(CLASSIFICATION)

DOCUMENT NO.

HW--61206

DE93 002081

GENERAL ELECTRIC UNCLASSIFIED

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

TITLE

THIS DOCUMENT CONTAINS RESTRICTED DATA AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954. ITS TRANSMISSION OR THE DISCLOSURE OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED.

ATTACHMENT WITH MODIFICATIONS - 100-B/C

☐ OTHER OFFICIAL CLASSIFIED INFORMATION

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U. S. C., SECS. 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

AUTHOR

J. E. Corley

VED-75

CIRCULATING COPY
RECEIVED 100D AREA

RETURN TO

THIS DOCUMENT MUST NOT BE LEFT UNATTENDED OR WHERE AN UNAUTHORIZED PERSON MIGHT HAVE ACCESS TO IT. WHEN NOT IN USE, IT MUST BE STORED IN AN APPROVED LOCKED REPOSITORY WITHIN AN APPROVED GUARDED AREA. WHILE IT IS YOUR POSSESSION AND UNTIL YOU HAVE OBTAINED A SIGNED RECEIPT FROM CLASSIFIED FILES, IT IS YOUR RESPONSIBILITY TO KEEP IT AND ITS CONTENTS WITHIN THE LIMITS OF THIS PROJECT AND FROM ANY UNAUTHORIZED PERSON. ITS TRANSMITTAL TO, AND STORAGE AT YOUR PLACE OF RESIDENCE IS PROHIBITED. IT IS NOT TO BE DUPLICATED. IF ADDITIONAL COPIES ARE REQUIRED, OBTAIN THEM FROM THE RELATED ISSUING FILE. ALL PERSONS READING THIS DOCUMENT ARE REQUESTED TO SIGN IN THE SPACE PROVIDED BELOW.

ROUTE TO:

PAYROLL NO.

LOCATION

FILES ROUTE
DATE

SIGNATURE AND DATE

**RECORD
COPY**

Received by DSTR

100-B/C 1992

MASTER

Indefinite Retention

Disposal Date

Authority

Authority

UNCLASSIFIED

UNCLASSIFIED

HW-61206

October 7, 1959

This document classified by:

This document consists of
13 pages. No. 6 of
20 copies. [REDACTED]

SCOPE STUDY

EFFLUENT SYSTEM MODIFICATIONS - 100-B/C

BY

J. P. Corley

WATER PLANT & UTILITIES ENGINEERING
PLANT AND INDUSTRIAL ENGINEERING
FACILITIES ENGINEERING OPERATION

Approved by:

Accepted by:

[Signature]
Supervisor,
Water Plant & Utilities Engineering

[Signature]
Manager
B/C Reactor Operation

SPECIAL RE-REVIEW

FINAL DETERMINATION

DISCLOSURE CONFIRMED

BY JW Jordan DATE 8-14-81
BY JD Denavim DATE 9-3-81

[REDACTED]
This document contains restricted data as
defined in the Atomic Energy Act of 1954.
Its transmission or the disclosure of its
contents in any manner to an unauthorized
person is prohibited.

UNCLASSIFIED

UNCLASSIFIED

HW-61206

DISTRIBUTION

1. JW Baker
2. JP Corley
3. RL Dickeman
4. WJ Ferguson
5. AB Greninger
6. RT Jaske
7. PC Jerman
8. RT Jessen
9. AR Keene/RL Junkins
10. TH Lyons
11. AR Maguire
12. DW Pearce
13. CA Priode
14. W Seeburger
15. WW Windsheimer
16. 300 File
17. Records Center
- 18-20. Extra

EFFLUENT SYSTEM MODIFICATIONS - 100-B/CINTRODUCTION

The 107-B retention basin was constructed in 1943-44 as part of the original reactor installation. Thermal stressing has caused extensive cracking of the concrete walls and leaking at cracks and joints, requiring repeated maintenance including a major repair program in 1952-53. Although a major repair or replacement program will eventually be necessary, (1,2) existing basin leakage does not require immediate action, other than periodic control effort, with one exception. Effluent from 107-B leakage is flowing into the 181-B river pumphouse forebay, measurably increasing the temperature of the raw water and raising the question of continued stability of the building foundation.

