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PROJECT QUALITY ASSURANCE

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for Quality Management Systems (QMS) applied to Projects and/or product and service suppliers. It also provides guidelines for implementation of Quality within projects or Scopes of Work (SOW).

The DEP focuses on the quality activities that are performed on Projects or SOW and does not discuss by whom (Shell or Contractor) due to the number of different contracting arrangements and strategies. The SOW for each contract shall define roles and responsibilities regarding the required quality activities.

This DEP is aligned with Shell Project Standard 13 and Project Guide 13a.

This is a revision of the DEP of the same number dated February 2012; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in Scopes of Work or facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

The following definitions are from ISO 9000:2008 (E).

Term	Definition
Quality	Degree to which a set of inherent characteristics fulfils a requirement.
Quality Assurance	All the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality.
Customer	Recipient of a product provided by the Supplier. The 'product' may be a piece of hardware or a service.
Non-Conformance	Not meeting a specified requirement.
Non-Conformance Report (NCR)	Documents a specified requirement is not met.
Quality Control	Operational techniques and activities that are used to fulfil the requirements for quality.
Quality Improvement	Actions taken throughout the organization, to increase the effectiveness and efficiency of activities and processes to provide added benefits to both the organization and customers. Reference
Quality Management	All activities of the overall management function that determine the quality policy, objectives and responsibilities, and implement them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system.
Quality Planning	Determining and defining the customer's needs on quality, and framing the objectives, standards and controls to meet them.
Quality Plan	A document setting out the specific quality practices, resources and sequence of activities relevant to a particular product, service, contract or project. The plan for the project as a whole should be termed the Project Quality Plan; plans prepared by the Contractors or the Suppliers may then be termed Contractor or Supplier Quality Plans.
Quality Management System	Organizational structure, procedures, processes and resources needed to meet the quality objectives.
Standard	A document providing rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.
Requirement	A need, expectation, or obligation, which can be stated or implied by an organization, customers, or other interested parties.
Competence	Demonstrated ability to apply knowledge and skills.
Scope of Work (SOW)	All activities and deliverables to be done for a client and the nature of how it shall be conducted. In some cases, the SOW is the same meaning as the Project in others it defines the work to be conducted as part of a contract.

1.3.3 Abbreviations

Term	Definition
CVA	Certification Verification Authority
EFA	Enterprise Frame Agreement
HSSE	Health, Safety, Security and Environment

Term	Definition
HAZOP	Hazard and Operability
HAZAN	Hazard Analysis
ISO	International Organization for Standardization
ITP	Inspection and Test Plan
ITT	Invitation to Tender
KPI	Key Performance Indicators
MC	Mechanical Completion
MOC	Management of Change
NCR	Non-Conformance Report
NDE	Non Destructive Examination
PLAC	Permits, Licenses, Approvals and Consents Register
PQP	Project Quality Plan
PCAP	Project Controls Assurance Plan
QA	Quality Assurance
QC	Quality Control
QIRMS	Quality Inspection Report Management System
QMS	Quality Management System
RCA	Root Cause Analysis
RFQ	Request for Quotation
SCE	Safety Critical Element
TA	Technical Authority
TAMAP	Technically Accepted Manufacturers and Products
TIV	Technical Integrity Verification
TPI	Third Party Inspection
TS	Technical Standard

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (4).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a minor revision of the DEP of the same number dated February 2012. The following are the main, non-editorial changes.

Section/Clause	Change
1.1	added sentence on scope of work
2.4.4.3	added details on handover dossier
2.5.1	added second paragraph
3.1.3	added text in second paragraph
3.2.5	item a) added "precommissioning/commissioning"

3.5.2	added new item m)
3.5.2.1	changes made
3.6	numerous changes made
3.7	added new section on QIRMS
Appendix K	various changes made

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://sww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (Other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in *italic style* in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

2. QUALITY MANAGEMENT SYSTEM (QMS)

2.1 GENERAL REQUIREMENTS

Quality Management Systems shall be in compliance with ISO 9001:2008 and Technical Specification ISO TS 29001:2010 which expands ISO 9001:2008 to include additional requirements specific to petroleum, petrochemical and natural gas industries.

