



# Materials System Specification

01-SAMSS-022

3 July 2007

## Fracture Control Testing Procedures for Line Pipe

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## Saudi Aramco DeskTop Standards

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## 1 Scope

- 1.1 This specification defines the fracture toughness testing procedures applicable to line pipe purchased in accordance with 01-SAMSS-035 and 01-SAMSS-038. This specification is applicable to pipe with nominal diameters equal to or greater than 4 inches, wall thicknesses of 6.3 mm to 38 mm (0.25 to 1.5 inch), for use in cross-country pipelines, offshore pipelines, flowlines, and trunklines at design temperatures above 0°C. All testing shall be in accordance with API SEPC 5L as modified herein.
- 1.2 This specification shall be attached to the relevant requisitions, quotation requests, and purchase orders.
- 1.3 This specification is not applicable to in-plant piping. Impact testing of in-plant piping shall be in accordance with ASME B31.3 and SAES-L-130.

## 2 Conflicts and Deviations

- 2.1 Any conflicts between this specification and other applicable Saudi Aramco Materials System Specifications (SAMSSs), Engineering Standards (SAESs), 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 specification 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 specification shall comply with the latest edition of the references listed below, unless otherwise noted or modified by specific provisions of this document.

### 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 Materials System Specifications

*01-SAMSS-035*                      *API Line Pipe*

*01-SAMSS-038*                      *Small Direct Charge Purchases of Pipe*

## 3.2 Industry Codes and Standards

### American Petroleum Institute

*API SPEC 5L-SR5&6*                      *Specification for Line Pipe, Supplementary Requirement 5 (SR5) and Supplementary Requirement 6 (SR6)*

### American Society for Testing and Materials

*ASTM A370*                                      *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

## 4 Classification of Line Pipe

Line pipe, within the scope of this specification, is herein classified according to the fracture toughness acceptance criteria required for different types of fluid service.

4.1     **Class I Line Pipe:** This class is for liquid lines with maximum vapor pressures up to 690 kPa (100 psia).

4.2     **Class IV Line Pipe:** This class is for gas, two-phase flow, and liquid lines such as NGL, whose vapor pressure exceeds 690 kPa (100 psia).

## 5 Testing

5.1     Charpy V-Notch Impact Test: Classes I and IV are to be tested.

5.2     Drop Weight Tear Test: Class IV is to be tested.

## 6 Charpy V-Notch Testing

### 6.1 General Test Requirements

6.1.1   Charpy V-notch impact testing shall conform to the requirements of API SPEC 5L.

6.1.2   All testing shall be conducted at 0°C.

### 6.2 Specimen Size and Orientation Requirements

6.2.1   The specimen size and orientation shall be in accordance with Table 14

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of API SPEC 5L. Pipe in size and specified wall thickness combinations not covered by this Table shall be referred to Chairman of Materials & Corrosion Control Standards Committee.

6.2.2 The orientation specified in Table 14 of API SPEC 5L shall apply except that for spiral welded (helical seam) pipe, the specimen shall be transverse to the rolling direction of the skelp (perpendicular to the helical seam).

### 6.3 Acceptance Criteria

#### 6.3.1 Class I Line Pipe

6.3.1.1 Impact test results for welded pipe shall meet the requirements of API SPEC 5L-PSL2 for parent metal, heat affected zone (HAZ) and weld metal.

6.3.1.2 Impact test results for seamless pipe parent metal shall meet API SPEC 5L PSL2.

#### 6.3.2 Class IV Line Pipe

6.3.2.1 Minimum average Charpy impact energy value shall be as specified by the Buyer in the relevant requisitions, quotation requests, and purchase orders. .

6.3.2.2 For welded pipe, both weld metal, HAZ and parent metal tests are required.

6.3.2.3 All parent metal Charpy fracture surfaces shall exhibit at least 85% average and 75% minimum shear per each set of test.

## 7 Drop Weight Tear Test (DWTT)

7.1 All grades of line pipe, having diameters 20 inch and larger, in Class IV must be qualified by this test. Two specimens per heat shall be tested at 0°C, in accordance with API SPEC 5L-SR6. The specimens shall not exhibit less than 85% average and 75% minimum shear per heat.

### *Commentary Note:*

*Each specimen must tear completely to give a readable fracture surface as shown in API RP 5L3 Figure 5 and Appendix A. Specimens that buckle, collapse, deform or rip are considered invalid and the test must be performed again. Specimens must be firmly mounted to promote acceptable test results.*

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7.2 The type of notch for the DWTT shall be as follows:

7.2.1 For pipe order with specified minimum average Charpy V-notch value less than 95J (70 ft-lb), the pressed type notch shall be used for the DWTT.

7.2.2 For pipe order with specified minimum average Charpy V-notch value greater than 95J (70 ft-lb), the Chevron type notch shall be used.

7.3 DWTT results shall be reported in accordance with API RP 5L3.

## 8 Retests

8.1 DWTT

DWTT retests shall be conducted to the same criteria as API SPEC 5L paragraph 9.12.2. Paragraphs SR6.4 and SR6.5 of API SPEC 5L do not apply.

8.2 Charpy Impact

A lot, as defined in API SPEC 5L, that fails to meet the required Charpy fracture toughness criteria may be retested. Retesting criteria shall be in accordance with API SPEC 5L paragraph 9.12.6.

## 9 Reporting

A test certificate shall be provided in the English language. The certificate shall include specimen sizes, locations and orientations, shear area, and (for Class IV) absorbed energy corrected for specimen size.

## 10 Marking

Pipe marking shall include "01-SAMSS-022 Class I" or "01-SAMSS-022 Class IV" as appropriate.

23 April 2007

3 July 2007

### Revision Summary

Major revision.

Editorial revision to delete Section 10.