

# AKER KVAERNER™



**Removal of Jacket structures by use of Buoyancy Tanks**  
**Date: 08.12.04.**  
**Jacket Float-Off.**

# Introduction

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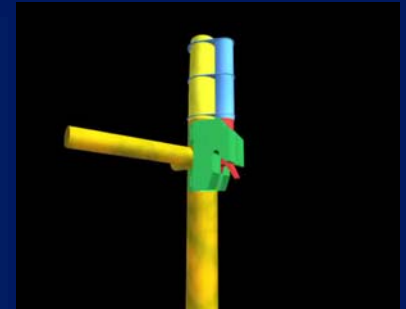
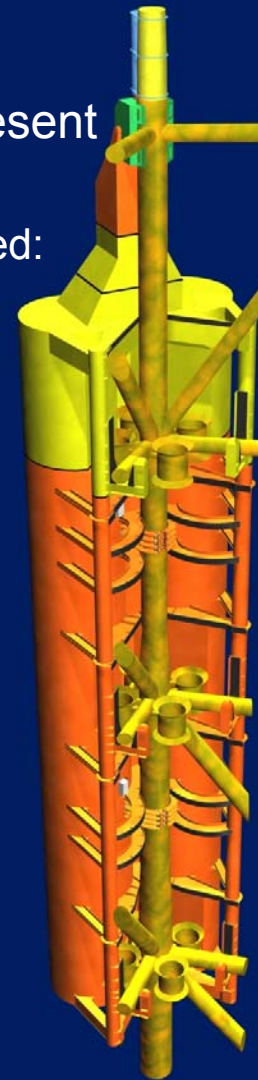
The following presentation will cover float up, transport and dismantling of large Offshore jackets using Buoyancy Tanks for single lift. The method will be used for removal of Frigg DP2 and Frigg QP jackets. Those jackets will be removed in 2007 and 2008.



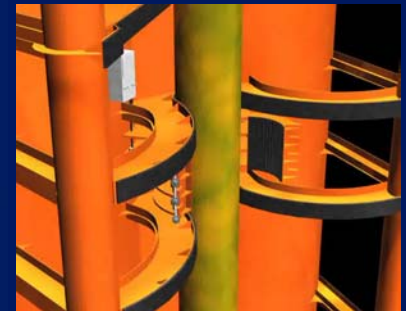
# Introduction

The Buoyancy Tanks consist of the following (present configuration):

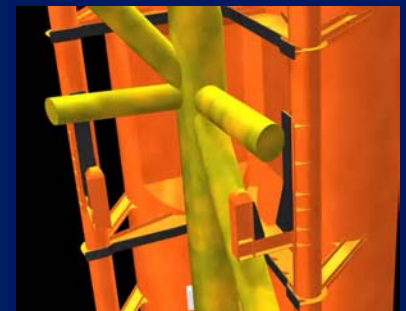
- Two independent tanks (1 tank assembly) connected:
  - Diameter: 6.0 meter (each tank).
  - Length: 50.0 meter
  - Weight: 410 tonne pr. leg (each assembly).
  - Total buoyancy: 1150 tonnes pr. tank (basis).
  - Basis is 10 meter float up and vertical tow to Stord
- Top bracket welded at Spider deck level.
- Clamps (2 off)
- Mating hooks
- Roll stoppers (Two sides)
- Separate clamp protection (and guides)



