

DEP SPECIFICATION

STRUCTURAL STEEL FABRICATION OF SMALL DEEPWATER OFFSHORE SKIDS, FACILITY PACKAGES, AND SUBSEA SLEDS AND MANIFOLDS (BASED ON AISC STEEL CONSTRUCTION MANUAL ASD, API RP 2A-WSD AND AWS D1.1)

DEP 37.81.10.32-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements and gives recommendations for the fabrication of structural steel skids, facility packages, subsea sleds, subsea manifolds, and other miscellaneous structural steel structures. It is applicable for designs performed using DEP 37.81.10.31-Gen.

EPP Projects Civil/Marine Engineering should be consulted on the use of this DEP for applications outside those noted above.

This DEP applies to small statically designed steel structures, less than 907 metric tons (1000 short tons), that are not subject to significant global cyclic stress that may lead to fatigue failure over the structural life.

Steel structures covered in this DEP are categorized as either a Type-A or Type-B structure. The category is dependent on weight and/or function and is defined by the Principal. See (2) for default category.

This DEP is based on:

- AISC-ASD
- AWS D1.1
- API RP 2A-WSD

The additional and/or modified requirements contained in this DEP form the complete specification.

This DEP replaces the former SIEP standard DEP 37.81.10.32-EPP dated January 2010.

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 authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to offshore oil and gas exploration and production facilities. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process should 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

Term	Definition
Accept, Accepted, or Acceptance	The Principal's written agreement that the submitted item has been performed in accordance with the requirements.
Approve, Approved, or Approval	The Principal's written approval process
Auditable (requirement)	Requirement that is observable, measurable, is neither vague nor ambiguous, and has finite acceptance/rejection criteria.
Contract Drawings	The detailed engineering drawings prepared for this project and all official revisions to those drawings. The Tie Specification or General Data Sheet contains a list of those drawings.
Review	The Principal's right, but not obligation, to comment on the submitted item. Contractor may begin construction of the item following submittal.
Standard	Document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.
Standard Drawing	Standard, primarily pictorial, representing an item or configuration and considered to have wide applicability in Shell International Exploration and Production – EP Projects.
Subcontractor	Shall mean any person or company having a subcontract with any Contractor to perform work covered under this DEP.
Type A	Structures shall include skids and packages weighing less than 455 metric ton (500 short tons), except for subsea structures.
Type B	Structures shall include skids and packages weighing more than 455 metric ton (500 short tons) but less than 907 metric tons (1000 short tons), and subsea structures (sleds and manifolds) regardless of weight.

1.3.3 Abbreviations

Term	Definition
API	American Petroleum Institute.
ASME	American Society of Mechanical Engineers.
AWS	American Welding Society.
BOP	Bead on Plate.
BS	British Standard.
DEP	Design and Engineering Practice.
EPP	SIEP - Exploration and Production – Projects.
ID	Internal Diameter.

FY	Specified Minimum Yield Stress
ISO	International Standards Organization.
NDT	Non Destructive Testing
OU	An Operating Unit of the Royal Dutch/Shell Group.
PQR	Procedure Qualification Record
PQT	Procedure Qualification Testing
QA/QC	Quality Assurance / Quality Control.
SIEP	Shell International Exploration and Production.
SWL	Safe Working Load.
WPS	Welding Procedure Specification.

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (9).

1.5 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of "DEPs on the Web", available through the Global Technical Standards web portal <http://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

1.6 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.

2. GENERAL REQUIREMENTS

2.1 GENERAL

A Scope of Work document may be issued by Principal, detailing the project-specific general requirements. The Scope of Work shall supplement / supersede the specific requirements contained within (2).

Alternative codes for the fabrication, welding, and inspection of the structure may be proposed by Contractor for approval by the Principal, prior to the start of fabrication. The proposed codes shall provide a basis with an equivalent set of requirements for the fabrication, welding and inspection. The specific requirements in this DEP, Contract Drawings, and Standard Drawings shall apply.

2.2 STRUCTURE CATEGORY

Structures shall be categorised as either Type-A or Type-B by the Principal. The default categories are as follows:

- Type-A structures shall include skids and packages weighing less than 455 metric tons (500 short tons), except for subsea structures.
- Type-B structures shall include skids and package weighing more than 455 metric tons (500 short tons) but less than 907 metric tons (1000 short tons), and subsea structures (sleds and manifolds) regardless of weight.

The requirements in this DEP are applicable to both Type-A and Type-B structures unless indicated otherwise.

2.3 WORK, MATERIALS, AND SUPERVISION

2.3.1 Work

All work performed under this DEP shall be strictly in accordance with the Contract Drawings and/or Standard Drawings and this DEP.

