

DEP SPECIFICATION

STEAM SURFACE CONDENSERS AND AUXILIARIES

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DESIGN AND ENGINEERING PRACTICE



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PREFACE

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- 3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) or 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

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All administrative queries should be directed to the DEP Administrator in Shell GSI.

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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies requirements and gives recommendations for the design, materials, fabrication and inspection of horizontal steam surface condensers and auxiliaries as specified herein.

This DEP is also applicable to deaerating steam turbine condensers (DSTC). Compared to steam surface condensers the design of the DSTC requires more stringent control of oxygen levels in the condensate leaving the heat exchanger, which affects the design of the vacuum system and other design features that help to minimize air in-leakage.

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 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

Term	Definition
deaerating steam turbine condenser	Type of steam surface condenser that is used to condense steam from the steam turbine exhaust and to deaerate the condensate to stringent dissolved oxygen levels before it leaves the condenser.
shell expansion joint	Flexible shell element that reduces shell and tube longitudinal stresses and/or tube-to-tubesheet joint loads

Term	Definition
transition piece	Flexible joint that connects the turbine exhaust flange with the steam inlet flange of the steam surface condenser. This joint takes care of a lot of differential movement to prevent excessive loads acting on the turbine exhaust.

1.3.3 Abbreviations

Term	Definition
HEI	Heat Exchange Institute
ERW	electric resistance welding
DSTC	deaerating steam turbine condenser
TEMA	Tubular Exchanger Manufacturers Association

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 (8).

1.5 SUMMARY OF MAIN CHANGES

This is a new DEP.

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://www.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.

2. GENERAL INFORMATION

2.1 GENERAL

The design and construction of steam surface condensers and auxiliaries shall conform to the latest edition of Heat Exchange Institute (HEI) "Standards for Steam Surface Condensers", HEI "Standards for Steam Jet Vacuum Systems" and HEI "Standards for Vacuum Liquid Ring Pumps" and the requirements outlined in this DEP.

The design of the DSTC shall follow the requirements for the steam surface condenser as outlined in this DEP, unless specifically stated otherwise.

Unless specified otherwise, the steam surface condenser shall be designed and fabricated as per following codes and standards:

- The tube side shall be designed and fabricated in accordance with the applicable pressure design code and as amended by DEP 31.22.00.31-Gen.;
- The shell side shall be designed and fabricated as per HEI "Standards for Steam Surface Condensers";
- Where applicable according to this DEP, the latest edition of TEMA class R requirements shall be followed.

Unless specified otherwise, the inter/after condensers of the ejector system shall be designed and fabricated as per following codes and standards:

- The tube side and shell side shall be designed and fabricated in accordance with the applicable pressure design code and as amended by DEP 31.22.00.31-Gen.;
- The latest edition of TEMA class C requirements shall be followed.

2.2 SCOPE OF SUPPLY

The steam surface condenser shall be of the horizontal type with internal venting section(s) designed for continuous operation and connecting to the steam turbine exhaust flange.

Manufacturer shall furnish auxiliary equipment with each unit to provide a complete and operable installation, including but not necessarily limited to the following:

- a. One (1) twin element two-stage ejector or vacuum liquid ring pump unit with a shell-and-tube type inter- / after-condenser for each stage;
- b. Atmospheric relief valve (or valves) as required to relieve pressure in the event of cooling water failure. Relief valve design shall incorporate a suitable lift mechanism and provision for water-sealing including a sight glass to indicate the seal water level;
- c. Transition piece between turbine exhaust and condenser inlet;
- d. Interconnecting piping, valves, strainers, and fittings;
- e. Air flow meter and hogging ejector complete with silencer on after-condenser vent stream.

For DSTC, the Manufacturer shall supply, in addition to the above, the following:

- a. One (1) twin element two-stage steam ejector / liquid ring vacuum pump combination or twin element two-stage liquid ring vacuum pump system with a shell-and-tube type (inter- / after-) condenser for each stage in lieu of twin element two-stage steam ejectors;
- b. Two (2) steam stripping nozzles in the bottom of the hot well for (future) stripping steam.