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Quality Requirements for Welding of Pressure-containing Equipment and Piping (API)

Public Review Draft



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Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

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Introduction

The purpose of this quality requirements specification (QRS) is to specify quality management requirements and the proposed extent of purchaser intervention activities for the welding of pressure-containing equipment and piping in accordance with IOGP S-705 for application in the petroleum and natural gas industries.

Purchaser intervention activities are identified through the selection of one of four conformity assessment system (CAS) levels based on a risk and criticality assessment. The applicable CAS level is specified by the purchaser in the procurement data sheet (PDS) or purchase order.

The IOGP S-705 specification documents follow a common structure (as shown below) comprising a specification, also known as a technical requirements specification (TRS), a PDS, an information requirements specification (IRS) and this QRS. These four specification documents, together with the purchase order, define the overall technical specification for procurement.



JIP33 Specification for Procurement Documents Quality Requirements Specification (QRS)

This QRS is to be applied in conjunction with the specification, the PDS and the IRS, referred to in this document as IOGP S-705, IOGP S-705D and IOGP S-705L respectively. Further information on the purpose of these documents and the order of precedence for their use is provided in the introduction of the specification.

1 Scope

This QRS specifies quality management requirements for the welding of pressure-containing equipment and piping to IOGP S-705 including:

- a) supplier quality management system (QMS) requirements;
- b) purchaser conformity assessment (surveillance and inspection) activities;
- c) traceability requirements.

2 Normative references

For the purpose of this document, the documents referenced in IOGP S-705 and those listed below, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

EN 10204, *Metallic products - Types of inspection documents*

IOGP S-705, *Supplementary Specification to API Recommended Practice 582 for Welding of Pressure-containing Equipment and Piping*

ISO 9000:2015, *Quality management systems — Fundamentals and vocabulary*

ISO 9001:2015, *Quality management systems — Requirements*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 29001, *Petroleum, petrochemical and natural gas industries — Sector-specific quality management systems — Requirements for product and service supply organizations*

3 Terms, definitions and abbreviated terms

For the purpose of this document, the terms and definitions given in IOGP S-705 and ISO 9000:2015 (normative to ISO 9001:2015) and the following shall apply.

3.1 Terms and definitions

3.1.1

conformity assessment

demonstration that specified requirements are fulfilled

Note 1 to entry: "Conformity assessment" is also referred to as "assessment".

Note 2 to entry: Conformity assessment includes review, inspection, verification and validation activities.

Note 3 to entry: Conformity assessment activities may be undertaken at supplier/sub-supplier premises, virtually by video link, desktop sharing, etc. or by review of information.

3.1.2 conformity assessment system CAS

system that provides different levels of purchaser interventions to assess and verify supplier conformance to specified requirements

Note 1 to entry: CAS level A applies to the highest risk and associated extent of verification. CAS level D is the lowest.

3.1.3 hold point H

<conformity assessment> point in the chain of activities beyond which an activity shall not proceed without the approval of the purchaser or purchaser's representative

3.1.4 witness point W

<conformity assessment> point in the chain of activities at which the supplier shall notify the purchaser or purchaser's representative before proceeding

Note 1 to entry: The operation or process may proceed without witness if the purchaser does not attend after the agreed notice period.

3.1.5 surveillance S

<conformity assessment> observation, monitoring or review, by the purchaser or purchaser's representative, of an activity, operation, process, product or associated information

3.1.6 review R

<conformity assessment> review of the supplier's records, procedures and supporting information to verify and/or validate conformance to requirements

3.2 Abbreviated terms

CAS	conformity assessment system
CRA	corrosion resistant alloy
DHT	dehydrogenation heat treatment
IRS	information requirements specification
ITP	inspection and test plan
NDE	non-destructive examination
PDS	procurement data sheet
PQR	procedure qualification record
PWHT	post weld heat treatment
pWPS	preliminary welding procedure specification
QMS	quality management system

QRS	quality requirements specification
TRS	technical requirements specification
WPS	welding procedure specification

4 Quality requirements

4.1 Quality management system (QMS)

The supplier shall operate and maintain a quality management system (QMS) that conforms with ISO 9001, ISO 29001, API Specification Q1 or an equivalent QMS standard.

4.2 Conformity assessment system (CAS)

4.2.1

The CAS provides different levels of assessment of supplier control activities. The CAS level is defined by the purchaser using a risk-based approach, and included in the purchase order / contract. The defined CAS level may be adjusted by the purchaser during manufacture based on the supplier's performance and re-assessment of risk.

NOTE For industrial proven solutions, CAS level D is specified unless risk assessment indicates that a more stringent CAS level is required.

4.2.2

Quality plans and inspection and test plans shall include provision for purchaser intervention activities based on the CAS level selected in the PDS or purchase order. See Table A.1.

4.2.3

The supplier's performance in meeting the requirements may be routinely assessed during execution of the scope and, where appropriate, corrective action requested, and conformity assessment activities may be increased or decreased consistent with criticality and risk.

4.2.4

If any subcontracted or scope of supply occurs outside of the primary supplier location, it shall include interventions within the primary inspection and test plan (ITP) or secondary ITP. It is discouraged to use "hold" (H) within Table A.1, section 3 and recommended to use "surveillance" (S).

5 Certification and traceability

Material certification and traceability shall be maintained in accordance with API 582 / IOGP S-705, 6.1.6, 6.1.10 and 6.1.12.

6 Evidence — conformance records

Documents and information shall be provided for in accordance with IOGP S-705L.

