TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

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August 17, 1984

U.S. Nuclear Regulatory Commission
Region II
ATTN: James P. O'Reilly, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Dear Mr. O'Reilly:

Enclosed is our supplemental response to R. C. Lewis' May 2, 1984 letter to H. G. Parris regarding our June 4, 1984 response to Inspection Report Nos. 50-259/84-12, 50-260/84-12, 50-296/84-12 for the Browns Ferry Nuclear Plant. This response provides supplemental information for Violations 1 and 2 as requested in your May 2 letter. A two-day extension to August 17 was discussed between Ross Butcher of your staff and Mike Hellums of my staff on August 15, 1984. If you have any questions, please call Jim Domer at FTS 858-2725.

To the best of my knowledge, I declare the statements contained herein are complete and true.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

D. L. Lambert

D. L. Lambert
Nuclear Engineer

Enclosure

ENCLOSURE
SUPPLEMENTAL RESPONSE
NRC INSPECTION REPORT NOS.
50-259/84-12, 50-260/84-12, AND 50-296/84-12,
RICHARD C. LEWIS' LETTER TO H. G. PARRIS
DATED MAY 2, 1984

Supplemental Response Request (1):

Corrective actions which have been and will be taken to avoid further violations of excess water in resin liner shipments, including test results obtained or tests planned to ensure that your dewatering procedures are effective and your administrative controls to ensure that resin loading conforms to the test parameters.

Corrective Steps Which Will Be Taken to Avoid Further Violations

Section 9.3 of the Final Safety Analysis Report (FSAR) provides a general description of the Browns Ferry solid radwaste system. Specific operational details required to meet the safety design basis are omitted. Important in these specific details is the correct connection and sequencing of liner filter elements during the dewatering process. The multiple layers of filters internal to a liner are connected to a common vacuum pump. Water is extracted from the resin slurry in the liner until vacuum is broken. Then the next lower filter elements are valved to the pump and dewatering continues. The dewatering process is terminated when vacuum is broken on the bottom layer of filter elements.

An extensive investigation was conducted into the cause for the excess water discovered in two resin liners in October 1983. Plant engineering and operating personnel reviewed the theories resulting from the investigation. The most plausible theory was that procedural and administrative deficiencies resulted in final dewatering from a filter element layer other than the bottom. Liner hose connections were not uniformly and clearly labeled and operating instructions were not explicit in requiring final dewatering from the bottom. Final dewatering from any other filter layer would leave a substantial quantity of water at the bottom of the liner at the time of shipment. The similar excess quantities of water found in the two liners (95 and 100 gallons) supports this theory. Compounding these problems was the fact that Browns Ferry did not have an effective quality control (QC) program to check the adequacy of dewatering.

Another theory was formulated at the same time attributing the incident to mixing bead and powdered resin. The basis for this theory is that bead resin and powdered resin dewater differently. Powdered resin can be vacuum dewatered quickly and efficiently. The small particle size allows capillary action to draw water to the filters from great distances. Bead resin does not vacuum dewater efficiently. The large particle size supports gravity draining as opposed to capillary action. Because of this, when vacuum is broken there is no assurance that all the water has been removed from bead resin that is not immediately adjacent to the filter element.

Both liners found to contain excess water were theorized to contain high concentrations of bead resin. Prior to shipment, the exact composition of bead resin in both liners was not known. The concentration of bead resin in the liner returned to Browns Ferry was determined to be 20 to 25 percent. Operating practice at Browns Ferry has been to mix bead and powdered resin in phase separators prior to filling liners. Subsequent QC tests have indicated that liners can be successfully dewatered with bead resin concentrations up to 45 percent. To produce almost identical quantities of excess water (95 and 100 gallons), the bead resin concentration in each liner would have had to be in excess of 45 percent and identical. The theory that bead resin is responsible is highly improbable.

The experience and training of the operating personnel involved in the filling and dewatering of the two liners was investigated and determined to be adequate.

Our corrective action was to immediately label all waste package hose connections in a uniform and permanent manner. The radwaste operating instruction was revised to include detailed steps outlining the proper sequencing of liner filters during vacuum dewatering.

