

# Engineering Standard

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SAES-C-001

31 July 2002

## Process Design of Trays and Packing

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## Saudi Aramco DeskTop Standards

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## 1 Scope

- 1.1 This standard covers the minimum mandatory requirements for the process design of trays and inert packing for pressure vessels (herein after referred to as vessel).
- 1.2 The requirements in this standard shall be used by the Design Engineer for the completion of Saudi Aramco Process Design Data Sheets (herein after referred to as data sheets) for trays and packing.
- 1.3 This standard covers the design requirements of new trays and the repair of existing trays.
- 1.4 This standard may not be attached to nor made a part of purchase orders.

## 2 Conflicts and Deviations

- 2.1 Any conflicts between this standard and other applicable Saudi Aramco Engineering Standards (SAESs), Materials System Specifications (SAMSSs), Standard Drawings (SASDs), or industry standard, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Process and Control Systems Department of Saudi Aramco, Dhahran.
- 2.2 Direct all requests to deviate from this standard in writing to the Company or Buyer Representative, who shall follow internal company procedure [SAEP-302](#) and forward such requests to the Manager, Process and Control Systems Department of Saudi Aramco, Dhahran.

## 3 References

The selection of material and equipment, and the design, construction, maintenance, and repair of equipment and facilities covered by this standard shall comply with the latest edition of the references listed below, unless otherwise noted.

Saudi Aramco Engineering Procedure

[SAEP-302](#)

*Instructions for Obtaining a Waiver of a  
Mandatory Saudi Aramco Engineering  
Requirement*

Saudi Aramco Engineering Standard

[SAES-D-001](#)

*Design Criteria of Pressure Vessels*

Saudi Aramco Materials System Specifications

[32-SAMSS-004](#)

*Manufacture of Pressure Vessels*

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[32-SAMSS-020](#)

*Manufacture of Trays and Packing*

Saudi Aramco Forms and Data Sheets

[9524-ENG](#)

*Process Design Data Sheet-Packing*

[9524-1-ENG](#)

*Process Design Data Sheet-Stream Compositions*

[9524-2-ENG](#)

*Process Design Data Sheet-For Trays*

## 4 Definitions

**Design Engineer:** The Engineering Company responsible for specifying on the data sheets the process and mechanical requirements for trays and packing.

**Packing Manufacturer:** The company responsible for the process design and manufacture of packing in accordance with [32-SAMSS-020](#).

**Saudi Aramco Engineer:** General Supervisor of the Downstream Process Engineering Division, Dhahran. ||

**Tray Assemblies and Systems:** Components required for the complete tray installation, including tray decks, downcomers, feed distributors, and tray hardware.

**Tray Hardware:** Components required for assembling tray sections and attaching tray assemblies to a vessel, including clamps, nuts, bolts, washers, and gaskets.

**Tray Manufacturer:** The company responsible for the process design and manufacture of trays in accordance with [32-SAMSS-020](#).

## 5 Responsibilities

- 5.1 The Design Engineer is responsible for specifying all process design data required for the design of trays and packing, verifying the validity, consistency and completeness of data on the design data sheets, and verifying the process designs of the Tray and Packing Manufacturers.
- 5.2 The Tray Manufacturer is responsible for the process design, mechanical design, and fabrication of tray systems.
- 5.3 The Packing Manufacturer is responsible for the process design and fabrication of packing.

## 6 Tray Design

- 6.1 The following process data is required for the design of trays:
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- Heat and material balances (maximum, minimum, and design vapor and liquid flowrates) for the overall vessel and for pertinent sections of a vessel such as feed trays, side draw-off trays, heat transfer or pump around trays, below and above flash chambers
- The physical properties of liquids and vapors as per Forms 9524-1-ENG and 9524-2-ENG
- The required number of actual trays (include tray efficiency)
- Tray type (e.g., valve, bubble cap, sieve, etc.)

6.2 The minimum tray spacing for bubble cap trays shall be as follows:

<b>Vessel Diameter</b>	<b>Minimum Tray Spacing</b>
1.8 m and smaller	610 mm
2.0 to 3.0 m	690 mm
3.2 to 5.0 m	760 mm
5.2 m and larger	910 mm

6.3 The minimum tray spacing for valve and sieve trays shall be as follows:

<b>Vessel Diameter</b>	<b>Minimum Under Tray Spacing</b>
1.8 m and smaller	450 mm
1.9 m and larger	610 mm

6.4 The minimum acceptable diameter for conventionally trayed vessels shall be 910 mm. Smaller diameters are acceptable for cartridge-type tray assemblies only.

6.5 The Tray Manufacturer's design shall be comparable with a design tested by Fractionation Research Inc. or other Saudi Aramco approved testing laboratory.

6.6 The Tray Manufacturer's process design calculations shall be reviewed and approved by the Design Engineer.

## **7 Packing Design**

7.1 The following process data is required for the design of packing:

- Material balances (maximum and minimum vapor and liquid flowrates) for the overall vessel and for each packed section
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- The physical properties of liquids and vapors in accordance with Forms [9524-ENG](#), and 9524-1-ENG
  - The required number of theoretical stages for each packed section
- 7.2 For the redistribution of liquid running down the shell of a vessel to the next section of packing, a conical-shaped deflector shall be used, as a minimum.

## **8 Vessel, Tray, and Packing Manufacturing**

- 8.1 Vessels shall be mechanically designed in accordance with [SAES-D-001](#).
- 8.2 Vessels shall be manufactured in accordance with the requirements of [32-SAMSS-004](#).
- 8.3 Trays and packing shall be manufactured and installed in accordance with the requirements of [32-SAMSS-020](#).

## **9 Maintenance and Repairs**

The maintenance and repair of tray assemblies, including replacement in-kind, shall be in accordance with the original design modified by Technical Alerts, inspection history, and industry practices. For assistance in the incorporation of these modifications consult the Saudi Aramco Engineer.

### **Revision Summary**

31 July 2002

Revised the "Next Planned Update." Reaffirmed the contents of the document, and reissued with minor changes.