

LIST OF OIL & GAS INDUSTRY STANDARDS OF INTEREST

- Standards Testing are done on request (Contact Dr. Advincula, e-mail: rca41@case.edu).
- Standards List is not exhaustive. Other standards testing will be initiated on a need basis.
- Standards Testing not available in the Advincula Research Group (ARG) but done by other CWRU Laboratories - will be referred.
- Access to the procedures (literature) can be done through the individual industry and professional organization (ISO, API, NACE, ASTM, EN, DNV, EEMUA, NORSOK).
- Other standards testing not available in the ARG Laboratory and CWRU Campus will be referred or negotiated with third party vendors.
- We also strive to create higher standards of testing beyond industry requirements (HTHP and other stress, frequency or time-dependent tests). A number of goals involve more molecular and macromolecular (chemical) investigation methods.

Corrosion Standards and Guidelines

ASTM G1 – 03 (2011)	Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens
EEMUA 194	Guidelines for Materials Selection and Corrosion Control for Subsea Oil & gas Production Equipment
EFC 17	Corrosion Resistant Alloys for Oil & Gas Production. Guidance on General Requirements and Test Methods for H ₂ S Service
EFC 23	CO ₂ Corrosion Control in Oil & Gas Production – Design Considerations
EFC 42	Corrosion in refineries
EFC 39	The use of Corrosion Inhibitors in Oil & Gas Production
ISO 13680	PGNI – Corrosion-resistant alloy seamless tubes for use as casing, tubing and coupling stock – Technical delivery conditions
ISO 15156-3	PGNI – Corrosion-resistant alloy seamless tubes for use as casing, tubing and coupling stock – Technical delivery conditions
NACE MR 0175	Standard Material Requirements, Metals for Sulfide Stress Cracking and Stress Corrosion Cracking Resistance in Sour Oilfield Environments
NACE RP 0169	Standard Material Requirements, Metals for Sulfide Stress Cracking and Stress Corrosion Cracking Resistance in Sour Oilfield Environments
NACE RP 0170	Protection of Austenitic Stainless Steel in Refineries against Stress Corrosion, Cracking by use of Naturalizing Solutions during shutdown
NACE RP 0175	Control of Internal Corrosion in Steel Pipelines and Piping Systems
NACE RP 0176	Standard Recommended Practice, Corrosion Control of Steel Fixed Offshore Structures Associated with Petroleum Production
NACE RP 0192	Monitoring Corrosion in oil & gas production with iron counts
NACE RP 0675	Control of external corrosion on offshore steel pipelines
NACE RP 0775	Preparation and installation of corrosion coupons and interpretation of test data in oil field operation
NACE TM 0169	Control of external corrosion on underground or sub merged metallic piping systems
NORSOK M-506	CO ₂ Corrosion rate calculation model

NORSOK M-503	Cathodic Protection
ASTM G 48	Standard Test Method for Pitting and Crevice Corrosion Resistance of Stainless Steel and Related Alloys by the use of Ferric Chloride Solution
DNV CN 33.1	Corrosion prevention of tanks and holds
ISO 3506 - 1	Mechanical properties of corrosion resistant stainless steel fasteners – Part 1: Bolts, screws and studs.
ISO 3506 - 2	Mechanical properties of corrosion resistant stainless steel fasteners – Part 2: Nuts.
ISO 11972	Corrosion-resistant cast steels for general applications
ISO 12944 - 3	Paints and Varnishes – Corrosion protection of steel structures by protective paint systems – Part 3: Design considerations.
ISO 12944 - 5	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 5: Protective paint systems.
ISO 19840	Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Measurement of, and acceptance criteria for, the thickness of dry film on rough surfaces
U.S. Mil. Spec. 18001	Military Specification for Anodes, Corrosion preventive, Zinc; slab, disc and rod shaped.
NACE RP 0169	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP 0170	Protection of Austenitic Stainless Steels and Other Austenitic Alloys from Polythionic Acid Stress Corrosion Cracking during Shut down of Refinery Equipment
NACE RP 0472	Methods and Controls to Prevent In-Service Environmental Cracking of Carbon Steel Weldments in Corrosive Petroleum Refining Environments
NACE RP 0775	Preparation and Installation of Corrosion Coupons and Interpretation of Test Data in Oil field Operations
NACE RP 0176	Corrosion Control of Steel Fixed Offshore Platforms Associated with Petroleum Production
NACE RP 0177	Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems

Standards for Scaling

NACE TM 0374	Laboratory Screening Test to Determine the Ability of Scale Inhibitors to Prevent the Precipitation of Calcium Sulfate and Calcium Carbonate from Solution (for Oil and Gas Production Systems)
NACE TM 0197	Laboratory Screening Test to Determine the Ability of Scale Inhibitors to Prevent the Precipitation of Barium Sulfate and/ or Strontium Sulfate from Solution (for Oil and Gas Production Systems)
NACE TM 0397	Screening Tests for Evaluating the Effectiveness of Gypsum Scale Removers
ASTM C672/C672M	Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
ASTM D4993-08	Standard Practice for Calculation and Adjustment of Silica (SiO ₂) Scaling for Reverse Osmosis

STP 717	Geothermal Scaling and Corrosion
ASTM D4692-01	Standard Practice for Calculation and Adjustment of Sulfate Scaling Salts (CaSO ₄ , SrSO ₄ , and BaSO ₄) for Reverse Osmosis and Nanofiltration
ASTM 7126	Standard Test Method for On-Line Colorimetric Measurement of Silica
ASTM D859	Test Method for Silica in Water

Hydraulic Fracturing Fluids:

ISO 3628-6: the functional and material testing of hydraulic fluids, is available in the lab.

Rheology of Fluids:

Some rheology test standards, such as D445: test method for kinetic viscosity of transparent and opaque liquid; ISO12644: Determination of rheological properties of paste inks and vehicles; ASTM D7394-13: Rheological characterization of architectural coating and D2196: Rheological properties of Non-Newtonian material by rotational viscometer are available.

API RP 13B-2 – Recommended Practice for Field Testing Oil-Based Drilling Fluids

Proppants Standard tests

API RP 56 - Recommended Practices for Testing Sand Used in Hydraulic Fracturing Operations

API RP 58 - Recommended Practices for Testing Sand Used in Gravel Packing Operations

API RP 60 - Recommended Practices for Testing High-Strength Proppants Used in Hydraulic Fracturing Operations

API RP 61 - Recommended Practices Evaluating Short Term Proppant Pack Conductivity

ISO 13503-1 / API RP 13M - Measurement of viscous properties of completion fluids

ISO 13503-2 / API RP 19C - Proppant crush test for hydraulic fracturing and gravel-packing operations

ISO 13503-2 §4 and §5 – Sampling and Sample Handling

ISO 13503-2 §6 – Sieve Analysis (particle size)

ISO 13503-2 §7 – Sphericity and roundness

ISO 13503-2 §8 – Acid solubility

ISO 13503-2 §9 – Turbidity (fines and impurities)

ISO 13503-2 §10 – Density

ISO 13503-2 §11 – Crush resistance

ISO 13503-3 / API RP 13J - Testing of heavy brines

ISO 13503-4 / API RP 13M-4 - Procedure for measuring stimulation and gravel-pack fluid leakoff under static conditions

ISO 13503-5 / API RP 19D - Procedures for measuring the long-term conductivity of proppants

Thermal Analysis

Thermal analysis standards, such as ASTM E793-06(2012): standard test method for enthalpies of fusion and crystallization by differential scanning calorimetry, ASTM E794-06(2012): standard method for melting and crystallization temperatures by thermal analysis, and ASTM E928-08: standard test method for determination of purity by differential scanning calorimetry (DSC).

OTHER STANDARDS OF INTEREST FOR THE OIL & GAS INDUSTRY

API Standards

API Bull 91	Planning and Conducting Surface Preparation and Coating Operations for Oil and Natural Gas Drilling and Production Facilities in a Marine Environment
API RP 5L2	RP for Internal Coating of Line Pipe for Non-Corrosive Gas Transmission Service
API RP 5L7	RP for Un-primed Internal Fusion Bonded Epoxy Coating of Line Pipe
API RP 5L9	External Fusion Bounded Epoxy Coating of Line Pipe
API RP 652	Linings of Aboveground Petroleum Storage Tank Bottoms
API 1160	Managing system integrity for hazardous liquid pipelines
API 2217A	Guidelines for Work in Inert Confined Spaces in the Petroleum Industry

ASTM Standards

ASTM 06.02	Paint-Products and Applications; Protective Coatings; Pipeline Coatings
ASTM G 8	Test method for cathodic disbanding of pipeline coatings
ASTM G14	Standard Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test).
ASTM G17	Standard Test Method for Penetration Resistance of Pipeline Coatings (Blunt Rod).

DNV

DNV RP-F102	Pipeline field joint coating and field repair of line pipe coating
DNV RP-F106	Factory applied external pipeline coatings for corrosion control.

