ANALYSIS OF OFFSHORE PLATFORM BY USING SACS

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Abstract—Nowadays offshore structure is mainly used around the world for a variety of functions, water depths and environment. There are lots of difficulties to design the offshore structure because of the high level of uncertainties which is the main factor in design. To maintain and control the high quality and integrity of operation life of the offshore structure, we have to understand the different type of structures and the load exposed to it in a very detailed manner. An overview of analysis of offshore structure in the case of fixed platform will be discussed in this thesis. It is mainly to provide understanding and guideline for the purpose of the analytical phase. This analysis is done by using SACS software. The analysis result is discussed in brief.

Keywords—- Offshore, Deck slab. Jacket structure, SACS, Skirt pile, Mud mat.

I. INTRODUCTION

offshore platform Analysis and construction are technically a hybrid of steel structure design and harbor design and construction. The numbers of faculties that are focusing on offshore structural engineering are limited. For that concern, I am focusing more on this project to develop design projects. In addition, the design of offshore platforms can be done only after continuous study and research.

The uses of offshore structures are oil exploration and production, navigation, ship loading, and unloading, and supporting bridges and causeways. On the design part, we must include a life period of 25 years or more.

II. TYPES OF OFFSHORE STRUCTURE

The offshore structures built in the ocean to explore oil and gas are located in depths from very shallow water to the deep ocean. Depending on the water depth and environmental conditions, the structural arrangement and need for new ideas required. The classification based on geometry, function and geometrical are as follows.

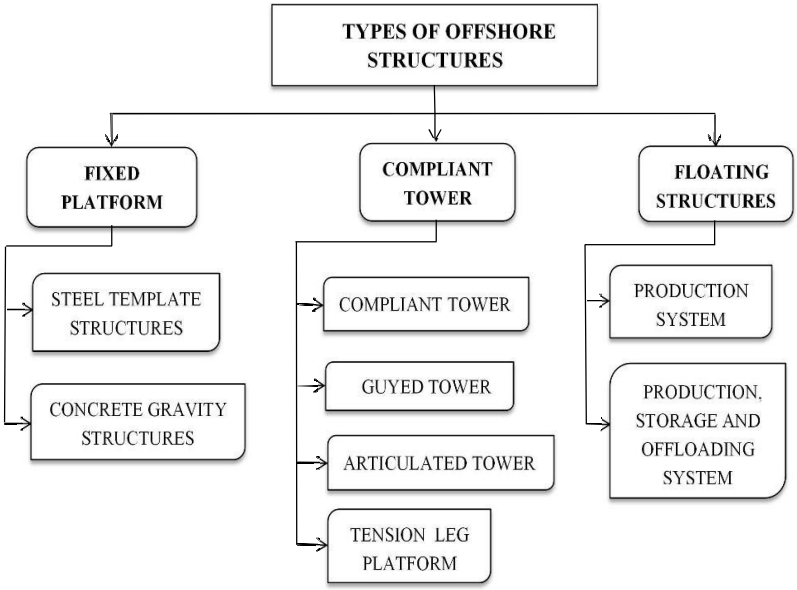

Figure 1. Types of offshore structure

III. COMPONENTS OF OFFSHORE PLATFORM

3.1 Important Components

1.The steel jacket structure.
2.The foundations consisting of pile clusters and mud mat.
3.The topsides consisting of top cellar and spider decks, accommodation quarters and helipad, drilling derrick and flare boom.
4.Drilling derrick with the associated components as marine risers and conductors and associated seabed components as sub-sea wells, BOP and others.

