

**BASIS OF DESIGN**  
for  
 **ENHANCED SAFETY HELIDECK**

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1. These specifications form the guidelines for the structural design of the enhanced safety aluminium helideck proposed for the project. The helicopter deck integrates a patented, passive fire-retarding system into its surface grating to provide enhanced safety and is manufactured under the trade name - *XE ENHANCED SAFETY HELIDECK*.
  
2. The helideck shall be designed for a Helicopter(s) specified by the client and to meet the following codes and specifications:
  - U.K. Civil Aviation Authority CAP 437
  - US API RP2L, “Designing and Planning Offshore Heliports”
  - ICAO
  - BSL D-5-1 (CAA-N)
  - NMD
  - Norsok C-004
  - NORMAM 27
  - Australia CASA CAAP 92-2 (1)
  - IMO Modu Code
  - Classification Society Rules
  - Eurocode 9, “Design of Aluminium Structures”
  - Client’s specifications
  
3. These specifications address the following areas:
  - Special Safety Feature
  - Helideck Features
  - Interface with Steel Support Truss Structure Below Helideck
  - Size and Arrangement of Helideck
  - Material Properties of Helideck Components
  - Design Considerations
  - Drainage for Helideck

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- Reaction Forces
- Helideck Pancake Weight

#### 3.1 SPECIAL SAFETY FEATURE: *passive fire-retarding system*

The most critical moments of helicopter operation are during landings and take-offs. An accident at either stage can mean hundreds of gallons of jet-fuel spilling from ruptured fuel tanks in the belly of the aircraft.

A crash and burn scenario is always a frightening possibility – the intense, fuel fed fire will spread on the helideck, making passenger rescue extremely hazardous. Vital time is lost in combating the helideck fire when all attention should be delivered to the helicopter crew and passengers instead.

The *XE Enhanced Safety Helideck* was developed to reduce these risks and integrates a passive, enhanced safety system into the decking of the helideck. The system requires no maintenance, power assist, foam or other fire-extinguishing materials for its operation.

The *XE Enhanced Safety Helideck* works by allowing burning fuel to pass through densely packed layers of “Explosafe®” expanded aluminium mesh. The mesh is packed to a proprietary compression in batt form inside a hollow landing grating which runs between the helideck structural main beams. In case of a deck surface fire, burning fuel drains through holes in the deck surface into the batts. The burning fuel is starved of oxygen and the aluminium mesh causes rapid heat dissipation. The fire is retarded and starts to extinguish immediately. Spilt fuel is quickly and safely drained away unburned inside the hollow decking into perimeter drains and header pipes.

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Any remaining vapor burn-off on the helideck surface can be extinguished in seconds with a minimal water spray.

The *XE Enhanced Safety Helideck* is therefore capable of achieving the following:

- a) Commence retardation of helideck fire immediately upon ignition.
- b) Collect and extinguish burning Jet A1 fuel.
- c) Channel the unburned and extinguished fuel safely away from the burning site.
- d) Allow the use of water spray as a vapour extinguishing medium.
- e) Control burning within initial fuel spill area only to facilitate escape of survivors.
- f) Attenuate fire within 3 minutes from ignition with no active fire fighting equipment being used (in a test condition).
- g) Attenuate fire within 15 seconds from ignition if water spray is used as a fire fighting aid. (in a test condition)

Live fire tests of the *XE Enhanced Safety Helideck* were conducted in Singapore in 1989, in the United Kingdom in 1996, and in 2004 and 2008 before representatives of the UK Civil Aviation Authority, ICAO, Det Norske Veritas, Lloyds Register, Shell Brunei, Shell Sarawak, Petronas, ESSO, Sikorsky Helicopters, Bell Helicopters and others. Documentation is available on request.

