MCDERMOTT AUSTRALIA ICHTHYS UMBILICALS, RISERS AND FLOWLINES

Design of Mid Depth Buoys & Gravity Bases, Timor Sea

ICON Engineering was engaged by McDermott Australia Pty Ltd to design two (2) mid depth buoys (MDB) and gravity bases for operator, of the Ichthys Development, INPEX, in the Timor Sea in 250 m water depth. The design had to cater for a 40 year operating life, the ability to survive 1:10,000 year cyclone events, as well as meet more traditional installation and operating criteria.

Mid Depth Buoy Design

The stringent INPEX functional specification, dictated that each mid depth buoy support five flexible risers / umbilicals. Furthermore, the minimum required 285 Tonnes net buoyancy was to be developed from syntactic foam. The buoy structure and arch system was prescribed to be largely composed of open steel sections, in order to minimise reliance on a significant volume of "closed pressure vessel buoyancy".

Completed Buoy on Cradle

Key buoy dimensions

Length	24 m over all	Dry Weight	480 Tonnes
Width	17 m over gutters	Buoyancy	285 Tonnes
Height	10 m		

The functional specification also dictated that each MDB system, be fitted with fully redundant secondary tethers of high performance polyester rope. The design was further enhanced with structural appurtenances to allow the fitting of replacement tethers while in the operating condition, using fully diverless techniques.

The arches and riser support systems were configured to allow flex installation by either the "lay to" or "lower over" techniques. A multi-function transportation cradle for each buoy was integrated into the design. These cradles supported the buoys in the inverted position, to allow safe and efficient loading of syntactic foam blocks, then

Inverted buoy on cradle for Loading of Syntactic Foam

supported the buoys and pre-installed tether components, in the upright position during loadout, sea transport, and also during rig up on the offshore installation vessel.

Gravity Base Design

The design of the gravity bases was based on the worst case installation load, extreme event survival condition load and the failed tether / replacement tether condition. Padeyes were provided for each of the primary, secondary, and replacement tethers as well as for loadout and end of life retrieval. The gravity bases also include perimeter and internal skirts and a fully plated mudmat as determined by geotechnical design.

Completed Gravity Base

Key gravity base dimensions

Length	28 m over all	Dry Weight	680 Tonnes
Width	15 m	Submerged weight	460 Tonnes
Height [plus	1.3 m 0.6 m skirts]		

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