

- 3231. It is the responsibility of the Supplier to define and implement a detailed Quality Management System that meets the requirements set forth in this document, and ensures products, processes and services provided to Baker Hughes conform to applicable Baker Hughes specifications.
- 3232. Any applicable industry and regulatory standards (such as ANSI, AGMA, API, etc.) must also be included into the system. Baker Hughes requires that this Quality Management System meets the requirements of ISO 9001 (latest edition) at a minimum and the evidence must be made available to Baker Hughes for review upon request. Equivalent Quality Management System may include ISO 17025, API Q1, API Q2 or AS9100.
- 3233. Compliance of the Supplier's QMS may be verified through
 - (a) a review of the Supplier's QMS documentation or available certifications to a recognized international quality standard; or
 - (b) an on-site or remote QMS audit conducted by Baker Hughes or qualified Third Party.

3.2.4. Process Assessment

- 3241. A Process Assessment is carried out to assess the Supplier's capability for the specific scope, and to ensure that the processes related to the supply under qualification are in conformance with the applicable Process Qualification Requirements (PQR), Supplier Requirement Specification (SRS) or other process documentation. A Process Assessment is required for all process types which the supplier is to provide (e.g., welding, painting, machining, assembly, etc.), and may be conducted through an on-site audit or desktop audit at Baker Hughes' discretion.
- 3242. If processes are outsourced to Sub-Suppliers, it may be necessary to verify related process requirements directly at the Sub-Supplier site.
- 3243. Processes requiring assessment to be qualified for the supplier's Process Assessment will be defined by the Baker Hughes Qualification Team (refer to section 3.2.4.6 for additional details).
- 3244. The process assessment may require a Control Plan and may include the Process Assessment / Product Qualification Requirements Review (refer to Annex B). The Baker Hughes Qualification Team will determine the scope and activities necessary for each process assessment in accordance with Baker Hughes requirements.

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3245. When the Supplier meets the Process Assessment requirements, the Supplier is deemed to be approved for the process evaluated and the scope will be valid for all Baker Hughes Product Companies.

3246. **Processes requiring assessment**

- NDE, welding, heat treatment, coating and surface treatments (if applicable) are always considered processes requiring assessment. Other processes may include, but are not limited to those listed in Annex F.
- Suppliers are responsible to identify the relevant processes that are performed at their premises for Baker Hughes and must have specific, documented and controlled procedures for each of them.
- Supplier shall ensure that processes which require pre-qualified procedures and/or work methods are tested and qualified before work begins; e.g. NDE, special fabrication techniques, lining and painting, etc. Such procedures shall be submitted to Baker Hughes for review and approval where specified in the purchase order before the work begins. It is the Supplier's responsibility to ensure operators are qualified for the process in accordance with the procedures and/or applicable standards.
- Suppliers must also maintain documentation for any process requiring assessment that is performed by their Sub-Suppliers.
- Baker Hughes may require the use of Baker Hughes qualified Sub-Suppliers for processes requiring assessment.
- **Welding:** Suppliers, including Sub-Suppliers, performing welding as a primary value-added process, shall be qualified in accordance with procedures and technical specifications applicable to Baker Hughes (including ANSI B31.3, ASME section IX or AWS, if applicable). Submittal of procedures for review and approval may be required. Welders and procedures must be qualified in accordance with ASME Section IX or similar governing agency specified on purchase order, specification or drawings from Baker Hughes business.
- **NDE:** Suppliers, including Sub-Suppliers, performing NDE shall be qualified in accordance with procedures and technical specifications applicable to Baker Hughes (including ASNT, ISO 9712, and NAS410). Submittal of procedures for review and approval may be required. Certification to these requirements may be performed by a Third Party, as required by Baker Hughes.

Note: Baker Hughes Customers may require specific NDT certifications for Supplier NDT personnel (e.g., ASNT ACCP).

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- **Heat Treatment:** Suppliers, including Sub-Suppliers, performing Heat Treatment shall be qualified in accordance with industry standards, procedures and technical specifications applicable to Baker Hughes. Submittal of procedures for review and approval may be required. Heat Treatment Processes requiring assessment shall include (Quench, Temper, Stress Relieving, Induction Hardening and Annealing).

3.3. Product Qualification

- 3.3.1.** The Supplier shall conduct a First Article Inspection (FAI) or First Piece Qualification (FPQ) process for the first item or batch in a series. Records of the FAI/FPQ results shall be maintained by the Supplier.
- 3.3.2.** The Baker Hughes Qualification Team may also require a FAI for product verification. Baker Hughes will determine if a product verification FAI will be conducted by the Supplier, Baker Hughes or a Baker Hughes -authorized Third Party. When a FAI for product verification is conducted by a Baker Hughes - authorized third party, unless otherwise agreed in advance, the Supplier shall bear the costs. BAKER HUGHES Qualification Team may also require Supplier to submit documentation record of FAI performed as part of qualification requirement.
- 3.3.3.** Products shipped prior to approval of the FAI and without written authorization from Baker Hughes, may be shipped back to the Supplier at their expense, including, but not limited to additional labor back-charges to the Supplier.
- 3.3.4.** The Baker Hughes Qualification Team determines the specific activities required for each Product Qualification prior to the start of manufacturing.
- 3.3.5.** Product Qualification may include the following:
- Kick-Off Meeting (KOM) requirements for Product Qualification Review – Refer to Annex B.
 - Manufacturing Process Plan (MPP) – Refer to Annex C.
 - Inspection Test Plan/Product Quality Plan (ITP/PQP) – Refer to Annex D.
 - First Article Inspection (FAI) – Refer to Annex E.
 - Design/Process FMEA (when required by qualification team)
 - Technical Regulations and Standards (TRS) – Refer to Annex G.
- 3.3.6.** Upon formal notification from BAKER HUGHES of successful completion of the qualification process, the Supplier is released to fulfill subsequent purchase orders received from Baker Hughes.
- 3.3.7.** Qualification completion does not relieve the Supplier of the full responsibility to assure the manufacturing processes remain in control and the product or process supplied on subsequent orders meets drawing and specification requirements.
- 3.3.8.** Any deviations from, or changes to an approved Product Qualification must be in accordance with applicable Baker Hughes supplier deviation and management of change requirements.

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3.3.9. Qualification Documentation

3391. Qualification records, e.g., Control Plans, material certifications, FAI and related documentation, are subject to periodic review by Baker Hughes. Baker Hughes also reserves the right to request submittal of these records at any time.
3392. When required by the Baker Hughes Qualification Team, an Electronic Qualification Book must be submitted in accordance with the specific product qualification requirements determined by the Baker Hughes Qualification Team. Additional details are outlined in Annex A. Any deviation from these requirements must be approved by the Baker Hughes Qualification Team.

3.4. Supplier Disqualification

- 3.4.1.** A Supplier may be disqualified for failure to meet and/or maintain the Baker Hughes quality requirements.
- 3.4.2.** If a Supplier is disqualified, successful completion of a new qualification is required to receive new purchase orders. Baker Hughes, at its sole discretion, has the option to not requalify a Supplier.

3.5. Quality Record Retention

- 3.5.1.** The Supplier shall have a written procedure for the documentation and retention of quality and product records related to products or services supplied to Baker Hughes, including any specific records determined by Baker Hughes. The procedure shall determine appropriate storage means to meet the retention requirement and allow for timely retrieval of records.
- 3.5.2.** Records shall include, but are not limited to, product quality or inspection and test plans and results, material specifications, qualification documentation and certificates of conformance. Specific component record requirements may be specified in Baker Hughes purchase orders, contracts or specifications.
- 3.5.3.** The Supplier's records pertaining to Baker Hughes must be retained for a period of at least ten (10) years unless otherwise specified by Baker Hughes. Quality records must be available upon request.

3.6. Sub-Supplier Management

- 3.6.1.** Supplier shall communicate all applicable Baker Hughes requirements (e.g., product documentation, SRS, PQR, etc.) to sub-suppliers.
- 3.6.2.** If a Supplier chooses to outsource a product or a process, the Supplier is fully responsible for qualifying Sub-Suppliers to meet Baker Hughes requirements and notifying Baker Hughes of this qualification.
- 3.6.3.** Supplier shall not outsource any process requiring assessment to any Sub-Supplier without Baker Hughes' formal approval.

