

Engineering Standard

SAES-L-136

31 August 2005

Selection and Restrictions of Carbon Steel Pipe

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Saudi Aramco DeskTop Standards

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1 Scope

This Standard supplements the ASME B31 Pressure Piping Codes, and provides requirements for the selection and restriction of carbon steel pipe.

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 standards, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Consulting Services 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, Consulting Services 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 these documents to the extent specified in this standard.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

[SAEP-302](#)

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

Saudi Aramco Engineering Standards

[SAES-B-064](#)

Onshore and Nearshore Pipeline Safety

[SAES-L-100](#)

*Applicable Codes and Standards for Pressure
Piping Systems*

[SAES-L-105](#)

Piping Materials Specifications

[SAES-L-130](#)

Material for Low Temperature Service

[SAES-L-131](#)

Fracture Control of Line Pipe

[SAES-L-132](#)

Material Selection of Piping Systems

[SAES-L-133](#)

*Corrosion Protection Requirements for
Pipelines/Piping*

<u>SAES-L-310</u>	<i>Design of Plant Piping</i>
<u>SAES-L-410</u>	<i>Design of Pipelines</i>
<u>SAES-W-011</u>	<i>Welding Requirements for On-Plot Piping</i>

Saudi Aramco Materials System Specifications

<u>01-SAMSS-016</u>	<i>Qualification of Pipeline, In-Plant Piping and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking</i>
<u>01-SAMSS-022</u>	<i>Fracture Control Testing Procedures for Line Pipe</i>
<u>01-SAMSS-035</u>	<i>API Line Pipe</i>
<u>01-SAMSS-038</u>	<i>Small Direct Charge Purchases of Pipe</i>
<u>01-SAMSS-332</u>	<i>High Frequency Welded Line Pipe, Class B</i>
<u>01-SAMSS-333</u>	<i>High Frequency Welded Line Pipe, Class C</i>

3.2 Industry Codes and Standards

American Petroleum Institute

<i>API SPEC 5L</i>	<i>Specification for Line Pipe</i>
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American Society of Mechanical Engineers

<i>ASME B31.3</i>	<i>Process Piping</i>
<i>ASME B31.4</i>	<i>Liquid Transportation Systems for Hydrocarbons, LPG, Anhydrous Ammonia, and Alcohols</i>
<i>ASME B31.8</i>	<i>Gas Transmission and Distribution Systems</i>

4 Definitions

Code: The appropriate code (ASME B31.3, ASME B31.4, or ASME B31.8) as specified in [SAES-L-100](#).

ERW Pipe: Electric-resistance welded pipe, also referred to as electric-welded pipe by API SPEC 5L. This also includes other designations and varieties such as high frequency welded (HFW), high frequency induction (HFI), high frequency ERW (HFERW), and high frequency resistance (HFR).

Hazardous Service: Any fluid service other than Category D as defined in ASME B31.3.

RSA: Delegated Responsible Standardization Agent.

Spiral-weld Pipe: Double submerged-arc welded (DSAW) pipe with one spiral (helical) seam; referred to by API SPEC 5L as helical seam submerged-arc welded pipe.

Transportation Pipelines: Pipelines constructed to ASME B31.4 or ASME B31.8 codes. See [SAES-L-100](#).

5 General

5.1 Saudi Aramco Materials System Specifications

Carbon steel line pipe shall be in accordance with the applicable specification (SAMSS) as follows:

01-SAMSS-016	<i>Qualification of Pipeline, In-Plant Piping and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking</i>
01-SAMSS-022	<i>Fracture Control Testing Procedures for Line Pipe</i>
01-SAMSS-035	<i>API Line Pipe</i>
01-SAMSS-038	<i>Small Direct Charge Purchases of Pipe</i>
01-SAMSS-332	<i>High Frequency Welded Line Pipe, Class B</i>
01-SAMSS-333	<i>High Frequency Welded Line Pipe, Class C</i>

5.2 Fabricator Supplied Pipe

Pipe used for shop-fabricated assemblies when supplied from vendor's stock shall comply with the API or ASTM (or equivalent) specification listed in the applicable Code, Standard, or Specification and as further limited in paragraphs 6 and 7.

5.3 Minimum Wall Thickness

For sour service applications, straight seam SAW pipe shall have a minimum wall thickness of 0.375 inch (9.5 mm).

Commentary Note:

Experience has shown that thinner wall thicknesses will have an increased susceptibility to HIC in straight seam SAW pipe produced from plate.

6 Materials Selection

Materials selection of pipe for specific services shall be in accordance with [SAES-L-130](#) and [SAES-L-132](#).

