PTT Exploration and Production Public Company Limited

PTTEP Engineering General Specification

(Engineering and Development Group)

Standard

Quality Requirements for Contractor / Vendor

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Revision History

Rev	Description of Revision	Date
Old	New Document Refer : PEGS-0710-ADM-006 Revised after 3years cycle review - Added criticality rating analysis(Section 5.4) - Deleted section 5.7(Inspection by COMPANY and CA) - Modified all other sections - Revised the document title New document number PEGS-12060-ADM-006	11-Jul-12 15-Jan-16
R00	Revision note : Revised due to new document numbering system and new document format ***Item No./Clause*** — ***Description of Change*** All — Update document numbering and template align to PTTEP library system	18-Aug-17

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1.0 INTRODUCTION

Quality plays a vital role in any of the WORK to be conducted and hence this specification has been developed to specify QA/QC requirement irrespective of who perform the WORK so that quality is consistently achieved and maintained across all projects.

2.0 PURPOSE

This specification describes the quality assurance and quality control requirements for all phases of WORK to be implemented by CONTRACTOR, Vendor or Sub-contractors including their supply chain.

QA/QC requirements vary depending on:

1) Scope of the supply and its performance criticality
2) Design complexity and maturity
3) Production process complexity
4) Safety criticality

This specification also defines the process for the evaluation of criticality rating of materials, equipment and/or services which in turn determine the QA/QC verification and surveillance activities based on criticality rating

3.0 SCOPE

This specification is applicable to all CONTRACTORs, Vendors, or Sub-contractors during all phases of WORK.

CONTRACTOR shall be responsible for management of all quality assurance and quality control activities of their Sub-contractors and Vendors at different stages of the WORK.

4.0 RESPONSIBLE ACTION PARTIES

- CONTRACTOR including their Sub-contractors
- Vendor
- Manufacturer
- Fabricator

5.0 DEFINITIONS

A number of different terms are commonly used to describe the work stages, processes, and approvals which take place during the early stages of a development. This can often be a source of confusion so the following section is intended to show the PTTEP preferred terminology as used in this document.

5.1 LANGUAGE

In this document, the words should and shall have the following meanings:

Shall	Indicates a course of action with a mandatory status. The term "shall" shall be used if a requirement is considered to be necessary to claim compliance with a PEGS document.
Should	Indicates a preferred course of action. Should is a non-mandatory word and is not forbidden, but use in the body of the text should be the exception. Where none mandatory terms are used, each paragraph within these clauses shall also have an associated commentary paragraph that provides the rationale for why the stated choices and modifications are appropriate and circumstance under which the stated choices and modifications might be different.

5.2 TERMINOLOGY

Terminology	Description
Approval	The authorization in writing given by the COMPANY to the Contractor to proceed the work without releasing in any way the Contractor from any of his obligations to conform with the technical specifications, requisitions, etc. The words "Approve", "Approved" and "Approval" shall be construed accordingly
Certifying Authority	A suitable qualified independent Third Party providing certification of the project based on agreed scope of work
COMPANY	PTT Exploration and Production Public Company Limited and affiliates
CONTRACT	CONTRACT means the signed AGREEMENT together with the Exhibits and Annexes which are made part thereof, and any future amendments thereto. In the event of ambiguity or contradiction between the AGREEMENT and the other documents, the AGREEMENT shall prevail over its Exhibits and Annexes.
CONTRACTOR	Per contract: Contractor – 'The contractor who is a PARTY to this CONTRACT and where the context so requires including, Sub-contractors utilized by CONTRACTOR for the performance of the WORK'
Sub-contractor	Means any company or person to whom CONTRACTOR has subcontracted performance of any part of the WORK in accordance with the CONTRACT. Sub-contractor include Vendors
Supplier/Vendor	The company designed on the Purchase Order form or Contract as being the selected supplier of the said materials
WORK	All and any part of the works and services required to be performed by CONTRACTOR under the CONTRACT
WORKSITE(S)	The SITE and/or all and any construction location(s) where major parts of the PLANT (such as deck, jacket, piles, modules) will be fabricated and assembled by CONTRACTOR

5.3 COMMON ACRONYMS

Set out below in alphabetical order are common acronyms as found within this document:

AML	Approved Manufacturer List
CA	Certifying Authority
FAT	Factory Acceptance Test
HVAC	Heating Ventilation and Air Conditioning
ITP	Inspection and Test Plan
MWS	Marine Warranty Surveyor
NDT	Non-Destructive Test
PCHE	Printed Circuit Heat Exchanger
PO	Purchase Order
PWHT	Post weld heat treatment
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
QVL	Qualified Vendor List
SAT	Site Acceptance Test
TPIA	Third Party Inspection Agency
VDRS	Vendor Document Requirement Schedule

6.0 REFERENCES

The reference documents listed below, including Industry Codes and Standards and COMPANY specifications, form an integral part of this Engineering General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published on the effective date of a contract.

