Template and manifold
Goal

- Know the purpose and design requirements for templates
- Know the purpose and basic functions of a manifold

Codes and standards

The following standards are a selection normally used for template/manifold design. The code requirements will vary with customer preference and local legislation

- ISO 13628-15 Subsea structures and manifolds (2011)
- ISO 13628-1 General requirements and recommendations
- Steel structure: Eurocode 3
- NORSOK U-001 (Dropped objects)
- ASME B 31.3 (Process piping)
- ASME B 31.8 (Gas transmission piping)
- DNV-OS-F101 (Submarine pipeline systems)
- BS8010 Part 3
- DNV standards for planning and Execution of Marine Operation
**Templates**

- Guide, hang off and support to drilling and to the wellhead conductor
- Base for the subsea trees and the manifold

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**Template Design**

The design of the template will vary with:

- Location
  - Local legislation
- Installation methods
  - Moonpool, drillpipe, crane vessel, modular, barge or wet tow
- Pipeline methods
  - Horizontal or vertical flowline connection, pipeline forces,
- Protection requirements
  - Fishing gear protection, dropped objects
- Drilling methods
  - Suction of drill cuttings, cement suction, drill cutting injection
Template Foundations

- Based on seabed condition, the template be designed with:
  - **Mudmats** as foundation and provide bearing capacity to avoid settlements
  - **Washout sleeves** to avoid shortfall and fracture in seabed during 36" drilling
  - **Skirts** to penetrate seafloor for resist lateral forces and to provide friction against heave during installation
  - Mini **suction piles** or a large single suction pile to support vertical and horizontal loads on the manifold
Mini Suction Piles

Template foundations with skirts or mini-suction piles:

- Installed before main manifold so reduced weight
- Allow drilling taking place (normally one season prior to manifold installation)
- Each mini pile can be sucked down individually to adjust elevation
- Supports weight of manifold or template and anchors it in place on the seabed

Single Suction Piles

Key features:

- Supports vertical and horizontal loads on the template
- Also used as anchor foundations for FPSO or Semi-submersible moorings
- Installed partially by self weight and then by ROV deployed pump
- Can be recovered by reverse pumping
- May be designed so that orientation is not critical during installation
Fixed Template – Production Guidebase

Hinged Manifold / Template
Manifolds

A manifold is a system of headers, branched piping and valves used to gather produced fluids or to distribute injected fluids. The manifold should provide sufficient piping, valves and flow controls to safely gather produced fluids or distribute injected fluids such as gas, water or chemicals. (ISO 13628-1)

- The Manifold Module provides the interface between the production pipeline, flowline and well.
- Pipelines or flexibles normally interconnect the manifold.
- Collecting produced fluids from individual subsea wells.
- Distributing production fluids, inject gas, inject chemicals and control fluids.
- Distribute the electrical and hydraulic system.
- Several XT can be connected to the manifold.
- Satellite modules (if required) will be connected to the manifold via a flow line.

Manifold headers

Flowlines / piping are connected to one or two headers in the manifold. Two production headers have the advantage of:

- Increased flexibility in export options
- Increased flexibility for future tie-ins
- Increased production availability
- Possibility for installing a pigging loop
- Possibility for hydrate plug removal from two sides

...at the cost of increased complexity and weight
**Manifold Piping**

- 6” Branch Line To/From Well
- 5 1/8” Branch Valves
- 2” CI Valves
- Remote Actuated Valves
- 10” Main Header
- Pigging Loop Isolation Valve
- ROV Panel

**Manifold**
Manifold Piping

Snøhvit Subsea Concept

Notes
1) Annulus lines can be routed directly from the DPH to the manifold.
2) Gas injection to multiphase producer lines should be considered routed from DPH to choke module, suppressor, and chokes.

Legend:
- Produced oil line
- NEC supply line
- Gas line
- Annulus line
- Surface injection line
- Surface controlled valve
- ROV operated valve

Manifold deployment
Gemini

Gemini System Integration Test (SIT)
Manifold System Integration Testing (SIT)

Manifold and distribution System

Manifold centers w/o template function
Foundations

From ISO 13628-1

1. Riser joint
2. Applied moments
3. Environmental (current, wave action, snag loads, etc.)
4. Flowline connection
5. Soil reaction
6. Thermal

The two main methods used are:

1. The 30” suspension joint are suspended by drilling rig during cementing. Common for satellites.
2. The 30” suspension joint is hung off in a drilling guide base or in a template structure.

Soil condition, external loading capacity to wellhead and the installed infrastructure are selection criteria for the method. The load can be illustrated with trawl protection, riser loads and drilling loads.
Foundations

Two main methods for foundation.

Example of method 1

Example of method 2

Cluster Manifold

GE Oil & GAS: KIZOMBA manifold & foundation
Template Manifold

GE Oil & GAS: SKARV manifold & foundation

Template Manifold

GE Oil & GAS: Snøhvit manifold & foundation
Templates and Manifolds

Key takeaways:

- The purpose of a template
- Functions of a manifold
- Seabed foundations

Videos

- Installation of sub sea template Animation
- Super Pipeline construction of Ormen Lange marine natural gas pipeline
- Constructing Totals Dalia Field Part 9 - Installation of Manifold