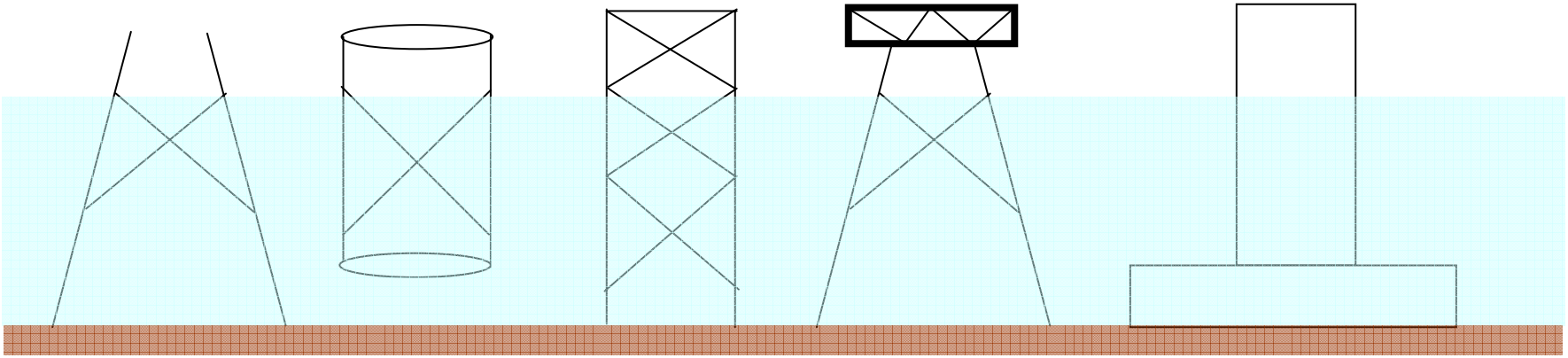
Basic Offshore Configuration and Installation Concepts.

Standard Offshore Module Support Structure Concepts



Fixed Jacket No MSF | **DDCV (Spar)** | **Compliant Tower** | **Fixed Jacket with MSF** | **GBS (Gravity Based Structure)**

Fixed Jackets are usually from 4 to 8 hollow legs. Some jackets have gone up to 12 or so legs.

After setting a jacket, piles are driven either through the legs, or through a pile clusters attached to the jacket legs.

Jackets are used in waters less than 1,000 feet in depth.

"Bullwinkle" was in 1,500 feet.

Compliant Towers-similar to Fixed Jackets.

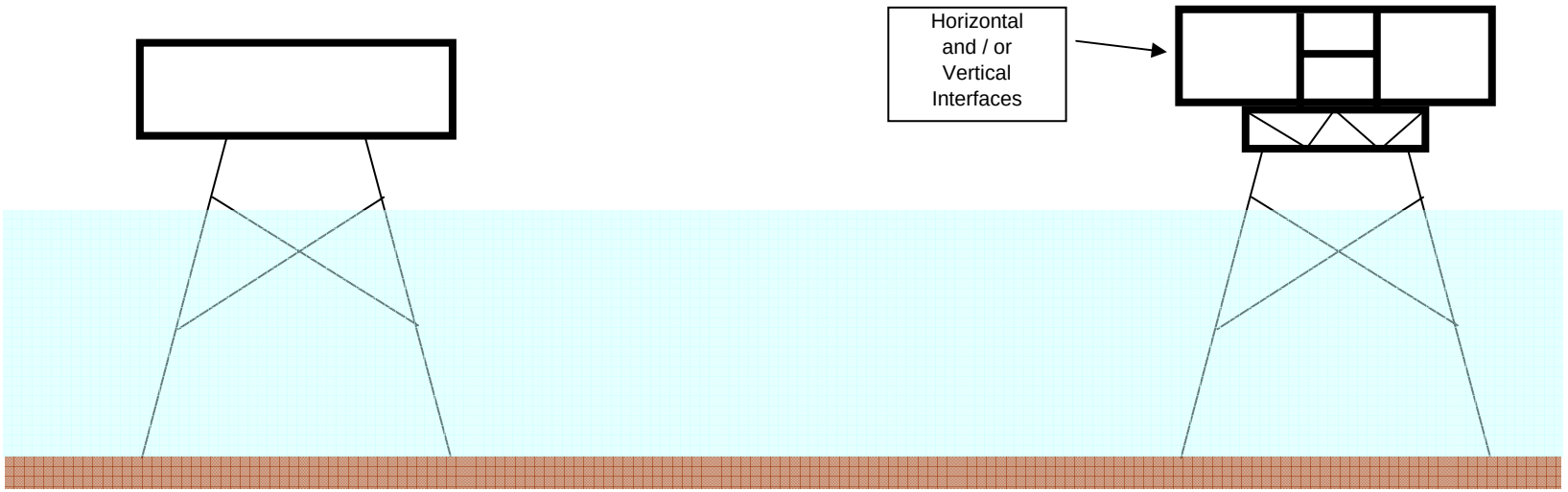
DDCV (Deep Draft Caisson Vessel) - also referred to as a Spar, are floating structures which are anchored and serve as a support for modules. Water depth is not a consideration except it must be deep.