The overall order of precedence of the applicable documents shall be:

1. Applicable Laws, Rules and Regulations of the country in which the system/equipment will be operated (if any);
2. Purchase Order/ Service Order/ Contract Documents (Only applicable for direct purchase by COMPANY);
3. Project Particular Specification (PPS), and relevant data sheet(s) if any;
4. COMPANY General Specification;
5. Codes and Standards in reference.

Any conflict between any of the Contract Documents, or between this specification and any other Contract Documents, shall be reported to COMPANY for decision. In such a case, and unless otherwise agreed or decided by COMPANY, it is understood that the more stringent requirement shall apply.

Exceptions to, or deviations from this specification are not permitted unless previously accepted in writing by COMPANY. For this purpose, requests for substitutions or changes of any kind shall be completed with all pertinent information required for COMPANY assessment. COMPANY's approval, nevertheless, will not, in any way, relieve the responsibility of the Contractor to meet the requirements of the industry Codes and Standards referred to and amended herein, in the event of conflict.

6.1 PTTEP INTERNAL REFERENCES

Internal documents applicable to this document are indicated in the table below.

Document Number	Document Title
10008-STD-6-GEN-003* PEGS-12060-ADM-002**	Minimum Requirements for Vendor's Documentation
10008-STD-6-GEN-004* PEGS-12060-ADM-004**	Minimum Requirements for Contractor's Documentation
10008-STD-6-INT-001* PEGS-12060-INT-001**	Inspection and Testing Requirements
10008-STD-6-GEN-007* PEGS-12060-MMA-001**	Material Traceability

*New document number due to revision in document numbering system

**Old document number

6.2 INTERNATIONAL STANDARDS

International standards applicable to this document are indicated in the table below i.e. ISO, IEC or ITU.

Document Number	Document Title
ISO 9001	Quality management systems- Requirements
ISO/TS 29001	Petroleum, petrochemical and natural gas industries – Sector-specific quality management systems – Requirements for product and service supply organizations

6.3 CODE AND OTHER STANDARDS

Codes, standards and regional legislation applicable to this document are indicated in the table below.

Document Number	Document Title
API SPECIFICATION Q1	Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry
API SPECIFICATION Q2	Specification for Quality Management System Requirements for Service Supply Organizations for the Petroleum and Natural Gas Industry

7.0 QUALITY REQUIREMENTS

7.1 QUALITY MANAGEMENT SYSTEM

CONTRACTOR including their Vendors / Suppliers and Sub-contractors shall have an established documented Quality Management System for all the phases of WORK.

CONTRACTOR's, Vendor's, and Sub-Contractor's Quality Management System shall meet the requirements of International Standard ISO 9001 or ISO/TS 29001 or API Specification Q1 or API Specification Q2 as appropriate or an internationally recognized standard acceptable to COMPANY.

The effectiveness of the Quality Management System shall be demonstrated throughout the execution phase. COMPANY reserves the right to evaluate the effectiveness of CONTRACTOR's, Vendor's, and Sub-contractor's quality management system.

7.2 PROJECT DELIVERABLES

CONTRACTOR, Vendor, or Sub-contractor shall submit together with his bid, the Quality Manual, Quality Management System certificate and document register showing the proposed documentation that would be generated for the project.

Upon award of CONTRACT, CONTRACTOR shall submit Master Document Register for COMPANY approval within 30 days of CONTRACT effective date or Letter of Intent date. CONTRACTOR's Master Document Register shall specify all the deliverables that would be generated for the project including deliverables from Sub-contractor or separate Master Document Register shall be submitted for Sub-contractor depending upon the scope of work.

Vendor shall submit VDRS for COMPANY approval within 2 weeks of award of PO.

VDRS and Master Document Register shall cover all relevant procedures, plans and work instructions required for the completion of the WORK.

Should COMPANY consider the procedures to be inadequate to control the WORK, CONTRACTOR, Vendor, or Sub-contractor shall revise and/or produce additional procedures to cover the WORK to the satisfaction of COMPANY, and within a timeframe acceptable to COMPANY.