Top bracket



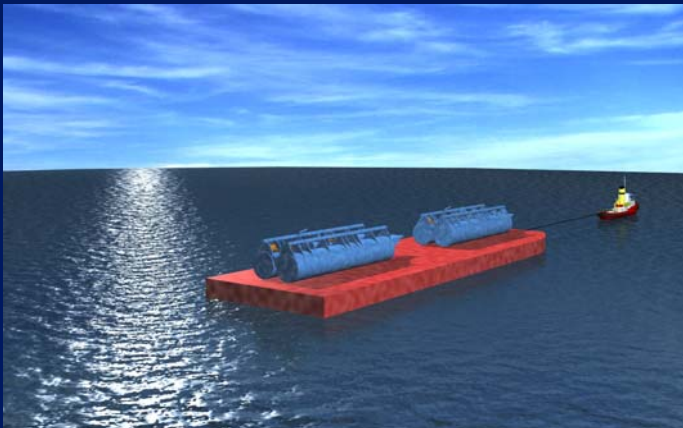
Clamps



Mating hooks

# Fabrication and transport

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- The buoyancy tanks will be fabricated and transported to a workshop for outfitting and testing. The tanks will be transported on barges from fabrication yard to the outfitting yard. The tanks will be lifted onto the quay for instrumentation and testing.
- The testing will consist of:
  - ✓ Instrumentation of tanks.
  - ✓ Dry functional test of support and control system.
  - ✓ Wet upending test.
  - ✓ Dismantle and pack /prepare of system/equipment for offshore transport
- The tanks will be towed to the field using minor tractor tugs (45 tonnes).



Transport to outfitting quay.



Testing and completion

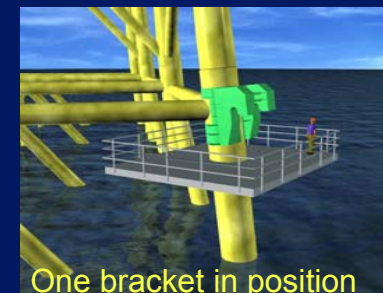
# Preparation at the platform one year prior to float up.

## Above water.

As a general assumption, the preparation will be performed while all topside facilities are intact and it is possible to live on the platform. As an alternative an accommodation vessel must be used.

The following activities will take place:

- Installation of winces for tie in of tanks (to be placed on the deck)
- Pull in of the wires used for installation of tanks.
- Installation of brackets.
- Installation of fairleads.
- Clean the surface which will be underneath the brackets.
- Removal of boat bumpers or other obstacles underneath the brackets.
  - Remove by RAT (climbers) and oxy-acetylene, thermal lancing, diamond wire and/or guillotine saw



## Preparation at the platform one year prior to float up, Subsea.

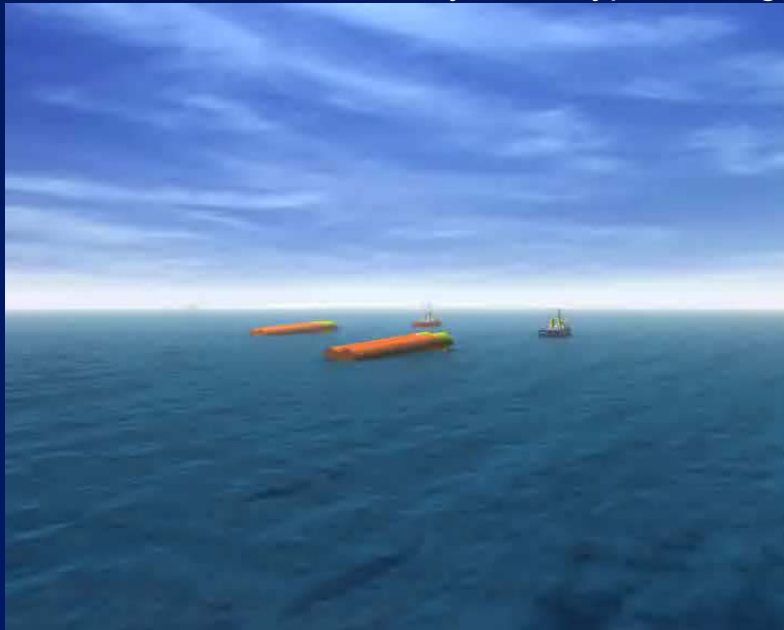
All the subsea activities will be performed using ROV.  
No divers will be used. The following activities will be performed:

- Removal of risers, hoses and cables (method independent).
  - Cut loose at seabed, ROV assisted w/DWCM or Water Grit as best suited.
- Installation of fairleads/rollers used during installation of the tanks.
- Inspection and removal of obstacles along the jacket legs. This may be:
  - Anodes
  - Risers
  - Pile guides (only to be removed if major conflict with BT is expected).
- Relevant inspections.