With current technology, there are roughly 50 different configurations for this type of structure.

An MSF, a "module support frame", is placed on a jacket to provide an area of sufficient footprint size so when modules are placed on the structure, it maintains its stability. In most cases, the MSF becomes the "Cellar Deck".

Gravity based structures are constructed of many materials including concrete and steel. The configurations may include a single support riser (monopod), or multiple support risers (quadropods).

Module(s) on fixed Support Structure Concepts



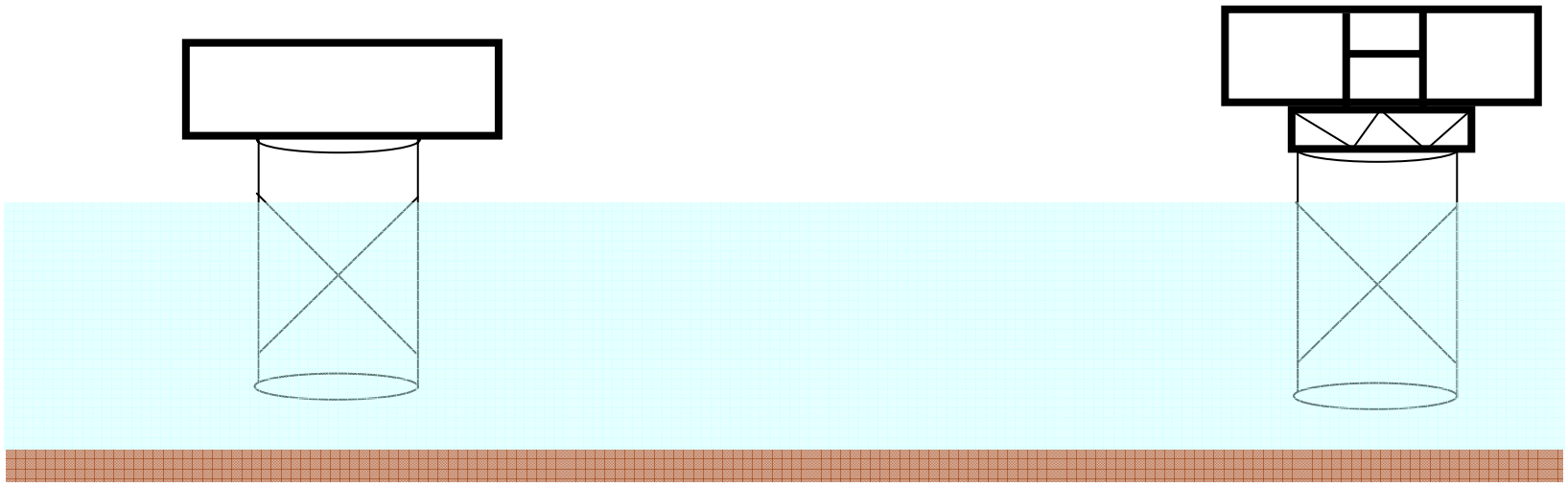
Single Module
Fixed Jacket
No MSF

Multi Module
Fixed Jacket
with MSF

A standard platform configuration will probably have the following decks:

Drill Deck
Production Deck
Cellar Deck

Module(s) on floating Support Structure Concepts



Single Module
DDCV
No MSF

Multi Module
DDCV
with MSF

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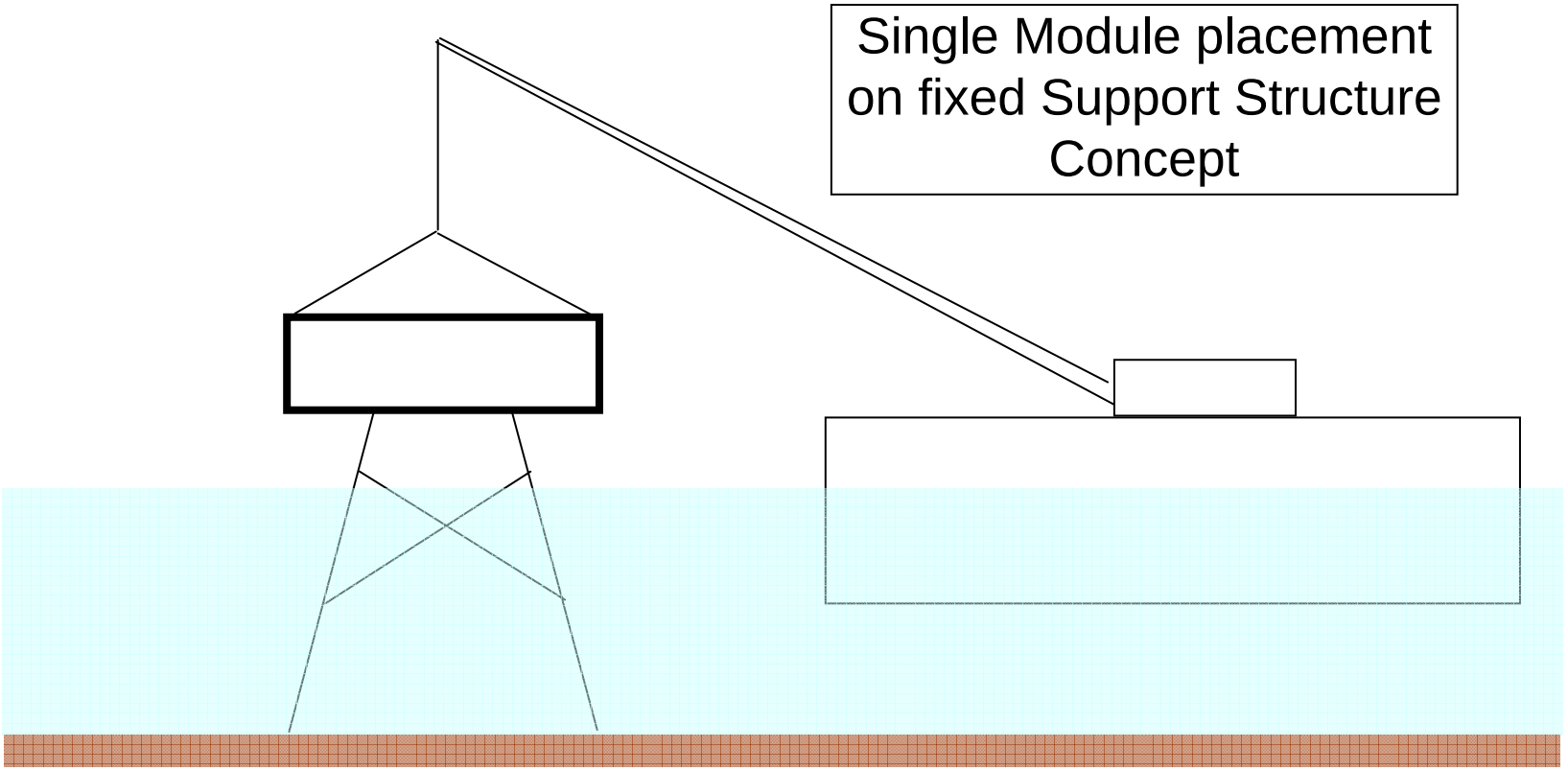