Documented procedures and work instructions shall address, as a minimum, the followings;

1) Document deliverables – VDRS and Master Document Register
2) Schedule and planning control
3) Design and development
4) Design / fabrication interface
5) External interface control
6) Change management

7) Document control
8) Purchasing control, including assessment, evaluation and control of Vendors or Sub-contractors
9) Material control, including material receipt, inspection, control of non-conforming materials, storage, material traceability, material reconciliation, etc.
10) Project quality audit and closeout / follow up audit findings
11) Manufacturing procedures and QA/QC deliverables, including but not limited to:
    a) Manufacturing procedure specification
    b) Welding procedures qualification test program
    c) Welders and welding operators qualification test program
    d) Consumable qualification test program
    e) Weld map and NDT map
    f) Inspection & Test Plan
    g) Welding consumables handling, conditioning and issuance control procedure
    h) Corrosion test procedure (as required)
    i) Control and calibration of inspection, measuring and test equipment
    j) Forming procedures and qualification
    k) Heat treatment procedures
    l) Dimensional control procedures
    m) Surface preparation and coating procedure
    n) Coating qualification program
    o) Qualification and control of inspection and testing personnel
    p) Non-destructive test procedure
    q) Inspection and testing, including receipt, manufacturing, FAT, SAT, final inspection and test records
    r) Compilation of quality records in accordance with final documentation requirements.

Documentation shall be prepared and submitted in accordance with requirements specified in 10008-STD-6-GEN-003 or 10008-STD-6-GEN-004 as applicable.

CONTRACTOR shall be responsible for the overall coordination and documentation submission to COMPANY and CA (as applicable).

CONTRACTOR shall ensure that all documents either issued by CONTRACTOR or by his Sub-Contractor(s) or Vendor(s) are adequately reviewed by CONTRACTOR's concerned engineers before submitting to COMPANY for review/approval.

7.3 PROJECT QUALITY PLAN

CONTRACTOR shall submit a Project Quality Plan to COMPANY for review and approval within 30 days after CONTRACT effective date and prior to commencement of manufacturing or fabrication activities.

For Sub-contractor or Vendor's scope of work, Project Quality Plan shall be submitted depending upon the scope of work and criticality rating in accordance with Table 3.

Project Quality Plan shall contain following, as a minimum;

1) An outline description of the project Quality Management System and controls to be adopted to ensure that project quality objectives are achieved
2) Details of the organizational provisions to be implemented for managing the CONTRACT including interfaces with various concerned parties
3) An outline description of scope of supply including resource management specifically identifying items supplied by Sub-vendors or Sub-contractors
4) Project organization chart providing interface of the main function groups, departments or disciplines
5) Job functions, descriptions and responsibilities for all key personnel assigned to the WORK
6) Complete set of documented procedures, WORK instructions for all activities to complete the WORK, as described in this procedure
7) List of all design documents, drawings, specifications, design and manufacturing codes and legislation required to complete the WORK
8) List of all Sub-vendors or Sub-contractors
9) Project quality audit schedule and the competency of the auditors

Project Quality Plan shall be implemented, maintained and revised as necessary during the course of the WORK.

7.4 CRITICALITY RATING

Criticality rating analysis is a formalized technique for measuring the relative importance of a specific WORK within the project. CONTRACTOR shall perform criticality rating analysis on each WORK well in advance of its commencement and furnish result of assessment to COMPANY for approval.

The criticality rating reflects the degree of verification and surveillance to be implemented as a baseline to manage the WORK in terms of the extent of required engineering design and technology, expected quality, required degree of safety, competency of engaged personnel and degree of surveillance and monitoring programs to be implemented for each manufacturing process or services provided.

7.4.1 CRITICALITY RATING ANALYSIS

CONTRACTOR shall;

- Endeavour to conduct project risk assessment at appropriate level, taking into account its own procurement strategy to mitigate any risk to As Low As Reasonably Practicable (ALARP) level.
- Perform independently the critical rating analysis of each WORK and seek concurrence with COMPANY before issuance of a tender document.
- Seek mitigation, through engineering deviation etc., when Vendor or Sub-contractor has evidence that the WORK could not be achieved in accordance with the criticality rating.

Two essential categories of risks shall be considered when assessing the overall criticality of the materials or equipment.