API Specification Q1 has also adopted ISO TS 29001:2010 in its entirety.

2.2 QUALITY MANAGEMENT SYSTEM STRUCTURE

The QMS Structure should consist of quality planning, control, assurance and continuous improvement processes. The structure may either be managed on behalf of the project centrally by the organization or independently by the project. The QMS systems shall be integrated with other management systems which properly interface with the Principal's management systems and does not give rise to conflict or duplication.

The QMS Structure shall be explained in the Project Quality Plan (PQP).

2.3 MANAGEMENT RESPONSIBILITY

2.3.1 Management commitment

Project management shall communicate commitment to quality to all parties and personnel involved in the Project through the publication and communication of the Project Quality Policy, Quality Objectives and approval of the Project Quality Plan. Management shall also ensure that sufficient resources are available for quality management.

2.3.2 Management review

The Quality Management System supporting the project shall be reviewed at least once every 12 months. The plan for reviewing the system shall be documented within the PQP as detailed in (2.5).

The results (specifically highlighting those areas that need further improvement) of Management Reviews should be presented to the Principal for review.

2.4 PROJECT QUALITY PLAN (PQP)

Each project shall develop a project-specific PQP that is consistent with the requirements of this DEP. The PQP shall fully describe how quality objectives will be managed for the duration of the Scope of Work including those for the Contractors, the Subcontractors and/or the Suppliers. The PQP shall also be developed during the earliest stages of the Scope of Work and cover the following sections including the applicable Project Realization section (3). ISO 10005 should be used as guidance. Example content of a Project Quality Plan is included in (Appendix C).

2.4.1 Project quality policy and objectives

The Project should align with and adopt the organization's overarching Quality Policy and objectives or adopt new policy statements when necessary. The Project Quality Plan should reference the Quality Policy and objectives and contain the additional statements if applicable. An example of a Project Quality Policy is included in (Appendix D).

The quality objectives should be monitored for effectiveness. The objectives should link to metrics, which measure the project's performance against objectives. Metrics shall be documented in the Project Quality Plan (PQP).

2.4.2 Project quality organization

Project organization charts should show how the quality function is organized and structured. The organization charts shall show reporting relationships, how the quality organization functions and connects to other dependent quality organizations (e.g., other Contractors and Subcontractors, matrix organizations, or divisional resources supporting other divisions of a company).

2.4.3 Project resource management

2.4.3.1 Project roles, responsibilities, and authorities

The organizational roles, responsibilities, authorities and authority delegation that have a role within QA/QC shall be listed and documented in the PQP.

2.4.3.2 Project quality resources

The Project quality organization shall contain quality resources having the requisite experience and competency to support the Project or Scope of Work. Adequate quality resources shall be in place to ensure that the Quality Assurance activities are performed in accordance with the requirements.

A Project Quality Manager/Lead role shall be allocated to the Scope of Work and to each site where significant work is performed. The Project Quality Manager/Lead should report directly to the Project Manager or assurance manager (independent from responsibility for delivery). The Project Quality Manager/Lead shall have the authority and the responsibility to assure the quality requirements are achieved. The Project Quality Manager/Lead should have worked in a similar role on previous similar projects and have experience with and competency in the preparation and implementation of a Quality Management System in accordance with ISO TS 29001 or ISO 9001.

Qualification procedures and records should be maintained for the following quality roles:

- a) Quality Managers/Leads
- b) Quality Engineers
- c) Inspectors
- d) Non-Destructive Examination (NDE) Technicians
- e) Dimensional Control Coordinator/Lead(s)
- f) Lead Auditors and Auditors

2.4.3.3 Training and competency

The PQP should reference or contain a system for managing and assuring the competence of those responsible for executing and controlling the quality. All persons responsible for executing and controlling the work should be competent, properly qualified, skilled and experienced in accordance with the requirements.