# Tow of the tanks from outfitting yard to the Field.

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- The first two tanks will be towed from the outfitting yard to the Field using one tug (45 tbp) for each tank.
- One tank is moored while first tank is being installed by use of winches/wires and assisted by two tugs.
- During first installation, the third tank will arrive to the field and moored in the same mooring configuration as the first.
- The third tug will return to the outfitting yard and collect the last buoyancy tank.
- Total duration: 6-10 days for a typical 8-legged jacket.



Tow from the outfitting yard to the Field.



Upending to vertical position.

# Installation of the tanks.

- Pulling winch (40 tonnes) will be positioned at Cellar deck. As a base case, the topside and modules will still be on during this operation. If the modules have been removed, the winces must be installed when the last module is lifted off.
- Horizontal pulling lines are activated to bring the BT in contact with the jacket.
- Roll stoppers and mating hooks are equipped with rubber that acts as shock absorbers.



One tank moored while the first one is installed.

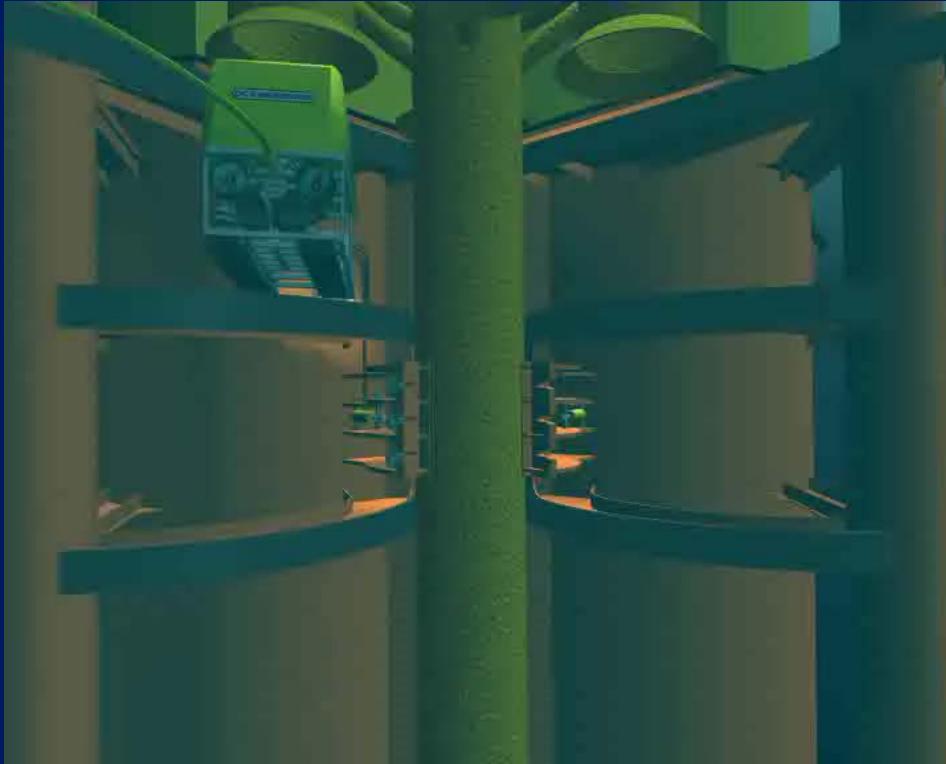


Pull in below surface



# Installation of the tanks.

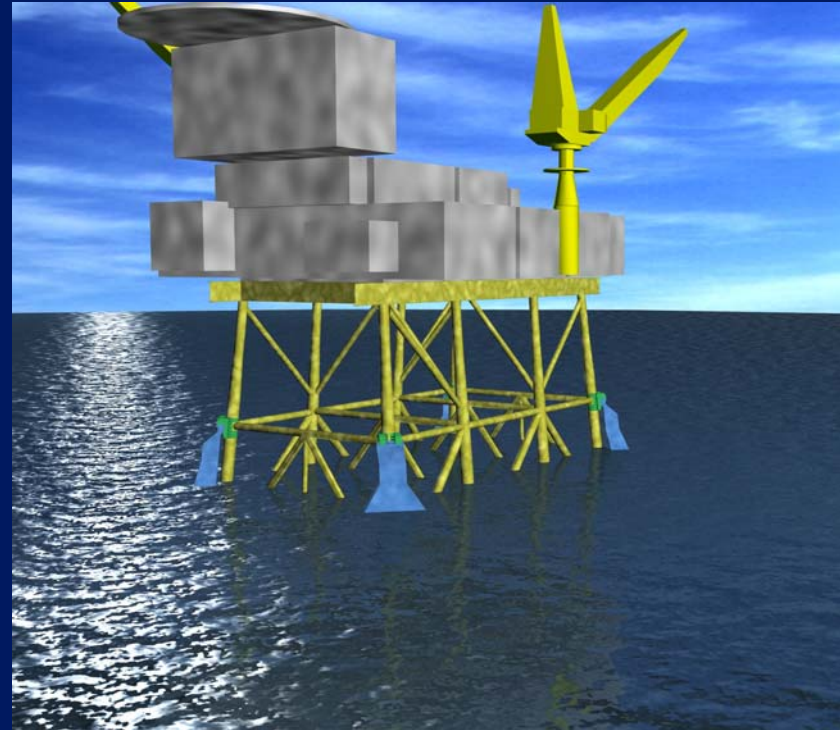
- ■ ■ ■
- All subsea work will be without use of divers. All operations takes place using ROV.
- When the hooks are in position and upper part of BT properly attached into the brackets, the BT assembly is calm and closing of the clamps can commence.
- The clamp are closed assisted by ROV. The ROV also tighten up the bolts when vertical loads are transferred to the top-bracket.



ROV closes the clamp.

# Preparation for float up.

- When all tanks are installed, the hoses, instrument cables etc. that shall be used during float up will be routed from the tank top along Spider deck and fastened at Cellar deck level.