A QC program was established to periodically check the adequacy of dewatering. Because of concern over the possibility of filling a liner with only bead resin, laboratory personnel were instructed to notify operations whenever a visual examination of a resin sample was found to contain an excessive concentration of bead resin. Those liners suspected of having an elevated concentration of bead resin were conservatively left under vacuum for an additional two hours. Recently a technique has been perfected to quantitatively determine the actual percent bead resin present in a liner. The highest concentration of bead resin found in a liner using this technique is approximately 45 percent.

Twelve hours after termination of vacuum dewatering, this liner was again subjected to vacuum. The resulting quantity of water extracted from the 45 percent mixture was less than that allowed by burial ground criteria. Liners with lower concentrations of bead resin had been successfully tested previously.

Because of concern over the concentration of bead resin in our liners, we plan to continue to make quantitative determinations on the amount of bead resin in liners loaded from phase separators having mixtures of bead and powdered resin. If a concentration of bead resin is determined to be in excess of that previously tested for adequate dewatering, then that liner will be tested independent of QC frequency requirements. It is felt that this additional corrective action will help ensure that the safety design basis for the solid radwaste system will be maintained.

Supplemental Response Request (2):

10 CFR 50.59 evaluation of the change to the radioactive waste system concerning mixing of bead and powder resins, which is not addressed in the FSAR.

Additional Information for Consideration on 84-12-02

Section 9.3 of the FSAR contains both a written description of the solid radwaste system and a flow drawing (figure 9.3-1A). This figure agrees with the text and shows both bead and powdered resin slurries being routed to the common waste packaging area. The figure contains small details such as hose connections, flush lines, and liner internals not mentioned in the text. Just because these details are not mentioned in the text does not lessen their importance, nor does it prohibit their use in meeting the systems design basis. It is Browns Ferry's use of these small details that require further clarification. Attachment A is a copy of figure 9.3-1A marked to show how plant personnel attached a reinforced rubber hose to transfer bead resin to waste phase separators 'E' or 'F.' It is clearly evident that the connection was made through a flush line and flow was in a direction opposite to that shown. This configuration is still in use and is preferred by plant personnel. Because the free end of the hose can only reside in one phase separator at a time, administrative control over bead resin mixing is maximized.

Attachment B is a copy of figure 9.3-1A marked to show the use of permanently installed hose connections to route bead resin from the spent resin packaging outlet to a common line leading to all six waste phase separators (A - F). The arrangement shown on attachment A was not evaluated to determine if an unreviewed safety question (10 CFR 50.59 evaluation) existed at the time of installation. Once plant personnel became aware of this oversight, a 10 CFR 50.59 evaluation was performed.

