





Kelvin Wave


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1. GENERAL

A 16m aluminium gangway ladder is designed for efficient and safe transfer of personal. It allows easy transport from storage location to operation site manually with no more than 5 pax handling. A tarpaulin sheet shall be provided by Contractor to covers the entire gangway to prevent warping and damage when not in use. The material used shall be aluminium and the capability to hold a load of 500kg (an approx. 6 pax). The ladder shall be attached to the gangway platform securely via hinges or pinned connection and shall allow for inclination of the gangway up to 30°.

2. REGULATION

The gangway ladder shall be design and comply with:

- 1) IMO MSC.1/Circ .1331 Guidelines for construction, installation, maintenance and inspection/ survey of means of Embarkation and disembarkation.
- 2) Accommodation ladders and gangways, including associate winch and fittings, should be properly maintained and inspected at appropriate intervals as required by SOLAS regulation III/20.7.2.
- 3) ISO 2553:2019: Welding and allied processes – Symbolic representation on drawings – Welded joints

3. DESIGN CONDITION

3.1 Design loading

The assembled gangway ladder shall be designed to withstand a uniform decking load of 5,000 N/m² applied to the decking and treads while the gangway is in a horizontal position which is equivalent of limited access up to 6 persons. The gangway is roller support at two ends.

3.2 Factor of safety


The allowable stress to be used in the design of the gangway as specified in 2.1 shall be determined by applying a factor of safety of 2 on the 0.2% proof stress ($R_{p0.2}$) of the aluminium alloy used.

3.3 Wind Condition

The wind load of 36m/s is applied on projected area of the gangway ladder's structure frames and the wind loading factor is assumed to be 1.0.

3.4 Dynamic Factor

The dynamic factor is assumed as 1.3 which applied on the gangway ladder structure.

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4. STRUCTURE OF GANGWAY LADDER

4.1 Summary of Gangway Ladder Structure

	Description	Material
1	Side Stinger	AA6061
2	Cross member	AA6061-T6
3	Decking	AA3105
4	Treads	AA6061-T6
5	Stanchions	AA6061-T6
6	Caster Wheel	Polyurethane
7	Lifting Lugs	AA5083-T111
8	Non-Slip Lug	AA5083-T111
9	Ladder Tread	AA5052
10	Hinge Lug	AA5083-T321
11	Bolt & Nut	AA2024-T3
12	Split Pin	SUS or AA
13	Ramp Flap	AA5052

4.2 Main Structures & Components

4.2.1 Side Stringers

Side Stringers shall be constructed from extruded U-channel.

4.2.2 Cross-members

Cross-members attached to the side stringers shall be arranged to support the decking and shall be of rectangle hollow sections.

4.2.3 Decking

The decking shall comprise with individual flat plate section, which shall have a non-slip coating applied between the treads.

4.2.4 Treads


Treads shall be of aluminium angle bar section spaced at regular intervals of 400mm longitudinally.

Treads shall have a minimum height of 30mm above the decking.

All treads shall be secured fitted and shall extend over the full width of the gangway between the railing.

4.2.5 Stanchions

Stanchions shall be constructed in aluminium. They shall be fitted at regular intervals along the gangway, with maximum permitted interval of 1500mm. Stanchions and associated hand guides

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shall be designed for a side loading at the upper guide level of 500N/m, without permanent deformation to stanchions.

4.2.6 Roller or wheels

A heavy-duty caster wheels of 100mm minimum outside diameter shall positioned at one end of the gangway. The caster wheels shall be provided with self-lubricated bearings or fitted with lubrication nipples having a tread M10x1. To ensure protection of user's feet from movement of the gangway, wheel guards shall be provided. At the maximum angle of the use of the gangway there shall be no loss of contact between the wheels and the contact surface

4.2.7 Lifting lugs

The gangway shall be provided with four lifting lugs, securely attached to the side stringers and positioned to produce a balanced lift.

4.2.8 Anti-slip lugs

The gangway shall be provided with anti-slip lugs secured attached to the side stringer and positioned to prevent the gangway slipping from its position on the bulwarks or other supporting structure.

4.2.9 Ladder Tread

Ladder Tread shall be designed with width at least 410mm and platforms are slip-resistant. It shall be capable of supporting at least four times their maximum intended load.

