

ENGINEERING STANDARDS DETAILS

This reference table is provided to outline the details of each Engineering Standard.

Number	Standard Name	Description
D01-101	Use of Engineering Standards	This standard provides specific requirements and general guidance for Engineering Standards. Included in this standard is a summary of the Project Engineer's responsibilities.
D01-102	Policy & Style for Engineering Standards	This standard provides style, format, and content requirements for the preparation of an Engineering Standard.
D01-103	Approval & Updating Procedures	This standard provides a general procedure for the review and approval of new or revised Engineering Standards.
D02-101	Design Basis, Electrical	This standard provides requirements, guidelines, and an overview of all related Company Engineering Standards used in the design of electric power supply and distribution systems, wiring and grounding systems, equipment and personnel safety systems, control systems, and measurement and control instruments used to power and control pipeline facilities.
D02-102	Design Basis, Main Line	<p>This standard presents requirements for the basic conceptual design approach for new or looped pipeline facilities for the transportation of crude oils, refined products, and natural gas liquids in the Company's pipeline system.</p> <p>This standard addresses conceptual design considerations and will serve to establish parameters and criteria on which detail designs and procedures will be based.</p>

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D02-103	Design Basis, Station & Terminal	<p>This standard provides the recommendations and design basis for conceptual and detail design of pipeline and support facilities specific to the pumping, metering, and storage of crude oil and petroleum products.</p> <p>This standard directs the Project Engineer to the specific detailed engineering standards associated with the design of stations and terminals.</p>
D02-104	Hazardous Area Classification	<p>This standard provides design requirements for the classification of areas for the installation of electrical equipment at pipeline facilities, where flammable and combustible liquids are handled or stored.</p>
D02-105	Fire Protection, Extinguishment	<p>This standard provides the design and installation requirements for the application of fire protection systems to the transportation, metering, and storage of crude oil, natural gas liquids, and petroleum products. It includes the requirements for materials, design, procurement, manufacture, inspection, and testing. The fire protection systems presented in this standard include only the system design and installation parameters of the equipment required for fire extinguishment. Fire, vapor detection, and alarms are presented in separate standards.</p>

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D02-106	Noise & Acoustic Dampening	<p>This standard provides technical parameters for noise measurement and the design requirements of new and retrofit acoustic dampening systems.</p> <p>In addition, reference is made to regulations for acceptable noise levels intended to maintain the health and safety for worker exposure and/or the impact on public dwellings or public lands surrounding pipeline facilities. Included are discussions pertaining to noise level predictions relating to equipment selection.</p>
D02-107	Station Manual, Preparation	<p>This standard provides requirements for the compilation of or additions to station manuals, as a result of the addition of new plant, equipment, or facilities.</p>
D03-101	Pipeline Corrosion Assessment	<p>This standard provides assessment procedures and acceptance criteria for both external and internal pipeline corrosion, which exceed the tolerable limits specified in the Company's Operating and Maintenance Procedures Manual. External and internal pipeline corrosion shall be determined by either on-site inspection or by high resolution magnetic flux leakage internal inspection instruments.</p>

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D03-102	Integrity Assessment, Oil Storage Tank	<p>This standard provides criteria for the assessment and repair of crude oil storage tanks designed and constructed to API Std 650. The standard is intended to supplement API Std 653: Tank Inspection, Repair, Alteration, and Reconstruction, only in the areas of integrity assessment. Matters relating to tank modifications are outside the scope of this document and are covered in the Company's Operating and Maintenance Procedures Manual. Further, the scope of this standard is essentially restricted to the assessment of pressure retaining and structural elements, when failure of such could result in leakage or rupture.</p>
D03-103	Internal Inspection, Main Line	<p>This standard establishes criteria to coordinate and conduct the assessment of pipelines, using various types of internal inspection tools (pigs). It covers the reasons for internal inspection and outlines the use of these tools in an inspection program.</p> <p>Operational conditions for planning and preparing a line for pigging and requirements for running various types of tools are presented.</p>
D03-104	Weld Inspection	<p>This standard provides procedures for quality control of welded construction. Welding quality control applies in the construction of pipelines, pipeline stations and terminals, tanks, and support structures.</p>
D03-105	Shop Inspection	<p>This standard provides guidelines for the Project Engineer and the Purchasing Department to inspect and expedite manufactured products and components, primarily at the manufacturer's facilities.</p> <p>The guidelines in this standard shall be used in conjunction with Company equipment</p>