2.3.2 Materials

Contractor-furnished material shall be new, except as specified below, and of the size, grade, and quality required in this DEP. Temporary bracing, erection aids, scaffolding, etc., shall be furnished by Contractor and need not be new if safe and serviceable.

All Contractor-furnished items shall be subject to inspection, testing, and Approval.

2.3.3 Inspection

Inspection shall be carried out per this DEP, including the requirements contained in (Appendix 4) or (Appendix 5) "Typical Welding Details" drawing.

2.4 REFERENCE COPIES

Contractor shall maintain reference copies of this DEP at locations readily accessible to the work sites.

2.5 TYPICAL WELDING DETAILS DRAWING

"Typical Welding Details" drawing for structural steel, skids, and miscellaneous items, as shown in (Appendix 4) or (Appendix 5), is a part of this DEP. This drawing defines steel designations and properties, welding and inspection requirements, and typical structural details and tolerances. This drawing is included in reduced size at the end of this DEP and may also be included in the Contract Drawings.

2.6 APPLICABLE DOCUMENTS

All work and material shall be in accordance with this DEP. Refer to (Appendix 3) for a list of documents requiring submittal for approval or review by the Principal .

NOTE: Additional submittals may be required for documentation purposes as stated within this DEP.

2.7 INCONSISTENCIES

Contractor shall carefully study and compare Contract Drawings and/or Standard Drawings, this DEP, and other instructions and shall report at once to the Principal any error, inconsistency, or omission.

2.8 SIMILAR DETAILS

Details of appurtenances, clearly indicated on any of the Contract Drawings and/or Standard Drawings as typical, shall apply to similar beams, joints, etc., even though not clearly indicated on other Contract Drawings and/or Standard Drawings.

2.9 SUBCONTRACTORS

Approval of all Subcontractors shall be obtained from the Principal prior to the start of the subcontractor work.

It shall be Contractor's responsibility to ensure that all work done by the Subcontractors is in accordance with this DEP.

The Principal's inspection rights also apply to all work done by the Subcontractor.

3. FABRICATION

3.1 GENERAL FABRICATION REQUIREMENTS

Contractor shall completely fabricate the structure(s) and its components in accordance with this DEP and applicable Contract Drawings and/or Standard Drawings.

Contractor shall completely coat the structure(s) and its components in accordance with the Principal-approved coating system and applicable Contract Drawings and/or Standard Drawings.

Fabrication shall conform to AISC's Manual Of Steel Construction and AWS D1.1, as well as API RP 2A -WSD, where applicable. AWS D1.1 shall govern in case of conflict with AISC's Manual Of Steel Construction (ASD) or API RP 2A-WSD.

Contractor shall submit the proposed procedures for skid/package fabrication and assembly for review by the Principal prior to the start of fabrication.

Any proposed changes in this DEP and/or Contract Drawings and/or Standard Drawings desired by Contractor shall be submitted for Approval before ordering material or starting fabrication.

Contractor shall test-fit all field installed components after coating system, including insulation, is applied.

3.2 FABRICATION AIDS

Fabrication aids are any items used to aid fabrication that are not detailed on Contract Drawings and/or Standard Drawings. This includes such items as temporary erection braces, sling stops, scaffolding supports, padeyes, dogs, walkways, etc. Welding of fabrication aids to the structure shall be performed in accordance with an approved procedure for the structural materials being welded.

Fabrication aids shall not be welded to any process equipment or the base plates to process equipment.

All fabrication aids shall be removed unless otherwise approved by the Principal.

The Principal reserves the right to restrict the location and welding of such items.

3.3 DIMENSIONS AND TOLERANCES

Except as noted otherwise on the Contract Drawings, all tolerances shall be in accordance with AISC's Manual of Steel Construction, API Spec 2B, and API RP 2A-WSD, as applicable.

Centerline dimensions for field tie-ins or connections shall be within 6 mm ($\frac{1}{4}$ inch) tolerance. This applies to the dimension between adjacent tie-in points and to the overall dimensions.

Shims used under continuous beams in skids and packages to adjust for difference in elevation of different beam sizes shall be field-verified prior to welding due to tolerances in plate and beam heights.

For Type-B structures, Contractor shall develop a dimensional control procedure for the Principal approval and report on dimensional accuracy on a biweekly basis.

3.4 CLEAN-UP REQUIREMENTS

3.4.1 Welding Clean-up

Contractor shall clean the weld area of slag, splatter, and other debris to allow complete examination.

3.4.2 Removal of Fabrication Aids

Fabrication aids shall be cut no closer than 3 mm ($\frac{1}{8}$ inch) to base material. "Washing Off" of fabrication aids with an oxygen-fuel torch shall not be permitted on steels with FY

greater than 317MPa (46 ksi). Final removal shall be by mechanical means with edges smoothed or rendered flush to the base material. Once the fabrication aid is removed, the attached area shall be inspected to the specified level required by the Principal.