A basic inadequacy also exists in the inability to dispose of undesirable effluents other than to the river. The unique situation of B Reactor adjacent to the C Reactor effluent system permits consideration of improving the effluent disposal situation in this one area with minimum capital investment.

It is recognized that proposed future increases in plant production may eventually require effluent treatment which would revolve additional system modifications. (3) However, development work required to delineate the necessary changes in effluent or process water treatment is not yet complete.

The purpose of this report is therefore to provide the scope for a project proposal for interim effluent system modifications in 100-B Area only. This will avoid future production losses and improve effluent disposal capability during resolution of a more permanent solution to the overall problem of effluent routing and treatment.

SUMMARY

Although all three of the older retention basins, 107-B, D, and F, show excessive leak rates, only at 100-B Area is the leakage causing a measurable loss of production capacity, and potentially endangering other buildings. In addition, the condition of the 107-B basin is such that a severe rupture incident could result in a basin full of effluent which could not be cribbed and which could cause off-site limits on fission product concentrations in the river to be exceeded. Some risk also exists of a sudden increase in shore-line radioactivity releases to the river which would endanger other reactor area sanitary water supplies.

Current development work is aimed at effluent decontamination which may eventually result in further effluent system modifications. An interim solution is therefore proposed, consisting of new effluent lines to route normal 105-B effluent through 107-C west tank, with provisions for diverting either B or C effluent when necessary to drain to crib the contents of either 107-C tank. Improved monitors and remote gate controls would be provided. With proper operating attention, this system should meet all current criteria for effluent control, while eliminating the prospective loss of production capacity. The estimated cost of this proposal is \$495,000.

1. Letter, G. H. Bauer to R. G. Clough, "100-B Retention Basin Engineering Inspection and Evaluation", April 25, 1956.
2. Letter, G. H. Bauer to R. T. Jaske, same subject, November 14, 1957.
3. HW-54953, (Secret), "Environmental Consequences of Proposed Changes in Reactor Operations", by B. V. Anderson et. al., February 11, 1958.

UNCLASSIFIED

STATEMENT OF THE PROBLEM

Design and Status

The 107-B basin consists of two wood-baffled rectangular sections with a central flume, with massive gravity-type concrete walls, mesh-reinforced gunite sloping side walls, and reinforced (but unconnected) concrete bottom slabs. The limited number of expansion joints used in the construction has resulted in almost complete extrusion of the joint-sealing mastic at present effluent temperatures. Considerable cracking of the concrete walls, as evidenced by numerous leaks, has also occurred.

Inspections of this basin by G. H. Bauer of the Construction Engineering Operation in 1956 and 1957 lead to the following conclusions: (1,2)

1. The already extensive leakage from the B basin will increase with the passage of time.
2. Sudden structural failure is unlikely, although continued gradual deterioration is probable.
3. Major repairs of the type done in 1952-53 would be of little value.
4. Continued use of the basin would be limited by the results of the leakage rather than structural safety considerations.

Accelerating basin leakage led in 1952-53 to a project for cleaning out and repacking joints in all concrete basins with the best available mastic. The cost of this project for 107-B was approximately \$165,000 and was only temporarily successful in reducing leakage. Basin losses calculated from periodic draw-down tests since that time have been reported as high as 10,000 GPM.

Surface leakage is a recurring problem, although it is currently under fair control by diking and trenching. Some work will be required this fiscal year to maintain this status. Air-borne contamination spread has been to date a problem only with a nearly empty basin with dry inner surfaces.

Immediate action to stop the potentially serious bottom leakage might not be required except for an apparently unique situation at 100-B. Effluent leaking from the 107-B basin enters the river along the plant shore from numerous hot springs. The soil structure is such that much of this leakage flows underground in a westerly (upstream) direction, emerging on both sides of and within the 181-B/C river pumphouse forebay. The major outflow observed to date is through an opening between the walls of the 181-B and 181-C structures, where a flow estimated at greater than 500 GPM with a temperature greater than 60° C emerges. (Radio-analyses of samples of this stream confirm the source.) The circulation of the forebay is such as to carry this flow across the 181-B side intake, C Reactor being affected to a lesser extent. The calculated temperature increase of about 0.5° F is confirmed by a comparison of measured pump-well temperatures at 181-B with raw water temperatures from the KE raw water line. The average difference in these temperatures for the last half of 1958 was 0.54° F. The temperature increase actually may be as much as 1° F

Design and Status (Cont'd)

based on scattered upriver measurements. This temperature increase has operating significance when B Reactor is operating on water temperature limits, either bulk or tube outlet, at which time any such increase in inlet water temperature results in an equivalent loss of production capacity.