- Project phases:
    - Its impact on the schedule
    - The different failure modes e.g. late delivery, unfitness for purpose, cost over-run, etc.
    - The consequences of its failure mode on project objectives
    - Operational risk factor e.g. safety, fluid characteristics, availability and accessibility for maintenance
- Manufacturing phases – The consequences of non-delivery due to complexity or competency and constraint of the CONTRACTOR, Vendor, or Sub-contractor.
    - The complexity of the equipment or products
    - Maturity of the design, engineering, manufacturing and installation processes especially for innovative products
    - The complexity of realization processes
    - The confidence level with regards to their safety performance, quality control and delivery track record.
    - Recent feedback

7.4.2 CRITICALITY RATING CRITERIA

Criticality rating criteria analysis is based on identifying the risk of failure probability / consequence and the impact it would have on the facility or project.

Criticality rating of each material or equipment is determined by completing criticality rating calculation sheet provided in Appendix 1.

Table 1 below details the minimum nine (9) criticality criterion imposed to evaluate the failure probability / consequence risk of each item.

Table 1

	Criterion	Failure Probability / Consequence	Points
1	**Health and Safety :** Failure would result in	No risk to health and safety of operating personnel	0
		Limited risk to the health and safety of operating personnel	1
		Significant risk to the health and safety of operating personnel	2
		Undue risk to the health and safety of operating personnel and/or limited risk to the public	3
		Undue risk to the health and safety of operating personnel and to the public	4
2	**Fluid Characteristic:** Fluid(s) contained are judged to be	Completely harmless	0
		Unlikely to present a hazard under normal conditions	1
		Low Hazard, toxicity, pressure or temperature	2
		Medium hazard, toxicity, pressure or temperature	3
		High hazard, toxicity, pressure, or temperature	4
3	**Operating Significant:** Failure would result in	No operational consequence	0
		Use of an installed spare, bypass of failed item, or change out without difficulty	1
		Reduction in operation efficiency, without loss of plant integrity	2
		By pass or change out of failed item, with loss of plant integrity	3
		Plant operations being jeopardized, with serious consequence	4
4	**Availability and Accessibility for Repair / Replacement / Maintenance:** Item is	Easily accessible, spares available and replaceable from normal site spares inventory	0
		Accessible and replaceable from normal site spares inventory	1

	Criterion	Failure Probability / Consequence	Points
		Difficult to access for repair or replacement but parts are readily available	2
		Inaccessible during operations, no spares available, requires special purchase, requires plant shutdown for repair or replacement	3
		Long lead item with protracted delivery, requires shutdown for replacement, replacement is difficult, and time consuming	4
5	**Design Maturity:** Design is	Proven by frequent previous use	0
		Combination of proven design elements for same application	1
		Modification of proven design for a different application	2
		Redesign of existing design for a different application	3
		New design from first principles of a complex item	4
6	**Complexity of Manufacture / Construction / Installation**	Few simple processes required	0
		Significant number of simple processes required	1
		Few complex processes required	2
		Significant number of complex processes required	3
		Large number of complex processes required	4
7	**Economics:** Failure would result in	Negligible inconvenience and/or costs	0
		Limited direct and/or consequential costs	1
		Significant direct and/or consequential costs	2
		Serious direct and/or consequential costs	3
		Extreme direct and/or direct consequential costs	4
8	**Delivery Effects on Schedule:**	Negligible inconvenience and/or costs	0
		Moderate engineering efforts	1
		Moderate manufacturing but long travel time	2
		Significant vendor input and engineering efforts	3
		Significant engineering, manufacturing and/or construction efforts	4
9	**Environment Aspect:** Unplanned release / operational failure would result in	Negligible environmental impact	0
		Minor and short term environmental impact	1
		Moderate and short term environmental impact	2

	Criterion	Failure Probability / Consequence	Points
		Significant extensive environmental impact	3
		Significant permanent environmental impact	4

Criticality rating is based on the summation of the allocated failure probability / consequence of occurrence and its impact (points) of each item as shown in Table 2 below.

Table 2

Total Points	Criticality Rating	Mitigation Description
28 - 36	1	Item is highly critical. Quality is vital and must not be compromised
19 - 27	2	Item is critical. Quality is of significant importance
10 - 18	3	Item is moderately critical. Quality is of moderate importance
0 - 9	4	Item is not critical. Normal commercial quality is acceptable

CONTRACTOR shall utilize the criticality rating to determine their intensity of quality assurance and quality control verification and surveillance requirements as shown in Table 3 below. Nevertheless all requirements specified in applicable code / standard / specification shall be complied in full.