Training needs should be identified and provided when a gap in competency is identified as needed. Training methods should also be evaluated for effectiveness. All qualification, training and competency records shall be maintained. All records shall be made available to the Principal for verification as and when required by the Principal.

Awareness programs should be made available to those persons who are responsible for controlling the quality of the work to ensure that they are aware of the quality management system requirements.

2.4.4 Information management

2.4.4.1 Control of documents

The Project Quality Plan shall contain or reference established procedures for controlling project documentation. The document control procedures shall cover how documents are prepared, reviewed, approved (internally and externally) and issued by authorised personnel. The document control procedure shall specifically cover how reviews and approvals are managed with internal and external technical authorities.

2.4.4.1 Control of software

The Project Quality Plan shall contain or reference established procedures for control, verification and record of all project software. The procedures shall address, as a minimum, the following:

- a) Project control of authorized users.

- b) Formal registration of all versions of software in use.
- c) Antivirus controls
- d) Back-up controls

The measures shall be established and controlled to ensure that software used for calculations and analysis are authorized and that all results can be traced to the software type and version that was used for the task. Effective validation of these controls shall be demonstrated through validation certificates, manual spot checks of calculations and checking validity at the numerical limits of the input/output.

2.4.4.2 Quality records and certification

A procedure shall be established to control quality.

Where legal and/or regulatory requirements apply, procedures shall be provided to ensure conformance to the legal and regulatory requirements. Procedures shall cover quality record storage of: document hardcopies (primarily "wet-signed" originals), reviewed check-prints, and final handover documents.

Quality records and certification should demonstrate evidence of: project activities performed, effective implementation of the QMS, technical integrity requirements, compliance of project requirements, record of changes, non-conformities including deviations and waivers, assurance and verification results achieved, and traceability.

2.4.4.3 Handover Dossier

The Project Quality Plan shall contain or reference established procedures for preparing and submission of Handover Dossiers to the Principal in accordance with the Project Scope of Work.

An index or table of contents of the Handover Dossiers shall be prepared and submitted to the Principal for review within the time stated in the Project Scope of Work. Handover Dossiers includes Manufacturing Records Books (MRBs) when Scope of Work includes equipment provision.

A method of tracking Handover Dossier and Manufacturing Data Record Books should be implemented. A final documented in-house quality check on each Handover Dossier shall be conducted to ensure that all vital and essential non-conformance items have been closed out and evidence provided.

Documents formally handed over to Principal shall be indexed in accordance with the Project Scope of Work.

2.4.5 Project codes, standards and specifications

Project Codes and Standards shall be listed for each Project Scope of Work and referenced or contained within the PQP. The project codes, standards and specifications shall be accessible to all Project resources and included in all contracts and/or purchase orders.

New Codes and Standards shall not be used unless first approved by the Principal.

Requests for concessions or deviations from approved project codes and standards, project specifications, data sheets, drawings or specified construction material shall be submitted to the Principal for review and approval. The project codes, standards and specifications shall also be managed by the projects Management of Change (MOC) procedure (2.4.7).

Should there be any conflict between the contractual documents, the requisition, data sheets, drawings, specifications, or lack of clear definition as to the applicability of any codes and standards; this shall be identified to the Principal in writing for resolution/clarification.

2.4.6 Permits, licenses, approval and consents register and regulatory legislation compliance

"Permitting" is the process by which authorities ensure that project activities comply with laws and regulations.

When regulatory and legal authorities are involved, a plan is required. Example titles include Permits and Consents Plan, Third-Party Permit and Approvals Plan, and/or Permits, Licenses, Approvals and Consents (PLACs) Register. The plan shall be identified and maintained that is related to the Project's activities and Scope of Work to ensure that all permitting requirements are consistently and correctly included in plans, schedules, procedures, work instructions, deliverables, contracts and purchase orders.