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- 3.6.4.** Baker Hughes reserves the right to require Sub-Suppliers to be qualified by Baker Hughes.
- 3.6.5.** Where a Baker Hughes Business Segment permits the Supplier to select sources for raw metallic material which are not approved by Baker Hughes, the Supplier shall select, evaluate, approve, monitor, and manage those raw metallic material Sub-Suppliers in accordance with the requirements in this document and any applicable Baker Hughes, and Baker Hughes Business Segment requirements. Refer to Annex I- Management of metallic raw material for (TPS) Sub-Tier Suppliers.
- 3.6.6.** Baker Hughes reserves the right to review the Supplier's process for selection, qualification, and surveillance of Sub-Suppliers, to approve Sub-Supplier qualifications, audit and monitor the Sub-Supplier's processes and facilities when deemed necessary. This requirement also applies if the Supplier is a sales representative or distributor that procures from Sub-Suppliers for manufactured parts or assemblies.
- 3.6.7.** The planned use and manufacturing location of any critical Sub-supplier must be clearly identified in the Control Plan during the qualification process. Upon successful completion and qualification of the primary Supplier, the Sub-Suppliers identified as part of that qualification must not be changed without prior approval from Baker Hughes. This requirement shall also be applicable to Baker Hughes directed Sub-Suppliers.
- 3.6.8.** Additionally, when outsourcing products, processes or services, Supplier shall:
- a. identify, evaluate and manage the impact of risks which the use of a Sub-Supplier may have on the quality or delivery of the product / service the Supplier will provide to Baker Hughes;
 - b. review Sub-Suppliers to ensure those selected have the capability and capacity to meet product/service requirements and other applicable Baker Hughes requirements;
 - c. ensure control over any outsourced process that affects product conformity to Baker Hughes requirements;
 - d. have an established qualification process, including but not limited to, audit requirements, first article requirements, and technical evaluations of the product / process / service being considered for approval;
 - e. have an established process to identify, train and qualify auditors responsible for audits of Sub-Suppliers. The process shall ensure and maintain competency of auditors;
 - f. have an established method to identify their approved Suppliers (Sub-Suppliers);
 - g. have a defined method for the periodic monitoring and re-evaluation of Sub-Supplier performance;

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- h. continually improve the performance of Sub-Suppliers through use of audit results, key performance indicators, analysis of data, corrective and preventive actions;
- i. have a communication plan to notify the Sub-Supplier's supply chain of the latest specifications and to verify the product / service on an ongoing basis;
- j. maintain a process for MOC with Sub-Suppliers.

3.7. Inspection and Auditing

- 3.7.1. Baker Hughes nominated Inspectorate and/or Baker Hughes Customers reserve the right of access to inspect, audit, expedite or witness at Supplier premises and at any of Supplier's Sub-Suppliers' (of any tier) locations.
- 3.7.2. Baker Hughes shall provide reasonable notice to the Supplier prior to the commencement of any agreed audits. Baker Hughes and/or its nominated Inspector may perform inspection surveillance at both Supplier and Sub-Supplier locations. Baker Hughes reserves the right to amend the inspection activity and frequency of visits identified in a Control Plan as it deems necessary.
- 3.7.3. Baker Hughes SQE's may use BH-SOU-015 Checklist to audit the Supplier against these Supplier Quality Requirements. The Checklist can be provided upon Supplier's request.

3.8. Source Inspection and Test Witness Requirements

- 3.8.1. Baker Hughes, its Customer and/or their authorized Third Party may elect to inspect parts, and/or witness subassemblies at the Supplier's facility during processing, testing, or at final inspection. Source inspection and test witness requirements are to be identified and coordinated through the Baker Hughes SQE or another designated representative.
- 3.8.2. The Supplier may be subject to Third Party source inspections because of poor quality performance, in which case the Supplier shall bear the costs.
- 3.8.3. The Supplier is responsible to notify Baker Hughes in advance, when material will be ready for inspection. Re-execution of a witnessed inspection due to the Supplier's responsibility is subject to charge back of the costs of the inspection to the Supplier.
- 3.8.4. When required by Baker Hughes, the Supplier shall complete Baker Hughes provided inspection checklists during Supplier's internal tests or inspections.
- 3.8.5. Baker Hughes and/or Customer acceptance of product does not relieve the Supplier of its obligations to supply products or services that meet specifications and purchase order requirements.
- 3.8.6. Inspection by Baker Hughes or its Authorized Representative does not relieve the Supplier of its responsibility to execute and document the internal tests and inspections as per PQP/ITP. Baker Hughes has the right to review and approve this documentation upon request.

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3.9. Safe Work Environment

- 3.9.1.** Baker Hughes is committed to safe work environment for workers and for visiting people and expects the same of its Suppliers. Therefore, Supplier shall brief its visitors about general safety information and Residual Risks relating to the witnessed activities prior to the start of those. The risks associated with test failure and the personnel safety mitigation plans shall be reviewed. This may include the review of signage implementation that identifies an area of risk and additional Personal Protective Equipment (PPE) that will be required. For examples of Residual Risks, (i) a pneumatic high-pressure test may require explanation of how risks are mitigated and to remain at the proper distance and why or (ii) a high voltage test may require observation of the warning signs and to not touch any live part. Examples are for illustration only and are not intended to limit possible heightened risk scenarios that require additional safety briefings. Supplier shall develop an internal process for determining when risks are heightened and ensuring repeatability of the briefings.
- 3.9.2.** The Supplier shall identify and comply with all applicable safety requirements and regulations.
- 3.9.3.** Baker Hughes reserves the right to conduct an HSE audit at the Supplier's facility

3.10. Supplier Scorecards

- 3.10.1.** Baker Hughes has implemented a system to rate the Supplier using the methodology explained in greater detail in Annex H.

3.11. Independent Validation / Certification

- 3.11.1.** When required by equipment specification and data sheets, the Supplier shall engage a recognized independent Certification Authority to certify equipment design and compliance to specified codes such as pressure vessels, heat exchangers, lifting equipment, etc.

3.12. Product / Service Documentation

- 3.12.1.** Requirements for supporting documents, e.g., material certification, product or material test reports, inspection reports, country of origin, material traceability, certificates of conformance, Control Plan activities, etc., are identified within product, service and / or purchase order documentation. Requirements for these records are applicable to the Supplier and any relevant outsourced activities. The Supplier shall maintain required documentation and make it available to Baker Hughes as required.
- 3.12.2.** Where language is not specified, supporting documents shall be provided in the English language, unless otherwise agreed to in writing by Baker Hughes.

3.13. Testing and Calibration Laboratories

- 3.13.1.** Laboratories performing mechanical Testing, metallurgical testing, chemical testing and calibration services may be qualified by Baker Hughes.

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- 3.13.2.** Qualification of the laboratory can be waived on a valid accreditation according to ISO17025 (or higher standards) issued by an accreditation body and including all testing methods/standards required by Baker Hughes.
- 3.13.3.** As an alternative, laboratory may be directly qualified and approved by Baker Hughes based on Product Companies applicable practices.
- 3.13.4.** Additional requirements will be applicable when specified in Baker Hughes product/process specifications or the purchase order.
- 3.13.5.** The Baker Hughes required testing methods shall be included on the laboratory's "scope of accreditation". This applies to mechanical testing, chemical analysis, calibration activities, NDE and other services provided by the laboratory.
- 3.13.6.** For laboratories performing testing for Baker Hughes chemical products, Baker Hughes requires a valid current certification to ISO9001, ISO/IEC 17025 or an equivalent standard. When laboratory tests are performed for regulated products or materials, testing shall follow applicable local regulatory standards, or accredited for the specific material type being tested.
- 3.13.7.** Additional requirements will be applicable when specified in product/process specifications or the purchase order.

3.14. Material Traceability

- 3.14.1.** Traceability is meant to ensure proper identification of finished products down to raw materials. Suppliers shall demonstrate effective material control procedures that, where specified, can trace materials from point of origin through stages of the manufacturing process, including any outsourced processing, through to acceptance by Baker Hughes. The Supplier's material control system and traceability procedures shall be made available, upon request, for review.

3.15. Supplier Self-Release Program

- 3.15.1.** Suppliers may be selected to participate in the Baker Hughes Supplier Self Release (SSR) program. This program focuses on world-class process and material controls at the Supplier, which are designed, implemented and monitored to prevent defects at the very earliest possible point, resulting in consistently excellent quality and approval to ship directly to stock at Baker Hughes. Contact Baker Hughes Supplier Quality for information on this program.

3.16. Nonconformity Management

- 3.16.1.** The Supplier shall operate a system to detect and control nonconformance's throughout product realization. If the Supplier intends to request concession to use the nonconforming product, the Supplier shall immediately notify Baker Hughes through the Supplier Deviation Request (SDR) process/tool about any deviations from specified requirements or conditions that may have an impact on the final Product or Service (see section 3.18). Nonconforming product shall not be used without prior written approval from Baker Hughes.

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3.17. Supplier Deviation Request (SDR)

- 3.17.1. An SDR must be submitted by the Supplier for approval of alternate materials, drawing errors, drawing changes and other deviations from the purchase order requirements or an agreed Control Plan.
- 3.17.2. The request must include a complete description of the deviation, drawing number, zone of referenced area, material specification, the quality affected, and processes requiring assessment involved in the repair (as applicable). Additionally, the specific material covered by the SDR must be identified on the SDR. For serialized parts, the serial number(s) must be identified; for non-serialized parts, the specific purchase order(s) must be identified.
- 3.17.3. SDRs shall be submitted through the specific Baker Hughes business applicable tool. For any questions, Suppliers shall contact the Baker Hughes Sourcing or Procurement Representative.
- 3.17.4. The Supplier shall not presume approval of the request until a dispositioned SDR is made available by Baker Hughes to the Supplier. No repairs/changes shall be made, nor products or services delivered prior to approval.
- 3.17.5. For any approved SDR, the Supplier must send a copy of the SDR along with the product(s) at the time of shipment. Additional marking or tagging may also be required at the discretion of Product Companies.
- 3.17.6. SDRs are "one-time" exceptions to Baker Hughes requirements. Unless the SDR involves a drawing or specification change, Baker Hughes expects the nonconformance(s) to be eliminated on subsequent deliveries.
- 3.17.7. SDRs shall be submitted by the primary Supplier (the Seller on the purchase order), including any deviations (e.g. drawing changes, material substitutions, etc.) related to a Sub-Supplier's scope.
- 3.17.8. An SDR may also be known as a Deviation Waiver Request (DWR).