The question has been raised as to the effect on 181-B/C structural stability of the sizable flow apparently entering the forebay between the two structures. There is a possibility that part of this stream is actually flowing under the building foundations. The soil structure is such that washing of fine material can occur, leaving only partially supported large cobbles or even complete void. A structure such as 181-B may continue to be stable in such circumstances until an earth disturbance such as an earthquake or explosion triggers gravel compaction and building support failure. A consultant in soil mechanics was given the opinion (4) that the possibility of sudden failure, although remote, does exist and should be further investigated. This investigation, which will require drill-probing through the pump well slabs, is being pursued. Results will not be available for some time, however.

Other problems will of course arise in the future if the current large volume leak rates is permitted to continue. Additional settling of 107 bottom slabs and eventual reduction of the decontamination efficiency of the soil column between the basin and the river may be cited. A major reduction in the use of the 107-B basin, especially in the exposure to hot effluent, could extend the useful life of the basin and would greatly reduce the effects of the leakage.

Function and Criteria

The 107 basins were originally intended to furnish a holdup period for decay of short-lived radioisotopes in reactor effluent. When fuel element ruptures began appearing, effluent routing through only one side of the basin was adopted, keeping the other side in reserve to receive debris from the ruptured elements. Cribs and pumps were supplied. Flow increases eventually made this method impractical, and parallel basin flow has subsequently been used on the basis that an instrument capable of detecting a limiting rate of fission product release would be available and would be used to designate shutdowns. (5) With the newer reactors (C and K), multiple steel tanks were provided to permit batch holdup and crib disposal when necessary.

4. Letter, W. L. Shannon to R. T. Jaske, "Building 181-B", October 5, 1959.
5. HW-31059 (Secret), "Operation of Both Sides of Reactor Effluent Retention Basins", J. W. Healy, March 3, 1954.

Function and Criteria (Cont'd)

Recent reviews of basin function (6, 7) point out that although the decay resulting from basin hold-up is of small value at current flow rates, the basins do serve other purposes. Most important is the opportunity given to detect a serious rupture incident and divert the effluent containing the consequent fission products from the river. Secondly, the presence of the basins in the effluent system has been used extensively as evidence to the public and public health agencies of our concern for and our desire to minimize disposal of radioactive wastes to the river. The basins also act to some extent as catch basins for radioactive particulates, laboratory tests indicating a catchment efficiency of up to 50 per cent for particles from a uranium-water reaction. (8)

The value of the basins for detection and diversion obviously depends on the ability to do so. A limited number of effluent samples taken during fuel element rupture emission of fission products indicates an average concentration well below any suggested limit. (8) The possibility exists, however, of a severe rupture or multiple ruptures causing off-site fission

6. HW-60529 (Secret), "Direct Disposal of Reactor Effluents", J. W. Healy, May 27, 1959.
7. Letter, D. W. Pearce and A. R. Keene to P. C. Jerman, "Reactor Areas - Liquid Waste Disposal", March 6, 1959.
8. HW-61325 (Confidential), "Significance of Rupture Debris in the Columbia River", J. D. McCormack and L. C. Schwendiman, August 17, 1959.

Function and Criteria (Cont'd)

product concentrations above recommended limits. The gamma monitoring equipment, sampling each rear-face crossheader, is the basic monitoring device at present of fission product release from fuel element ruptures. Although the sensitivity of these instruments is adequate for detecting fission product release rates of real concern, a large variance still exists in the quantitative calibration of these instruments. Susceptibility to false signals affects the operational use of the instrument. Rupture indications are received several times per shift at each reactor, but subsequent sampling and rechecking usually fails to confirm such indications. Improvements to the system are presently being scoped and should eliminate many of the false alarms and improve the reliability. When a rupture does occur, it may take from twenty to forty minutes from the time of the first indication of the gamma monitor to determine the existence of a rupture with sufficient reliability to justify shutting down the reactor. Even though a severe rupture would probably become evident in less time, the system at best will introduce a significant time delay into any diversion system.