It shall be noted that any new recently approved Vendor or Sub-contractor shall undergo in-depth quality surveillance by CONTRACTOR based on “Criticality Rating 1 or 2”.

Recommended criticality ratings are shown in Appendix-2. CONTRACTOR may use this rating directly without conducting analysis as detailed above, however it shall be subjected to COMPANY prior approval as criticality rating may differ depending on selection of Vendor / Sub-contractor and project or product complexities.

Table 3

S/N	QA/QC VERIFICATION & SURVEILLANCE REQUIREMENTS	Criticality Rating			
		1	2	3	4
1	Documented QMS to ISO 9001 or ISO/TS 29001 or API Q1 or API Q2 as appropriate by CONTRACTOR, Vendor, Supplier or Sub-contractor including their supply chain – Review of Quality Manual and Quality Management system certificate	Y	Y	Y	Y
2	Approval of additional proposed Vendors, Suppliers or Sub-Contractor not listed in the AML or QVL	Y	Y	Y	Y
3	Review Vendor’s, or Sub-Contractor’s competency, experiences and resources prior to award or commitment of Purchase Order	Y	Y	Y	D
4	Submission of Project Quality Plan for approval	Y	Y	D	N
5	Submission of Unpriced Purchase Order (UPO) for approval by COMPANY	Y	Y	D	N
6	Submission of Inspection and Test plan for COMPANY approval	Y	Y	Y	D
7	Submission of relevant design engineering documents including software and manufacturing / testing documents based on approved Master document register or VDRS for COMPANY review/approval	Y	Y	Y	D
8	Kick off Meeting at CONTRACTOR’s office	Y	Y	D	N

S/N	QA/QC VERIFICATION & SURVEILLANCE REQUIREMENTS		Criticality Rating			
			1	2	3	4
9	Pre-production or Pre-Inspection meeting at manufacturing location (Vendor's, or Sub-contractor's works as appropriate)		Y	Y	D	N
10	Witness Welding procedure qualification tests (WPQT), Welder & Welding operator qualification tests (WQT) (as required)		Y	Y	D	N
11	Witness Production Test (as required)		Y	Y	D	N
12	Witness PWHT, mechanical testing and corrosion testing		Y	Y	D	N
13	Witnessing of inspection and testing at specific stage of manufacturing by CONTRACTOR as per approved ITP		Y	Y	D	N
14	Witnessing of inspection and testing at specific stage of manufacturing by COMPANY or CA (as required) as per approved ITP		Y	Y	D	N
15	Project quality audit by CONTRACTOR during fabrication (Notify COMPANY for attendance)		Y	Y	D	N
16	Approval of WORKSITE(S) and test laboratories by COMPANY prior to commencement of WORK		Y	Y	Y	D
17	Final Inspection / FAT / SAT by CONTRACTOR / Vendor, COMPANY and CA (as required) prior to release of product		Y	Y	Y	D
18	Review of quality control records (such as material certificates, test reports, conformity certificates, etc.)		Y	Y	Y	Y
19	Review of Vendor's or Sub-contractor's Final Documentation by CONTRACTOR / Vendor, COMPANY and CA (as required)		Y	Y	Y	Y
20	Inspection Release Note or Certificate by CONTRACTOR, TPIA, CA and/or MWS (as required) prior to delivery		Y	Y	Y	N
21	CONTRACTOR's resident inspector at Sub-contractor or Vendor's works		Y	D	N	N
Key	**Y = Required**	**D = Dependent on nature of product. CONTRACTOR shall discuss with COMPANY and COMPANY to confirm the requirement.**	**N = Not required**			

7.5 INSPECTION AND TEST PLAN

CONTRACTOR's, Vendor's, or Sub-contractor's Inspection and Test Plan(s) (ITP) shall be developed based on the approved criticality rating. The extent of the verification and surveillance programs implemented by CONTRACTOR shall commensurate with the criticality rating.

CONTRACTOR, Vendor, and Sub-contractor shall be responsible to provide advance notification on all surveillance points marked as "Hold Point" and "Witness Point" in the ITP.

Details of the inspection and testing requirement shall comply with Inspection and Testing Requirements "10008-STD-6-INT-001".

7.6 INSPECTION BY CONTRACTOR, VENDOR, SUB-CONTRACTOR

CONTRACTOR, Vendor, or Sub-contractor shall carry out inspection and testing activities according to the approved ITP.