European Norm (EN)

EN 10288	Steel Tubes and Fittings for Onshore and Offshore Pipelines - External Two Layer Extruded Polyethylene Based Coatings
EN 10289	Steel Tubes and Fittings for Onshore and Offshore Pipelines - External Liquid Applied Epoxy and Epoxy-Modified Coatings
EN 10290	Steel Tubes and Fittings for Onshore and Offshore Pipelines External Liquid Applied Polyurethane and Polyurethane-Modified Coatings
EN 10300	Steel tubes and fittings for onshore and offshore Pipelines - Bituminous hot applied materials for external coating
EN 10301	Steel tubes and fittings for on and offshore pipelines - Internal coating for the reduction of friction for conveyance of non corrosive gas
EN 10310	Steel tubes and fittings for onshore and offshore pipelines - Internal and external polyamide powder based coatings
EN 10329	Steel tubes and fittings for onshore and offshore pipelines - External field joint coatings

ISO

ISO 15741	Paints and varnishes - Friction-reduction coatings for the interior of on- and offshore steel pipelines for non-corrosive gases
ISO 20340	Paints and varnishes – Performance requirements for protective paint systems for offshore and related structures
ISO 21809	Petroleum and natural gas industries – External coatings for buried or submerged pipelines used in pipeline transportation systems: <i>Part 1: Polyolefin coatings (3-layer PE and 3-layer PP) (In preparation)</i> Part 2: Fusion-bonded epoxy coatings (issued 2007) Part 3: Field joint coatings (issued 2008) <i>Part 4: Polyethylene coatings (2-Layer PE) (In preparation)</i> <i>Part 5: External concrete coatings (In preparation)</i>

NACE

NACE 30105	Electrical Isolation/Continuity and Coating Issues for Offshore Pipeline Cathodic Protection Systems
NACE RP0105	Standard Recommended Practice Liquid-Epoxy Coatings for External Repair, Rehabilitation, and Weld Joints on Buried Steel Pipelines
NACE RP-0176	Corrosion Control of Steel, Fixed Offshore Platforms Associated with Petroleum Production
NACE RP0178	Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Surface.
NACE RP0188	Discontinuity (Holiday) Testing of Protective Coatings.
NACE RP0191	Application of Internal Plastic Coatings for Oilfield Tubular Goods and Accessories
NACE RP0193	External Cathodic Protection of On-Grade Carbon Steel Storage Tank Bottoms

NACE RP0198	Control of Corrosion Under Thermal Insulation and Fireproofing Materials - A Systems Approach
NACE RP0274	High-Voltage Electrical Inspection of Pipeline Coatings
NACE RP0303	Standard Recommended Practice Field-Applied Heat-Shrinkable Sleeves for Pipelines: Application, Performance, and Quality Control
NACE RP0304	Design, Installation, and Operation of Thermoplastic Liners for Oilfield Pipelines
NACE RP0375	Field-Applied Underground Wax Coating Systems for Underground Pipelines: Application, Performance, and Quality Control
NACE RP0394	Application, Performance, and Quality Control of Plant-Applied, Fusion-Bonded Epoxy External Pipe Coating
NACE RP0399	Plant Applied, External Coal Tar Enamel Pipe Coating Systems: Application, Performance, and Quality Control

NACE SP0490	Holiday Detection of Fusion-Bonded Epoxy External Pipeline Coatings of 250 to 760 μm (10 to 30 Mils)
NACE TM0102	Measurement of Protective Coating Electrical Conductance on Underground Pipelines
NACE TM0104	Offshore Platform Ballast Water Tank Coating System Evaluation
NACE TM0105	Test Procedures for Organic-Based Conductive Coating Anodes for Use on Concrete Structures
NACE TM0174	Laboratory Methods for the Evaluation of Protective Coatings and Linings Materials on Metallic Substrates in Immersion Service
NACE TM0185	Evaluation of Internal Plastic Coatings for Corrosion Control of Tubular Goods by Autoclave Testing
NACE TM0186	Holiday Detection of Internal Tubular Coatings of 250 to 760 μm (10 to 30 Mils) Dry Film Thickness

NACE TM0204	Exterior Protective Coatings for Seawater Immersion Service
NACE TM0299	Corrosion Control and Monitoring in Seawater Injection Systems
NACE TM0304	Offshore Platform Atmospheric and Splash Zone Maintenance Coating System Evaluation
NACE TM0384	Holiday Detection of Internal Tubular Coatings of Less Than 250 Micrometers (10 mils) Dry-Film Thickness
NACE TM0404	Offshore Platform Atmospheric and Splash Zone New Construction Coating System Evaluation

NORSOK

NORSOK M-501	Surface preparation and protective coating
---------------------	--

EEMUA

EEMUA 194	Guidelines for Materials Selection and Corrosion Control for Subsea Oil and Gas Production Equipment
------------------	--