IV. TYPES OF LOADS

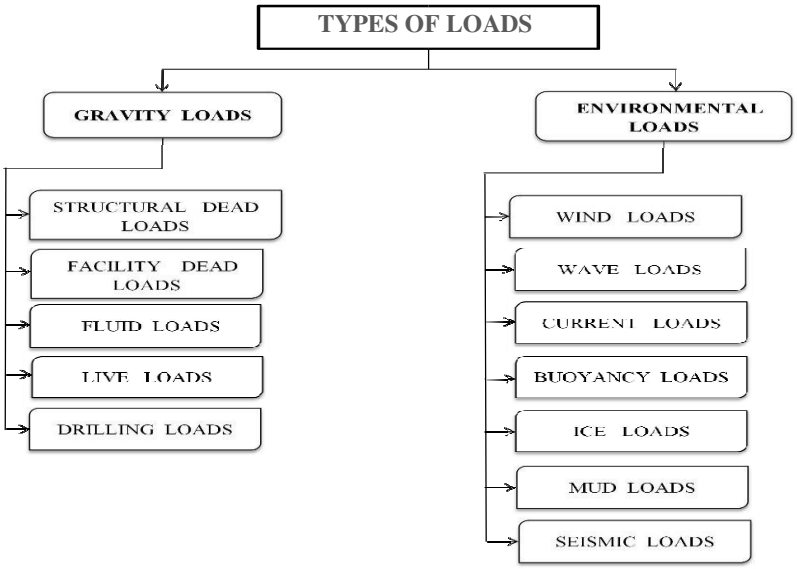

Figure 2. Types of Loads

V. MODEL DATA

The platform considered in the study is a four legged production platform. Water depth at the location is 60 m. The platform is designed based on the API recommended criteria for 50 years return period for a wave height of 10 meters. The cellar and the main deck elevation are +77.5 m and +85 m respectively. The major deck framing is 50 by 50 m in plan and the jacket legs are battered at one to eight in both broad side and end on framing. The deck legs, the jacket column and the pile are of 1.372 m, 1.42 m, 1.524 m OD obtained from the preliminary design. The average wall thickness is 20 mm uniform to the whole structural members. The jacket is sub divided into 5 bays of 10 meter each. The bottom three bays are provided with x-bracings of 61 cm outer diameter both on end on and broad sides. The bracing provided on the fourth bay from the bottom is 50.8 cm and the top most bay is provided with 45.7 cm outer diameter braces. The model is generated using 204 beam elements and 69 plate elements. The jacket bracing and the horizontal framing is of 695 Mpa steel materials with average yield strength of 106 ksi (kilo pounds per square inch). The members are considered to be cold rolled pipes and small members of rolled pipe sections. The soil data is obtained for driven pile of 1.524 m diameter at Mumbai High region. Referring standards: DNV-OS-C101, API-RP-WSD, BS6235(1982), ISO-19902.