In addition, the disposal of excessively contaminated effluent from 107-B in the event of a severe slug rupture incident is at present impossible. Although a crib is provided, the basin must be emptied to it by pumping. At 107-B, the probability of undermining of the pump base slab makes pumping unadvisable at present. In any case, the capacity of the pumps currently provided is inadequate to keep up with the leakage rates between the two sides of the basin, much less the shutdown flow rate. Three criteria have been recommended by the Radiological Engineering Operation for adequate safeguards for severe rupture conditions. (9)

1. It must be possible to divert effluent water to a crib.
2. It must be possible to accomplish this diversion before a significant amount of fission product burden reaches the river.
3. It must be possible to divert back to a relatively clean system when the source of fission products have been removed.

The present condition of the B basin precludes these criteria from being met. With our current rupture experience, fission product releases are not a major contributor to the total drinking water radioactivity dose at Pasco. However, a single severe rupture, with the fission products so released passing through the basin to the river as at present, could cause off-site river concentrations in excess of the permissible limit.

To summarize, the 107-B basin leakage causes losses of production capacity and poses a continuing threat to structural stability and existing basin conditions prevent adequate disposal of a severe fission product release.

9. Letter, R. B. Hall to J. P. Corley, subject "107 Basin Replacement," dated November 6, 1957.

PROPOSED SOLUTION

The proposed solution provides for normal routing of B effluent through the 107-C West Tank and back to 1904-B, with provisions for diversion to 107-B when required. All diversion valves would be remotely controlled at the respective 105 control rooms, and new fission product monitors and basin level alarms would be provided. Modifications to the 107-C Diversion Box and a spray system for contamination control at 107-B would also be required. A scope print SK-1-3740 is attached; a detailed breakdown of facilities required is shown in Appendix A. The scope estimate for the proposal is \$495,000, including \$75,000 contingency.

The proposed method of operation would be as follows: Normal effluent routing during operation would be for B Reactor through 107-C west tank and for C Reactor through 107-C east tank. When required due to a fuel element rupture or other reasons, flow would be diverted at the respective diversion box after trapping the undesirable effluents in the tank. B effluent would be diverted to the concrete 107-B basin. Diversion of C effluent would require both reactors to divert, B to 107-B and C to 107-C west, in order to avoid flooding of the C diversion box at full operational flow due to the limited capacity of the existing 60" steel cross-tie line. If C flow were reduced to normal shutdown flow, the double diversion would not be required, diversion to 107-B being available. Concurrently, the drain valves of the affected 107-C tank would be opened and the contents drained to the 107-C crib. After draining, and flushing if required, flows would be re-diverted into the proper tanks.

This proposal would accomplish the minimum interim objectives of eliminating effluent leakage into the 181-B forebay and of enabling cribbing of off-standard effluents. Thermal cycling of the large 107-C tanks would be minimized and exposure of the 107-B basin to heated effluents would be greatly reduced. Capacities of the new facilities shown have been selected to avoid bottlenecking at flow rates for B of over 95,000 GPM and for C of over 105,000 GPM. Even at these flow rates, capacities of parts of the existing system may become limiting.

ALTERNATE SOLUTIONS

An alternate modification which would eliminate the use of 107-B altogether would be as follows: Normal routing of C effluent would again be through 107-C east tank, but B effluent would go to a new steel tank of approximately 1.8 million gallons capacity. The new tank would afford a mean detention time of 15-20 minutes, long enough for two successive alarm points on the existing gamma rupture monitors and diversion action. Both reactors would divert effluent into the 107-C west tank until a rupture was discharged or the presence of a rupture disproved. Starting with an empty tank, the 107-C west tank would receive shutdown flows for several hours from both reactors without overflowing. The following items would be required: A steel tank 150 feet in diameter with concrete foundation and gravel base; a new diversion point with valves as above and a 66" steel line to 107-C west tank; a 66" line and tie-ins from the new tank to the existing line from 107-B west to 1904-B outfall; a 24" drain line and tie-ins from the new tank to the existing 107-C drain line; contamination control measures for 107-B, a ring spray system for the 107-C west tank supplied from 107-C east tank; motor controls and position indicators at the respective 105 buildings for the diversion gates; new basin outlet monitors and tank level signals. The scope estimate for this proposal is \$630,000.