The PLAC may include, but are not limited to, licenses to design, construct, commission, permits to erect temporary facilities, work permits and professional licenses required for the work at all worksites.

Requests for waivers from Legislations, Regulations, Codes and Standards shall be raised to the Principal for review and approval.

2.4.7 Management of change

The Project Quality Plan shall reference or include a procedure for Management of Change (MOC). The principles of change management requirements should be included in contracts and purchase orders.

The current agreed baseline should be summarised and maintained in a controlled document such as a Design Data Book or Basis of Design. A procedure is required whereby effects of all proposed changes are assessed in multidisciplinary way before approval is to proceed. Proposed changes which would modify the form, fit, function, design concept, have HSSE implications, increase cost or adversely affect schedule shall be referred to management for authorisation via the established MOC procedure.

2.4.8 Control of deviations and concessions

The Project Quality Plan shall reference or include a procedure for management of deviations, waivers, concessions and derogations from the Shell Standards (DEP), Project Specifications, Statutory regulations or International Codes and Standards. The principles of deviation and concession requirements should be included in contracts and purchase orders. The deviations and concession processes shall be included in the procedures for Technical Authority approval (3.2.3.1) and Management of Change (2.4.7).

A risk assessment for derogations to DEM1 Mandatory DEPs and on the impact on quality, cost, schedule and technical integrity shall be conducted by affected discipline Principal representatives. Final judgment and deviation approval is made by the appropriate level of Principal Technical Authorities (TA), as listed in the project PCAP. (TA-1 for DEM1 derogations). The Principal's Procedure for Derogation Management will be applied to any technical deviations to the DEM1 and DEM2 per Shell HSSE Control Framework.

2.4.9 Interface management

The Project Quality Plan shall reference or include the process for Interface Management. The Interface management processes should identify the important external and internal interfaces and should consider the following: responsibility matrix, interface register, interface meetings, technical query register, interface reporting, action items register, outstanding work register, and open deficiency register.

2.5 MEASUREMENT, ANALYSIS AND IMPROVEMENT

2.5.1 General

The effectiveness of the quality management system and related processes shall be reviewed to determine the effectiveness, suitability and improvements needed. The results (specifically highlighting those areas that need further improvement) should be presented to the Principal and shall be contained in the Management Review.

Review methods may include auditing, health checks, quality surveillance, inspection, and testing. Reviews shall focus both internally within the parent organization (including the Principal and EPC Contractor) and externally within the supply chain/Contractors. Resulting review data should provide information on:

- a) Customer satisfaction and/or dissatisfaction

- b) Conformance to customer and quality requirements
- c) Cost of quality, including monitoring of failure, lost time and repair costs
- d) Process or product non-conformities and their trends
- e) Root cause analysis or corrective actions results
- f) Lesson learned process or project reviews
- g) Subcontractor and Vendor performance

2.5.2 Quality performance monitoring and continuous improvement

Quality Key Performance Indicators (KPIs) shall be established and implemented to report and monitor performance. Examples of typical KPIs provided for guidance only are listed in (Appendix K).

The Contractors shall submit the list of proposed Quality KPIs to the Principal for review and approval within the timeframe defined in the contract.

The Contractor shall establish and implement a process for making use of audit results, analysis of data and records from management reviews to monitor and, where appropriate, improve the effectiveness of the project QMS. This shall include data from Subcontractors.

The Contractor shall report to the Principal on regular basis as defined in the Project Scope of Work on its improvement effort showing results trends against established KPIs and quality objectives. This shall also include Subcontractors.

2.5.3 Quality audits

The Project Quality Plan shall make reference to or include a project-specific Audit Plan and/or Procedure. ISO 19011 should be utilized as a guide for auditing procedures. The Audit Plan shall be submitted to the Principal for review and approval within the timeframe defined in the contract.

