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"B" Plant Reactivation - 4X Program

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W. R. Felts

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TO: R. H. Beaton, Manager
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This document consists of 13 pages. ~~Copy 1~~

DESIGN CRITERIA - PART I

"B" PLANT REACTIVATION - 4X PROGRAM

I. INTRODUCTION

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The purpose of these criteria is to present the scope for the reactivation of the bismuth phosphate separations plant in the 200 East Area.

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By Authority of CG-PR-2

RM Iten 7-20-92
M. Eick 10-16-92
J. Jello 10-15-92

In view of the urgency of this work, Part I of this report is being issued now to include all the items which are firm and necessary for the reactivation of the "B" Plant. Part II (to be issued later) will include those items presently not scoped which will be required to achieve the maximum production rate of 150 tons of low exposure uranium per month for the plant.

For planning purposes it is assumed that the "B" Plant will start up about September 1, 1955 and operate for at least two years.

II. DISCUSSION

The "B" Plant has been completely inactive for about one year. Construction of this plant was completed during the spring of 1945 and the first production run was made during the summer of that year. The production requirements at that time did not necessitate continuous maximum capacity operations. Only two dissolvers, one extraction cycle and a single line decontamination process were in operation. A second extraction cycle was activated during 1948 and the decontamination cycle was paralleled in 1950.

In the fall of 1952, the production program was such that only one of the bismuth phosphate plants was required to operate. The last production run in the "B" Plant was made in August 1952. The "B" Plant was then kept in stand-by condition for about a year and in 1953 steps were taken to place the plant in a "layaway" condition. All equipment was kept intact insofar as possible and the following major work was done:

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1. Steam and water supply lines to the plant were disconnected.
2. All chemical and process lines were drained, flushed and blanked.
3. All instruments were disconnected.
4. Air compressors and 291 steam fan were dismantled.

During the layaway period, the following major pieces of equipment were removed for use elsewhere in the Hanford Works:

1. The 221-B crane periscope was removed for reinstallation in the Purex Building.
2. An auxiliary hoist and accessories for the 221-B crane were removed for use in the Redox building.
3. Three chemical storage tanks (one 9' x 36' horizontal and two 10' x 14' vertical) were removed for use on other projects.
4. Miscellaneous equipment and jumpers were removed for emergency requirements in other plant buildings.

III. PROPOSED WORK

The items listed below are considered necessary for the reactivation of the 200 East Area "B" Plant. The extent of repairs or replacements of the first six items is not known at this time. The work is required, however, to place the facilities in satisfactory working condition. Major repairs or replacements will be scoped in Part II to be issued later. The approximate cost of the first six items may range from \$20,000 to \$50,000, excluding major repairs or replacements.

1. Reconnect service supply lines to the "B" Plant. Regasket and repair as necessary.
2. Reconnect all service lines in pipe gallery. Regasket and repair as necessary.
3. Test all process lines and vessels to check for leaks. Replace and repair process lines, if necessary. Repair process vessels if possible.

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4. Test and inspect waste lines from 221-B and 224-B to diversion boxes.
5. Check conditions of centrifuges and agitators. There are 17 centrifuges and 38 agitators in the "B" Plant (221 and 224) to be checked. Some are defective and others are not connected.
6. Check chemical storage facilities. This checking is to include hydrostatic testing of the HF storage tanks, hydrostatic testing of heating coils in the caustic storage tanks and inspection of platforms, railings and stairs. HF piping from 211-B to 224-B, and HF pumps will need replacing. Two other pumps (one sulfuric acid and one nitric acid) are missing and must be replaced.
7. Regasket all trench jumpers. Some are leaking and others are uncertain. Approximately 150 jumpers are involved. Approximate cost - \$12,000.
8. Regasket all product jumpers in cells and other cell jumpers as required. A maximum of 600 jumpers may be involved. Approximate cost - \$48,000.
9. Replace all missing or defective jumpers with new ones. About 150 new jumpers are anticipated. Approximate cost - \$300,000.
10. Replace the process transfer lines between the precipitator tanks and the centrifuges in the 224-B Building B, D, and E cells. The above lines have been subjected to extremely corrosive conditions and have not been replaced to date in the "B" Plant. These lines have recently failed in "T" Plant and were replaced. To insure continuity of 224-B operation after start-up, these lines must be replaced before activation of the facility. Approximate cost - \$5,000.
11. Renovate 221-B Crane. Total approximate cost - \$400,000
 - a. Procure, assemble, install and test crane periscope. Approximate cost - \$250,000.
 - b. Procure and replace missing auxiliary hoist, rail, hooks, etc. Approximate cost - \$20,000.