- One manifold will be installed in the same location and tested.
- Hoses, cables etc. from the manifold will be prepared in order to be retrieved from a vessel prior to the actual float up.
- When the above is completed, no more jacket removal activities will be performed until all modules have been removed.
- The winch position will vary from platform to platform.
- In a position with all tanks installed, the jacket shall be able to resist a 100 year summer storm if the topside removal is assumed to last more than 30 days.



## Float up. Cutting of Piles (Method independent)

- If the MSF can remain on the jacket during float up and tow to Stord, Diamond Wire Cutting technique will be used. The reason for this is that there are no internal access in the legs/piles.
- If internal access can be provided, cutting by use of water grit can be used.



Diamond wire cutting (in figure above represented by Tecnospace DWC)

# Float up

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- The float up operation will be controlled from the main vessel. The platform will be unmanned during all preparatory work and the float up operation.
- The cutting of the piles will start after the modules have been lifted off.
- The main tugs will connect themselves to the jacket prior to the final cuts.
- All, except for two piles, one at each corner, will be cut before the actual float up starts.
- When the float up starts, the final cuts will be taken with two individual systems (from boat) and one in backup.



Float up.

# Float up

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  - After the jacket w/MSF has been elevated 10 meters, tow to Stord and Eldøy Decommissioning Yard will commence. Estimated tow speed: 2-3 Knots.



