

ISO 15156-2:2020 (E)

Petroleum and natural gas industries — Materials for use in H₂S-containing environments in oil and gas production — Part 2: Cracking-resistant carbon and low-alloy steels, and the use of cast irons

Contents

| | |
|---------|--|
| | Foreword |
| | Introduction |
| 1 | Scope |
| 2 | Normative references |
| 3 | Terms and definitions |
| 4 | Symbols and abbreviated terms |
| 5 | Purchasing information |
| 6 | Factors affecting the behaviour of carbon and low alloy steels in H ₂ S-containing environments |
| 7 | Qualification and selection of carbon and low-alloy steels with resistance to SSC, SOHIC and SZC |
| 7.1 | Option 1 — Selection of SSC-resistant steels (and cast irons) using A.2 |
| 7.1.1 | For p H ₂ S < 0,3 kPa (0,05 psi) |
| 7.1.2 | For p H ₂ S ≥ 0,3 kPa (0,05 psi) |
| 7.2 | Option 2 — Selection of steels for specific sour-service applications or for ranges of sour service |
| 7.2.1 | Sulfide stress cracking |
| 7.2.1.1 | General |
| 7.2.1.2 | SSC regions of environmental severity |
| 7.2.1.3 | Region 0 — For p H ₂ S < 0,3 kPa (0,05 psi) |
| 7.2.1.4 | SSC regions 1, 2 and 3 |
| 7.2.2 | SOHIC and SZC |
| 7.3 | Hardness requirements |
| 7.3.1 | General |
| 7.3.2 | Parent metals |
| 7.3.3 | Welds |
| 7.3.3.1 | General |
| 7.3.3.2 | Hardness testing methods for welding procedure qualification |
| 7.3.3.3 | Hardness surveys for welding procedure qualification |
| 7.3.3.4 | Hardness acceptance criteria for welds |
| 7.4 | Other fabrication methods |
| 8 | Evaluation of carbon and low alloy steels for their resistance to HIC/SWC |
| 9 | Marking, labelling, and documentation |
| Annex A | (normative) SSC-resistant carbon and low alloy steels (and requirements and recommendations for the use of cast irons) |
| A.1 | General |
| A.2 | SSC-resistant carbon and low-alloy steels and the use of cast irons |
| A.2.1 | General requirements for carbon and low alloy steels |
| A.2.1.1 | General |
| A.2.1.2 | Parent metal composition, heat treatment and hardness |
| A.2.1.3 | Carbon steels acceptable with revised or additional restrictions |

- A.2.1.4 Welding
- A.2.1.5 Surface treatments, overlays, plating, coatings, linings, etc.
- A.2.1.6 Cold deformation and thermal stress relief
- A.2.1.7 Threading
- A.2.1.8 Cold deformation of surfaces
- A.2.1.9 Identification stamping
- A.2.2 Application to product forms
- A.2.2.1 General
- A.2.2.2 Pipe, plate, and fittings
- A.2.2.3 Downhole casing, tubing, and tubular components
- A.2.2.4 Bolting and fasteners
- A.2.3 Application to equipment
- A.2.3.1 General
- A.2.3.2 Drilling blowout preventers
- A.2.3.2.1 Shear blades
- A.2.3.2.2 Rams
- A.2.3.2.3 Drilling, well construction and well-servicing equipment exposed only to drilling fluids of controlled composition
- A.2.3.3 Compressors and pumps
- A.2.3.3.1 Compressor impellers
- A.2.3.3.2 Special provisions for compressors and pumps
- A.2.4 Requirements for the use of cast irons
- A.2.4.1 General
- A.2.4.2 Packers and subsurface equipment
- A.2.4.3 Compressors and pumps
- A.3 SSC-resistant steels for use throughout SSC region 2
- A.3.1 General
- A.3.2 Downhole casing, tubing, and tubular components
- A.3.3 Pipeline steels
- A.4 SSC-resistant steels for use throughout SSC region 1
- A.4.1 General
- A.4.2 Downhole casing, tubing, and tubular components
- A.4.3 Pipeline steels

Annex B (normative) Qualification of carbon and low-alloy steels for H₂S service by laboratory testing

- B.1 Requirements
- B.2 Uses of laboratory qualifications
- B.2.1 General
- B.2.2 Qualification of manufactured products
- B.2.3 Qualification of a manufacturing source and route
- B.2.4 Use of laboratory testing as a basis for proposing additions and changes to Annex A
- B.3 Test procedures to evaluate the resistance of carbon and low-alloy steels to SSC
- B.4 Test procedures to evaluate the resistance of carbon and low-alloy steels to SOHIC and SZC
- B.4.1 General
- B.4.2 Small-scale tests
- B.4.2.1 Specimen selection
- B.4.2.2 Evaluation and acceptance criteria for UT test specimens
- B.4.2.3 Evaluation and acceptance criteria for FPB test specimens
- B.4.3 Full pipe ring tests
- B.5 Test procedures and acceptance criteria to evaluate the resistance of carbon and low-alloy steels to HIC/SWC

Annex C (informative) Determination of H₂S partial pressure and use of alternative parameters

- C.1 Calculation of partial pressure of H₂S for systems with a gas phase
- C.1.1 General
- C.1.2 Gas phase considerations, H₂S partial pressure and fugacity
- C.1.3 Aqueous phase considerations, H₂S concentration and chemical activity
- C.2 Calculations of effective H₂S partial pressure for gas-free liquid systems
- C.2.1 General
- C.2.2 Considerations for high pressure gas-free oil wells, H₂S activity

Annex D (informative) Recommendations for determining pH

Annex E (informative) Information that should be supplied for material purchasing