7 Restrictions

The following Restrictions apply in addition to those given in the applicable Code:

- 7.1 Furnace butt-welded pipe shall not be used.
- 7.2 Cast iron pipe specifications shall not be used for hazardous services.
- 7.3 Only steel pipe specifications shall be used to handle flammable fluids.
- 7.4 Carbon steel pipe for hazardous service shall have specified minimum yield strength (SMYS) of not less than 35 ksi (241 MPa).
- 7.5 Restrictions on use of ERW carbon steel pipe
 - 7.5.1 ERW Pipe shall comply with the following requirements:
 - a) Requirement Class A - For non-hazardous service, e.g. fire water system, high frequency welded pipe meeting the requirements of [01-SAMSS-332](#) shall be used.
 - b) Requirement Class B - For hazardous liquid hydrocarbon, water injection, sweet dry gas service, tank farm and bulk plant applications, high frequency welded pipe meeting the requirements of [01-SAMSS-332](#) shall be used. High frequency welded pipe for SAMS stock shall meet Requirement Class B in accordance with [01-SAMSS-332](#).
 - c) Requirement Class C - For sour gas or corrosive services, and any offshore pipelines, high frequency welded pipe meeting the requirements of [01-SAMSS-333](#) shall be used.
 - 7.5.2 ERW pipe shall not be used in the following applications:
 - a) ASME B31.3 in-plant piping in hazardous service, with the exception of tank farm and bulk plant applications.
 - b) Gas pipelines in sour or corrosive services, as defined in [SAES-L-133](#) Section 6, in locations Class 3 and 4 as defined in [SAES-B-064](#).
 - c) Gas pipelines within 500 meters of the battery limits of plants and permanently manned facilities.
 - d) High strength pipe Grade X70 and above in sour service.
- 7.6 Restrictions on use of spiral welded pipe

Spiral weld carbon steel pipe shall not be used except when manufactured and tested in accordance with [01-SAMSS-035](#).

Spiral weld pipe shall not be used in sour gas service, either for ASME B31.3 in-plant piping or for pipelines, unless it is heat treated in a furnace to relieve residual stress. Spiral weld pipe that is not heat treated may be used for sour crude lines if approved by the Chairman of the Materials and Corrosion Control Standards Committee.

Exception:

Spiral weld pipe may be used for sour flare systems, including headers and lines, with no need for stress relief heat treatment.

- 7.7 For ASME B31.3 plant piping, and at other permanently manned facilities, the following restrictions shall apply for sour gas service and stress corrosion cracking environments listed in [SAES-W-011](#) paragraph 13.3:
- a) For pipe diameters up to, and including, 20 inch O.D., seamless pipe shall be used.
 - b) Above 20 inch O.D., straight-seam submerged-arc welded (SAW) pipe that is cold expanded or heat treated, as required in [01-SAMSS-035](#) and [01-SAMSS-038](#), shall be used. As specified in paragraph 7.6, spiral weld pipe may also be used if each pipe is heat treated in a furnace to relieve residual stress.

Commentary Note:

The above provisions are related to reducing the probability of stress corrosion cracking and stress-oriented hydrogen-induced cracking (SOHIC). [SAES-L-133](#) also addresses corrosion and environmental cracking considerations.

- 7.8 Pipe per API SPEC 5L grades X65 and X70 shall be derated to X60 when used in specifications within the scope of ASME B31.3 and shall be subject to review and approval by the Chairman of the Piping Standards Committee and the Chairman of the Materials and Corrosion Control Standards Committee. The pipe shall be marked with the actual grade. In addition, girth weld requirements established in Saudi Aramco welding standard [SAES-W-011](#) for grades X65 or greater shall be followed.

X70 or higher strength pipe shall not be used in any sour service unless specifically approved by the Chairman of the Materials and Corrosion Control Standards Committee for the maximum carbon equivalent tested. High Frequency (ERW/HFI) welded pipe shall not be used for sour service as indicated in paragraph 7.5.2(d) above.

- 7.9 Piping Design Minimum Temperature

- 7.9.1 When the design minimum temperature (defined in [SAES-L-310](#) or [SAES-L-410](#) as applicable) is at minus -18°C and above, pipe in accordance with [01-SAMSS-035](#), [01-SAMSS-038](#), [01-SAMSS-332](#), or [01-SAMSS-333](#) shall be used, subject to the above restrictions.
- 7.9.2 When the design minimum temperature is between minus -18°C and -45°C, pipe shall be in accordance with [SAES-L-130](#).
- 7.10 The additional requirements of [01-SAMSS-022](#) shall be applied as specified in [SAES-L-131](#) for fracture control of transportation pipelines.

8 Material Selection and Testing Subcommittee

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Revision Summary

31 August 2005

Minor revision. Included minimum thickness for sour service welded pipe, added restriction for grade X70 pipe and higher strengths against sour service, allowed use of ERW pipe for offshore pipelines, fire water system, tank farm and bulk plant applications, removed class 2 location restriction and corrosion service from ERW pipe restrictions, restricted the use of spiral pipe from sour gas service, either for in-plant piping or pipelines applications, unless each pipe is stress relief heat treated, and revised committee and subcommittee list. Revised the "Next Planned Update".