CONTRACTOR, Vendor, or Sub-contractor shall be responsible for implementing the project quality requirements on their supply chain including performing the necessary surveillance and inspection.

CONTRACTOR, Vendor, or Sub-contractor shall ensure that COMPANY, TPIA, or CA (as applicable) have access to the WORK at all times and shall be at liberty to inspect the WORK at any stage of the process.

7.7 CONTROL OF SUB-VENDOR, SUB-CONTRACTOR

All requirements of CONTRACT / PO, including QA/QC requirements shall be applied equally to Sub-vendors, or Sub-contractors:

1) CONTRACTOR, Vendor, or Sub-contractor shall be responsible for ensuring that the provision of QA/QC by any of their Sub-vendors or Sub-contractors satisfies the quality and the certification requirements of the CONTRACT.

2) No material, equipment or fabricated items shall be purchased from a Sub-vendor who does not operate an appropriate Quality system according to requirements of this specification.

3) No part of the WORK shall be purchased without review by CONTRACTOR, Vendor, or Sub-contractor and approval by COMPANY. When required, CONTRACTOR, Vendor, or Sub-contractor shall submit an appraisal report on the proposed Sub-Vendors on completion of the PO.

7.8 MATERIAL TRACEABILITY

All the material shall be identified and traceable in accordance with requirements specified in 10008-STD-6-GEN-007.

7.9 MANUFACTURING DATA RECORD

CONTRACTOR, Vendor, or Sub-contractor shall develop and maintain complete, up-to-date records of all inspections, surveys and tests, including failures.

CONTRACTOR, Vendor or Sub-contractor shall also specify, in full, the certification and documentation to be provided by Sub-Vendor or Sub-Supplier on all enquiry documents and purchase orders.

Materials, equipment and other items shall not be accepted for incorporation in the WORK unless accompanied by the relevant certification accepted by COMPANY and/or CA as appropriate. Any WORK arriving on the WORKSITE(S) without the correct documentation shall be quarantined until receipt of the correct documentation.

Final documentation shall be compiled in accordance with the requirements of 10008-STD-6-GEN-003 or 10008-STD-6-GEN-004 as applicable.

8.0 APPENDICES

Appendix 1. **Criticality rating calculation sheet**

PTTEP	**CRITICALITY RATING CALCULATION SHEET**				
Project Name:		**Doc No.:**		**Rev:**	
CONTRACTOR:		**Vendor / Sub-contractor:**			
Description of WORK (Materials/Equipment/Services):					
Equipment Tag No.:		**PO No.:**		**RFQ No.:**	

Category	Criticality Level	Weightage	Points Evaluated
1. Health & Safety: Failure would result in	a) No risk to health and safety of operation personnel	0	
	b) Limited risk to health and safety of operation personnel	1	
	c) Significant risk to health and safety of operation personnel	2	
	d) Undue risk to health and safety of operation personnel and/or limited risk to the public	3	
	e) Undue risk to health and safety of operational personnel and public	4	
2. Fluid Characteristics: Contained are judged to be	a) Completely harmless	0	
	b) Unlikely to present a hazard under normal conditions	1	
	c) Low Hazard, toxicity, pressure or temperature	2	
	d) Medium hazard, toxicity, pressure or temperature	3	
	e) High hazard, toxicity, pressure, or temperature	4	
3. Operation Significance: Failure would present	a) No operational consequence	0	
	b) Use of an installed spare, bypass of failed item, or change out without difficulty	1	
	c) Reduction in operation efficiency, without loss of plant integrity	2	
	d) By Pass or change out of failed item, with loss of plant integrity	3	
	e) Plant operations being jeopardized, with serious consequence	4	
4. Availability and Accessibility for Repair / Replacement / Maintenance: Item is	a) Easily accessible, spares available and replaceable from normal site spares inventory	0	
	b) Accessible and replaceable from normal facility spares inventory	1	
	c) Difficult to access for repair or replacement, but parts are readily available	2	
	d) Inaccessible during operations, no spares available, requires special purchase, requires facility shutdown for repair or replacement	3	
	e) Long lead item with protracted delivery, requires shutdown for replacement, replacement is difficult, and time-consuming	4	

CRITICALITY RATING CALCULATION SHEET

Project Name:		**Doc No.:**		**Rev:**	
CONTRACTOR:		**Vendor / Sub-contractor:**			
Description of WORK (Materials/Equipment/Services):					
Equipment Tag No.:		**PO No.:**		**RFQ No.:**	

