

CRBRP DESIGN FOR MAINTAINABILITY

DE82 002909

R. Spear  
W.J. O'Bryant  
E. Perry

**MASTER**

CRBRP Project Office  
Westinghouse Advanced Reactors Division  
Burns and Roe, Inc.

The Clinch River Breeder Reactor Plant (CRBRP) Project has recognized, from its very inception, the importance of incorporating maintainability into the design of the plant. Even at the very early stages of conceptual design, maintainability considerations played a major role in such basic decisions as providing a larger containment building. Since then, the Project has followed a rigorous technical management discipline to assure that the total design meets the needs for maintainability including in-service inspection and testing.

At the heart of the technical management discipline that assures maintainability, is the establishment (and documentation) of basic design requirements. The design configuration as it develops, is extensively reviewed to assure that these requirements are fully met. Subsequently, all changes to the design configuration are rigorously controlled to assure continued maintainability of the design.

A one-half-inch-to-a-foot scale model of the plant is the central tool for assessing the maintainability of the design. As individual systems and components are placed on the model, an evaluation is made to optimize maintenance access. Later the model is reviewed on an area basis to insure that mutual access is afforded to all components located within each cell and that maintenance platform configurations and laydown are provided space for component disassembly. Maintenance access requirements for equipment such as automatic welding machines or ultrasonic inspection tools, tube withdrawal areas for heat exchangers or other maintenance actions requiring major space are considered.

Procedure outlines were developed and are being continually updated to describe all scheduled and unscheduled maintenance activities. Guidelines were developed to ensure that there was adequate and consistent information provided by the various design organizations and that there was a coordinated effort to provide a data base to support the overall project maintainability goals. A coordinated approach was developed for integrating and interfacing all procedure outlines throughout the project to verify the design and to assure the ability to meet project availability goals.

Equipment removal and replacement studies were accomplished to provide design information in two areas; first, to determine the required space and to design maximum floor loading for corridors and walkways so that should the replacement of components be required, a minimum impact on permanent plant systems and structures would be required for rigging new components into place. The second objective of the equipment removal study was to evaluate a method of in-place component rigging and to determine building interface requirements for rigging attachment points to accomplish component replacement. The plant scale model is used to hold the required removal path space free of piping, cable trays or other equipment.

Data contained in the maintenance procedure outlines is used in a coordinated maintenance/radiation protection program for the plant. The Project top level documents allocate integrated radiation dose limits on a system basis along with overall radiation protection criteria. System designers must demonstrate, in the maintenance outline procedures, the ability of the system design to meet the allocated doses and criteria. Periodic project and health physicists ALARA reviews are conducted with each of the design organizations to evaluate their design against the integrated dose limits and to verify that the CRBRP As Low As Reasonable Achievable (ALARA) radiation exposure criteria are met.

Special consideration was given to the technique and requirements for inservice inspection. (ISI) and surveillance for the CRBRP because of the unique, first-of-a-kind design. Maintenance Outline Procedures are prepared by the designer to cover all ISI and surveillance requirements. In addition to the Maintenance Outline Procedures, an implementation document is being prepared to provide an integrated program that incorporates the intent of ASME Section IX, Division I and the proposed Division III.

Outage planning studies are being conducted utilizing the information and data base accumulated from the programs previously identified. These studies provide a scheduled outage plan for each of the 29 scheduled refueling plant outages and demonstrate the ability to accomplish all identified maintenance and inspection tasks within the allocated time and radiation exposure limits of the available plant and subcontract personnel. Crane availability, manpower (crafts) access provisions and work space conflicts are considered in the outage planning.

As a final step in this overall approach of technical management discipline, extensive reviews, including detailed walk-thru's of various operations, maintenance and test operations have been and are being conducted. As a result of this approach numerous design features have been added, deleted or modified to enhance maintenance.

The CRBRP design thus truly has maintainability integrated in the total design process from the very beginning. As a result of this approach, we can look forward to a plant which meets the industry needs for ease of maintenance, including testing and inspection.



Refer to:  
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Westinghouse  
Electric Corporation

Advanced Power Systems  
Divisions



Advanced Reactors Division  
Clinch River Site

Box W  
Oak Ridge Tennessee 37830

November 9, 1981

U. S. Department of Energy  
Technical Information Center  
P. O. Box 62  
Oak Ridge, Tennessee 37830

Attention: Special Assistant for Reproduction & Processing

Subject: CRBRP; Release of Technical Paper Under Contract  
DE-AC15-76CL02395

Dear Sir:


Enclosed are two reproducible copies of a paper entitled "CRBRP Design For Maintainability" by W. J. O'Bryant.

The paper has been patent cleared by the U.S. DOE/Chicago Patent Office and incorporates the comments of the CRBRP Project Office set forth in its approval for release to TIC. It is to be presented to the ANS Topical Conference in March 1982 and published in the proceedings thereafter.

This letter satisfies commitment number LR5777.

Should there be questions or comments concerning the above, please contact Ms. V. K. Hunt (615/576-1644) of the LRM.

Very truly yours,

  
Jos. A. Heeke, Jr., Manager  
LRM Procurement

VKH:rw  
LMP-81-814  
Enclosures

cc: CRBRP/PO - R. J. Getz, Chief, Information Division  
ARD/RM - M. A. Leogas, CRBRP Planning & Scheduling