

## CONTAINMENT SYSTEM SELECTION

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### SUMMARY

A variety of Containment Structures are in commercial operation today which are an outgrowth of new design approaches, types and sizes of plants etc. After a Nuclear Steam Supply System (NSSS) has been selected for a particular project and the conceptual general arrangements are established, one of the first engineering activity is the selection of a specific Containment System. The purpose of this paper is to identify the influence of various parameters like cost, general arrangement, NSSS mass and energy data, construction and site conditions and recommend procedures for the selection of containment system with due consideration to the functional requirements. The types considered are different shapes of steel, reinforced and prestressed concrete containment, single or multi-barrier, for PWR and BWR Nuclear Plants.

The major contributor to the Containment selection is the cost and schedule associated with the engineering and construction phase. To arrive at the most economical containment for a given set of project conditions, some of the factors considered are preliminary design, material takeoffs, present labor rates, cost of equipment and special construction techniques. The physical requirements to accommodate the NSSS and all related auxiliary equipment, influences the minimum diameter of the Containment. The determination of containment height by optimizing the pressure/net volume ratio is discussed. The effects of total mass-energy released, NSSS design, heat sink capacity and containment spray system on the containment design are also presented.

Importance of site conditions related to seismology, geology and meteorology are emphasized. In areas of high seismicity, the ratio of containment diameter to height ratio may have to be altered. Geology and site conditions often dictate the type of containment, especially with respect to the total containment weight when considering allowable soil bearing pressures and longtime settlements. Effect of structural system frequency characteristics are discussed with relation to soil-structure interaction behavior.

Necessity to establish a design and analysis sequence in the form of an engineering logic network is explained. The network includes activities, interrelations, restraints and end product of a specific level of detail. The network is then transmitted into a time frame and CPM.

A case study of a PWR containment selection in soft soil condition is presented in terms of cost, schedule technical requirements, licensing, constructability, and aesthetics. The principle alternate containments are a steel lined single-barrier containment and a free standing steel shell with a shield building multi-barrier containment. Both concepts include several variations of each general concept.

The layout criteria for containment building with relation to other major structures is established with specific consideration to missile protection, separation of redundant system, accessibility etc.

For prestressed concrete containments, advantages and disadvantages of various types of tendon arrangement are identified. Recommendations are made for containment foundation system. Possibility of prestressing of foundation under certain circumstances are discussed. The salient features of liner plate system selection are also included.

In conclusion, a logical approach to arrive at the final containment selection is achieved with due consideration to all component systems.