DEVELOPMENT OF PRESTRESSED CONCRETE PRESSURE VESSEL FOR H.T.R.

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SUMMARY

In 1970 an H.T.R. development programme was started. Whilst the PCPV required to house the H.T.R. will be seen as a natural development from those already designed and under construction for A.G.R., it was considered important to obtain experimental verification of a number of certain aspects related essentially to the H.T.R. vessel. In particular these included the increased wall thickness in relation to cap thickness and internal height, diameter of boiler penetration and the small ligament in the standpipe zone. Furthermore, about 50% of the cross-sectional area of the pressurised zone is occupied by the standpipe penetrations.

This paper describes part of the experimental works undertaken to develop the design of the PCPV. The particular investigations described are:

1. Ultimate load tests on 1/40th scale concrete vessels pressurised in the short term to failure. The behaviour of the models is compared with that predicted by an ultimate load method of analysis. The method which was applied to the Hartlepool and Heysham vessels is based on finding the collapse mechanism associated with the minimum potential energy in the vessel.
2. Short and long term tests on 1/26th and 1/8th scale models of the top cap of the vessel to examine the behaviour under the action of prestress loads, internal pressure and sustained temperature. An assessment of the ultimate strength of the cap, based on simplified design methods is presented. Furthermore the components of the total shear force are identified e.g. shear resistance of the compression zone and shear transfer of the aggregate interlock within the tension zone. Estimation of the magnitude of these components is also given.

This work has shown that the design concept developed for the A.G.R. vessels can be satisfactorily developed to produce a containment vessel suitable for H.T.R.