PIPING MATERIAL PIPE CLASS AND TECHNICAL SPECIFICATION

CL150, Carbon Steel, Sour Service

1. Scope

This specification provides the baseline for a CL150 carbon steel piping system for sour service, requiring compliance with NACE MR0175 / ISO 15156 to prevent sulphide stress cracking (SSC). This is a general guide; detailed specifications must be developed for defined operating conditions (partial pressure of H_2S, pH, temperature, chloride content, etc.).

2. General requirements

• Design code	ASME B31.3 Process Piping
• Sour Service standard	NACE MR0175 / ISO 15156 and NACE MR0103 for refinery environments
• Material standard	All materials must meet the metallurgical and hardness requirements of NACE MR0175, including the base material, weld metal, and heat affected zones.
• Corrosion allowance	3.0 mm
• Heat treatment	PWHT

3. Pipe Specifications

• Material	ASTM A106 Grade B, or API 5L, killed and melted per fine grain practice for enhanced resistance to hydrogen-induced cracking (HIC).
• Grades	For API 5L, Annex H applies and HIC testing is required.
• Standard	ASME B36.10M
• Manufacturing	Seamless pipe. For larger diameters, Electric Resistance Welded (ERW) pipe may be acceptable if specifically treated and tested for sour service. Project specification restrictions apply, where relevant.

4. Fittings Specifications

• Material	ASTM A234 Grade WPB, NACE MR0175.
• Type and standard	○ Butt-weld fittings (2.5” and above): API B16.9. ○ Socket-weld fittings (2” and below): API B16.11
• Welding	All fittings must be compatible with the specified pipe material for sour service welding procedures.

5. Flange Specifications

• Material	Forged carbon steel per ASTM A105N, with heat treatment and hardness control to meet NACE MR0175.
• Standards	ASME B16.5 for sizes up to NPS 24 (ASME B16.47 for larger diameters)
• Facing	Raised Face (RF).

6. Valve Specifications

• Valve types	Gate, globe and check
• Material	Body and bonnet materials shall be carbon steel, ASTM A216 Grade WCB or equivalent. See below, for trim materials.
• Standards	○ Flanged valves (2.5” and above): ASME B16.34 ○ Socket-weld valves (2” and below): API 602 (Class 800)
• Trim	NACE-compliant trim is mandatory. All trim materials must be corrosion resistant alloys (CRAs) suitable for sour service per NACE MR0175, such as 13% Cr or better.

7. Gaskets

Spiral wound gaskets in accordance with ASME B16.30, with 316L stainless steel inner ring and windings, and graphite filler.

8. Bolting

• Material	Stud bolts: ASTM A193 Grade B7M (for sour service) Nuts: heavy hexagonal nuts per ASTM A194 Gr. 2HM
• Coating	Appropriate coating should be used for corrosion protection.

9. Welding Procedures

• WPS / PQR	Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) to meet NACE MR0175 requirements, ensuring final weldment and heat-affected zone hardness is below specified limits.
• NDE	Non-Destructive Examination (NDE) procedures for welds must be in accordance with ASME B31.3 and any project-specific requirements.

10. Testing and Inspection

• HIC testing	For materials in wet sour service, Hydrogen-Induced Cracking (HIC) testing in accordance with NACE TM0284 may be required.
• Hardness testing	Post-weld hardness testing is required on production welds to ensure compliance with NACE MR0175.
• Documentation	All material test reports (MTRs) and certifications must include evidence of NACE compliance, including chemical composition and hardness test results
• Material certification	EN 10204 Type 3.1