



Structural Engineer: AMEC Process & Energy Ltd
Steelwork Contractor: Kvaerner Oil & Gas Ltd
Main Contractor: Kvaerner Oil & Gas Ltd
Owner: Britannia Operator Ltd

Award *Industrial Building*

Integrated Deck, Britannia Platform, North Sea



The Britannia field is located 130 miles north-east of Aberdeen with gas reserves that will meet eight per cent of the UK's requirements for 30 years. An Integrated Deck houses process, wellhead and utility facilities for the Platform and also provides support to accommodation, drilling and gas compressor modules, as well as a 120m long flare boom.

The Deck structure is approximately 85m long by 43m wide and 22m high and has an operating weight of 13575 tonnes with steelwork of 4916 tonnes. It is supported by an eight-legged jacket structure. High strength steel was used for weight and cost efficiency - grade 450 for the main frame and grade 355 elsewhere.

To reduce lift vessel reach and increase capacity, while at the same time minimising the amount of offshore completion work, a number of deck sections cantilevered up to 9m from the main frame were designed to be hinged to a vertical position during transportation and installation, then simply lowered and welded into position.

During operation the structure resists dynamic loads applied via wind loading on the flare boom and wave loading on the jacket structure. Detailed fatigue analyses were performed for both of these cases and the design also took into account the possible need for fire resistance, earthquakes and ship impact. Special design features were developed for potential blast overpressure. Tension ties span vertically between decks and utilise blast forces to restrict moment transfer to deck girders. Blast walls spanning approximately 8.5m between decks are designed to be self supporting.

Platform drilling is through 36 well slots, so the Integrated Deck is designed for the movement and differential loading associated with the drilling rig in each of these positions.

The main supporting framework of the structure comprises two longitudinal and six transverse trusses of tubular brace and column construction with deep plate girder chords. The three full and two partial floors comprise plate girders spanning between trusses with infill rolled section stringers and deck plate or floor grating.

Construction was achieved on time and well below budget. A number of simplifications which led to cost savings in the construction process included:

- Typical connection details developed in conjunction with fabrication supervisors.
- Electronic transfer of design drawings and use of a CAD program to automate the production of beam shop drawings from the typical connection details.
- "Drop-in" deck panels for which only the deck plate was welded to the main supporting structure, eliminating connection of deck stringers and resulting in a 17% cost saving against traditional deck panels.
- Steel "cut and waste" reduced to approximately 5% versus the traditional 20-25% for an offshore structure.

The effectiveness and simplicity of the design, and the fabrication efficiencies adopted are also demonstrated by the erection schedule achieved. Individual decks were built in parallel and then stacked to form the main structure of trusses and decks. From delivery of the first fabricated truss members, deck stacking was completed in 77 days.