

DEP SPECIFICATION

**SELECTION AND APPLICATION OF SYNTHETIC ROPE
FOR WET TOWING OF LARGE OFFSHORE STRUCTURES**

DEP 37.90.10.34-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for towing Large Offshore Structures (TLPs, SPARs, SEMIs, FPSOs, etc.) using synthetic rope. It includes selection, specification, rigging and abrasion protection, and proof testing of specific applications for synthetic rope and is a supplement to DEP 37.81.10.19-Gen. Marine Operations Requirements – Loadout, Transportation and Installation Deepwater Structures (Based on ISO 19901-6).

The purpose of this DEP is to establish strength standards for the use of synthetic rope for the towing of large offshore structures. This DEP also includes recommendations for testing parameters and inspection criteria for synthetic ropes used for towing.

The term “*Synthetic rope*” used in this DEP is intended to mean ropes manufactured using aramid, HMPE, or LCAP type materials, otherwise known as high modulus materials, for the load bearing yarns. This DEP is NOT intended to be used for conventional modulus materials such as nylon (polyamides), polyester or polypropylene.

This DEP only applies for wet towing and positioning of permanent offshore structures from a temporary construction location to their final location. This DEP does not cover lifting and hoisting or towing of Mobile Offshore Drilling Units (MODUs) nor long-term mooring of offshore structures.

This is a revision of the DEP of the same number dated February 2014; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

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This DEP is intended for use in facilities related to offshore oil and gas production. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a mandatory requirement.

The word **should** indicates a recommendation that a certain course of action is preferred or particularly suitable.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Aramid	Aromatic polyamides that comprise strong and heat-resistant synthetic fibers. Para-aramids are a class of aramids, including Kevlar and Twaron, which are widely used due to their high tensile strength and tenacity.
Core	A parallel bundle of load bearing elements (e.g., subropes) in a synthetic rope.
Coastal Towing	Towing in waters less than 12 nautical miles off the coast line.
HMPE	High-Modulus Polyethylene material with fibers composed of exceedingly long molecules and a molecular weight in the 2 to 6 million range. The fibers have excellent abrasion resistance and very low coefficient of friction.
Inshore Towing	Towing in sheltered areas which are free of waves and swells from open sea.
LCAP	Liquid Crystal Aromatic Polyester material is a high modulus Polyester material similar to Aramid but with a high melting point. LCAP tolerates kinks, bends and knots better than HMPE.
MODU	Mobile Offshore Drilling Unit. A mobile drilling vessel, including jackups, drilling semisubmersibles and drillships.
Minimum Break Load (MBL)	The specified or stated minimum strength of the rope, which is verified by testing under certain conditions. The MBL is not a property of the rope.
Offshore Towing	Towing outside territorial waters more than 12 nautical miles off the coast line. Typically, the water depth can be considered deep and does not affect the tug's bollard pull or the motion characteristics of the towed platform.

Term	Definition
Positioning	The marine operation required to position and install the towed platform in the operating location during the installation campaign. Positioning is considered complete when the platform is attached to its permanent mooring system.
Restricted Area towing	Can be either coastal or inshore towing, where water depth limitations, shipping channels or other navigation hazards are present.
Strand	The principal component of the rope or subrope. The strand is formed by an assembly of yarns which are grouped together. The strands form a rope either by helical or braided arrangement.
Subrope	A component of the synthetic rope. Several subropes are assembled in a parallel bundle to form a load-bearing core.
Synthetic Rope	A synthetic line tailored for offshore towing under tensions with or without bending.
Temporary Safe Condition	A condition where the offshore structure can sustain the unrestricted environmental loads for a defined time period.
Termination Hardware	The component inserted in the rope eye to transfer the line loads from the synthetic rope segment to the connecting elements, usually the hardware is made of steel.
3-T	The load bearing capability of the synthetic yarn material is referred to as 3-T (triple T) since it depends on the combination of critical parameters: tension, temperature and time.
Unrestricted Operations	Operations with characteristic environmental conditions that were estimated according to long term statistics.
Wet Tow	Towing the floating platform from one location to another.
Weather Restricted Operations	Operations with defined restrictions to the characteristic environmental conditions. These operations are planned to be performed within a period of reliable weather forecasts.

1.3.3 Abbreviations

Term	Definition
BP	Certified Bollard Pull of Tug (in metric tonnes)
CFD	Computational Fluid Dynamic Modeling
DAF	Dynamic Amplification Factor
DEP	Design and Engineering Practice
DNV	Det Norske Veritas
E-B	Bending Efficiency Factor
E_{BP}	Bollard Pull Efficiency Factor
E_{TERM}	Rope Termination Efficiency Factor
F_{2P}	Two Part Sling Factor
FPSO	Floating Production Storage and Offloading facility
FOS	Factor of Safety
HMPE	High-Modulus Polyethylene
HSSE	Health, Safety, Security and Environment
IG	Industry Guidelines
ISO	International Organization for Standardization
LCAP	Liquid Crystal Aromatic Polyester
M	Meter
MBL	Minimum Break Load in metric tonnes
MOC	Management of Change
MODU	Mobile Offshore Drilling Unit
mT	Metric tonne
MWS	Marine Warranty Surveyor
RMS	Surface roughness, measured in microinches
RP	Recommended Practice
SEMI	Semi-Submersible Platform
Shell GSI	Shell Global Solutions, Inc.