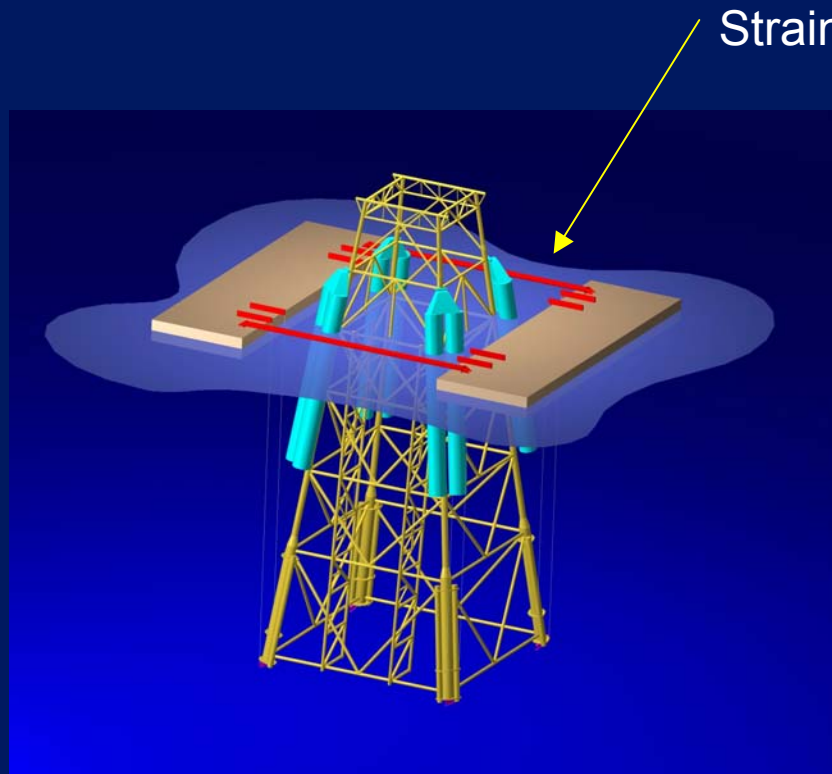




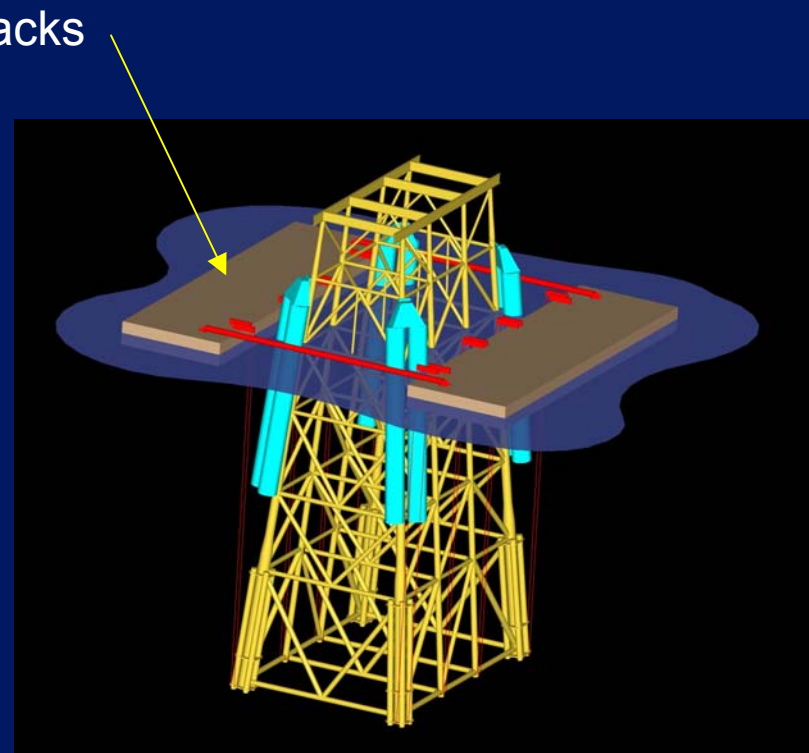


# Inshore Demolition of Jacket Structures

Slide showing typical jackets after strain jacks are attached.