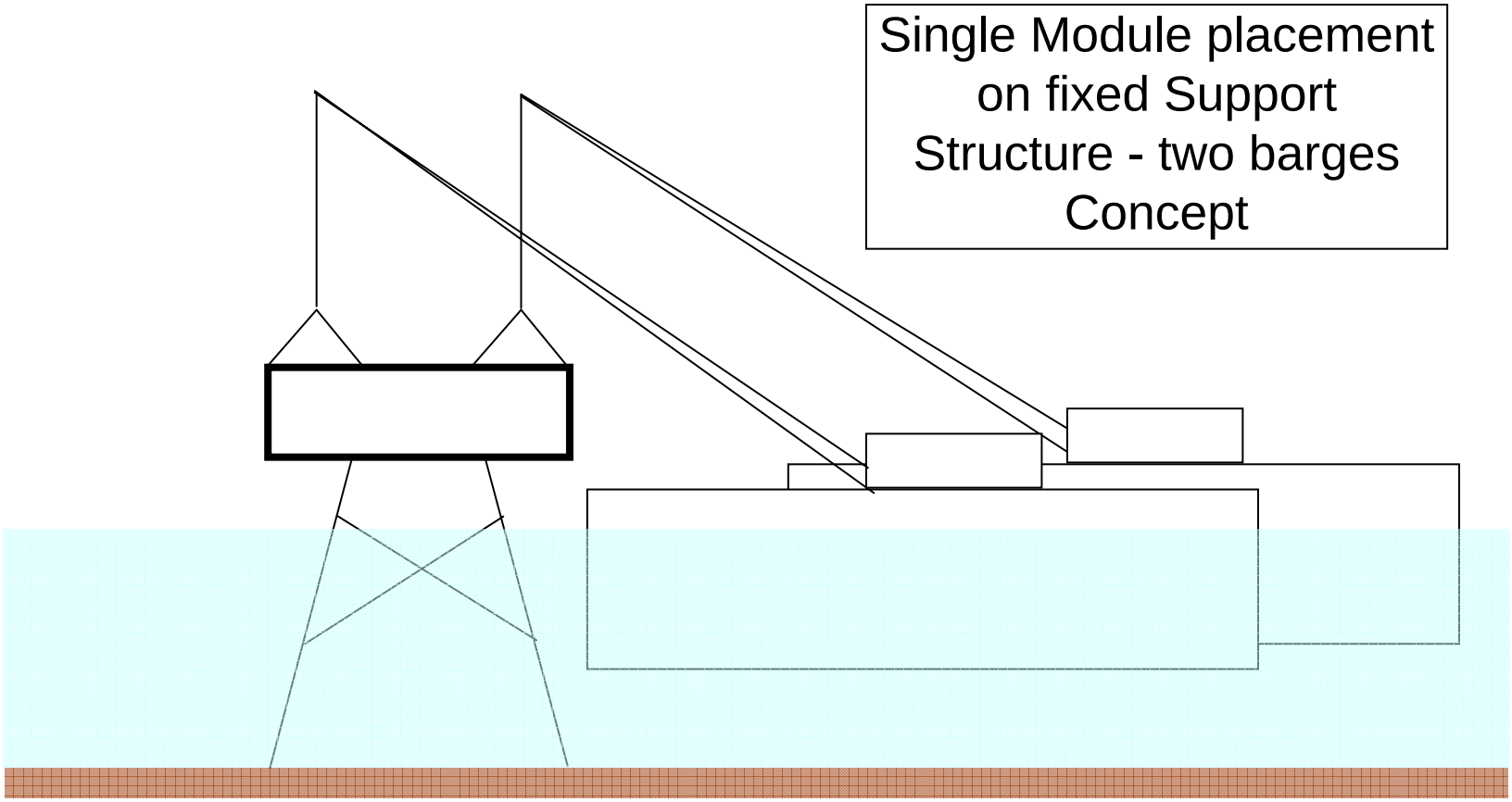
Single Module
Fixed Jacket
No MSF

Lift Barge
Setting One
Module

A single lift (one module) minimizies the amount of hook-up and commissioning (HUC) work that will need to be done off-shore.
A lift of over 3,500 tons is usually accomplished by a heavy lift vessel (HLV). These vessels are usually based in the North Sea and the mobiliztion costs generally force floatover scenarios in Far-Eastern projects.