3.18. Post shipment Non-Conformity Notification (Service Bulletins)

- 3.18.1. When Supplier discovers that goods or material already shipped or delivered to Baker Hughes has a defect, a quality or performance deficiency, or is not in compliance with the Order, specifications, any applicable code, standard or legal requirement, Supplier must notify Baker Hughes by a Service Bulletin and Baker Hughes may require that such goods be recalled, replaced and/or repaired.
- 3.18.2. The notification must at a minimum:
 - a. Identify specifically the impacted materials, goods and/or units of the fleet, by clear Baker Hughes tracking references (at a minimum Baker Hughes Purchase Order/Purchase Order lines number and job numbers).
 - b. Provide a clear analysis of the likely failure causes by detailing a description of the issue (problem summary), identified root-causes and investigation path.

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- c. Specify a clear action plan proposal for immediate Containment actions and long-term Corrective and the Preventive Actions, including action owners, deadlines, and where work will take place.
- d. Highlight the level of urgency by indicating the potential risk in case of failure, including but not limited to danger to people, property, facilities, and reduced equipment reliability or efficiency.

3.18.3. Supplier is also required to have in place a substantially similar process with its Suppliers and to notify Baker Hughes of any such service bulletins from Supplier's supply chain. Supplier will provide the Service Bulletin in writing to Baker Hughes.

3.19. Non-Conformities Detected after Supplier's Release

3.19.1. Baker Hughes addresses Supplier related quality issues detected after the Supplier's release using two categories. A nonconformance detected by Baker Hughes prior to release from a Baker Hughes facility is referred to as a Non Conformance Report (NCR). A nonconformance detected after release from a Baker Hughes facility is referred to as an Escape. In both cases a nonconformance report will be communicated to the Supplier.

3.19.2. At notification of the nonconformance, the Supplier shall immediately:

- a. review the issue and clarify details with the Baker Hughes SQE, as needed;
- b. define corrections to re-establish conformance to specifications;
- c. Determine containment actions to be put in place to ensure that no additional defects escape the Supplier's location. Actions shall address, at a minimum:
 - list of suspect products and communicate the list to Baker Hughes;
 - location of the parts;
 - plan to purge suspect parts;
- d. When required by Baker Hughes, execute an Root Cause Analysis (RCA) to be carried out with adequate and effective corrective and preventive actions, as applicable. Supplier is expected to provide RCA responses in a timely manner. The RCA shall include:
 - identified root cause(s) of the nonconformance (why the failure happened, why it was not detected, and why the system planning and internal Supplier controls failed to prevent the failure from happening and not to be detected);
 - corrective and preventive action plans to address the identified root cause(s) and prevent the recurrence of the failure or prevent the potential occurrence in other areas (actions, owners, due dates);
 - Planned date for next internal audit to verify actions have been effective.

3.19.3. Supplier shall review and document effectiveness of corrective and preventive actions.

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3.19.4. Upon request, all Suppliers and Sub-Suppliers must immediately provide all necessary support and data associated with nonconformance issues or quality investigations.

3.19.5. Baker Hughes reserves the right to charge administrative fees for processing the nonconformance.

3.20. Cost of Quality

3.20.1. Baker Hughes frequently incurs costs resulting from Suppliers' defects, non-conformance and/or poor quality. Costs associated with such defects, including but not limited to inspection costs, storage and transportation costs, scrap/rework costs, redesign costs, nonconformance after delivery and management costs are subject to recovery by Baker Hughes.

3.20.2. Baker Hughes will be entitled to, among other things, to set off the back-charged amounts with amounts due to the Supplier, suspend or revoke the qualification of supplier, and any other remedy permitted by Baker Hughes, Standard Terms of Purchase as amended and/or supplemented from time to time.

3.21. Management of Change (MOC)

3.21.1. The Supplier shall maintain a process for MOC, to ensure the integrity of the product / service realization processes and the quality management system is maintained when changes are made to these processes; potential risks associated with the change are identified and addressed; and any required approvals are obtained prior to the introduction of such changes.

3.21.2. At a minimum, the Supplier shall use the MOC process for any of the following changes which may negatively impact the quality or delivery of the product / service:

- a. changes in the organizational structure;
- b. key or essential personnel;
- c. critical Sub-Suppliers;
- d. critical materials;
- e. product realization processes;
- f. change in production equipment;
- g. test methods;
- h. change in manufacturing location of Supplier (or Sub-Supplier included in a Control Plan);
- i. design change that effects fit, form or function;
- j. Change in industry standards/regulations, etc.

3.21.3. The Supplier shall notify relevant personnel, including Baker Hughes when required, of the change and residual or new risk due to such changes. Records of MOC activities shall be maintained.

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3.21.4. Baker Hughes shall decide if the change will require a new process assessment, product qualification or other change evaluation activity. When Baker Hughes determines that the proposed changes require approval by Baker Hughes, the Supplier shall not proceed with the proposed changes without written approval from Baker Hughes.

3.21.5. Baker Hughes reserves the right to reject any products or services not conforming to the above MOC process.

3.22. Process Monitoring and Control

3.22.1. Baker Hughes expects our Suppliers to monitor, measure, analyze and improve in the key areas of their operations.

3.22.2. The Supplier shall identify critical processes and the relevant process parameters which may impact product or service conformity and apply suitable methods for monitoring and measuring these critical processes.

3.22.3. These methods shall demonstrate the ability of the processes to achieve planned results. The critical processes, parameters and methods may be documented in a Control Plan. When planned results are not achieved, correction and corrective action shall be taken. Records of process monitoring, and any necessary actions taken shall be maintained.

3.22.4. Where CTQs are identified in applicable Baker Hughes drawings or specifications, or by Baker Hughes, these CTQs shall be included in the Supplier's process monitoring and control program. Baker Hughes may identify other specific cases where process monitoring and control is required and may also require periodic reporting to Baker Hughes and specific Supplier improvement projects based on process performance.

3.23. Cyber Security

3.23.1. The requirements related to Cyber Security are relevant and applicable for Suppliers who provide a digital product (see the related definition) to Baker Hughes. A Supplier will be identified as cyber security relevant within the qualification process. For all the Cyber Security requirements described below, upon request, and subject to NDA, the Supplier shall provide documented evidence of the listed controls or relevant policies in place.

3.23.2. Supplier shall also implement reasonable measures to secure his development environment as well as any Supplier's devices which interact with Baker Hughes products/systems. These measures include but are not limited to:

- a. Network segmentation (use of firewalls, VLAN etc.);
- b. Account and password management (no default account, logging etc.);
- c. Malware protection (updated AV etc.);
- d. Security updates management (devices updated to latest security patches);
- e. Physical security (authorized personnel etc.);

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- f. Secure development lifecycle practices (security testing, Third Party libraries verification etc.);
- g. Incident and vulnerability management process, including notification to Baker Hughes.

3.23.3. Security Organization

- 32331. The Supplier shall designate and communicate to Baker Hughes a resource accountable for security management.

3.23.4. System Hardening

- 32341. The Supplier shall provide Baker Hughes with a hardening guide document detailing the process for secure configuration/operation of the supplied components.
- 32342. The Supplier shall ensure:
 - (a) products are updated to the latest validated security patches prior to start of Factory Acceptance Test (FAT)/Release;
 - (b) the above security patches have been validated in a representative environment prior to installation;
 - (c) all software components, ports, and services (logical and physical) that are not required for the normal or emergency operation and maintenance of the product, shall be removed or disabled prior to the FAT/Release;
 - (d) components shall be configured with least privilege permissions for all user accounts, file systems, and application-to-application communications;
 - (e) any maintenance backdoor shall be removed from the application before release;
 - (f) the Supplier shall provide evidence of its hardening activities, through vulnerability scan reports, digital fingerprints or system status reports.

3.23.5. Account and Password Management

- 32351. The Supplier shall:
 - (a) disable or remove all accounts which do not need to be active, prior to the FAT/Release;
 - (b) Disable, remove, and/or modify any default or guest accounts/credentials, no later than the time of installation/commissioning, re-installation or recovery.
- 32352. Products shall not have any accounts, passwords, or private/secret keys that cannot be changed, disabled, or removed by the authorized end user of the product (no hardcoded passwords/keys).
- 32353. Any default account/password shall be documented and modifiable.