ALTERNATE SOLUTIONS (Cont'd)

This proposal would eliminate leakage into the forebay and permit cribbing of off-standard effluent under all discharge conditions, including continuous charge-discharge. However, in addition to having a higher cost, it would probably double the frequency of thermal cycling of the 107-C west tank. Excessive thermal cycling in the past has led to accelerated bottomplate buckling and weld seam failure in both the C and K plant steel basins.

A number of other effluent routings and disposal schemes of varying complexity and completeness, have been considered. The estimated costs of such schemes could run upward of \$1,000,000. No disposal system considered which maintained a detention tank in the normal operational effluent routing and which provided for operational charge-discharge for C Reactor was found to be less costly than Alternate I.

A combination of trenching to intercept the effluent flowing underground toward 181-B and modifying the 107-B basin to permit parallel operation was considered. Further knowledge of the soil structure between 107 and 181-B is required before trenching can be realistically scoped. Basin modifications could include enlargement of entrance partition openings, replacement of gates, enlarging the outlet weirs, installation of new pumps and a new line to the B crib, and a clay-cinder seal for the basin bottom to prevent side to side flow. Allowing \$50,000 for the trenching, a total project cost of \$325,000 is estimated for the necessary work. In this case, C Operations would be unaffected and B would only use half the existing 107-B basin, reserving the other half for diversion when necessary. Although less expensive than Alternate I, it would leave B Reactor Operation still dependent on an aging basin with continuous maintenance expense.

JUSTIFICATION OF PROPOSED WORK

Justification for the work proposed lies primarily in improved operating continuity. The risk is minimized of having to shutdown B Reactor for an extended period in the event of a severe rupture incident (or sudden increase of shoreline activity due to basin failure) which would cause either off-site radioactivity limits for drinking water to be exceeded or downstream reactor water supplies to be excessively affected. The potential hazard to 181-B/C structural stability will also be reduced.

Stopping the leakage of hot effluent into the 181-B forebay will also result in some increase in production capacity, calculated as follows:

$$Q_B = 85,000 \text{ GPM}$$

$$Q_C = 95,000 \text{ GPM}$$

$$T = 0.3^\circ \text{ C}$$

$$T = 0.1^\circ \text{ C}$$

Bulk Limit Operation - 9 months/year

Overall operating efficiency - 80% Value of 1 MWD - \$30.

Value of decreased rupture potential - 0.7% of total MWD/ $^\circ \text{ C}$ for 3 months/year

Value of increase =
 $(0.2645 \times 10^{-3})(85,000 \times 0.3 + 95,000 \times 0.1) \times \$30 \times 0.80 \times \frac{9}{12} \times 365 = \$61,000/\text{yr.}$

Value of decreased rupture potential =
 $(0.007)(1600 \times 0.3 + 1900 \times 0.1) \times \$30 \times 0.80 \times \frac{3}{12} \times 365 = \$12,000/\text{yr.}$

Total improvement value	=	\$73,000/yr.
Increased maintenance costs	-	3,000
Net Return	=	\$70,000/yr.

WORK SCHEDULES AND METHODS

Since the bulk of the area where the work would be done is a radiation zone, at least for excavation, all of the work shown for Alternate I would be done by the J. A. Jones Company, with the possible exception of the spray water line.

Approximately one year would be required from project approval to beneficial use. No additional reactor downtime would be required for this installation, although some of the work on the C Diversion box will have to be done during a regular outage.

RELATED WORK

A spray system at the 107-C west tank, although not a part of the scope of this proposal, is required for safe drainage of this tank for maintenance work. During work in the east tank in 1957, a wind-borne spread of radio-active particulates occurred which cost over \$15,000 to control. Since installation of the required spray system could be done at the same time as the work in this document at a significant savings, and since the budget category is the same, it would seem desirable to combine the installation into the same project.