A HLV requires a calm sea state for less time than a floatover (2-3 hrs vs 24 hrs) and is preferred by many because there is a lot more experience with this type of module placement.

As of year end 2002, the lift of the "Ringhorne "Deck at 11,400 tons sets the upper limits for a single lift.



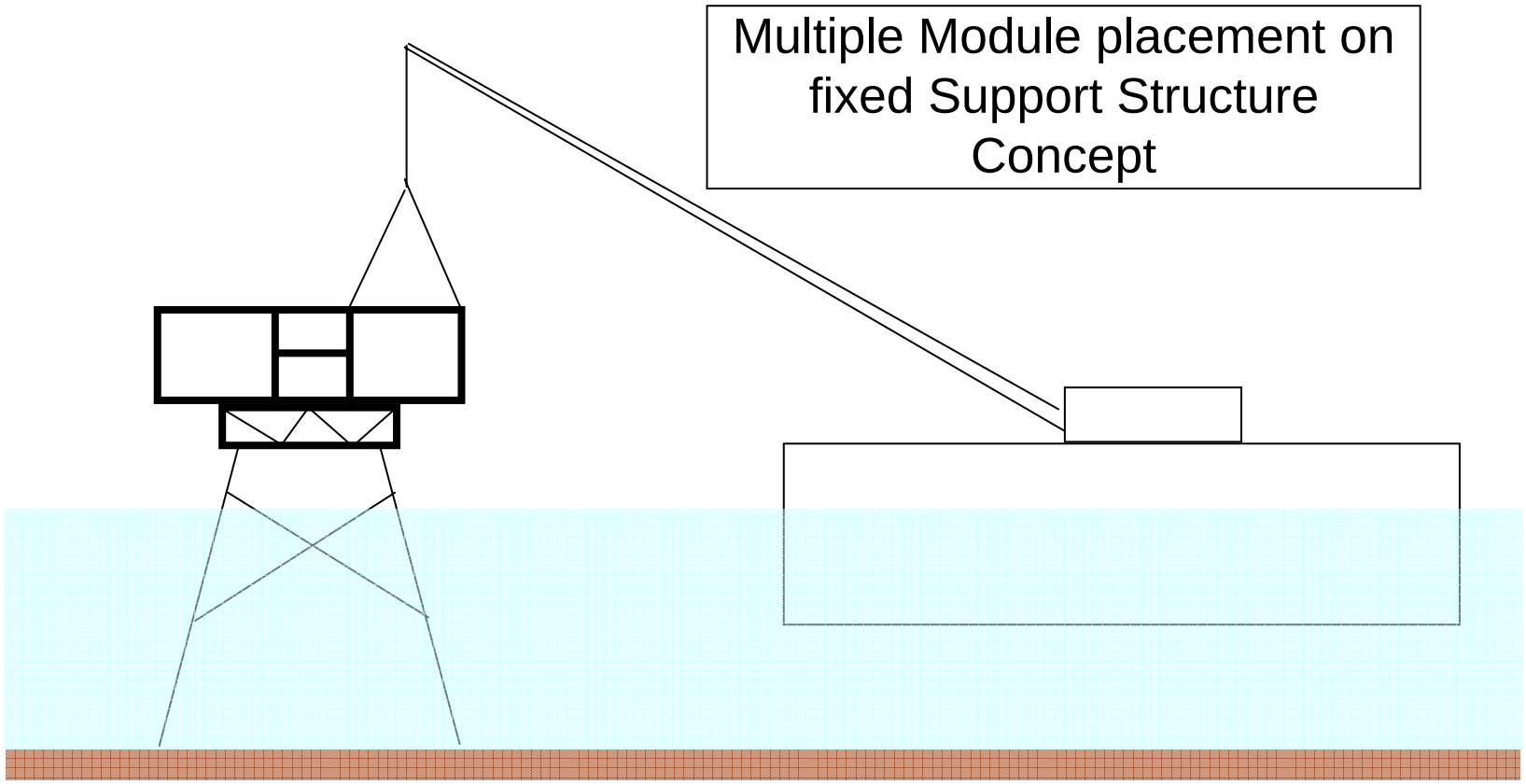
Single Module
Fixed Jacket
No MSF

Two Lift Barges
Setting One
Module

At times, two barges are used together to lift one module (large) to ensure the crane capacity is sufficient.