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		<p>specifications, industry codes and standards, and jurisdictional regulations, as applicable.</p> <p>This standard does not attempt to cover mandatory compliance requirements for the various commodities with industry codes and standards or jurisdictional regulations.</p>
D04-101	Cathodic Protection	This standard provides design requirements for the cathodic protection of the Company's metallic underground structures, which include station and terminal piping systems, tank bottoms, main line pipe, and associated appurtenances.
D04-102	Painting, Coating, Lining	This standard provides direction and insight to the Project Engineer regarding the selection and application of paints, coatings, and linings, for the planning and execution of projects.
D05-101	Berm, Containment	This standard provides design requirements for the construction of earthen containment berms used in either oil storage tank lots or station and terminal environmental security/drainage control applications.
D05-102	Site Preparation, Earthwork, Grading, Roads, & Pavement	This standard establishes the minimum design requirements for site preparation, earthwork, grading, roads, and pavement.
D05-103	Trenches, Underground Lines	This standard establishes the minimum design requirements for the construction of trenches and installation of underground lines, including sewers, water lines, and pipelines.
D05-201	Foundation, Oil Storage Tank	This standard provides design requirements for the construction of earth foundations placed on native, undisturbed soil to support vertical, cylindrical, above ground oil storage tanks.

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D05-202	Foundation, Station & Terminal	This standard establishes the minimum design requirements for the construction of both shallow and deep reinforced concrete foundations, including foundations for pipes, valves, platforms, buildings, and equipment.
D05-301	Building, Station & Terminal	This standard provides design requirements for pre-engineered metal buildings for installation at the Company station and terminal facilities.
D05-302	Laboratory, Sample, Sample Storage Buildings	This standard provides design requirements for the specification and design of laboratory, sample, and sample storage rooms or buildings. It is intended to meet or exceed the minimum requirements of the standards listed below. It includes guidelines for product sample storage and is applicable for all facilities where product samples are stored, analyzed, tested, or otherwise handled, such that hydrocarbon vapor may be released in the course of routine activity.
D05-401	Platforms, Stairs, Ladders	This standard provides the design requirements for the fabrication of structural steel members, including platforms, stairs, and ladders.
D06-101	Piping Design & Construction, Main Line	This standard presents the minimum technical design requirements for new construction of and repairs to main line piping. This document covers the purely technical aspects of main line design projects and should be used in conjunction with Engineering Standard No. D02-102: Design Basis, Main Line, for a comprehensive presentation of main line project requirements and considerations.
D06-102	Piping Design, Station & Terminal	This standard provides minimum design requirements for all above and below grade piping systems within stations and terminals, including crude oil, natural gas liquid, and refined petroleum products service. Station and terminal piping is defined as piping located

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		within the boundary of station isolation valves. This standard is intended for design of piping systems for new facilities or modifications and repairs to existing stations and terminals.
D06-103	Crossing Design, Main Line	This standard establishes the criteria for administration, environmental assessment and design of crossings of foreign facilities by the Company, and the crossing of the Company by foreign owners.
D06-104	Pipe & Fittings, Steel	This standard provides parameters for the selection and use of steel line pipe, fittings, and flanges larger than 168.3 mm (NPS 6), in non-sour crude oil, natural gas liquids, and petroleum product pipeline systems. It presents the Company's requirements for material, design, procurement, manufacture, inspection, and testing, and shall be used in conjunction with the manufacturing standards and other industry standards listed in Clause 2.
D06-105	Valves, Steel	This standard provides design requirements for flanged, butt weld end, and wafer type steel valves for use in crude oil, natural gas liquid, and petroleum product pipeline systems. It includes the requirements for materials, design, procurement, manufacture, inspection, and testing.
D07-101	Pumps, Main Line	This standard provides design requirements for horizontal, centrifugal, single, and multistage main line pumps in crude oil, natural gas liquids, and petroleum product services. Also included are the requirements for materials, design, procurement, manufacture, inspection, and testing.
D07-102	Pumps, Booster	This standard provides design requirements for centrifugal, single, and multistage booster pumps and associated driver for use in crude