Supplier Quality Requirements

3.23.6. Malware Detection and Protection

- 323.6.1. Any supplied components with wireless technology can be configurable with strong security feature(s).
- 323.6.2. The Supplier shall implement a malware scanning process to ensure all the components supplied (including their storage media, e.g., CDs, hard disks, or flash cards) and processed are free of known viruses and malware.

3.23.7. Data Security and Cryptographic Tools

- 323.7.1. The Supplier shall identify any remote channel used in the context of Baker Hughes' product/projects and ensure it is based on architectures and protocols approved by Baker Hughes (e.g. IPsec, SSL etc.).
- 323.7.2. Controls shall be in place to ensure portable media, including mobile devices, are securely managed (e.g. enforce scan before usage, no use of personal area networks etc.).
- 323.7.3. Any cryptographic tool and security functionality implemented/used in the product to:
 - 323.7.4. hash, encrypt, or sign data for storage or transmission;
 - 323.7.5. exchange certificates, establish keys, generate random numbers;
 - 323.7.6. authenticate end users;
 - 323.7.7. Shall follow approved FIPS 140-2 methods.
- 323.7.8. Supplier shall communicate to Baker Hughes and document any such tool/functionality that does not follow the above mentioned commonly accepted security industry recommendations. This documentation shall include, at least, its origin (e.g., proprietary tool), its reference documentation (e.g., academic publication), its functionality (e.g., encryption), its main security-related features, characteristics, and parameters (e.g., used ECC curve), as well as in which context or part of the Product it is used (e.g., user authentication).

3.23.8. Virtualized Systems

- 323.8.1. Applications that require physical separation shall not be hosted on the same system.
- 323.8.2. The requirements for the most critical instance of a system dictate those for all other virtual instances on that system.

3.23.9. Cloud Services and Systems

- 323.9.1. No service (included data storage) run from the Cloud can interact with Baker Hughes data tagged as Confidential or higher, without explicit approval from Baker Hughes.

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323.92 Applications that require physical separation shall not be on a cloud-based service.

3.23.10. Physical Security Software Integrity and Authenticity

323.101 Supplier shall use tamper evident seals on media and containers, to detect unauthorized access to protected products (e.g. tamper evident labels or seals, which self-destruct and leave a residue sticker if removed).

323.102 Likewise, Supplier shall ensure integrity of software deliverables, for example by using hashes, digital signatures, or appropriate packaging.

323.103 The Supplier shall ensure all software used in the creation of the components is genuine and licensed.

3.23.11. Training

323.111 The Supplier shall provide training and ensure its personnel and Sub-Suppliers / Contractors have been informed of, accept and comply with Baker Hughes' Cyber Security policies. Supplier personnel and Sub-Suppliers / Contractors must undergo an awareness and role-based training program that promotes Cyber Security. This includes relevant Supplier's security policies, procedures and awareness of industry standards (e.g. IEC62443), as well as secure coding principles and best practices for development staff.

323.112 The training shall be given to personnel and Sub-Suppliers / Contractors on a yearly basis at a minimum.

3.23.12. Product Documentation

323.121 The documentation provided with the Product shall include:

- (a) All user and system accounts in the Product with a recommendation to change at least the access credentials.
- (b) Description of all ports, services, and software needed to support any functionality in the Product, as well as how these ports, services, and software can be configured and, when applicable, how these can be disabled, blocked, or uninstalled.
- (c) Information on proper configuration and usage of Cyber Security related functionalities in the Product.
- (d) Specific instructions on how to configure the security controls provided by the Product (e.g., RBAC, security logging, or secure communication), as well as security controls provided in addition to the Product (e.g., antivirus, whitelisting, or security monitoring).
- (e) A recommendation for at least one malware prevention solution to be used during the operation of the Product, if applicable. The recommendation shall include the specific version of the malware prevention solution.

Supplier Quality Requirements

323.122. Supplier shall provide a list of all hardware and software components provided, with version numbers and description.

323.123. With respect to Open Source Software (OSS) and Third Party libraries and components, the Supplier shall provide:

(a) a list of OSS/Third Party components and libraries used in the product. This list must include version numbers of the component/library, and where possible a brief description of which part of the product uses it;

(b) licenses of OSS/Third Party libraries and components whenever the Product makes use of Third Party components with a copyright license (e.g. inclusion of open source software which requires GPL);

(c) assurance that OSS/Third Party components integrated in the product are security tested.

3.23.13. Third Party Security Updates Management

323.131. The Supplier shall document and implement a process for Third Party software security patches/updates.

323.132. For any Third Party software that is included in the build or installation package of the Product (e.g., Third Party libraries or embedded OS), the Supplier shall at least:

(a) monitor for security updates;

(b) Execute the vulnerability management process (as defined here in relevant section) for applicable security updates.

323.133. For any Third Party software on which the Product depends or that is used in the deployment of the Product without being an integrated part of it (e.g., Windows OS, Office, JRE, Acrobat Reader, etc.), the Supplier shall at least:

(a) Maintain a list of all relevant Third Party software dependencies;

(b) Recommend procedures for application of security updates for each of the listed Third Party software dependencies.

323.134. Also, as reasonably requested by Baker Hughes, for applicable security updates, the Supplier shall:

(a) validate Third Party software updates;

(b) communicate to Baker Hughes validation results and actions to resolve issues (if any).

323.135. Baker Hughes may decide to perform by itself the validation of the Product's Third Party software updates in some circumstances, in which case the Supplier shall support Baker Hughes as needed.

3.23.14. Vulnerability Management

323.141. The Supplier shall have a process to:

Supplier Quality Requirements

- (a) Monitor system vulnerabilities published or brought to their attention by Baker Hughes, and remediate them within the manufacturer's guidelines and according to Baker Hughes terms and conditions;
- (b) Manage extra security enhancement requirements, which may arise due to unforeseen events, added during project development. This includes the bounds of acceptability and management of these requests;
- (c) For any vulnerability submitted (by Baker Hughes or any other entity), the Supplier shall provide vulnerability remediation and advisory report with information on:
 - Description of vulnerability;
 - Vulnerability validity and impact;
 - List of potentially affected products and their versions;
 - Information on how to verify the existence of the vulnerability in its products;
 - Timeframe for the remediation, as well as possible workarounds while the remediation is identified and implemented.

323.142 If the product is included in the build/package of any Baker Hughes product/solution, the Supplier shall communicate the vulnerability remediation and the advisory report to Baker Hughes prior to public disclosure.

3.23.15. Security Risk Assessment

323.151. The Supplier shall have the capability to perform a security risk assessment of its components. The Supplier shall be able to support Baker Hughes with such information as needed.

3.23.16. Auditing

323.161. Baker Hughes is permitted to conduct a Cyber Security audit on Supplier's process and Cyber Security assessment on products to identify weaknesses and potential vulnerabilities, subject to agree upon notice.

3.23.17. Sub-Suppliers / Contractors

323.171. The Supplier shall ensure that all Sub-Suppliers / Contractors that supply components included in the Product or provide services related to its development (e.g., coding or testing) comply with the requirements listed in this document.

323.172. The Supplier shall take appropriate compensating measures to mitigate the risks whenever Sub-Suppliers / Contractors may not meet the listed requirements.

Supplier Quality Requirements

3.24. Counterfeit, Fraudulent, Suspect or Substandard Parts ("CFSI's")

- 3.24.1.** The supplier shall ensure that all materials provided to Baker Hughes, or used to manufacture materials provided to Baker Hughes, meet all requirements of the latest version of the applicable manufacturer data sheet (unless otherwise stated in the Baker Hughes product documentation), description, and/or industry standards and that they are genuine, new, unused, and not from old stock or inventory.
- 3.24.2.** Should the supplier desire to supply or use materials that may not meet these requirements, the supplier shall submit an SDR per section 3.17 and obtain approval prior to shipment to Baker Hughes
- 3.24.3.** Supplier shall notify Baker Hughes of known incidents of CFSI's involving materials provided to Baker Hughes, or used to manufacture materials provided to Baker Hughes.

Responsibility and Authority

- Baker Hughes Sourcing or Procurement Representative: Responsible for managing Purchase Order execution, supplier performance, communication between the Supplier and Baker Hughes, and engaging appropriate Baker Hughes resources as needed.
- Baker Hughes Supplier Quality Engineer (SQE): Responsible for providing quality and technical support for Supplier process assessment, product qualification, and Supplier monitoring and improvement activities.
- Supplier: Responsible to ensure their organization understands the requirements in this policy, and to implement and maintain the processes and/ or controls necessary to comply with these requirements.

Records

The records required by this procedure will be maintained and controlled according to requirements of Supplier's QMS and as prescribed in this procedure.

Terms, Definitions and Acronyms

Terms and Definitions

- **Baker Hughes Qualification Team** - Team responsible for determining specific steps and actions applicable to a Supplier for a process assessment and / or product qualification. Team is led by Supplier Quality and may consist of an SME, and representatives from Sourcing, Procurement, Engineering and Manufacturing as appropriate for each assessment or qualification effort.