The barges may be placed on each side of the module.

Another lift style involves two cranes on the same barge.



Multi Module Fixed Jacket With MSF

Lift Barge Setting One Module

With multiple modules, the weight is usually less and will allow a more conventional (cheaper) vessel to be utililized for the lifts. The lifts are always sequenced in a manner ensuring the maximum stability of the platform. Because of the multiple lifts, each requiring about 1 day (24 hrs of preparation and 2 hours of actual lift time) the required time (weather) window is longer and delays are frequently encountered.

Note: Multiple modules will increase the amount of offshore HUC hours. Offshore HUC hours are very costly and efforts to avoid them are advised.

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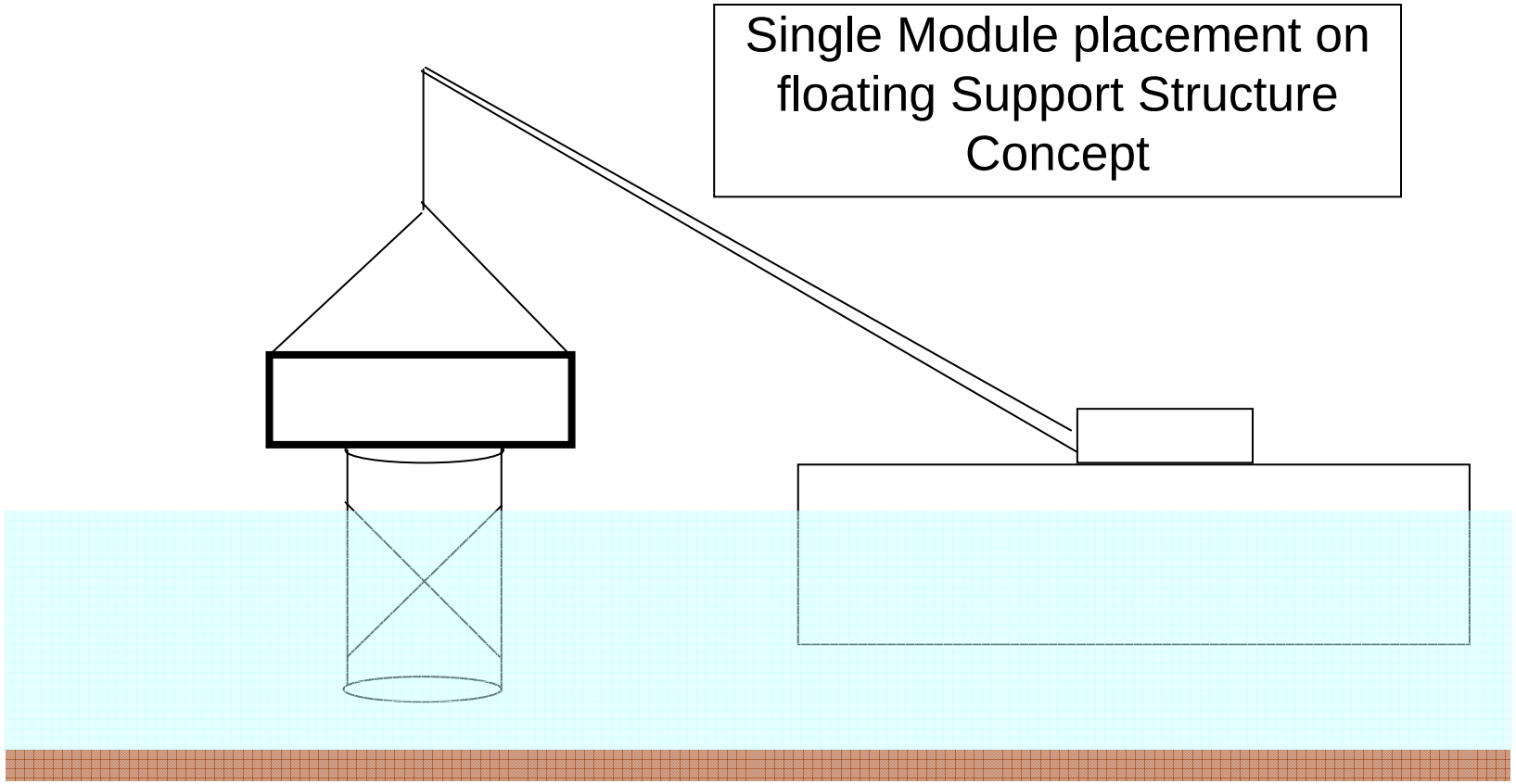
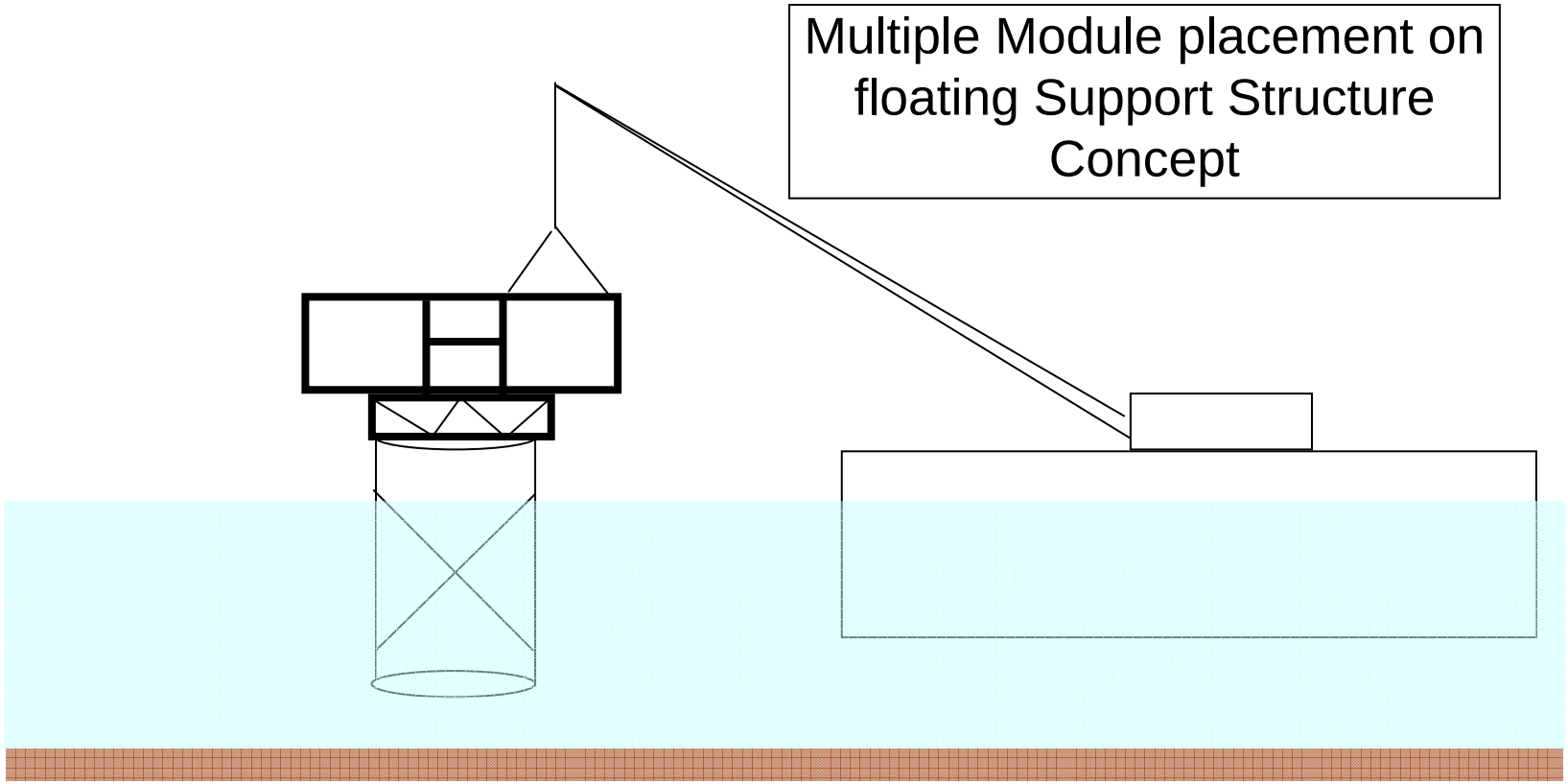