Category	Criticality Level	Weightage	Points Evaluated
5. Design Maturity: Design is	a) Proven by frequent previous use	0	
	b) Combination of proven design elements for same application	1	
	c) Modification of proven design for a different application	2	
	d) Redesign of existing design for a different application	3	
	e) New design from first principles of a complex item	4	
6. Complexity Manufacturing / Construction / Installation:	a) Few simple processes required	0	
	b) Significant number of simple processes required	1	
	c) Few complex processes required	2	
	d) Significant number of complex processes required	3	
	e) Large number of complex processes required	4	
7. Economics: Failure would result in	a) Negligible inconvenience and/or cost	0	
	b) Limited direct and/or consequential costs	1	
	c) Significant direct and/or consequential costs	2	
	d) Serious direct and/or consequential costs	3	
	e) Extreme direct and/or direct consequential costs	4	
8. Delivery Effects on Schedule:	a) Negligible inconvenience and/or costs	0	
	b) Moderate engineering efforts	1	
	c) Moderate manufacturing but long travel time	2	
	d) Significant vendor input and engineering effort	3	
	e) Significant engineering, manufacturing and/or construction effort	4	
9. Environmental Aspects: Unplanned release / operational failure would result in	a) Negligible environmental impact	0	
	b) Minor and short term environmental impact	1	
	c) Moderate and short term environmental impact	2	
	d) Significant extensive environmental impact	3	
	e) Significant permanent environmental impact	4	
Criticality Rating:		**Total Points:**	

Total Points	Criticality Rating	Mitigation Description
28 - 36	1	Item is highly critical. Quality is vital and must not be compromised
19 - 27	2	Item is critical. Quality is of significant importance
10 - 18	3	Item is moderately critical. Quality is of moderate importance
0 - 9	4	Item is not critical. Normal commercial quality is acceptable

	Name:	Department:	Signature:	Date:
Lead Discipline Engineer				
Project QA/QC Engineer				
Project Engineer				
Engineering Manager				
Procurement Manager				

Appendix 2. **Recommended Criticality Rating**

Note: These are the recommended criticality rating. Upon award of the CONTRACT and prior to placement of purchase order, CONTRACTOR / Vendor shall confirm criticality rating with COMPANY as criticality rating may differ depending on selection of Vendor / Sub-contractor, project or product complexities and past experience. For items not indicated in below table, criticality rating shall be established by CONTRACTOR and agreed with COMPANY prior to placement of purchase order.

Sr No	Description	Criticality Rating
1	**Pressure vessel**	
a)	Process vessel – Carbon Steel, Stainless Steel (≤ 50mm shell thickness)	2
b)	Process vessel – Carbon Steel, Stainless Steel (> 50mm shell thickness)	1
c)	Process vessel – Low alloy Steel, Non-ferrous materials	1
d)	Process Filters in gas / condensate service	2
e)	Process Filters in other service	3
f)	Reactor vessel, columns	1
g)	Utility vessel (including pressurized storage vessel)	3
h)	Atmospheric storage tank (for non-flammable fluid)	3
i)	Atmospheric storage tank (for flammable fluid)	2
j)	Heat Exchanger – Shell and Tube and PCHE type	2
k)	Air coolers – headers, tube bundle, fins	2
l)	Air coolers- fans, motors, plenum	3
m)	Electric heater	3
2	**Mechanical equipment / packages**	
a)	Gas Compressor	1
b)	Air compressor	2
c)	Gas Turbine generator	2
d)	Emergency generator	2
e)	Pumps	2
f)	Crane	2
g)	Material handling equipment	3
h)	All permanently installed lifting equipment more than 10T capacity	2
i)	Effluent treatment units	3
j)	Water maker package	3
k)	Inert gas generation package	2
l)	Chemical injection units	3
m)	Flare system	2
n)	Diesel centrifuge	3
o)	Produced water system	2
p)	Aviation fuel system	3
q)	Hypochlorite generation package	3
r)	Fuel gas system	3
s)	Hot water system	3
t)	TEG regeneration package	2
u)	CO_2 removal membrane unit	2