Supplier Quality Requirements

- **Characteristic Accountability and Verification (CAV)** - CAV form may be required in the qualification program. The CAV form includes, at a minimum, the following items: Identification of components, Characteristics and feature accountability, Inspection and test results, Manufacturing Planning, Production Product Acceptance Criteria. A CAV is typically only required on the first article piece (FAI) unless specifically required by the Baker Hughes SQE on subsequent orders or as indicated on the purchase order.
- **Control Plan** - A Control Plan is a documented description of the activities and / or measurements for controlling the variations in a process within the acceptable limits. Examples of control plans can be: CAV/ FAI report, ITP, MPP, QCP.
- **Critical Product/Component/Service/Process** - Anything that could have a significant impact on Baker Hughes product conformity and functionality, delivery, performance and Non-Productive Time (NPT).
- **Critical Supplier** - A Supplier deemed by Baker Hughes or Baker Hughes Customer as indispensable or essential.
- **Critical Sub-Supplier** - A Sub-Supplier deemed by a Supplier, Baker Hughes, or a Baker Hughes Customer as indispensable or essential.
- **Third party** - Also written as 3rd Party, is a Non-Baker Hughes Vendor, Supplier or Contractor.
- **Delivery** - The point in time and physical location at which the agreed transfer of ownership takes place.
- **Detailed Drawing, Manufacturing and Producibility Review** - A detailed drawing review with the Supplier and the Baker Hughes Qualification Team to ensure Supplier's thorough understanding of drawing requirements and specifications during the qualification process.
- **Digital Product** - Any good, component, system or service which contains software and/or a networked component. This Policy also applies to Baker Hughes' integration of products above with commercial off-the-shelf software, Open Source Software, and other software components. This includes, but is not limited to, any product that stores, processes, or transfers data or metadata for Baker Hughes service consumption. Cyber products also include all services that utilize technology to perform those services. Examples: software, firmware, drivers, embedded systems, routers, switches, controllers, smart sensors etc.
- **Direct Material/Service** - All the items/services that are part of the final product or service delivered to Baker Hughes' Customer.
- **Direct Support Service** - Services that do not become part of the final Baker Hughes product or service, but that do have a direct impact on the quality of the final Baker Hughes product or service.
- **Encryption** - The process of transforming information using an algorithm to make it unreadable to anyone except those possessing special knowledge, usually referred to as a key.
- **Engineering Technical Specification** - Technical specifications issued by Baker Hughes Engineering Department.
- **Escape** - A nonconforming product or service from a Supplier that is detected after it leaves a Baker Hughes facility.

Supplier Quality Requirements

- **Field Service Notice (FSN or NCM)** - A Field Service Notice which documents a nonconformance identified by Baker Hughes Field Engineers and authorizes Baker Hughes Field Personnel to perform warrantable equipment repairs.
- **First Article Inspection (FAI)** - A comprehensive evaluation of a first item or batch from a manufacturing process, consisting of inspecting, measuring and / or other verification of the properties, geometry and characteristics of the item, to determine conformance of the item to the defined specifications and the ability of the manufacturing process to consistently produce a conforming product, including documentation of the results.
- **Frozen Process** - A manufacturing method, process, procedure or control that has been approved by the Baker Hughes Qualification Team and documented in the Control Plan.
- **Indirect Material/Service** - Those products/services not part of the final product or service delivered to Baker Hughes' Customer.
- **Inspection** - Conformance evaluation by observation and judgment accompanied as appropriate by measurement, testing or gaging.
- **Installation Country** - Country where the procured good will be installed for operation.
- **Manufacturing Process Plan (MPP)** - A detailed, step-by-step list of operations and requirements by which product(s) are manufactured or service(s) are performed.
- **Nonconformance Report (NCR)** - A nonconformance report initiated during processing through a Baker Hughes factory or location. This also may be referred to as different names depending on the specific Baker Hughes business (e.g. QCR, QN, NCN or GRR).
- **Pilot Lot Qualification (PLQ)** - A pilot production lot may be required as determined from Baker Hughes specifications or processes. In addition, the Baker Hughes Qualification Team may require a pilot lot or additional pilot lot testing to verify control of the Supplier's processes upon final qualification.
- **Process Risk Assessment** - Evaluation of a process, or processes, by a cross functional team, to assess the effectiveness of these processes to consistently produce a conforming product or service, identify areas with potential for creating nonconformances or allowing nonconformances to escape the process, and objectively quantify any resulting negative impacts. One format for this assessment is a Failure Modes & Effects Analysis (FMEA).
- **Process Quality Requirement (PQR)** - A document issued by Baker Hughes that establishes the requirements necessary to validate a specific process.
- **Process Assessment / Product Qualification Requirements Review** - A Meeting between Baker Hughes and Supplier, to clarify the qualification requirements. Outcome of Qualification Requirements Review is a summary detailing the specific requirements a Supplier must fulfill to successfully complete the qualification (Annex B).
- **Product** - The result of a process. Whenever the term "product" occurs, it can also mean "service" or any deliverable associated with fulfillment of a purchase order.

Supplier Quality Requirements

- **Product Quality Plan (PQP)** - A detailed, step-by-step list of operations and requirements in which a Supplier identifies a process of how, what, why, when and who will perform tests or inspections and the applicable acceptance criteria. This may also be referred to as a Quality Control Plan (QCP) or ITP (Inspection and Test Plan) or other equivalent names depending on the specific Baker Hughes business.
- **Qualification Package** - Required documentation for qualification (Annex A).
- **Requirement** - Need or expectation that is stated, generally implied or obligatory.
- **Residual Risk** - The risk remaining after risk treatment (refer to ISO 31000).
- **Services** - Activity purchased by Baker Hughes.
- **Sourcing or Procurement Representative** - The primary contact between the Supplier and Baker Hughes. May be Sourcing, Procurement or the Buyer depending on the Baker Hughes Business Segment.
- **Process requiring assessment** - A process by which results cannot be fully verified through subsequent nondestructive inspection and testing of the product and where processing deficiencies may become apparent only after the product is in use.
- **Specification** - A document stating technical requirements.
- **Standard** - A technical specification or other precise criteria designed to be used consistently as a rule, guideline, or definition.
- **Sub-Tier Supplier** - A company that supplies products, processes or services to another company (Tier 1 Supplier) that then supplies them to Baker Hughes (also known as a Tier 2 Supplier).
- **Supplier** - Unless noted otherwise, refers to the corporation, company, partnership, sole proprietorship or individual with whom Baker Hughes places a purchase order for products or services.
- **Supplier Deviation Request (SDR)** - A request initiated by the Supplier to deviate from purchase order technical requirements (drawings, specifications, engineering instructions, etc.) This may also be referred to as Deviation Waiver Request (DWR) or other names depending on the specific Baker Hughes Business Segment.
- **Supplier Requirements Specification (SRS)** - A suite of documents issued by Baker Hughes defining minimum requirements for Suppliers relative to the products and services they provide.
- **Technical Regulation** - A mandatory requirement for a product, its processing, or its production method (may include packaging, marking, and labeling requirements).

Acronyms

- CFSI - Counterfeit, Fraudulent, Suspect or Substandard Part
- CTQ - Critical to Quality
- DWR - Deviation Waiver Request
- FAI - First Article Inspection
- ITP - Inspection and Test Plan

Supplier Quality Requirements

- MPP – Manufacturing Process Plan
- NDA – Non-Disclosure Agreement
- NDE – Non-Destructive Evaluation
- NDT – Non-Destructive Testing
- PO – Purchase Order
- PQP – Product Quality Plan
- PQR – Process Quality Requirements
- QCP – Quality Control Plan
- QMS – Quality Management System
- SSRP – Supplier Social Responsibility Guideline
- SRS – Supplier Requirements Specification
- SDR – Supplier Deviation Request
- TRS – Technical Regulations and Standards

References

The following documents form part of this document to the extent specified herein. Alternate applicable business-specific technical requirements will be communicated to Supplier as required (examples, ASME, API, ITN, etc.). Unless otherwise indicated, the latest document revision shall apply. Scope limitations are highlighted in brackets.