As with a fixed jacket, the actual set time is relativly short for a single lift to this type of structure. However, these structures are more weather sensitive and calm sea states need to be encountered for the lift.

"Diana" was this type of Installation but with two module, one on top of the other.

Basic Offshore Configuration and Installation Concepts.

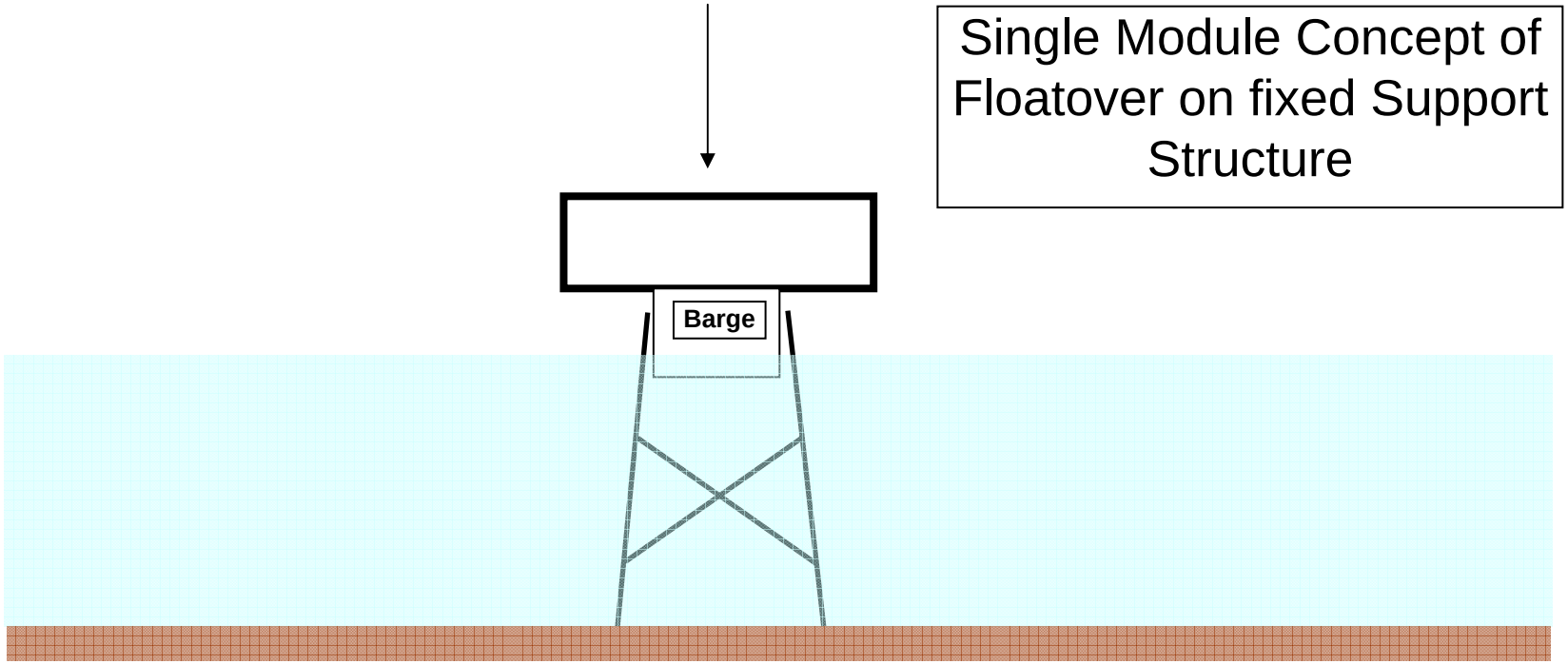


Single Module DDCV

Lift Barge Setting One Module

Similar to the single module DDCV scenario, but more modules imply more time and greater weather risk.

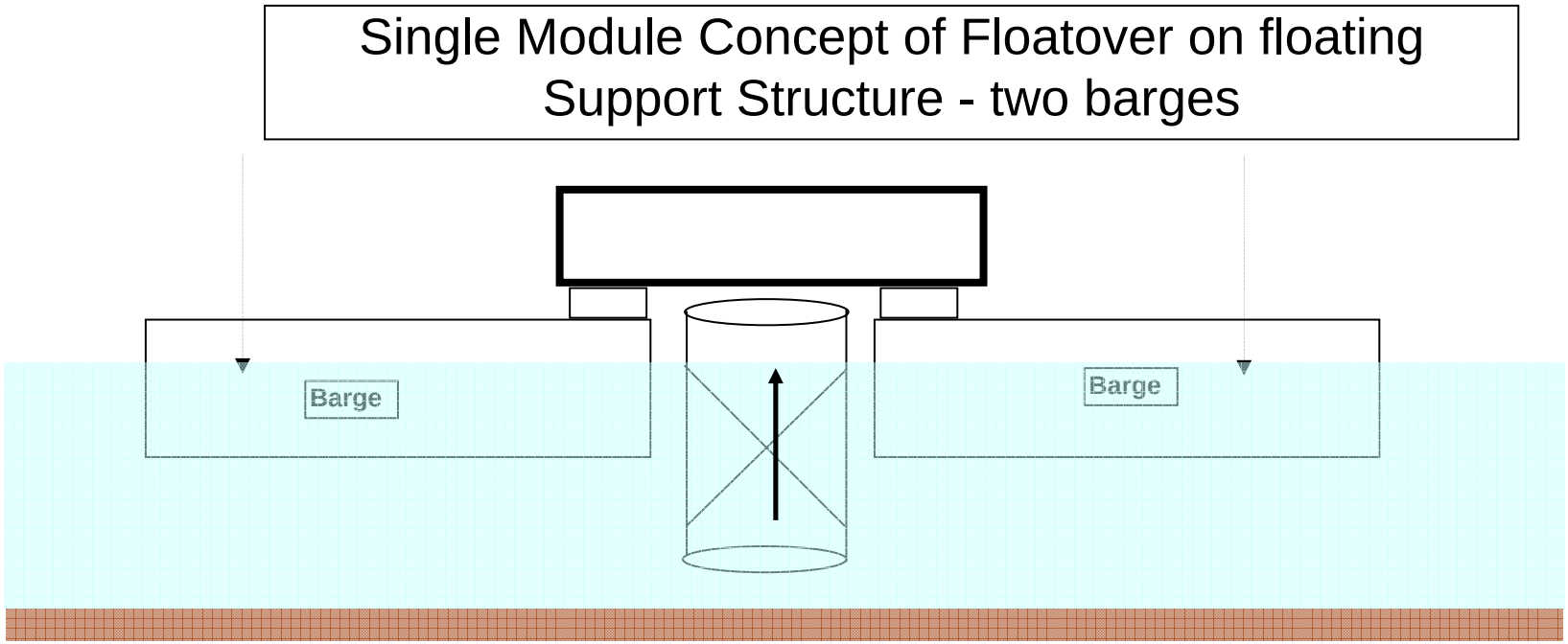
Caution: Multiple modules increase Offshore HUC costs substantially.