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- c. Procure and install monitoring equipment consisting of EM chamber and recorder, GM tube and recorder, CFM unit, air sampling unit and the related alarm circuits. This equipment was removed from the "B" Plant crane for installation in other facilities. *See attached letters.
- d. Erect ~~permanent~~ steel platform for crane repairs and inspection. Construction will consist of painted structural steel framing and steel grutings. At the present time, such a facility does not exist and a temporary platform must be erected each time work is performed on the crane. This platform will be utilized for periscope and hoist installations. Approximate cost - \$10,000.
- e. Clean or replace 75-ton crane power cables and install new shoes.
- 12. Activate a third dissolver cell (3-5L). This involves a new dissolver, tower, silver reactor unit, jumpers and a new control panel. Required for maximum production capacity. (See Document HW-32694.) Approximate cost - \$100,000.
- 13. Activate a third extraction cycle. Involves a new centrifuge, a new precipitator tank, a fifteen HP agitator, a five HP agitator, and new jumpers (part of Item 9). Required for maximum production capacity. (See Document HW-32694.) Approximate cost - ^{100,000} \$150,000.
- 14. Replace missing nitric acid storage tanks (two vertical 10' x 14' tanks and one horizontal 9' x 36' tank). These tanks will provide a two week minimum supply of nitric acid for the "B" Plant. A 30-day minimum supply is more desirable but justification cannot be made because of the short range protection program. Approximate cost - \$50,000.
- 15. Purchase radiation monitoring instruments and install those as required. The requirements set forth by the Radiological Sciences and Manufacturing Departments include the following:
 - a. 28 Portable Instruments;

b. 14 Stationary and semi-portable instruments.

c. 27 fixed monitors.

d. Effluent monitoring.

The cost of the instruments required is approximately \$50,000.

16. Provide dry chemical handling facilities. This includes one fork lift truck (2000# capacity), two jack-lift dollies and 150 pallets. Present facilities are inadequate and lacking in the above equipment required for the new production program. Approximate cost - \$10,000.

(17) Provide metal storage facilities and underwater regasketing facilities in Section 2R (swimming pool). This involves partition of the pool (by a concrete partition or insertion of an open steel tank) for lag storage of metal on one side and regasketing facilities on the other. Regasketing tools and equipment will be required as presently provided in the "T" Plant.

Facilities for lag storage of metal must be provided to enable the efficient scheduling of ^{and cars} east ~~can~~ for Separations Plants charging operations. Additional ^{and cars} east ~~can~~ will be required if lag storage facilities are not provided. Approximate cost - \$50,000.

18. Install central air monitoring systems in 221-B and 224-B. Present equipment consisting of 5 small portable monitors would have to be augmented by at least 13 additional monitors for the reactivation program.

The central air monitoring system would be similar to that provided in the 221-U canyon Building and as indicated on Drawing E-4-1645 except that "quick-fittings" are not required. Installation of this system will provide a uniform means of air sampling which will require a minimum of maintenance. Approximate cost - \$45,000.

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19. Provide tank for collecting floor drainage waste from the 224 Building operating cells. This tank to be located in C cell. The present drainage collection tank (No. C-7) is to be converted into a waste hold-up tank for waste from B and E cell processing. Also install lines connecting the B-3 and E-1 and E-3 and B-1 tanks.

A cell drainage tank must be provided to collect product or potential product bearing waste from all operating cells. This product waste originates from line leaks, decontamination operations, and for tank leaks. Since ponderable quantities of product may be present it is necessary to collect, sample and obtain the analysis prior to disposal as waste or re-processing as recycle.

Due to the number of runs scheduled for processing through the building to meet the production commitments, time lost awaiting analysis cannot be tolerated. The 222-S laboratory must be used for analytical purposes for two to four months after "B" Plant start-up, consequently, samples must be transported from 221-B and 224-B in the 200-East Area to 222-S Laboratory in the 200-West Area (a distance of about 7 miles each direction). This lost time becomes more pronounced when re-sampling and re-runs of sample are required. Eventually the Purex Laboratory will service the 221-B and 224-B process which will still require transportation of about 1-1/2 miles each direction. The present C-7 tank would serve as a waste hold-up tank for either B or E cells allowing normal processing to continue in either while awaiting analysis. The lines connecting the B-3 and E-1 and the E-3 and B-1 tanks will allow re-processing out-of-specification wastes in either cell thereby cutting down on lost time. The present C-7 tank (noted above) converted for waste hold-up will be connected by lines to the B-1 and E-1 tanks. Approximate cost - \$20,000.