Sr No	Description	Criticality Rating
v)	Blowers, mixers	4
3	**Piping**	
a)	Pipes and fittings (seamless) – Carbon Steel, Austenitic Stainless Steel and Non-ferrous material (Utility application)	4
b)	Pipes and fittings (seamless) – Process application	3
c)	Pipes and fittings - Welded	3
d)	GRE pipes / fittings	3
e)	Flanges - <12” and <300# (Carbon steel and Austenitic stainless steel)	4
f)	Flanges - ≥12” or ≥300# (Carbon steel and Austenitic stainless steel)	3
g)	Flanges – other than carbon steel and austenitic stainless steel	3
h)	Gaskets – Spiral wound and non-metallic	4
i)	Gaskets – Metallic RTJ gaskets	3
j)	Fasteners	4
k)	Valves – Utility	4
l)	Valves – Process (<600#)	3
m)	Valves – Process (≥600#)	2
n)	Valves – Shut down valve & Class E valves	2
o)	Hoses and hose connectors (for piping class <600#)	4
p)	Hoses and hose connectors (for piping class ≥600#)	3
q)	Sight glass	4
r)	Liquid trap	4
s)	Strainers	3
t)	Pipe supports, saddles	4
u)	Sampling connection	4
v)	Self-acting regulators	4
w)	Corrosion coupon	4
x)	Injection quills	4
y)	Mechanical interlocks	4
z)	Expansion joints	3
4	**Structural**	
a)	Special category and first category steel	2
b)	Secondary category steel	3
c)	Non-structural member or miscellaneous structure	4
d)	Helideck	4
e)	Anodes	4
5	**Safety / firefighting equipment**	
a)	Foam / Deluge valve skid	3
b)	Hydrant, hose reel and monitor	4
c)	Fixed CO_2 flooding system	3
d)	Portable fire extinguisher	4
e)	Fixed fire suppression system / skid	3
f)	Safety net	4
g)	Fire-fighting Portables	4
h)	Free fall life boat, life raft and davit	3
i)	Lifesaving equipment and life jackets	4
j)	Navigation Aids	4

Sr No	Description	Criticality Rating
6	**Pipeline / Subsea**	
a)	Pig launcher / receiver	2
b)	Line pipes – seamless	2
c)	Line pipes – welded	1
d)	Pipe line / riser components such as fittings, flanges	2
e)	X Mass trees	2
f)	Manifolds	2
g)	Buoy	2
h)	Turret and Mooring System	2
i)	Rigid and Flexible Risers	2
j)	Umbilicals	2
k)	Clump Weights	4
l)	Mooring Chain and Wires	3
m)	Mooring Anchors	3
n)	Bolts and Shear Pins	3
o)	Main Bearing (Turret) and Pedestal Bearing	3
p)	Winches	3
q)	Anodes	4
7	**Electrical**	
a)	Switchgear	3
b)	Motor control center	3
c)	Power Transformers	3
d)	Lighting / earthing transformers	4
e)	Motors / generators	3
f)	Uninterruptible power supplies	3
g)	Electrical control system	2
h)	Cables – 1kV power or greater	3
i)	Cables – less than 1KV power	4
j)	Lighting fittings, junction boxes, lighting panels etc.	4
k)	Batteries, chargers and distribution boards	3
l)	Navigational Aid system	4
8	**Instrumentation**	
a)	ICSS system	2
b)	HIPPS System	2
c)	Well head control unit / Hydraulic Power Pack	2
d)	Safety system PLCs (ESD,FG)	2
e)	Gas custody transfer / condensate allocation metering system	2
f)	Flow meters	3
g)	Analyzers	3
h)	Control panels	3
i)	Gauges, transmitters, pressure switches, controllers	4
j)	Control Valve / Pressure Safety valve / Relief valve (Rating < 600#)	3
k)	Control Valve / Pressure Safety valve / Relief valve (Rating ≥ 600#)	2
l)	Choke valve (Rating < 600#)	3
m)	Choke valve (Rating ≥ 600#)	2

Sr No	Description	Criticality Rating
n)	Pressure control regulators	4
o)	Restriction orifice	4
p)	Fire and gas detectors	4
q)	Instrument cables	3
r)	Cable glands, fittings, tubings	4
9	**Telecommunication**	
a)	Telecommunication equipment	3
b)	CCTV	3
10	**HVAC**	
a)	Air handling units	3
b)	Chilled water units	3
c)	HVAC control panel	3
d)	Ventilation fans	4
e)	Dampers	4
f)	Water pump	4
g)	Fan coil units	4
h)	Duct heaters	4
i)	Condenser / Air cooler	4
j)	Buffer tanks	4
k)	Sound attenuator	4

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