

T-Shape Barge Design for Transportation and Mating of Sakhalin II Topsides

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ABSTRACT

The barge design and the fabrication of LUN-A and PA-B topsides of Sakhalin Phase II Project are carried out by Samsung Heavy industries (SHI). Since the topsides are quite heavy, a newly devised barge is needed for the purpose of transportation and installation of these topsides in site. The design and construction of the barge shall be suitable for the load-out, transportation and float-over mating of topside with heavy loads. This paper is prepared to introduce the design of barge for transportation and installation of LUN-A and PA-B topsides of the Sakhalin II Project. The noticeable difference of the barge comparing with other conventional cargo barges is in the shape. The barge has sponsons of T-shape that protrudes from its port and starboard in the aft body outwards. The sponsons are aimed to provide the additional stability of the barge, since it would not provide the adequate stability for transportation without that kind of structural appendage. In addition, the whole ship analysis and the hold analysis for structural strength assessment of the barge are carried out. The “Dynamic Loading Approach (DLA)” for the structural analysis is adopted, in which the dynamic loads are determined explicitly. As a result of the above strength assessment and buckling check, Sakhalin NBB is safe to transport and installation the considering the topside.

KEY WORDS: Sakhalin Phase II Project, LUN-A, PA-B, New built barge, Float-over mating, Transportation and installation, Stability, Concrete Gravity Based Structure (CGBS).

1. General

Recently, the two different topsides of Sakhalin Phase II Project, so called LUN-A and PA-B, are designed and constructed in SHI yard. For the transportation of these topsides, a special type barge is newly devised which has sponsons of T-shape. The design and the construction of the barge are performed to be suitable for the load-out, transportation and float-over the topside. The barge has to be capable of supporting heavy loads (topside) transferred from shore by skid ways and having sufficient stability and ballasting capacity to operate in the various conditions from cargo skid on to float-over mating. Permanent ballast pumps capacity should be such that the pumps cover the emergency condition in the topside load-out operation during 12 hours.

The barge is designed to have a flat main deck, skid beam and reinforced mid section with strong webs in order to cope with a large amount of load. The main dimensions are decided by mating analysis considering the interval between the legs of the CGBS (Concrete Gravity Based Structure) and height of legs. The barge should also have sufficient ballast capacity for operation in the various float-over mating conditions. The gravity flooding system is installed in order to supply the required ballasting capacity to minimize the impact loads transferred to the CGBS during float-over mating. The “Dynamic Loading Approach (DLA)” to determine the dynamic loads is adopted. The seakeeping analysis for the vessel motions and accelerations is performed to determine the loads imposed on the structure of the barge.

2. Main Dimensions and Layout of Barge

The barge consists of 33 ballast tanks (main barge: 27, port sponson: 3, starboard sponson: 3) and one (1) control room are arranged onto No.2 centre ballast tank below deck. Machinery room is arranged below main deck and divided into two (2) spaces by partial deck, which is longitudinally framed; one is upper space, the other is lower space. The upper space will be provided near control room to avoid unnecessarily complicating the control system and be segregated with a watertight door as a contingency against fire or flooding. The lower space will be provided at centre of No.3 water ballast tank row for easy piping routing and intake/outlet. The control/battery room and storehouse will be provided at the same elevation as the upper space of machinery room on the center of the No.2 ballast tank row. The control/battery room and storehouse will be segregated. The barge has a T-shaped configuration and can be considered by dividing two (2) parts (main barge, sponsons) for sake of convenience. Two (2) sponsons will be connected to the port side and the starboard side at the aft part of main barge. Both sponsons have same shape and dimensions. The main particulars are given as follows:

- Length overall	: 190.0 m
- Width at sponsons	: 92.0 m
- Width excluding sponsons	: 45.0 m
- Length of sponsons (portside & starboard)	: 47.5 m
- Width of sponsons	: 23.5 m
- Depth	: 12.5 m