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19. 20. Provide opening and SWP facilities for canyon entry at Section 20 of the operating gallery. This involves the opening of a passageway through the canyon wall which is presently grouted in with fill material, construction of an air lock to the canyon, provision of an SWP lobby in the operating gallery at Section 20 and construction of stairs from this lobby to the pipe gallery. These facilities will eliminate the present procedure involving use of the 271 locker room and outside entrance R-13 to the canyon and greatly reduce time required for the performance of work by operating and servicing personnel in the canyon proper. Approximate cost - \$25,000.

21. Make necessary roof repairs as presently being done at the "T" Plant. This involves the replacement or repair of flashings, expansion joints and roofing material. It is essential that this be done to provide adequate weather protection. Approximate cost - \$25,000.

22. Paint interior surfaces as required. Painting is required for the following:

- a. Operating galleries - 221 and 224.
- b. Offices.
- c. Lunch rooms.
- d. Locker rooms.
- e. F-10 room - 224.
- f. Cells - 224.
- g. Canyon Deck - 221.

Approximate cost - \$15,000.

23. Erect partitions in Rooms 201, 202, 203 and 211 of 271-B Building to provide office spaces. See SK-2-1799 in addendum. This has been done at the "T" Plant and is also considered essential for adequate personnel quarters at the "B" Plant. Approximate cost - \$10,000.

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24. Provide 275 lockers and additional lunch room equipment. The lockers and lunch room equipment originally provided were greatly reduced in number during the layaway period because of requirements elsewhere on the plant. Approximate cost ^{10,000} \$15,000.
25. Erect ~~permanent~~ steel scaffold at railroad tunnel door. A scaffold (temporary) will be required anyway for the inspection and checking of the door, motor and controls. A permanent type scaffold will permit ready inspection and maintenance of the door which normally requires routine servicing. Approximate cost - \$2,000.
26. Provide adequate stack air sampling facilities as specified by Radiological Engineering. (See addendum - letter dated September 8, 1954, J. M. Smith to T. Prudich.) This involves renovation of the 292-B Building, stack sampler facilities for 50-foot and 200-foot levels, and provisions for sand filter sampling. Approximate cost - \$75,000.
- Study 13 under study*
- Study 27 10.11.*
27. Revise and repair F-10 tank in 224 Building to provide agitation and adequate load-out facilities.

At the present time, the F-10 tank is not provided with satisfactory agitation and sampling facilities. Product solutions unloaded from this tank are placed in transfer containers and transported to the 231 Building Facility.

In the 231 Building, the solution is filtered through the N-1 filter tank prior to sampling. Since the sample obtained in the F-10 tank is generally not a representative sample of the solution due to poor agitation in the tank, accountability of the process flow between the 224 and 231 Buildings cannot be maintained. Product hold-up on the N-1 filter cannot be determined as an accurate accountability figure for the solution transferred to the 231 Building is not available.

In addition, accountability through the 224 Building cannot be followed for the same reason. Load-out facilities in the F-10 room are inadequate for handling the large volume of material produced at the 150 tons per month production schedule. Improved facilities for filling PR cans and emptying recycle cans must be provided to insure the smooth flow of transfer cans between facilities with a minimum of time. Approximate cost - .

28. Move discarded and defective equipment to the burial ground. This involves fabrication of large boxes to totally house tanks, centrifuges, agitators, jumpers, silver reactors or other contaminated equipment destined for the burial ground. Approximate cost - ⁴⁰⁰⁰ \$30,000.
29. Provide additional product containers. The requirement for product containers for the low-level exposure program indicates that about 35 additional containers should be procured.

Two trucks equipped with casks for transporting product containers between the 224 and 231 Buildings will be required. The additional product containers and trucks are required to handle the planned increase in production for both the T & B Plants. Approximate cost - ²⁵⁰⁰⁰ \$35,000.

30. Provide cell jumper storage rack in canyon. The rack will be a simple steel framework capable of holding at least 12 jumpers and will facilitate jumper handling in the canyon. Approximate cost \$1,000.
31. Reactivate heating and ventilating equipment. Some renovation of equipment may be required. Approximate cost - \$5,000.
32. Provide welding gas manifolds and bottle shelters for piping welding gases into the 271-B maintenance shop. This is a safety requirement and efforts are presently being made to provide such facilities in the 200 Areas. Approximate cost - \$8,000.

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33. Provide air raid warning facilities in the "B" Plant.