### 3.2 HELIDECK FEATURES

- Integrated enhanced fire-retarding system
- Corrosion resistant, marine grade aluminium construction EN-AW6082T6/equal
- Largest extrusions in the industry, fewer joints and larger spans
- All bolted design with no heat affected zones

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- No structural welding to be allowed
- All structural fasteners A4-80, non-structural fasteners A4-70 (stainless steel grade 316)
- Non-slip, stay-dry decking with co-efficient of grip exceeding 0.65
- Proven design with extensive track record
- Quick assembly and installation
- Maintenance free aluminium alloy infill for safety nets
- Special extruded clamping system for all fasteners, no drilling required
- Absence of drilling holes to allow helideck to be relocated easily
- Integrated cable management system
- Fully extruded gutters and kick-plate

### 3.3 INTERFACE WITH STEEL SUPPORT TRUSS STRUCTURE BELOW HELIDECK

The aluminium helideck shall be secured to the steel supports by the use of steel transition joints which are pre-installed to the aluminium main beams. Transition joints are of carbon steel and only steel-to-steel welding shall be required at the time of helideck erection. The thickness of the transition plates shall be minimum 36 mm in order to avoid warping during welding. The insulation material shall be EPDM or stainless steel sheet, where required.

### 3.4 SIZE AND ARRANGEMENT OF HELIDECK

3.4.1 The helicopter deck is generally octagonal in shape and it shall be capable of accommodating the design helicopter in accordance with the stipulated standard.

3.4.2 The helideck is supported on aluminium or steel truss arrangement.

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- 3.4.3 The pancake consists of two layers of structural members. The lower members shall be the aluminium I-section girder beams (AOG range), and the maximum beam height is about 470mm.
- 3.4.4 The deck for landing sits on the aluminium girder beams and comprises approximately 130mm high aluminium multiple-wall punched gratings. These are secured to the girder beams via special extruded clamps and stainless steel fasteners. The grating is designed to efficiently absorb the high local loads of the crash helicopter. The punching of the holes on the surface of the grating is to allow fluids to drain into the double-wall hollow below and for the proper functioning of the safety system.
- 3.4.5 A perimeter drainage system shall be provided together with adequate drain headers to carry the helideck spill flow and rainfall.
- 3.4.6 Necessary lifting points, lifting procedure and the required spreader bar design shall be provided for the lift-out of the helideck.
- 3.4.7 Stainless steel or aluminium alloy helicopter tie-downs shall be provided.

### 3.5 MATERIALS PROPERTIES OF HELIDECK COMPONENTS

- 3.5.1 The helideck grating are EN-AW 6082T6/equal aluminium extrusions that have minimum yield strength of 250 N/mm<sup>2</sup>.
- 3.5.2 The helideck main beams are EN-AW 6082T6/equal aluminium extrusions that have minimum yield strength of 260N/mm<sup>2</sup>.

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3.5.3 The helideck is designed such that no structural welding is required and only bolted connections between members are used. Welding is confined to non-structural secondary members and drainage sections.

3.5.4. The following shall be included as deliverables in the Manufacturing Record Book:

- a) Mill Certification whenever materials are delivered.
- b) Workmanship for pre-fabrication in accordance to the Inspection and Test Plan approved.
- c) Project Quality Plan for design, fabrication and assembly.
- d) Class design approval letter and inspection certificate

## 3.6 DESIGN CONSIDERATIONS

3.6.1 Design loads to be considered are:

- a) Normal landing load
- b) Emergency landing load
- c) Live load on the surface of the deck
- d) Lateral Loads
- e) Helideck self-weight
- f) Wind Load
- g) Vessel acceleration load
- h) Other environmental load specified by rules

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3.6.2 A lifting analysis for the installation of the helideck onto the steel support shall be performed. This shall be carried out at the time of detailed engineering and cover the designed lifting points of the helideck.

3.6.3 The structural analysis method to be employed for the verification of the global and local strength of the helideck is being evaluated with the use of structural analysis computer software.

3.6.4 The helideck shall be checked for thermal expansion and contraction with respect to its non-aluminium interfaces. Suitable expansion joints shall be provided where required.

### 3.7 DRAINAGE FOR HELIDECK

3.7.1 Drainage of fluids from the helideck surface will be via the hollow grating extrusions, which run the entire surface of the deck. These extrusions lead to the perimeter drainage system where the headers are located.

3.7.2 The perimeter drainage gutter shall be dimensioned to satisfy the maximum continuous rainfall of 120 mm/hr with required contingency.

3.7.3 The perimeter gutters are covered for increased safety.

### 3.8 HELIDECK ENGINEERING WEIGHTS

The estimated weights for the helideck pancake, support structure, platforms and access stairways, can be calculated and included in Weight Report.