D4 Self-elevating drilling units

(1979) (Rev.1 1990) (Rev.2 1996) (Rev.3 Jan 2012)

D4.1 General

D4.1.1 This section applies to the unit type as defined in D2.2.1.

D4.2 Hull scantlings

D4.2.1 Scantlings of the hull structure, except as outlined below, are to meet the Rules.

D4.3 Design considerations

D4.3.1 Legs

(a) Leg types: Legs may be either shell type or truss type. Shell type legs may be designed as either stiffened or unstiffened shells. In addition, individual footings may be fitted or legs may be permanently attached to a bottom mat.

(b) Legs without mats: Where footings or mats are not fitted, proper consideration should be given to the leg penetration of the sea bed and the end fixity of the leg.

(c) Legs in the field transit condition: Legs are to be designed for a bending moment caused by a 6° single amplitude of roll or pitch at the natural period of the unit, plus 120% of the gravity moment caused by the legs' angle of inclination. The legs are to be investigated for any proposed leg arrangement with respect to vertical position during field transit moves, and the approved positions should be specified in the Operating Booklet. Such investigation should include strength and stability aspects.

(d) Legs in the ocean transit condition: Legs should be designed for acceleration and gravity moments resulting from the motions in the most severe anticipated environmental transit conditions, together with corresponding wind moments. Calculation or model test methods, acceptable to the Society, may be used. Alternatively, legs may be designed for a bending moment caused by minimum design criteria of a 15° single amplitude of roll or pitch at a 10 second period, plus 120% of the gravity moment caused by the legs' angle of inclination. For ocean transit conditions, it may be necessary to reinforce or support the legs, or to remove sections of them. The approved condition should be included in the Operating Booklet.

(e) Unit in the elevated position: When computing leg stresses, the maximum overturning load on the unit, using the most adverse combination of applicable variable loadings together with the loadings as outlined in D3, is to be considered. Forces and moments due to lateral frame deflections of the legs are to be taken into account. (See D3.3.3.(c) with respect to vibration).

(f) Leg scantlings: Leg scantlings are to be determined in accordance with a method of rational analysis, to the satisfaction of the Society.

Notes:

1. This UR apply to mobile offshore drilling units contracted for construction on and after 1 January 2013.

2. The "contracted for construction" date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to IACS Procedural Requirement (PR) No. 29.

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D4.3.2 Structure in way of jacking or other elevating arrangements

Load carrying members which transmit loads from the legs to the hull are to be designed for the maximum design loads and are to be so arranged that loads transmitted from the legs are properly diffused into the hull structure.

D4.3.3 Hull structure

The hull is to considered as a complete structure having sufficient strength to resist all induced stresses while in the elevated position and supported by all legs. All fixed and variable loads are to be distributed, by an accepted method of rational analysis, from the various points of application to the supporting legs. The scantlings of the hull are then to be determined consistent with this load distribution, but are not to be less than those required be D4.2. Scantlings of units having other than rectangular hull configurations will be subject to special consideration.

D4.3.4 Wave clearance

The unit is to be designed for a crest clearance of either 1,2 m (4 ft), or 10% of the combined storm tide, astronomical tide and height of the maximum wave crest above the mean low water level, whichever is less, between the underside of the unit in the elevated position and the crest of the design wave. This crest elevation is to be measured above the level of the combined astronomical and storm tides.

D4.3.5 Bottom mat

When the bottoms of the legs are attached to a mat, particular attention is to be given to the attachment and the framing and bracing of the mat, in order that the loads resulting from the legs are properly distributed. The envelope plating of tanks which are not vented freely to the sea is not to be less in thickness than would be required by the Rules for tanks, using a head to the design water level, taking into account the astronomical and storm tides. The effects of scouring on the bottom bearing surface should be considered. The effects of skirt plates, where provided, will be specially considered. Mats are to be designed to withstand the shock of touching bottom while the unit is afloat and subject to wave motions.

D4.3.6 Preload capability

For units without bottom mats, all legs are to have the capability of being preloaded to the maximum applicable combined gravity plus overturning load. The approved preload procedure should be included in the Operating Booklet.

D4.3.7 Sea bed conditions

Classification will be based upon the designer’s assumptions regarding the sea bed conditions. These assumptions should be recorded in the Operating Booklet. It is the responsibility of the operator to ensure that actual conditions do not impose more severe loadings on the unit.

D4.3.8 Deckhouses

Deckhouses are to have sufficient strength for their size, function and location, and are to be constructed to approved plans. Their general scantlings are to be as indicated in the Rules. Where they are close to the side shell of the unit, their scantlings may be required to conform to the Society’s requirements for bulkheads of unprotected house fronts.

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D4.4 Damage stability

D4.4.1 In assessing the damage stability of self-elevating drilling units as required by D3.7.3, the following extent of damage is to be assumed to occur between effective watertight bulkheads:

(i) Horizontal penetration: 1,5 m (5 ft).

(ii) Vertical extent: bottom shell upwards without limit.
The distance between effective watertight bulkheads or their nearest stepped portions which are positioned within the assumed extent of horizontal penetration should be not less than 3 m; where there is a lesser distance, one or more of the adjacent bulkheads should be disregarded.
Where a bottom mat is fitted, assumed damage penetration simultaneous to both the mat and the upper hull need only be considered when the lightest draught allows any part of the mat to fall within 1,5 m (5 ft) vertically of the waterline, and the difference in horizontal dimension of the upper hull and mat is less than 1,5 m (5 ft) in any area under consideration. If damage of a lesser extent results in a more severe final equilibrium condition, such lesser extent shall be assumed.
All piping, ventilating systems, trunks, etc., within this extent are to be assumed damaged. Positive means of closure are to be provided to preclude progressive flooding of other intact spaces. In addition, the compartments adjacent to the bottom shell are also to be considered flooded individually.

The recessed ends and sides of the drilling slot need not be subject to horizontal penetration if warning signs be posted on each side of the vessel stating that no boats be allowed inside the drilling slot. Instructions to this effect should be included in the Operating Booklet.

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Annex to UR D4 as Recommendations on Operation of Legs:

(1) Legs while lowering to bottom: Legs are to be designed to withstand the dynamic loads which may be encountered by their unsupported length just prior to touching bottom, and also to withstand the shock of touching bottom while the unit is afloat and subject to wave motions.

(2) Instructions for lowering legs: The maximum design motions, bottom conditions and sea state while lowering legs should be clearly indicated in the Operating Booklet, and the legs are not to be permitted to touch bottom when the site conditions exceed the allowable.

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