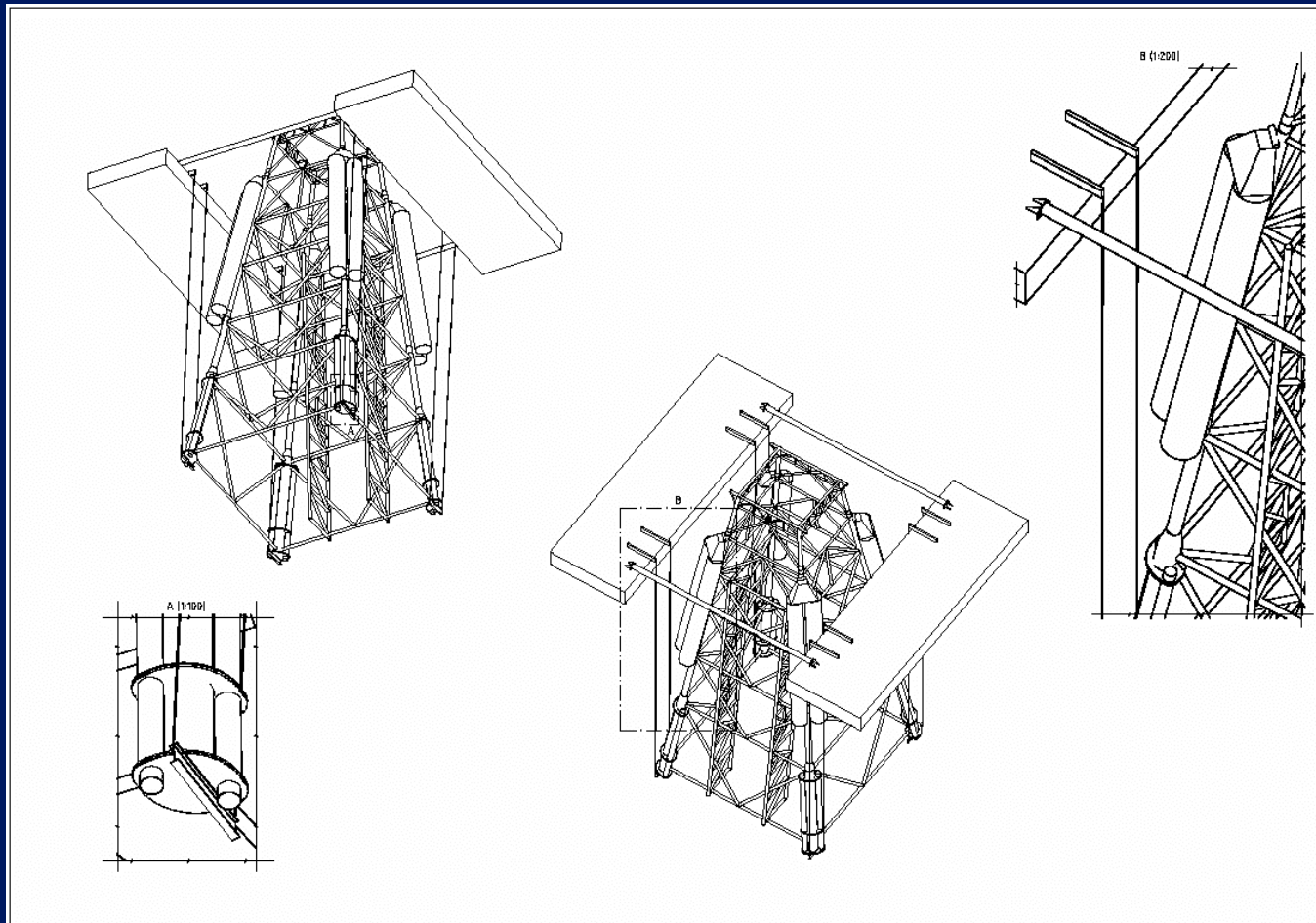


Miner jacket, including MSF



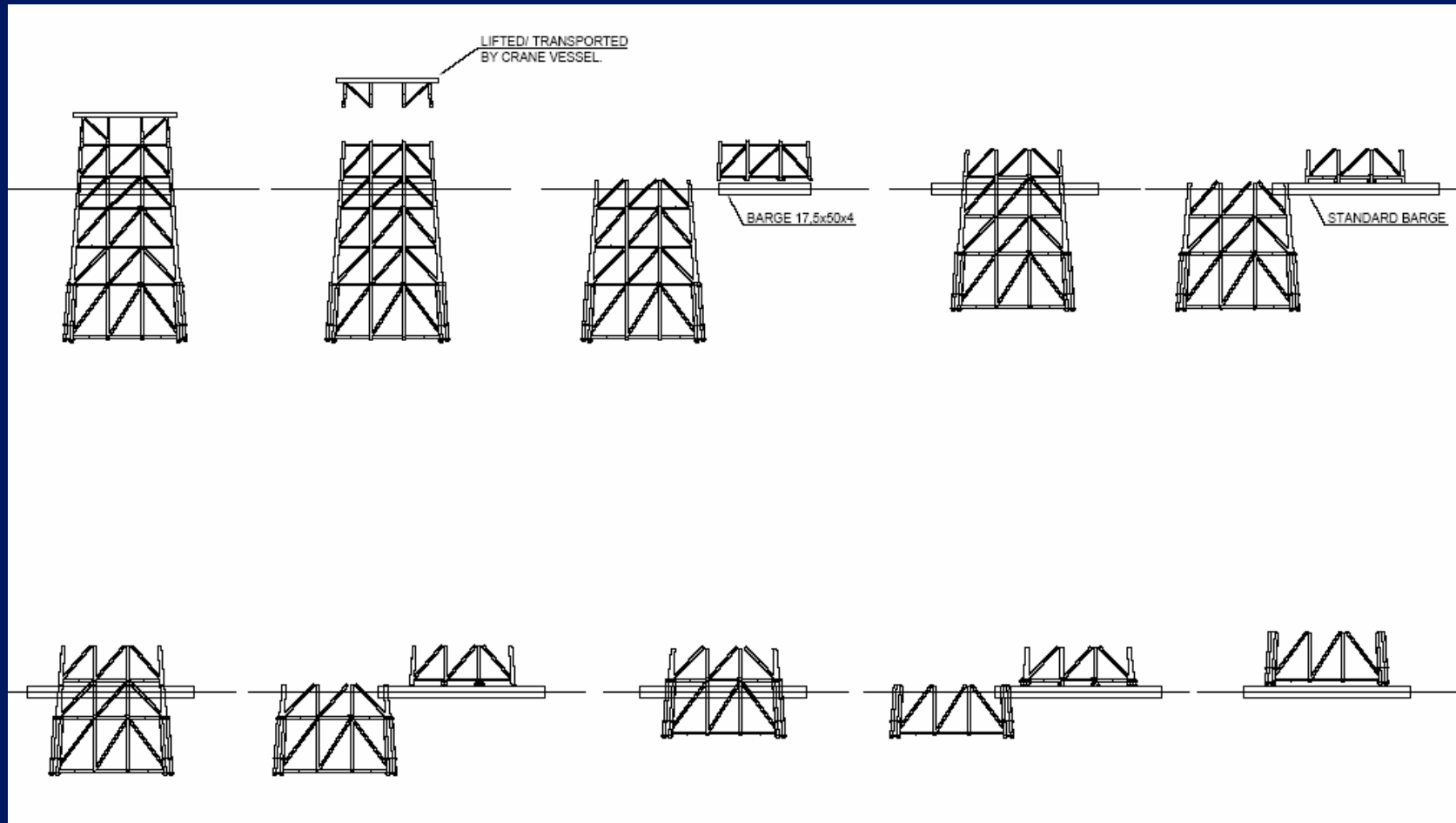
Large jacket, including MSF

# Inshore Demolition of Jacket Structures, cont'd



Showing typical how the jacking system is attached to the jacket.

# Inshore Demolition. Deconstruction by use of barge.



# Summary

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- Cost efficient method for large jacket structures
- Single lift technology.
- No divers, only ROV.
- Limited offshore work.
- Independent of HLV
- Vertical tow to shore.
- Buoyancy in each assembly is 1400 tonnes
- All vertical load to be taken by bracket at Spider deck.
- Traditional offshore work transferred inshore.

Slogan.

Up & TOW