Annex A (normative) Purchaser conformity assessment requirements

Table A.1 defines four CAS levels or levels of purchaser assessment.

Table A.1 — Purchaser conformity assessment requirements

Purchaser assessment activities		CAS			
		A	B	C	D
1	Operational planning and control activities				
1.1	Attend pre-inspection/pre-production planning activities including the following: — review of fabrication scope; — review of specification requirements, preliminary welding procedure specification (pWPS), welding procedure specification (WPS), procedure qualification record (PQR), and heat treatment procedures; — review of ITP; — verification of quality management system, plans, procedures, certifications, approvals and accreditations; — verification of external supply scope and controls; — verification of traceability system, certification and storage/preservation for consumables and materials; — verification of personnel qualification; — verification of test laboratory accreditation; — verification of equipment and instruments including calibration status; — review of welding facilities and site/shop conditions to confirm contamination of corrosion resistant alloys (CRA) can be prevented. Verify that the weld location is protected from unfavorable weather conditions. (IOGP S-705, 4.11.2, 4.11.3, 4.12.2, 4.13, 6.9.5, 6.9.6, 6.9.10, 6.9.11, 8.3, 13.10, C.1)	H	H	W	S
2	Design and development activities				
2.1	Welding procedure qualification — Special qualification requirements				
2.1.1	Monitor PQR testing (mechanical and non-destructive examination (NDE)) for welds and joints requiring special qualification requirements (IOGP S-705, D.9.1)	W	W	W	-
3	Externally provided products and services (outsourced)				
3.1	No applicable activities	-	-	-	-
4	Production and service provision				
4.1	In-process welding				
4.1.1	Production parameter monitoring for compliance with the WPS (IOGP S-705, 6.1.6, 7.4, 7.7, 13.13.1, D.6.7, G.4.2)	S	S	S	S
4.1.2	In process inspection including monitoring environmental conditions, material verification and traceability, equipment inspection, weld set-up, joint preparation and fit-up (IOGP S-705, 4.7, 4.11.2, 4.13, 5.2.2, 5.2.4, 6.1.4, 6.1.10, 6.9.6, 6.11.2, 6.11.3, 6.11.6, 6.11.7, 7.4, 7.8, 8, 11, 13.1, 13.4.2, 13.10, B.1.6, B.1.15, B.2.1, B.3.5, C.4.2.6, C.5, C.7.3, C.7.4, C.7.6, C.8, D.3.3, D.3.5, D.6.3, D.6.6.2, F.4, F.6.3, F.8, G.4.2, Table 4, Table 5)	S	S	S	S

Table A.1 (continued)

Purchaser assessment activities		CAS			
		A	B	C	D
4.1.3	Welding and testing of production test plates (IOGP S-705, 6.10, D.7.1, G.7.3)	H	W	W	W
4.1.4	Inspect welding repair activities (IOGP S-705, 10.2, D.6.1)	H	W	R	R
4.2	Post welding				
4.2.1	Inspect post-weld heat treatment (PWHT) activities (including dehydrogenation heat treatment (DHT), if applied) (IOGP S-705, 9.19, F.6.3, F.7, F.8, F.9)	W	W	R	R
4.2.2	Participate in inspection/NDE (IOGP S-705, 8.9.2, 11.5, 13.4.2, B.1.5, B.2.1, B.2.4, B.3.1, B.3.3, B.6.3, C.4.2.1, C.4.2.2, C.4.2.3, C.8.3, D.7.2)	H	W	S	S
4.2.3	Participate in production weld testing (IOGP S-705, 13.6.1, B.3.2)	H	W	R	R
5	Final inspection				
5.1	No applicable activities	-	-	-	-
Key - No intervention performed H Hold point W Witness point R Review S Surveillance					

Annex B (normative) Certification and traceability requirements

Table B.1 provides the certification and traceability requirements for the equipment and component parts.

Table B.1 — Certification and traceability requirements

Item		Certificate type ^a	Traceability level ^b	Additional requirements
Welding consumables	Electrodes, strips, rods and wire — chemical composition	3.1	Level II	The minimum certification requirement for filler metals chemical composition is ASME <i>BPVC</i> Section II, Part C Sch. 3/H or ISO 10474 or EN 10204 Type 3.1 (IOGP S-705, 6.1.10).
	Electrodes, strips, rods and wire — mechanical properties	2.2	Level II	The default certification requirement for filler metals mechanical properties is ASME <i>BPVC</i> Section II, Part C Sch. 2/G, ISO 10474 or EN 10204 Type 2.2 (IOGP S-705, 6.1.4).
	Flux	2.2	Level II	SAW fluxes, certification according to ASME <i>BPVC</i> Section II, Part C, SFA-5.01, paragraph 5, Schedule 2 or G, or EN 10204 Type 2.2 minimum (IOGP S-705, 6.9.12)

^a Inspection certificates shall be provided in accordance with ISO 10474 or EN 10204.

^b Traceability levels are defined in the following table.

Level	Traceability	Definition
Level I	Full traceability	Material is uniquely identified and its history tracked from manufacture through stockists (where applicable) to the supplier and to the actual position on the equipment with the specific location defined on a material placement record (the traceability to a specific location only applies to skids / packaged equipment, not to bulks).
Level II	Type traceability	The supplier maintains a system to identify material throughout manufacture, with traceability to a material certificate.
Level III	Compliance traceability	The supplier maintains a system of traceability that enables a declaration of compliance to be issued by the supplier.

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