Construction of Inner Containment Dome Reactor Building - A Case Study

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1. General

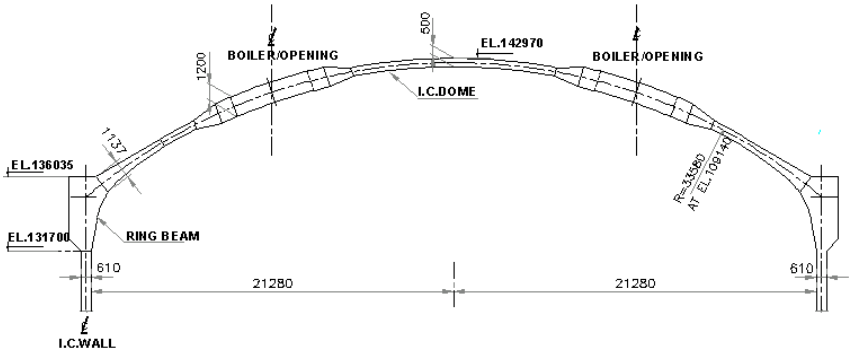
The Nuclear reactor is the heart of the Nuclear plant. In its central part, the reactor core's heat is generated by controlled nuclear fission. Since nuclear fission creates radioactivity, the reactor core is surrounded by a protective shield. This containment absorbs radiation and prevents radioactive material from being released into the environment. In addition, many reactors are equipped with a dome of concrete to protect the reactor against both internal casualties and external impacts.

This paper basically focuses on construction of Inner Containment dome for Reactor Building.

Construction of dome structure involves complex formwork designing, planning, erection and stripping procedures to guarantee the desired shape and quality of the concrete. Elaborate analysis and attention for detailing is required to ensure successful completion.

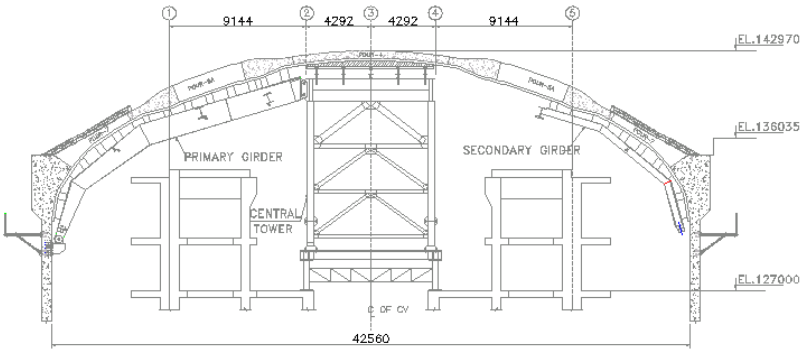
2. Introduction- Inner Containment Dome of Reactor building

Inner containment dome of the reactor building in the present case is a 42.56 m diameter prestressed concrete dome with 4 openings of 4.1m diameter to facilitate any replacement of stream generators during operational stage of reactor. The dome consists of a ring beam of 4.1 meter deep and a shell of 500 mm thick. Concrete of grade M-45 is used for the construction of this dome.



3. Supporting structure

A supporting structure for dome consisting of 32 radial built up primary girders resting on brackets fixed to I.C.wall and other end on central tower. Primary girder were inter connected with each other with 32 radial secondary girder and ring girders. In order to have exact profile of dome screw jacks were provided over the primary and



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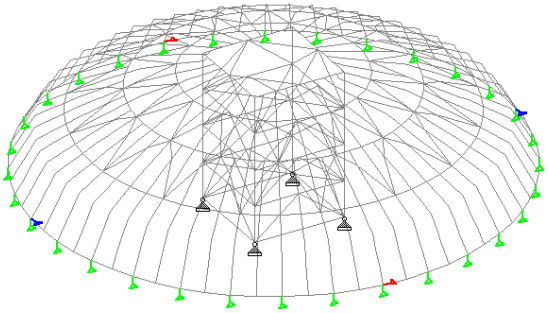
secondary girder for necessary adjustment in formwork. Plywood formwork with timber runners was erected over the screw jacks to support the dome concrete. At the all areas where slope of dome was more than 15 ^{o}, top shutters were also used.

4. Loading, Analysis and Design of Supporting Structure

Various loads such as superimposed load due to fresh concrete, dead load of top/soffit formwork, Self weight of steel dome, Live load due to construction activities, Dead load of prestressing cables and reinforcement and wind loads were considered during design of dome supporting. Analysis of different load combination is done using STAAD-PRO software.



5. I.C. Dome Supporting structure ground assembly and erection

Entire dome supporting structure was assembled on ground to form eight large segments and eight small segments. Thereafter the large segments were lifted from the ground assembly and erected in placed one by one by 650 t capacity crane.

6. Concrete Placement

Total quantity of concrete for dome and ring beam is 2130 cum. Concreting of dome including the ring beam was done in nine pours using state of the art methods of construction including pumping of concrete to a height of 50 meters by concrete pumps and placers.