An alarm system for warning personnel in the "B" Plant in the event of an air raid is not currently available. Installation of this equipment is required for personnel safety in the event of an enemy air attack. Similar installations are ~~to be installed in other~~ *under consideration for other* Separations Sections operating facilities. Approximate cost - ~~\$5,000.~~ *\$25,000.*

34. Install safety stops for the elevators in 221-B and 224-B similar to those in the "U" Plant. These stops are required for personnel safety when operating these elevators. Approximate cost - \$2,000.
35. Reactivate ~~all~~ *recycle* instruments in operating gallery. This involves reconnection of all lines and leads previously disconnected during the lay-away program. Replacement of some instruments or lines may be necessary. Approximate cost - \$30,000.
36. Replace the existing 6-1 tank with the present 10-1 tank. Remove the 6-2 centrifuge and centrifuge block from Section 6 and install a lag storage tank and jumpers for metal solution in this spot which is capable of holding approximately 20,000 to 25,000 pounds solution. The added storage capacity for metal solution is required to eliminate lost production time at the accelerated schedule proposed. The 6-2 lag storage tank is required for handling part batches of metal solution from the 6-1 tank which are too small to make up one complete run in the 6-3 tank. This will free the 6-1 tank to receive the next metal solution batch from the 4-7 tank for sampling prior to make-up.

The following items are under study to establish their feasibilities and justifications before including them in the over-all program to provide ^{waste disposal space,} additional production capacity, efficiency and safety for the "B" Plant:

1. First cycle waste scavenging.
2. Possible need of ammonia scrubbers.
3. Scavenging of TBP waste stored in the C farm if necessary to gain tankage for "B" Plant waste.
4. Alterations required at "T", 231, and 234-5² TBP Buildings due to 4X Program.
5. Laboratory facilities and sampling equipment. This work includes the installation of the Gilmont type sampler at all sample risers where trombone samples were previously utilized and the gooseneck pipette sampler on the risers where bayonet samplers were previously utilized. The improved sampling devices are required to reduce personnel exposure while sampling and analyzing these samples and to provide a more representative sample of the tank contents. Two sample delivery trucks will be required to deliver these samples to the 222-S Laboratory for analysis.
6. Emergency electrical power supply. Determine if present facilities are adequate.
7. Spare equipment.
8. Reroute the existing waste lines from the 224-B Building to the 200 series diversion box to enable the routing of waste from the 224-B building to a 100 series diversion box and thence to a waste tank farm containing three waste tanks in a cascade series. The old routing of 224-B waste to the 200 series B-farm cascade tanks cannot be utilized as these tanks are filled with 224-B waste sludge.
9. Provide SNF changehouse near railroad cut for use by train crews. Special hazards conditions in the railroad cut immediately north of the 221-B Building now require trainmen to don SNF clothing prior to entrance into the cut. Facilities will consist of an

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electrically heated shelter (approximately 12' x 15') of wood frame construction which will house lockers and clothing change facilities such as hampers and shelves.

10. Provide waste storage facilities for "B" Plant waste solution. This will include ^{removal of waste currently in tanks} installation of separate fill lines ~~to waste tanks~~ and installation of steam cleanout lines for the waste lines connecting tanks in cascade series. Installation of separate fill lines to underground waste tanks is needed to enable the storage of waste solution in specifically designated waste tanks which will be available for use. Installation of cleanout lines on the waste lines is needed to remove existing plugs in these lines and to provide facilities for unplugging metal waste lines in a cascade series when a plug occurs. Recent experience has proven that metal waste cascade lines frequently plug due to solids formation.

IV. JUSTIFICATION

The work proposed above is necessary for the reactivation of the "B" Plant under the Hanford 4X Program. (Reference - Directive HW-336.)

The "B" Plant will have an estimated production capacity of 150 tons of uranium per month. The "T" Plant is presently producing at a rate of 80 to 100 tons per month, and after installation of the third extraction cycle (authorized September 1, 1954 by Directive HW-336) the potential capacity will be 150 tons per month before the first of January 1955.

The Hanford production program for 80 M.G.S. plutonium during the next three fiscal years indicates that both the bismuth phosphate separations plants must be operated at their maximum capacities. (References - Documents HW-32431 and HW-32432.)

V. COSTS

The cost of the reactivation of the "B" Plant is estimated to be approximately \$1,750,000, including only those items which are firm at this time. The cost of the additional work which will be required is estimated to range from \$500,000 to \$1,000,000. The above figures do not allow contingencies for additional material and equipment which may be required as a result of initial test work. It is conceivable that items such as a new waste line, additional tanks, centrifuges and equipment may add appreciably to the cost.

VI. SCHEDULES

No major design work is required, except for possibly the ammonia scrubbers and first cycle waste scavenging. All design work can be completed by March 1, 1955.

Authorization to proceed with preliminary construction and test work has been requested by a letter to the AEC. Unless the initial work is done soon, the procurement of additional critical material and equipment will be delayed.

It is expected that the "B" Plant can be ready for operation about September 1, 1955.

VII. REMARKS

A Part II of this security document covering the items presently under study and those items which are found to be required as a result of initial test work is expected to be issued about November 1, 1954.

PREPARED BY _____

Design Engineering
Design Section
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APPROVED BY _____

Head, Separations Design & Development
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