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		oil, natural gas liquids, and petroleum product services. Also included are the requirements for materials, design, procurement, manufacture, inspection, and testing.
D07-201	HVAC, Building, Station & Terminal	This standard provides the design and installation requirements on new construction for the heating, ventilating, and air-conditioning (HVAC) systems for buildings, stations, and terminals.
D07-202	Heat Tracing	This standard provides design requirements for electric heat tracing of main line pump seal oil drain lines and associated instruments, mechanical, float type level instruments mounted on underground oil collection sump tanks, and all other instruments which may require heat tracing cables for proper operation.
D07-203	HVAC, Pipeline Maintenance Building	<p>This standard provides the design and installation requirements for the maintenance building heating, ventilation, and air-conditioning (HVAC) system. The HVAC system shall be designed and installed to satisfy the requirements of the following facilities:</p> <ul style="list-style-type: none"> • building heating and general ventilation; • welding shop ventilation and makeup air system; • office and lunch room HVAC system; • storage room ventilation; • vehicle local exhaust system and carbon monoxide detection system; and • washroom and locker room exhaust system.
D07-301	Sump System Design	This standard provides design requirements for crude oil and product sump systems, incorporating horizontal, cylindrical, underground, atmospheric sump tanks, and

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		associated equipment and piping. The standard includes requirements for materials, design, fabrication, inspection, and testing.
D07-302	Flare Stacks & Pits	This standard provides design requirements for HVP and natural gas liquids flare stacks and flare pits, including horizontal and vertical flare tips, ignition systems, flashback prevention devices, flare knockout separators, and all associated accessories and controls. This standard includes requirements for materials, design, fabrication, inspection, and testing.
D08-101	Oil Storage Tanks	This standard provides design requirements for vertical, cylindrical, above ground, closed top, and open top welded steel oil storage tanks operating at atmospheric pressure, and includes the requirements for materials, design, procurement, fabrication, erection, inspection, and testing.
D08-102	Oil Storage Tanks, Roofs	This standard provides design requirements for all external and internal roofs as applied to vertical, cylindrical, above ground, and welded steel oil storage tanks operating at atmospheric pressure, and includes the requirements for materials, design, procurement, fabrication, erection, inspection, and testing.
D08-103	Oil Storage Tanks, Accessories	This standard provides design requirements for the following oil storage tank accessories: <ul style="list-style-type: none"> • tank gauging system; • tank high level alarm switch; • tank mixer; and • tank temperature measurement system.
D09-101	Oil Measurement, Mechanical	This standard provides minimum design requirements for all custody transfer metering facilities. This standard meets and, in some cases, exceeds all the minimum requirements of

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		the standards listed below. In all cases, the Project Engineer must be familiar with the standards listed below and must comply with their provisions.
D09-102	Oil Measurement, Electrical	This standard provides the requirements and guidelines for the design of the oil measurement flow computer and associated instrumentation. This standard meets or exceeds the minimum requirements of the related standards listed below.
D09-103	Sampler	This standard provides engineering design requirements for the specification and installation of pipeline content samplers.
D10-101	Power System Design	<p>This standard provides an overview of all electrical power systems at Company facilities. It provides general design guidelines and requirements for estimating and preliminary design of Company power systems.</p> <p>In addition to providing an overview of all aspects of power system design, this standard provides design requirements for the following subjects that are not covered in related standards:</p> <ul style="list-style-type: none"> • system voltage selection; • power system configuration and layout; • transformer sizing and specification overview; • power factor correction; • motor starting methods; and • interlocking.
D10-102	Substation Design	This standard provides design requirements for Company substations, including general design requirements for the substation grounding system. Refer to Engineering Standard No.