The 107-C tank foundations are at present in need of repair as a result of tank movement, caused by thermal expansion and contraction. These repairs, already scoped, should be completed prior to completion of this project.

Repairs to the expansion joint seals in Expansion Box No. 19 and 107-C entrance boxes are also required at present, and should preferably be done in connection with the work scoped herein.

A pilot plant size test now being scoped is aimed at developing a feasible method for partial decontamination of reactor effluent. Resolution of the many problems involved is believed to be at least nine months away, and very possibly more.

 Water Plant & Utilities Engineering
 Plant and Industrial Engineering
 FACILITIES ENGINEERING OPERATION

JP Corley/bhg

APPENDIX A - WORK REQUIRED

(See also SK-1-3740)

1. Install two steel diversion boxes (one in existing 66" line from 105-B to 107-B, one in existing 60" line from 107-CW to 1904-C) including pipe removal and tie-ins to existing lines, two motor-operated 66" sluice gates at each box, power supply, and water control.
2. Install 550 feet steel pipe, 66" O.D., 1/2" w.t., coated and wrapped.
3. Install inlet box, expansion joint, and wall tie-in of 66" line to 107-CW.
4. Install welded pipe wye and concrete anchor for tie-in of new 66" line to existing line from 107-B to 1904-B.
5. Install 1900 feet, cement-asbestos pipe, 6" diameter, 150-lb. class, for water spray system at 107-B, including tie-in to sanitary water main, culverts at road and railroad crossings, valves and valve covers.
6. Install 2400 feet galvanized steel pipe, 4" diameter and smaller, for basin spray loops.
7. Install 550 spray nozzles, assorted fan and circle spray types.
8. Remove and bury wood baffles from 107-B.
9. Install remote control operators and gate position indicators for valves at the near diversion boxes and C Diversion Box; two gates controlled at 105-B, eight gates at 105-C.
10. Install low-level alarms and new basin monitors at each 107-C tank, with remote indication at the respective 105 buildings; basin monitors to be multi-channel analyzers with ion-exchange columns.
11. Enlarge gate opening and install new 84" sluice gate at position No. 4 in C Diversion Box.
12. Cut opening in wall above gate No. 2 in C Diversion Box to bring top of wall to elevation 450.0.

APPENDIX B
100-B/C EFFLUENT SYSTEM MODIFICATION
SCOPE STUDY ESTIMATE

DESCRIPTION

Earthwork	\$ 16,500
Tie-in @ 107-CW	25,200
Concrete and Anchors	7,100
Piping	90,700
Electrical and Instrumentation	45,000
Remove and Replace Power Lines	4,500
Spray System - 107-B	27,000
Remove Wooden Baffles - 107-B	15,000
Misc. Repair at 107-B Pump House	6,000
Replace Gate and Cut Weir - 107-C Diversion Box	<u>30,000</u>
Subtotal	\$267,000
Other Direct & Indirect Costs	<u>83,000</u>
Total Construction Cost	\$350,000
Design and Administration	\$ 70,000
Contingency	<u>75,000</u>
TOTAL PROJECT COST	\$495,000

DETAIL
DETAIL C (OP)

UNCLASSIFIED

HW-61206
PAGE 13

QTY.	FT. NO.	DESCRIPTION

DETAIL A
ELEVATION VIEW

SCOPE

REV. NO.	DESCRIPTION	REV. BY	DATE	APP'D BY	FOR	DATE
REVISIONS						
CLASSIFICATION		CLASSIFIED BY				
NONE		PAGE 9-11-59				
SK-I-3740		REV. NO.				
SCALE: NONE		APPROVALS				
DRAWN RFD		BY				
CHECKED		FOR				
ISSUED		DATE				
DES. ENG. J. H. K.		UNIT				
20013F		DATE				
PROJECT		REV. NO.				
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC						
100-B EFFLUENT SYSTEM MODIFICATIONS ALTERNATE I PLAN & DETAILS						
REV. NO. 1904-B		REV. NO. 0110				
SK-I-3740		REV. NO.				

REV. NO.	DESCRIPTION
	REFERENCE DRAWINGS
	REV. NO.

END

**DATE
FILMED**

1 / 4 / 93