External References/International Standards

- API Spec Q1 Specification for Quality Management Systems Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry
- API Spec Q2 Specification for Quality Management System Requirements for Service Supply Organizations for the Petroleum and Natural Gas Industries
- ISO 9000 Quality Management Systems—Fundamentals and Vocabulary
- ISO 9001:2008 Quality Management Systems—Requirements
- ISO 9001:2015 Quality Management Systems—Requirements
- ISO 14001 - Environmental management systems -- Requirements with guidance for use
- ISO 31000 - Risk management -- Principles and guidelines
- ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratories

Internal References/Baker Hughes Procedures

- BH-SOU-015 Supplier Quality Requirements Checklist

Turbomachinery & Process Solutions (TPS)

- ARSB-O&G-002 Preservation Requirements for buy materials (Florence, Massa, Livorno, Vibo, Bari and Talamona)

Supplier Quality Requirements

- ARSB-O&G-003 Requirements for materials with shelf-life or perishable (Florence, Massa, Livorno, Vibo, Bari and Talamona)
- ARSB-O&G-004 Guidelines for FPQ/PLQ inspection (Florence, Massa, Livorno, Vibo, Bari and Talamona)
- ARSB-O&G-005 Suppliers Requirements for Completeness process (Florence, Massa, Livorno, Vibo, Bari and Talamona)
- ARSB-O&G-006 Supplier Quality Requirements Addendum for AS / EN9100 requirements (Florence, Massa, Livorno, Vibo, Bari and Talamona)

Oilfield Equipment (OFE)

- VGS2.20 Special Quality Requirements (Surface or Subsea Systems Only)
- QAC 1209 Vendor and Sub vendor requirements (Well stream – now called Flexible Pipe Systems)
- E000-SQG-0001, Supplier Quality Requirements (Global Fabrications and Distribution Systems)

Oilfield Services (OFS)

- SRS-QA1000 Series of General Supplier Requirement Specifications (SRS)
- SRS-QA00-0 Series of Critical to HSE SRS Documents (as applicable)
- SRS-QA00 Series of SRS Documents (as applicable)
- SRS-QA35 Self-Release for Raw Material Distributors (as applicable)
- SRS-QA1001 Sub-Supplier Management (as applicable)

Digital Solutions (DS)

Not Applicable

Supplier Quality Requirements

ANNEX A: Electronic-Qualification Book

This addendum defines the suggested requirements for preparing and submitting an Electronic-Qualification book for inclusion into Baker Hughes e-SQM, or Sourcing Quality Electronic Library. Detailed list shall be agreed with the Baker Hughes Qualification Team.

Qualification Documentation Requirements: As the final requirement of the Qualification Process, when required by the Baker Hughes Qualification Team, the Supplier must submit one Electronic-Qualification book to Baker Hughes for Qualifications.

Qualification Book Requirements: The Electronic-Qualification Book may require the following items, preferably in this order.

Section #	Quality Form Name	Quality Form Description
N/A	Cover Sheet	None
N/A	Table of Contents	None
1	Baker Hughes Purchase Order	Provide Copy of Baker Hughes Purchase Order for this Project.
2	Baker Hughes Specifications/ Baker Hughes Drawings	Provide a list of all Baker Hughes Specifications and Baker Hughes Drawings, including Revision level.
3	Supplier Drawings	Provide copy of all Supplier generated drawings, including Revision level.
4	Supplier Inspection Test Plan (ITP) /Product Quality Plan (PQP)	Provide a copy of the Supplier Inspection Test Plan (ITP) /Product Quality Plan (PQP), signed and dated by the Supplier Quality Representative.
5	Supplier Manufacturing Process Plan (MPP)	Provide a copy of the Supplier Manufacturing Process Plan (MPP), signed and dated by the Manufacturing Representative and/or the Sub-Suppliers used.
6	Characteristic Accountability and Verification Forms (CAV)	Provide a copy of the CAV report for this project.
7	Baker Hughes Qualification Program, Baker Hughes Product Quality Plan	Provide a copy of the Baker Hughes Qualification Program and / or Baker Hughes Product Quality Plan for this Project.
8	Bill of Materials (BOM)	List to include Item #, description, model, etc....
9	Component Conformance	Include Certificate of Conformance (C of C) for all Major Components: e.g., pump curves, testing certifications, calibration certificates, and relevant data sheets.
10	Design Calculations	Provide a copy of all design calculations for applicable Components/Systems (Pipe Stresses, Pipe Supports, Pressure Vessels, Lifting Lugs) per Domestic and International Codes.

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Section #	Quality Form Name	Quality Form Description
11	Code Compliance	Provide a copy of all documents to validate this commodity meets all Domestic and International Code Compliances for the following but not limited to: CSA, CRN, IEC, CE, PED, ATEX, NEC.
12	Material Test Reports	Provide copies of Material Test Reports for all material used on this Project to include, but not limited to the following: Piping, Structural Steel, Bolting materials (Bolts, nuts, washers), Tubing, Raw Materials, Welding Consumables.
13	Welding Procedures	Provide a copy of the Welding/ Brazing Procedure, Specification, and all welder qualification records used on the Project.
14	Nondestructive Examination	Provide copy of all Nondestructive Testing procedures. Provide copy of NDE Personnel list qualified to perform NDE on this project. It includes but not limited to Supplier's written NDE Practice Per. ASNT SNT-TC-1A.
15	Castings and Forgings	Provide all procedures, data and charts for the following processes: casting, machining, forging, bar stock.
16	Mechanical Testing and Heat Treating	Provide copy of all Hardness Testing, Heat Treatment, Stress Relieving, Metallography, and Grain Etch procedures and results.
17	Surface Preparation and Painting	Include all Metal Preparation, Prep for Paint, Paint Procedures along with QA Paint data, signoffs, and paint specifications.
18	Calibration	Provide copy of all Calibration Procedures and Certificates for all devices that were utilized.
19	Functional Testing	Provide a copy of all Mechanical, Electrical, and Functional Tests performed. This should include testing procedures, documented data of all testing performed and signoffs that equipment passed testing.
20	Proof Test, Type Test	Provide Procedures and Results for all Proof Tests, and Type Tests performed on this Project ASNI Referenced. Include the methods to be used in all type and proof testing, either by ANSI, ASME, IEEE, IEC, NEMA or other standard procedures, or by written description.
21	Flushing and Cleanliness	Provide a copy of the Flushing Procedure and Cleanliness Procedure used to verify cleanliness per BAKER HUGHES business specification.
22	Preservation and Packaging	Provide a copy of Procedures and Data to verify compliance in accordance with BAKER HUGHES specifications.
23	Repair/Rework	Provide any Rework Procedures and Results.

Supplier Quality Requirements

Section #	Quality Form Name	Quality Form Description
24	Supplier - Inspection Reports	Provide a copy of all Inspection Reports, Travelers, and other quality documents used in the Supplier's Facility.
25	Critical to Quality (CTQ) Data	Provide any Critical to Quality (CTQ) Data defined by the SQE for this project.
26	Supplier Deviation Record List	Provide a copy or List all SDRs used on this Project.
27	Photographs of the Equipment	Provide photos of the completed Commodity.
28	Packing List	Provide a copy of the Packing List.
29	Baker Hughes - Certificate of Conformance	Provide a copy of the C of C for the product, process or service.
30	Supplier Final Inspection Report	Provide a copy of the Final Inspection Report.
31	Baker Hughes First Article Inspection	Provide a copy of the First Article Inspection Report.
32	TRS Report	Report of the TRS audit, including answer to questionnaire and TRS checklists by country.

Applicable Sections and Documents: The Supplier and the Baker Hughes SQE shall discuss prior to submission of the Electronic-Qualification Book which Sections and Documents are applicable to the qualification.

Electronic-Qualification Book Format: The documentation shall be supplied in an Electronic Format. PDF is preferred. The Qualification Book may be supplied on a CD labeled accordingly and sent to the Baker Hughes SQE or shared through proper transmittal systems.

Qualification Book (Hardcopy): There may be cases where a hardcopy of the Qualification Book is also required. This requirement will be at the Baker Hughes SQE's request.

Supplier Quality Requirements

ANNEX B: KOM requirements for Process Assessment and Product Qualification Review

For Process Assessment

- A. Define the Baker Hughes Qualification Team.
- B. Determine process or service to be provided by the Supplier.
- C. Identify any Sub-Tier Suppliers.
- D. Review applicable specifications, drawings and requirements.
- E. Determine applicable QMS, HSE, TRS and Product Safety requirements.
- F. Determine any process requiring assessment such as welding, heat treatment and non-destructive examinations as a minimum.
- G. Determine requirements for documentation related to process requiring assessment and relevant test results as necessary/ data package requirements.
- H. Determine any applicable Control Plan requirements.
- I. Determine process assessment scope and requirements.
- J. Review process assessment scope and requirements with Supplier.

For Product Qualification

- A. Define the Baker Hughes Qualification Team.
- B. Determine product or service to be provided by the Supplier.
- C. Determine item codes/part numbers to be provided.
- D. Identify any Sub-Tier Suppliers.
- E. Determine traceability requirements.
- F. Determine product documentation / data package requirements.
- G. Determine if Baker Hughes design or Sourced Design Based on item code/part numbers to be provided.
- H. Review applicable drawings, specifications and requirements.
- I. Determine Control Plan requirements (CAV/FAI, CTQs, ITP/PQP, MPP, etc.), including any applicable Customer requirements.
- J. For Sourced design, determine specific applicable requirements.
- K. Determine product qualification scope and requirements.
- L. Review product qualification scope and requirements with Supplier.
- M. Determine packing and preservation requirements.

Prior to part manufacturing, the Supplier may be required to participate in a detailed drawing review with the Baker Hughes Qualification Team to ensure Supplier's thorough understanding of drawing requirements and specifications during the qualification process.

For Supplier Designed, not Build to Print (Functional Spec/Sourcing Controlled), the Supplier may be required to participate in an Engineering Capabilities Assessment and Supplier Design Reviews with the Baker Hughes Qualification Team.

