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HW--25431

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By Authority of

CG-PR-2

CH Henager 4-23-92

By J. Eick 10-2-92

J. Wells 10-6-92

REVISION REQUEST NO. 13
PROJECT C-431-B

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OCT 28 1992

Richland, Washington
August 23, 1952

TO: R. H. Beaton, Chairman
Design Committee

FROM: E. L. Reed, Chairman
C-431-B Project Committee

SUBJECT: PROJECT C-431-B - BALL 3-X SAFETY SYSTEM - 105-C

RECOMMENDATION:

The Project Committee recommends the following course of action on the subject system:

1. Initial installation of 39 hoppers of mixed boron steel and ordinary steel balls (80 percent boron steel balls - 20 percent ordinary steel balls). The remaining six hoppers are to be filled with removable step plugs.
2. Procurement of sufficient balls for possible later installation of 80-20 mixed balls in place of the step plugs.

SUSTIFICATION:

1. The original design provided for 45 ball hoppers - one for each vertical safety rod slot. Re-evaluation of the ball safety control system was necessitated by difficulty in procuring the quantity of boron steel balls required for 45 hoppers. By using a mixture of balls in a proportion of 80 percent boron steel and 20 percent ordinary steel, the following calculated control capacities are obtained:

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Mixed Balls (80-20)

33 Hoppers - 2200 inhours*
39 Hoppers - 2550 inhours
45 Hoppers - 2900 inhours

Boron Balls (100 percent)

45 Hoppers - 2900 inhours

* Minimum required control

2. Sufficient balls are available to make the recommended installation prior to start-up.
3. Procurement of the additional balls is recommended on the basis that an extra safety factor can be obtained later if desired by expending approximately \$25,000 now for the balls, plus the cost of removal of the step plugs and installation of the hoppers and balls.

REMARKS:

1. The ordinary steel balls will be identical to the boron steel balls with the exception of a diametral increase of 1/16 inch for identification and sorting if required.
2. The recommended course of action on Project C-431-B does not imply that the safety control system for Project CG-494 is inadequate, despite the substantially smaller safety factor provided for in the CG-494 design criteria. The case involved on C-431-B concerns utilization, at some extra cost, of existing control slots in order to provide increased safety, whereas CG-494 involves designing an adequate safety system with due consideration of all design factors.
3. The attention of the Design Committee is directed to the fact that removal of the six step plugs and installation of hoppers and balls after start-up represents a job of substantial size and expense because of radiation problems.
4. Possible use of boron steel balls in selected hoppers and ordinary steel balls in the remaining hoppers was investigated and produced the following calculated control capacities:

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NO. OF HOPPERS		CONTROL, INHOURS
<u>Boron</u>	<u>Steel</u>	
33	0	2200
31	8	2350
39	0	2550
45	0	2900

Essentially identical control capacities and control speeds are obtained in 105-C with straight boron steel balls and with the 80-20 mixture. It was therefore concluded that the cost reduction resulting from use of the mixture outweighs any possible advantage accruing from use of undiluted charges in 105-C for the sake of interchangeability of charges with other 100 areas or for the sake of obtaining additional control later through substitution.

DRAWING AFFECTED: P-8323, Rev. 2 - Distribution Control Arrangement Ball 3X System

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APPROVED BY

Project Committee

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1 / 7 / 93