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		D10-106: Substation Grounding, for detail design requirements for the layout and the design of the substation ground grid.
D10-103	Switchgear, Motor Control Center	<p>This standard provides design requirements for Company switchgear, related devices, and motor control center assemblies from the 4160V distribution bus at the substation down to utilization voltages of 480V and 120/208V.</p> <p>Included in this standard are design requirements for 4160V disconnect switches, circuit breakers, 4160V starters, 480V motor control center, and associated auxiliary devices.</p> <p>The scope of this standard is limited to switchgear that operates at or below 4160V (nominal). Design requirements for switchgear that operates above 4160V are provided by Engineering Standard No. D10-102: Substation Design.</p>
D10-104	Auxiliary Power Supplies	This standard provides requirements and guidelines for the design and installation of auxiliary power supplies, including engine driven standby generator systems, stored energy systems, and thermoelectric/photovoltaic energy systems.
D10-105	Power System Protective Relays	This standard provides protection schemes and design requirements for selecting and setting associated protective relays to protect Company AC distribution systems. This includes protection requirements for substation main power transformers and associated switchgear, 4160V and 480V feeders, and 4160/480V transformers. Motor protection is not covered in this standard; refer to Engineering Standard No. D11-103: Motor Protection, for details.

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D10-106	Substation Grounding	This standard covers design of grounding systems at Company substations. The criteria outlined here ensures grounding safety with respect to personnel and equipment and is specifically formulated to fit Company installations.
D10-107	Surge Protection, Insulation Coordination	This standard provides design requirements for the surge protection of Company substations, switchgear, capacitor banks, cable, and 4 kV motors.
D10-201	Wiring Methods	This standard provides requirements and guidelines for the design of wiring systems for pipeline electrical facilities. This standard is limited to cable type wiring systems for use at a supply voltage of 4160V or less.
D10-202	Grounding Methods	This standard provides guidance and mandatory requirements for the design of electrical and nonelectrical grounding systems for use at Company pipeline stations, terminals, metering stations, and other related facilities.
D11-101	Motor, Main Line Pump	This standard provides design requirements for squirrel cage induction motors for driving main line centrifugal pumps in crude oil, natural gas liquids, and petroleum product services. Also included are the requirements for materials, design, procurement, manufacture, inspection, and testing.
D11-102	Variable Frequency Drive	This standard provides design requirements and guidelines for the installation of large variable frequency drives for use with medium voltage (4 kV) induction motors on main line pumps in new and retrofit applications.

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D11-103	Motor Protection	This standard covers electrical protection requirements of main line induction motors. Motors in this category are rated 4000V and vary in size from 500 to 5000 hp.
D11-201	Lighting, Indoor	This standard provides design requirements for industrial building lighting as used in the Company's stations, terminals, and other facilities.
D11-202	Lighting, Outdoor	This standard provides design requirements for industrial outdoor lighting used in the Company's stations, terminals, and easements.
D11-301	Valve Actuation & Control	This standard provides design requirements and guidelines for the installation and specification of electric and electrohydraulic types of valve actuators used in pipeline service for crude oil and refined products.
D12-101	Control, Pump Station	This standard documents the pump station control system operation and philosophy. It also outlines the general procedures to follow if a change in operation of the system is necessary.
D12-102	Control, Injection, & Delivery Facilities	This standard provides requirements and guidelines for designing the control system for Company receipt, injection, and delivery facilities.
D12-103	Pressure Control Valves	This standard provides design requirements governing the sizing, selection, and installation of steel valves used for throttling and pressure control applications. Design criteria for control valve actuators is also covered within the scope of the standard.
D12-104	Pressure Relief	This standard presents policy and design requirements for pressure relief for main line and station.

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D12-201	Instrumentation, General	This standard, along with other Company and industry standards and recommended practices referenced herein, provides the basis for the selection and design of instrumentation necessary for the safe and efficient operation of the Company's pipeline systems.
D12-202	Gas Detection	This standard provides design requirements for the selection and installation of gas detection instrumentation at Company field facilities.
D12-203	Fire Detection	This standard provides design requirements for fire detection as used in the Company's stations, terminals, and easements.
D12-204	Vibration Monitoring	<p>This standard provides design requirements and guidelines for:</p> <ul style="list-style-type: none"> • the selection and installation of vibration monitoring equipment; • the specification of maximum vibration levels for factory acceptance and commissioning tests; and • the analysis of vibration signature records during factory acceptance tests.
D12-205	Programmable Logic Controllers	This standard provides application and design requirements for the use of programmable logic controllers in the control and monitoring of the Company's facilities, such as pumping stations, terminals, and delivery and receipt sites.