3.5 LIFTING PADEYES

Material used for lifting padeyes shall be in accordance with the contract drawings and shall be free of any laminations.

If cheek plates are required, they shall be permanently attached before drilling or boring the hole.

For Type-B subsea structures, all welds attaching the padeye to the structure shall be inspected after welding and again after load testing.

For Type-B subsea structures, all lifting padeyes and slings shall be load-tested to the requirements of the Principal. Lifting capacity of all padeyes and lifting points shall be clearly marked, identifying the safe working load, the angle of lift, and the number of lifting points.

Example: Four padeyes, 25 tons capacity each, no angle limitation, total capacity of 100 tons:

Stamp:	4 x SWL 25 tons 0 - 90°
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3.6 BOLTING

Bolts shall be as noted on the welding detail drawings.

Bolts, nuts and washers shall be galvanized or coated with Sermagard, or equivalent material approved by the Principal.

3.7 WELD TRACEABILITY

For Type-B structures, Contractor shall submit a plan to ensure weld traceability for the Principal approval. As a minimum, this procedure shall consist of weld numbers, unique welder ID, weld location, NDT requirements and NDT results, and weld ID drawings.

3.8 AS-BUILT DATA

Contractor shall develop an As Built data book, or "as approved" by the Principal, that shall contain at a minimum:

- a) Material MTR's
- b) Two-Way Material Traceability (For Type B structures only)
- c) Weld Procedures
- d) Welder Qualifications and PQRs
- e) NDT Reports
- f) As-Built Drawings
- g) Non-Conformance Reports and Site Queries
- h) Weld / Material Repair
- i) Weight and Center-Of-Gravity
- j) Final Dimensional Surveys

4. MATERIALS

4.1 CONTRACTOR FURNISHED MATERIALS

The surface of the material shall be free of defects and laminations such that a quality paint job is obtained. Substitutions shall not be made without Approval.

4.2 STRUCTURAL STEEL

Steel material shall be as indicated on the Contract Drawings and/or (Appendix 4) or (Appendix 5) "Typical Welding Details" drawing.

All material shall meet the Pcm requirements shown on the detailed welding drawings. Any material that does not meet the requirement shall be approved by the Principal on a case-by-case basis.

4.3 MISCELLANEOUS ITEMS

All grating shall be steel or phenolic as specified on the Contract Drawings. For Type-B subsea structures, grating shall be galvanized steel.

All steel grating, ladders, handrails, and miscellaneous hardware shall be hot-dipped galvanized.

Steel Grating:

All steel grating shall be at least 38 mm x 5 mm (1½ inch x 3/16 inch) serrated bar grating with 30 mm (1-3/16 inch) on center bearing bars and 102 mm (4 inch) on center cross bars and the grating shall be hot dipped galvanized. Fixed panels should be attached to the supporting beams by spot welding every fourth bearing bar with 5 mm (3/16 inch) double fillet welds, 38mm (1½ inch) long. Steel grating shall be used for subsea application and may be 25 mm x 5 mm (1 inch x 3/16 INCH) serrated bar grating provided dropped object strength requirements are met.

Grating termination "fingers" for short pieces supported at only both ends (simple span) and grating hatches shall be corrected by tacking 6 mm (1/4 inch) banding bar (flat bar) to prevent the grating from sliding (see Figure 4.3-1).

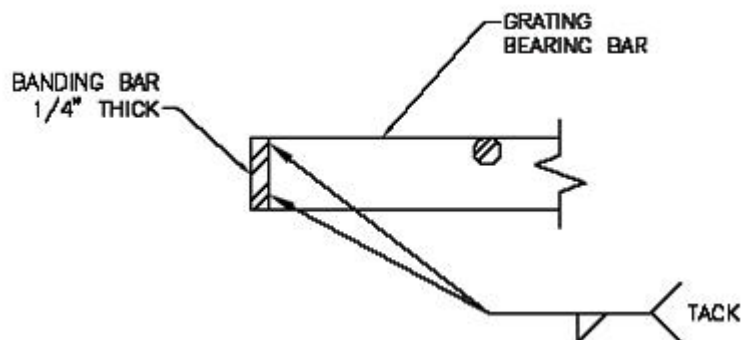


Figure 4.3-1 Typical Grating Banding Bar Detail

Phenolic Grating:

Phenolic grating shall be slip resistant and have ultraviolet stabilizer. Phenolic grating manufacturer shall be approved by the Principal.

All phenolic grating shall have 38 mm (1-1/2 inch) bearing bars spaced on 38 mm (1-1/2 inch) centers, and be approved by the Principal. All phenolic grating shall be attached to the beams using a fastening system. Fasteners are required at the end of each