Supplier Quality Requirements

ANNEX C: Manufacturing Process Plan (MPP) Minimum Requirements

An MPP must, at a minimum, contain the following information:

- A. a list of applicable Baker Hughes specifications, ordering sheets, outline drawings, and specifications/instructions for processes requiring assessment along with the latest revision letter or number;
- B. list of Weld Procedure Specifications (WPS) used in the manufacture of the part. When applicable, a visual weld inspection procedure according to Baker Hughes docs;
- C. identification of component parts and sources;
- D. the manufacturing location;
- E. identification of critical Sub-Tier Suppliers. Critical Sub-Tiers include but are not limited to Raw Material and any Supplier of process requiring assessment.
- F. a sequence plan of major and critical manufacturing and inspection steps with appropriate sign-off documentation.

Supplier proprietary processes may be handled with the Baker Hughes SQE directly. Once the MPP is approved, the MPP shall be considered part of the purchase order requirements even if not explicitly referenced on the purchase order.

Supplier Quality Requirements

ANNEX D: Product Quality Plan/ Inspection Test Plan (PQP/ITP) Minimum Requirements

An PQP/ITP must, at a minimum, contain the following information:

- A. clear identification of the item, component, or system to which the PQP is applicable;
- B. listing of technical documents that govern the inspection or test activity (i.e. Supplier documents, Baker Hughes specifications, industry codes/standards);
- C. Identification of the test or inspection criteria in an itemized listing. Each line item must identify what is to be inspected (to the characteristic level), how it is to be inspected, what frequency it is to be inspected, when the inspection or test is to be performed (in the sense of the manufacturing process), who is to perform the inspection (e.g., Operator, Inspector, etc.), and the acceptance criteria. Each item must include provision for sign off by the party performing the inspection;
- D. Identification of Project specific inspections and tests;
- E. Completion of each inspection and test will be accompanied by appropriate sign-off documentation. Each inspection and test must be signed-off during the execution of the PQP;
- F. Clear definition of Baker Hughes and Customer involvement in the inspection and test activities. This includes but is not limited to in-process inspections, Customer witness and hold points, document reviews and Baker Hughes, Third Party and/or Customer release inspections;
- G. Identification and verification of CTQs and inspection methods. CTQs can be identified by purchase orders, specifications, drawings, or by the appropriate Baker Hughes SQE;
- H. Detailed planning of packaging and preservation for shipment and storage;

The PQP or ITP may be included as part of the MPP or submitted as a separate document. The PQP/ITP must be approved by the Baker Hughes SQE.

The Supplier is responsible for the implementation of the PQP, ITP, or QCP at all applicable operations.

Supplier Quality Requirements

ANNEX E: First Article Inspection (FAI) minimum requirements

A FAI will verify the following:

- A. the item conformity against the applicable specifications/drawings and acceptance criteria as per applicable revision;
- B. Dimensional verification;
- C. Material Certificate conformity and completeness (if applicable);
- D. Documentation for processes requiring assessment (e.g., Welding, NDT, heat treatment, etc.) conformity and completeness (if applicable).

Note: FAI may be performed by Baker Hughes, Supplier or Baker Hughes authorized Third Party as determined by the Baker Hughes Qualification Team.

Supplier Quality Requirements

ANNEX F: List of Processes Requiring Assessment

This annex includes a list of processes that may require assessment, for reference of Suppliers and Sub-Suppliers. Such list is for reference and may not be fully exhaustive. Additional requirements may be defined by the Baker Hughes SQE or another representative.

Raw Material Production	Other Testing
Forging/Forming Hot and cold working ((open die, close die, ring rolling, rolled bar, extrusion)	Metallography
Casting (sand casting, die casting, lost foam)	Mechanical testing
Hipping	Chemical analysis
Powder Production process	Calibration
Additive Manufacturing	Temperature testing
Investment casting	Positive Material Identification
Heat Treatment & Surface Treatment	Hardness Testing
Annealing	Pressure testing (gas & liquid)
Quenching	Thermoelectric Potential
Tempering	Leak testing (LT)
Hardening	Thermal Spray
Ageing	APS (Air Plasma Spray
Normalizing	VPS (Vacuum Plasma Spray)
Carburizing	HVOF (High Velocity Oxygen Fuel)
Nitriding	Detonation Gun
Boriding	Cold Spray
Carbonitriding	LPPS (Low Pressure Plasma Spray)
Induction Hardening	TAS (thermal aluminum spray)
Flame Hardening	Diffusion Coatings
Stress Relief	Pack Cementation (Platinum Aluminum & Aluminide)
Post weld heat treatment	CVD (Platinum Aluminum & Aluminide)
Peening and Blasting including shot peening, hammer peening, water peening, sand blasting, and bead blasting.	ATP (Platinum Aluminum & Aluminide)
Roller Burnishing	Slurry (Aluminide)

Supplier Quality Requirements

Welding	Plating
LBW (Laser)	Electrolytic Nickel Plating
EBW (Electron beam)	ENP (Electro less Nickel Plating)
GTAW (Gas Tungsten Arc Welding) TIG	Hard chromium Plating
GMAW (Gas Metal Arc Welding) MIG-MAG FCAW	Hot dip galvanizing / galvalume
SMAW (Shielded Metal Arc Welding)	Electrolytic copper plating
PAW (Plasma)	Nickel and PTFE composite coatings
FW (Flash)	Surface special treatments & Coatings
Cladding, Lining, Weld Overlay	Pickling, Etching and passivation
SAW (Submerged Arc Welding)	All Shot Peen, including GASP and Laser shock peening
Special joining	Macro etching
Tenon Peening	Painting
Brazing	Laser Cladding (Coatings / Layers)
Soldering	PVD (Physical Vapor Deposition)
Wire Crimping	CVD (Chemical Vapor Deposition)
Non-Destructive Evaluation (NDE)	Surface finishing, tumbling (drag and chemical), Abrasive flow
Liquid penetrant evaluation (PT)	Xylan Coating – spray application, curing in the oven
Magnetic particle evaluation (MT)	Phosphate coating – application method by immersion
Radiographic evaluation and tomography (RT)	
Fluorescent Penetrant	
Thermal / Infrared	
Eddy Current Testing (ET)	
Ultrasonic evaluation (UT): Phased Array Ultrasonic Evaluation (PAUT), Time of flight diffraction (TOFD)	
Visual Test (VT)	

Supplier Quality Requirements

ANNEX G: Technical Regulations and Standards

Technical Regulations and Standards (“TRS”) are mandatory requirements that a product, its processing or its production method need to comply with.

They are defined to ensure the protection of Health and Safety, property and the environment, and promote the free trade and competition within a region through the technical harmonization of the regulations.

The number of TRS adopted by applicable jurisdictions has grown significantly because of higher demand for products’ safety and high-quality. Hence, the commitment of Baker Hughes and all its Suppliers shall grow accordingly, to ensure that the products do comply with applicable regulations.

Compliance with TRS, pursuant to applicable laws, is required for all such Suppliers that supply products and/or services that may be used in various jurisdictions. Baker Hughes is required to deliver products and services that need to comply with all applicable TRS requirements (e.g. design, procurement, manufacture, packaging, shipping/transportation, installation, testing, operation, maintenance, and disposal). Supplier shall be solely responsible to ensure that the product and/or services supplied or rendered to Baker Hughes are compliant with applicable TRS requirements as of the date such products are delivered and/or services are rendered. Supplier also covenants and agrees to cooperate with Baker Hughes to provide any necessary update to TRS requirements in case of future changes to such requirements.

It is solely responsibility of Supplier, who provides a product, service, process, or management system, to comply with applicable mandatory provisions, relating to, design, manufacture and testing. Supplier shall provide written evidence or certification, as applicable, that the product, service, process, or management system follows applicable laws and regulations, as needed. In case of any doubts concerning the applicable requirements, the Supplier shall seek a formal clarification from Baker Hughes prior to submitting its quotation proposal.

It is further agreed and understood that Supplier shall be entirely responsible for the following actions:

- Ensure that all products and services follow applicable law requirements of the Installation Country (if stated);
- Deliver its products according to TRS requirements written in the Engineering Technical Specification mentioned in the order.

In the Engineering Technical Specification, Supplier can find:

- The indication of the Installation Country. In case the product requirements are not impacted by TRS of the Installation Country, this information is not provided. In case of doubts, Supplier shall contact Baker Hughes to have a formal clarification;
- TRS specific requirements. In case the Engineering Technical Specification does not contain any TRS specific requirements it shall be Supplier’s sole responsibility to comply with laws applicable to the Installation Country; provided, however, that, Supplier shall be responsible to double check TRS specific requirements as indicated by Engineering Technical Specification and verify whether there are any other laws or regulations that are applicable to its scope of supply;

Supplier Quality Requirements

Please be advised that the TRS certification and/or documentation shall be duly completed in accordance with the applicable specifications before requesting the final inspection of the goods. The forgoing shall constitute an obligation of the Supplier deriving from mandatory law provisions. It is agreed and understood that any violations by the Supplier of one or more of the forgoing points shall constitute a material breach and shall entitle Baker Hughes to pursue any remedy available by contract equity or law.