VI. DECK SLAB

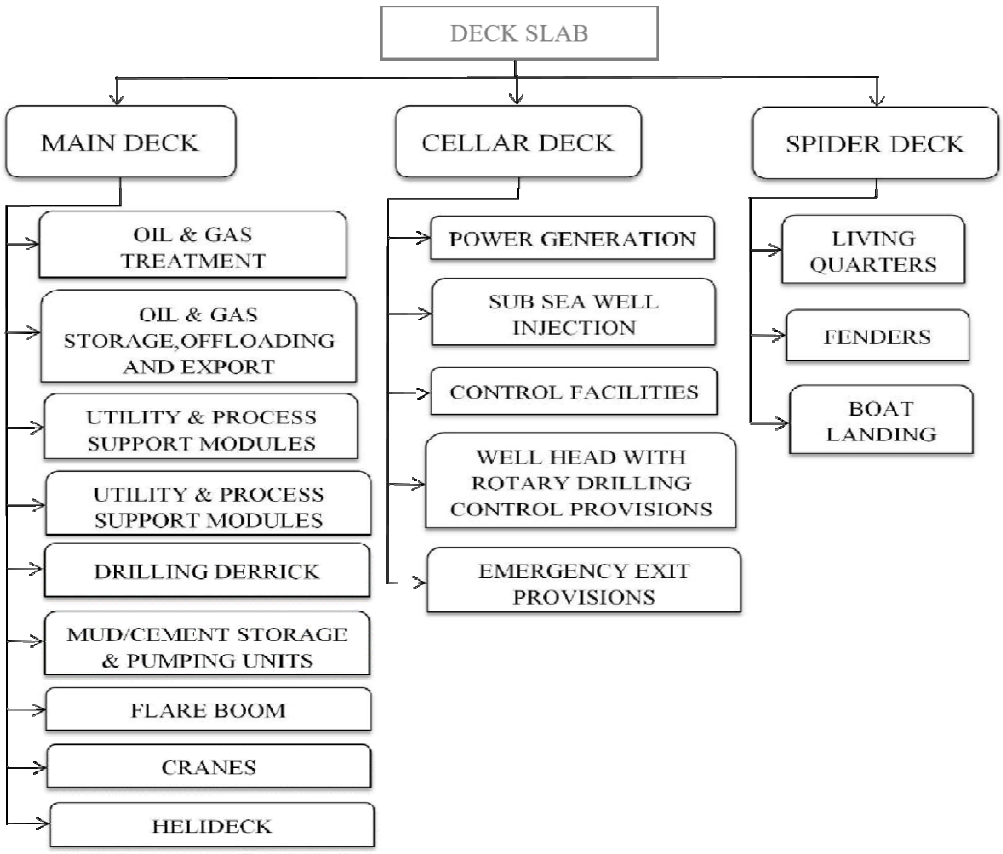

Figure 3. Deck slabs

VII. DECK SLAB PLANS

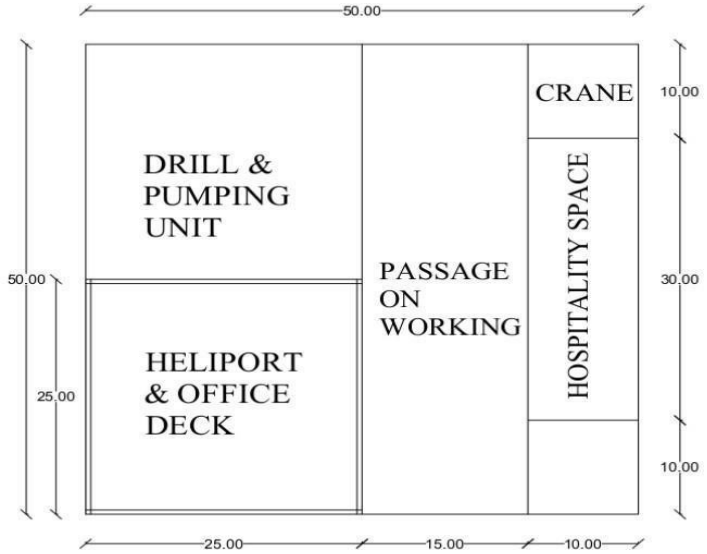

Figure 4. Plan of main deck

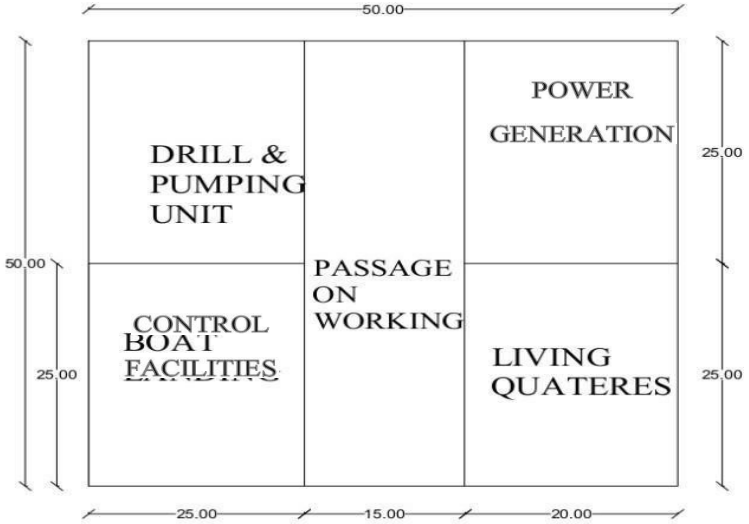

Figure 5. Plan of cellar deck

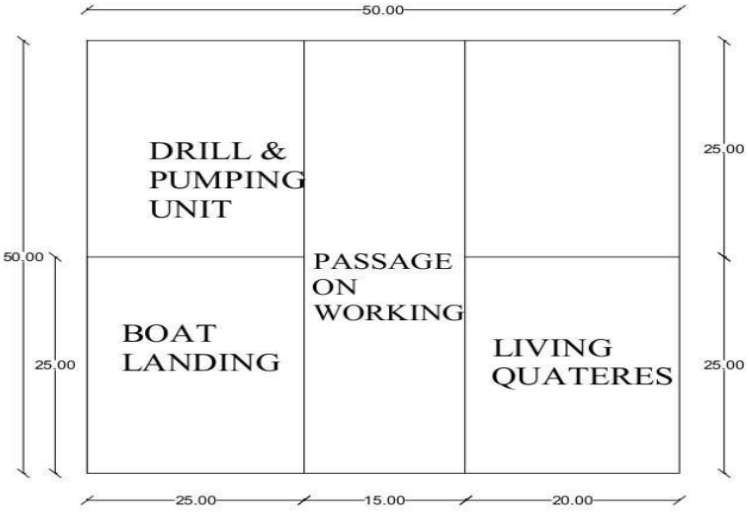

Figure 6. Plan of spiderr deck

VIII. ANALYSIS BY SACS SOFTWARE

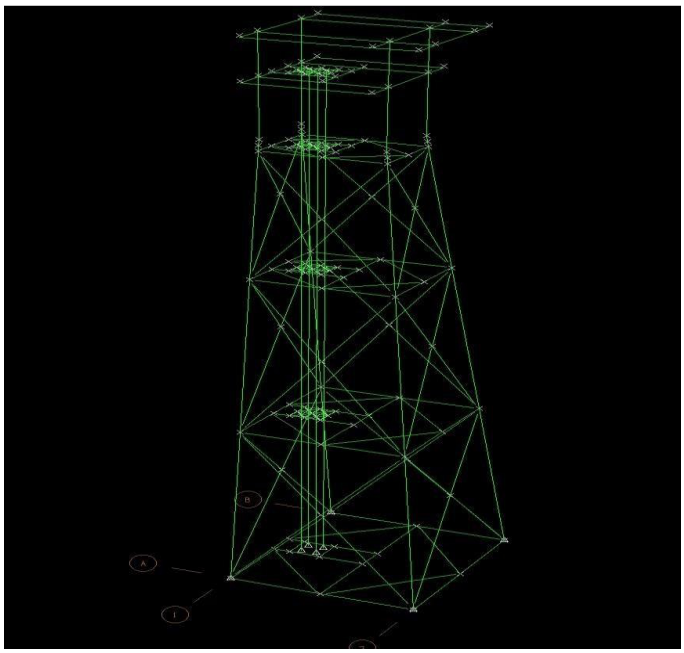

Figure 7: Analytical model by SACS

Member	Group ID	Maximum combined Unity check	Load Condition No	Axial stress N/mm^2	Bending stress Y N/mm^2	Bending stress Z N/mm^2	Shear Force Fy KN	Shear Force Fz KN
102P-202P	PL1	0.760	S000	-52.89	16.91	-22.58	30.90	-4.97
103P-203P	PL1	0.747	S090	-56.44	25.75	-1.33	1.54	-22.78
104P-204P	PL1	0.830	S045	-68.34	23.68	2.03	-4.80	-15.76
202P-302P	PL2	0.530	S000	-50.62	-8.18	6.56	-5.82	30.83
203P-303P	PL2	0.580	S090	-54.17	-9.89	-1.16	0.05	19.95
204P-304P	PL2	0.725	S045	-66.07	-10.97	-0.70	0.92	25.13
304P-404P	PL3	0.571	S045	-66.83	-4.51	0.18	0.13	20.05

Table 1. Member unit summery

IX. CONCLUSION

In this study, earlier I choose STAAD Pro software to analyze offshore platform. But analysis by STAAD seems quite complicated for whole structure. So I quit my STAAD analysis. Analysis will be continued by using SACS (Structural Analysis Computer System) software. SACS is similar to STAADPro and SAP. It is an integrated suite of software that supports the Analysis, Design and Fabrication of offshore structures, including oil, gas and wind farm platforms and topsides and it is one of the marine engineering software.

The analytical model of offshore platform (Jacket Type) have been created and studied by using Structural Computer System (SACS).

- The structure is safe for stress (axial and bending) because of the stress acting on the structure for different load condition is within the allowable stress limits.
- From static analysis report, the critical members are obtained.
- By selecting the maximum stress producing members, calculation of the stress acting on the structure is found.
- The use of model values is found to give a better representation for the structure.

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