Quality audits shall check compliance with requirements to verify effectiveness of systems and processes and to identify opportunities for improvement. Quality audits shall be based on the criticality and risk assessment of the Scope of Work. All audit findings shall be recorded and followed up to confirm timely close out.

The audit plan should include an audit schedule of activities performed by the Contractor and the Subcontractors. The Principal shall have the right to initiate or request audits on areas or activities that are identified as having potential adverse effect on quality. The Principal shall have the right to attend the Contractor audits as an observer and shall be given adequate notice to attend upcoming audits. The Principal or nominated representative shall have full access to all Contractor/Subcontractor's work locations for the purpose of audit and surveillance activities. The Principal shall be provided with a copy of all audit reports if requested.

Lead Auditors and Auditors shall be qualified and certified by an international recognised body or otherwise approved by the Principal.

2.5.4 Lessons learned and corrective and preventive actions

The Project Quality Plan shall make reference to or include a procedure for mitigating previous lessons, recording new lessons, and conducting corrective and preventive actions. Corrective and preventive actions are needed when non-conformances occur.

Root Cause Analysis (RCA) should be used to ensure that preventive actions are taken to eliminate root causes and prevent recurrence of significant non-conformities. Significant non-conformances shall be designated as a lesson learned/ flaw to be mitigated on future projects, if a Corrective Action/RCA was not performed to eliminate it from re-occurring in other projects (institutionalise).

Recording lessons learned shall be documented during lesson-learned workshops/reviews and at the completion of the Scope of Work. Non-conformances shall be reviewed during the lesson-learned workshops/meetings and/or project closeout meetings. A Closeout

Meeting Report shall be produced documenting the “learnings” at the completion of the Scope of Work.

The Quality Manager/Lead shall be the focal point for ensuring the procedure for mitigating previous lessons, recording new lessons, and conducting corrective and preventive actions are conducted effectively and reporting out to P&T, to ensure institutionalising in Shell processes, or capturing in lessons learned. All actions shall be tracked, monitored, and reported in accordance with an established procedure.

3. PROJECT REALIZATION

In addition to the elements of the quality management systems identified in (2), the Project Quality Plan shall address how the Project will deliver the Scope of Work. The Scope of Work may include one or more of the following Project segments: Conceptual design, front end engineering, detail design, procurement, construction and fabrication, and commissioning. Each segment has quality elements that must be managed. The processes that manage these elements shall be defined or described by the Project Quality Plan (PQP).

The following sections describe how quality is managed for specific project segments. Where there are good examples of how to execute these items, they are contained within the appendices.

3.1 QUALITY PLANNING

3.1.1 General

The Project Quality Plan shall document how the project will manage the quality of the Scope of Work. (Appendix C) contains example content.

The following processes in (3.1.2) and (3.1.3) shall be conducted for adequate planning of quality activities within the project.

3.1.2 Quality risk assessment

A Quality Risk Assessment as part of the Project Quality Planning process shall be conducted. The assessment shall be conducted in alignment with the Principal's risk assessment approach specified in the Scope of Work and shall consider the following:

- a) The overall Scope of Work of the project
- b) Identification of critical management activities
- c) Contracting strategy (with respect to the Subcontractors)
- d) Selection of the Contractors and Subcontractors
- e) Work performed in immature manufacturing locations
- f) Impact of quality defects of commodity items in large quantities
- g) Ability to recover from quality incidents if a quality issue is encountered (time and cost to repair or replace)
- h) Local content requirements
- i) Novel equipment design, manufacturing, or operating procedures
- j) Complex equipment design, manufacturing, or operating procedures
- k) Quality risks associated with cleanliness, tightness (leakages), and testing
- l) Risks associated with coinciding events or schedule risks
- m) Impact of poor quality from lower tier subcontractors or past poor performance from Suppliers
- n) Areas where work may be executed outside of established work procedures