If Supplier, as manufacturer, declares any TRS requirement to be applicable to any of their products, the Supplier shall specify such conformity to TRS requirements on IQR/RCI and the Supplier Quality Leader (or a delegate) shall certify the foregoing.

For TRS impacted products, Baker Hughes will execute audit during qualification and with surveillance purpose, based on TRS questionnaire that will be sent to Supplier.

Supplier Quality Requirements

ANNEX H: Scorecards

Baker Hughes has implemented a Scorecard measuring Supplier performance in three performance categories including Quality, Delivery, and Cost. The Scorecard will form the basis for periodic performance review of our Supplier base and will allow Baker Hughes to assess our suppliers' performance. This will also enable supply chain development that meets our requirements, fosters growth and builds strong partnerships.

Points are calculated and weighted for each performance category. The points weighted are summed to an overall score of 100 points. In addition, each performance category is assigned a Supplier Level which drives actions listed in detail below.

For the Quality category, the scorecard captures two defect types listed below:

- A. Internal defects are Supplier caused nonconformance captured by Baker Hughes
- B. External defects are Supplier caused nonconformance which escaped to Baker Hughes' Customer sites.

Note: External nonconformance are weighted heavier with stronger scorecard penalties.

The Delivery category captures the Supplier's performance against the agreed upon delivery date.

The Cost category captures Supplier related Costs of Quality and Recovery.

Depending on the number and magnitude of the ascertained performance category level, certain actions will be implemented (A – D are examples of the quality performance category):

- A. As Suppliers are meeting acceptable targets and defects found in each timeframe had minimum impact to the Supplier's overall score, no further action may be required.
- B. In case defects found in each timeframe changed the Supplier's overall score below acceptable levels, Baker Hughes reserves the right to require appropriate Supplier corrective action and preventive actions that will be agreed upon on an individual basis, including, but not limited to, charging applicable Costs of Quality to the Supplier.
- C. In case of repetitive unsatisfactory quality performances (including but not limited to scorecards below targets, negative audit results, major non-conformities), Baker Hughes reserves the right to require a Quality Development Plan, with the aim to implement corrective/preventive actions with permanent impact and set the timeline for such improvement actions and expected results.
- D. In case the defects found in each timeframe changed the overall scorecard balance to a level of warning, Baker Hughes reserves the right to suspend the Supplier from its Approved Supplier List.

The Key performance Indicators for defining the supplier performance shall be Business Segment specific and supplier rejection/disqualification shall be defined accordingly.

Supplier Quality Requirements

ANNEX I: Management of Metallic Raw Material (TPS) Sub-Tier Suppliers

Applicability

The following guidelines apply to:

- Forging Suppliers purchasing mill products (ingots, bars, plates)
- Other Suppliers purchasing metallic raw materials (forgings, castings, investment castings, bars, plates)

The above-mentioned categories are identified below as Supplier

Note	The guidelines hereby described are not applicable to raw material distributors (both Supplier or Sub-Tier)
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Supplier Responsibilities

The Supplier shall take the responsibility of managing its own approved raw materials sub-tier.

The Supplier shall evaluate their raw material sub-tiers based on an initial screening, a periodic maintenance program and a process monitoring/control during production.

All processes, documents and records related to compliance with this program could be subject to audit by Baker Hughes.

Initial Screening

The Suppliers shall verify with Baker Hughes SQE if the raw material sub-tiers they intend to use are on hold in Baker Hughes' system for quality issues.

The Supplier is responsible to perform an assessment of quality management system (in case it's not certified by an accredited third-party certification body to the latest version of ISO 9001) and capabilities (quality, delivery, technology, cost, and continual improvement objectives, process review).

Periodic Maintenance Program

The Supplier shall establish necessary requirements for re-evaluation of raw materials sub-tier processes. This shall include one or more of the following:

- audit plan
- statistical process control
- monitoring of performance (Non-conforming products/Cost of Quality)
- periodic retesting

Process Monitoring and Control

Critical processes and the relevant process parameters which may impact product conformity must be identified and suitable methods for monitoring and measuring critical processes must be put in place.

These methods shall demonstrate the ability of the processes to achieve planned results. When planned results are not achieved, correction and corrective action shall be taken. Records of these process capabilities, and any necessary actions taken shall be maintained.

Supplier Quality Requirements

The Supplier shall implement methods to continuously control raw material supply conformity. Records of these product conformity shall be maintained.

Procurement

- The Supplier shall verify the current Baker Hughes material specification (whenever applicable) revision level for each Purchase Order. The first-tier shall be responsible for obtaining the current revision specification prior to acquiring/manufacturing any materials.
- It is the Supplier's responsibility to ensure that the product complies with the Baker Hughes specifications (whenever applicable).
- It is the Supplier's responsibility to define raw material procurement specifications to achieve product conformity. Raw material specification shall meet the minimum requirements specified by Baker Hughes (whenever applicable) and/or by the first-tier procurement specifications. These requirements shall be defined within a Purchase Order, Engineering Drawing and/or Material Specification and shall indicate but not limited to the basic grade, size and quantity of the Material, Metallurgical, Chemical and Mechanical property requirements of the material and any treatments required, any special production process/parameters specified, NDE Inspection and any additional tests required.
- The Supplier shall ensure, document and furnish positive traceability of each individual material to the raw material certification/test report that represents the raw material from which each of the materials was manufactured. Traceability shall be provided by identifying the raw material heat, cast, lot, batch or melt number from the certification/test report on the material and on packaging (when used).
- A proper method for marking the material must be defined, ensuring the physical marking is traceable to all material records, verifying traceability upon material receipt, ensuring traceability of material back to raw material after any internal or outside processing, verification of material traceability during storage to ensure legibility, and requirements for maintaining or replacing identification and/or traceability marking when necessary.

Supplier Quality Requirements

ANNEX J: Monitoring of Radioactive Materials in the Scraps within Recycling Industry

Applicability

The following paragraphs apply to Companies melting scrap metal as raw material (including but not limited to steel, iron and aluminum foundries and steelworks producing forging ingots), identified below generically as “Baker Hughes Suppliers”.

Responsibilities

Baker Hughes Supplier is responsible to implement a specific procedure/work instruction to control all the incoming scraps, following the guidelines included in United Nations Economic Commission document ECE/TRADE/278 and any other local regulation on monitoring metal scrap for the presence of radioactivity.

The incoming inspection on scraps is required regardless of the controls over radioactive materials already performed by the scrap trader and the procedure must define clear rules for at least every area described below.

Instruments

Instruments to be used to perform the control must be clearly defined and identified; depending on company features both fixed (portal monitors) or portable (Geiger or Scintillation counters) are allowed.

Instruments must be periodically calibrated and tested to guarantee their ability to detect abnormal levels of radiation in scrap loads by the detection of energy between 50KeV and 1400 KeV and dose rate between 0,05 $\mu\text{Gy/h}$ and 1 mGy/h.

A sensitivity of 0,02 $\mu\text{Gy/h}$ is required.

Measuring equipment in CPS (Counts Per Second) are allowed only if they are capable of measuring 5 CPS for 0,01 $\mu\text{Gy/h}$ of dose rate with a typical natural energy spectrum.

Activity must be completed and certified by companies able to perform trials in which small radioactive sources are placed in typical scrap loads.

Background Radiation

Detection of radiation emitted from metal scrap must be distinguished from background radiation, which can be considered as noise in the detector system.

The reference value for the local background radiation must be daily verified when no vehicle is present to maximize the sensitivity of the system and minimizes the number of false alarms.

Average value and standard deviation must be considered as a reference.

Monitoring Points

Scraps must be controlled:

- At the entrance in the plant when scraps are still on vehicles
- When the vehicle is unloaded and scraps are sorted before transferring to the scrap yard

Vehicle speed (in any case not higher than 5 km/h), type of measurement (continuous or discrete in case of portable devices) and distance must be defined in the procedure.

Supplier Quality Requirements

Additional opportunities to increase at the highest level the detection of radiation, are a monitor point when scraps are handled at the entrance of the metal works and a re-check on a sample taken from the fusion.

In addition to instrumental check, a visual observation must be included since it may indicate the presence of radioactive materials like discrete sources, contained in thick-walled shielding, and having a clear indication of their content (i.e. radiation symbol).

The procedure must include pictures/examples to help personnel to recognize different types of containers used for storage and transportation of radioactive discrete sources.

Alarm Criteria

Settings must be defined with different thresholds to distinguish a real hazardous condition from innocent and false alarms.

Alarm can be set up in case measured value exceeds background radiation.

Actions in case of detection of radioactive material

Clear rules must be included in procedure/work instruction, to define:

- Immediate actions to be taken when an alarm level has been exceeded (including segregation of the material in a safe environment)
- Determination of risk to human health or the environment
- Subsequent actions to be taken

Training of Personnel

Workers dedicated to scrap monitoring must be properly trained in all aspects of the work instructions.

All other workers must be informed concerning the potential hazards and the precautions to be observed to ensure restriction of exposure.