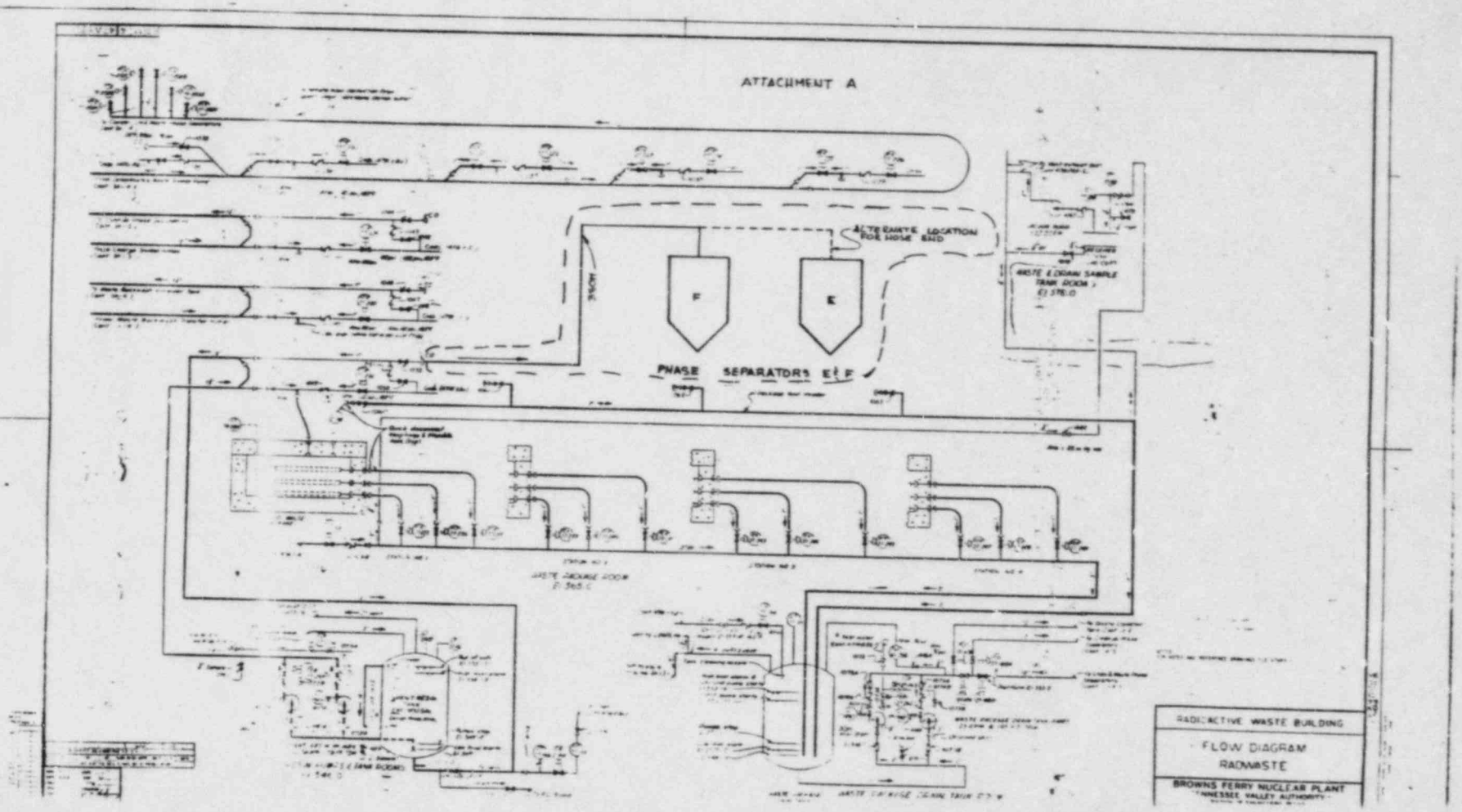
The key factor in performing the 10 CFR 50.59 evaluation was that the final result from using the configuration shown in attachment A is the same as from using the approved configuration shown on attachment B. Our evaluation was further confirmed in a memorandum from TVA Engineering Design that states: '. . . The design of the radwaste system did not preclude mixing of bead resin and powdered resin in a liner prior to disposal. An existing hose connection also allows upstream mixing in the phase separators. . . . '

The reasons for transferring bead resin to the phase separators and for mixing the resin types is explained in our original reply. These reasons result from operating experience gained after the FSAR was completed. The design of the solid radwaste system allows liners to be filled with either bead resin, powdered resin, or combinations of the two. The liners and dewatering equipment are common for all types of filter material handled by the solid radwaste packaging system. Plant personnel using the installed equipment have the responsibility of meeting all federal and burial ground criteria. Specific operating details and administrative controls necessary to meet these requirements are contained in plant procedures not in the FSAR. This allows the flexibility to change these instructions based on experience and to reflect changes in regulations. For instance, operating experience has demonstrated that the proper connection and sequencing of liner filter elements during the dewatering is important to meet the safety design basis. Operating experience has also demonstrated the need to exercise the option to transfer bead resin into the phase separators. The need for an unreviewed