Floatover
Fixed Jacket
Single Barge

Floatover is accomplished by ballasting the barge

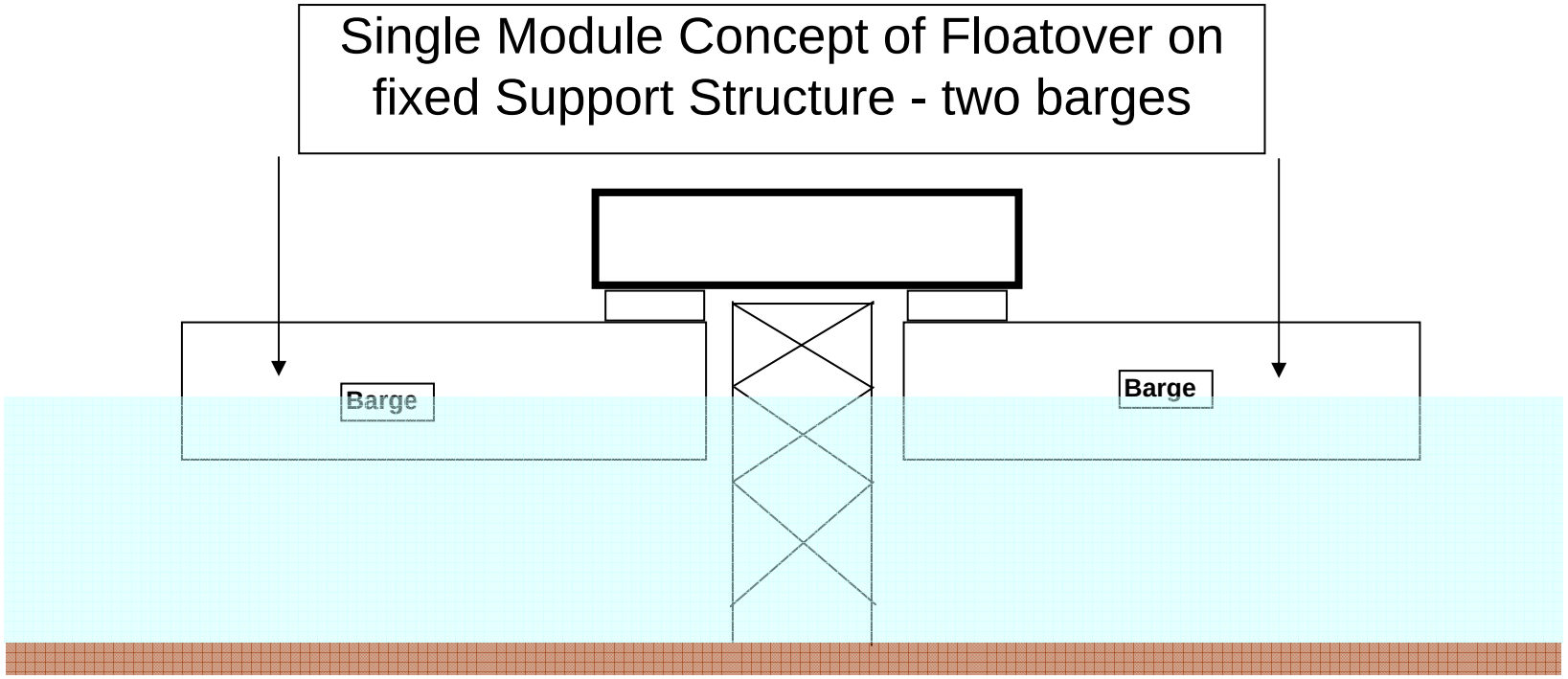
All floatover scenarios require the module(s) be fabricated with extra (additional) stiffening due to the large free span, avoiding potential distortion during delivery and installation. The jackets also must be designed with added steel because of the large slot (span) for the barge and the dynamics encountered during installation. For a single barge floatover, calm sea states are a must for installation. After beginning, the barge holding the module will be maneurvered into the middle of the jacket, then ballasted to the point where the module rests on the jacket.



Floatover - 2 Barge
DDCV

Floatover is accomplished by de-ballasting the DDCVwith minor barge ballasting

With a DDCv (which has it's own self-contained ballasting system, rather than the barges ballasting downward, the DDCV is de-ballasted until it touches the module to be set.



Floatover - 2 Barge
Compliant Tower

Floatover is accomplished by ballasting the barges

Ballasting two barges simultaneously is a complicated endeavour.
The placement of modules by two barges onto a fixed structure does not have a large history of experience to draw upon.