4.2.10 Hinge Lug

The Hinge lug shall be able to withstand the load acting on it when gangway is inclined.

4.2.11 Bolt & Nut


The bolt & nut serve as the pin for the rotation gangway to its max inclination of 30°.

4.2.12 Split Pin

A metal fastener with two tines which can be bent during the installation. This is to prevent the nut to loose off from the bolt.

4.2.13 Ramp Flap

The ramp flap is used to bridge the gap between gangway and ladder to prevent persons fall and trap on the gap. The hinge is welded to the flap to restrict the minimum rotation of the flap during inclining of gangway.

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5. Certification and Testing

A load test of the gangway is to be carried out by an accredited company and certified by a Professional Engineer (PE) registered with the Ministry of Manpower. Load test certification to be provided to the Authority together with the delivery of the gangway. The gangway shall be complied with the relevant guidelines, regulations and standards such as IMO and SOLAS (section 2). The gangway shall be certified safe for use by a Professional Engineer (PE) registered with the Ministry of Manpower.

5.1 Type test

One gangway of the longest design length for each stringer type shall be tested by the methods given below.

The deflection due to loading (according to 2.1) shall not exceed the value of the overall length divided by 75.

Each gangway submitted for type test shall be fully assembled with all fittings and subjected to the tests given in 4.2.1 & 4.2.1

5.2 Test methods

5.2.1 Lifting


Lift the gangway by means of the lifting lugs provided. After the test there shall be no evidence of strain to the lugs or the adjacent structure.

5.2.2 Initial Sag

Initial sag, Y, is as Place the gangway horizontally on supports positioned at one end under the and at the other end close to the anti-slip lug. The gangway shall be fully assembled with all fittings, comprising the dead load. Stretch a thin string or wire tightly between the two support points. Then measure the maximum vertical distance appearing between the horizontal line and the base of the gangway. This measurement shall be taken for both side stringers. The average of the two readings and for initial sag.

5.2.3 Deflection under load

With the gangway still supported as in carry out the deflection test immediately after the results of initial sag are determined. Apply, without shock, a uniform load equivalent to $5,000 \text{ N/m}^2$ to the longitudinal centreline of the decking. The load shall be arranged from a selection of conveniently sized sandbags or other material that will not damage the and located at equally spaced intervals of not more than 1m, Where the design incorporates individual decking plates, apply a load equivalent to $5,000 \text{ N/m}^2$ to each plate. Maintain the test load for before the total deflection of the gangway at each side stringer is measured. The maximum deflection for each side stringer shall be measured as the maximum vertical distance between the string or wire

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stretched tightly between the support points and the base of the gangway. The average of the two readings is taken as the total deflection. The deflection due to loading A_v shall be calculated by subtracting the initial sag from the total deflection.

6. MARKING

Each gangway shall be permanently marked by means of a rating plate prominently displayed. The rating plate shall contain information relevant to the gangway, including the following:


- a) manufacturer's name or trademark;
- b) type number and serial number;
- d) overall length;
- e) maximum permitted angle of inclination;
- f) design loading.

7. INSPECTION

Gangways subjected to a type test shall be inspected after testing to ensure that there are no signs of residual weakness or damage.

All gangways shall be visually checked after testing to ensure that:

- a) there is no distortion of the side stringers;
- b) the decking or deck plates are adequately secured;
- c) the wheels revolve freely;
- d) the rating plate is affixed and correct.

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8. DELIVERY TIMELINE

Within two weeks to complete the below drawings & reports:

No	Document No	Document Title	Delivery Duration (days)
1	KW2002-601-01	GENERAL ARRANGEMENT	3
2	KW2002-623-01	GANGWAY LADDER CONSTRUCTION DETAILS	7
3	KW2002-835-01	TECHNICAL SPECIFICATION	3
4	KW2002-835-02	STRENGTH ANALYSIS REPORT	7
5	KW2002-835-03	OPERATION & MAINTANCE MANUAL	7

Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14
GENERAL ARRANGEMENT	█	█	█											
GANGWAY LADDER CONSTRUCTION DETAILS			█	█	█	█	█	█						
TECHNICAL SPECIFICATION						█	█	█						
STRENGTH ANALYSIS REPORT					█	█	█	█	█	█	█			
OPERATION & MAINTANCE MANUAL								█	█	█	█	█	█	█



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