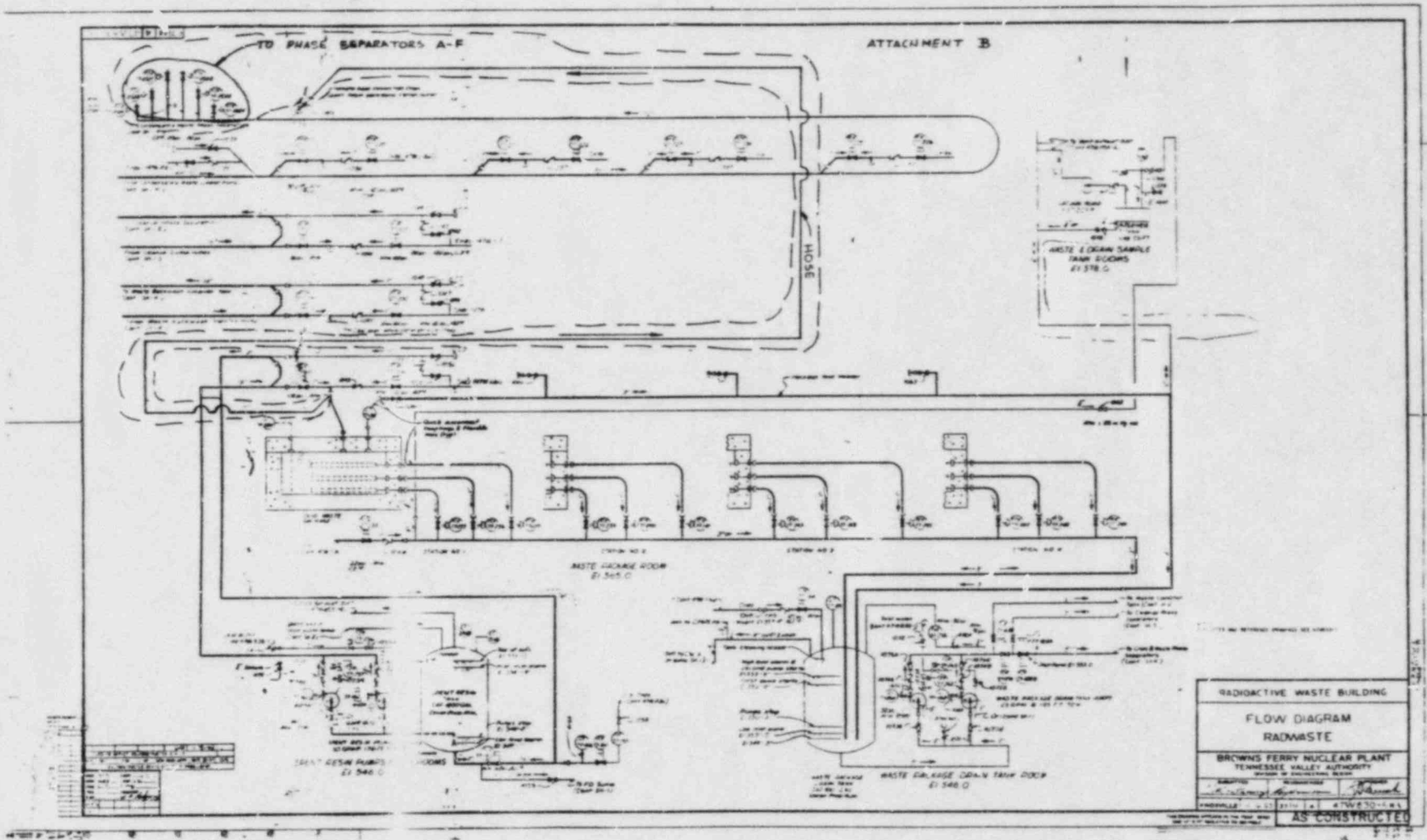
afety question determination is dependent on the details of the proposed changes. In this particular case, we believe that mixing of the resin types is within the scope of the FSAR description, and that an unreviewed safety question determination was not required.

NRC 84-12

ATTACHMENT A



ATTACHMENT B



RADIOACTIVE WASTE BUILDING

FLOW DIAGRAM
RADWASTE

BROWNS FERRY NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

AS CONSTRUCTED