

TDI EMERGENCY DIESEL GENERATOR 103 10<sup>7</sup> CYCLE CONFIRMATORY

TEST/INSPECTION REPORT

SHOREHAM NUCLEAR POWER STATION - UNIT 1

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TDI EMERGENCY DIESEL GENERATOR 103 10<sup>7</sup> CYCLE CONFIRMATORY

Shoreham Nuclear Power Station - Unit 1

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FaAA Eddy Current Examination Report

## I. EXECUTIVE SUMMARY

This report provides the results of the recently completed Confirmatory Test at the Shoreham Nuclear Power Station of Transamerica Delaval (TDI) Diesel Generator 103 (DG 103). The confirmatory test and post test inspections were performed in accordance with the NRC Staff's recommendations described in the "Safety Evaluation Report-Transamerica Delaval, Inc. Diesel Generator Owners Group Program Plan" issued on August 13, 1984 and subsequent discussions held between the NRC staff and LILCO staff, which are documented in LILCO's letter SNRC-1094 dated October 18, 1984.

The confirmatory testing ran for a period of approximately three and one half weeks to add about 525 hours of engine run time at 3300 KW. As part of the preoperational test program, DG 103 accumulated approximately 220 hours of run time at loads ranging between 3475 kW and 3900 kW. This provides a total of 740 hours of run time at or above 3300 kW. During the 525 hour test, engine parameters were monitored as set forth in SNRC-1094. All parameters were found to be within normal acceptable operating ranges. This confirmatory testing has now resulted in the accumulation of over 740 hours of operation at the qualified load of 3300 KW on the replacement 13 X 12 crankshaft. With respect to the crankshaft, 740 engine hours corresponds to  $1 \times 10^7$  stress cycles, a test data point for which it is generally accepted that infinite fatigue life has been demonstrated. Nondestructive examination of the crankshaft upon completion of the test (discussed in more detail below) has confirmed that the crankshaft successfully completed the  $10^7$  cycle endurance test and thus has been qualified for infinite fatigue life at 3300 KW.

Prior to commencement of the confirmatory test in October, strain gages were installed in the cam gallery area of the DG 103 block. The purpose of the strain gages was to experimentally verify the analytical work showing that this region of the block remained in vertical compression throughout all modes of operation. In fact, the strain gage data shows that the cam gallery area of the block remains in vertical compression for all modes of engine operation including rapid startup, steady state, shutdown and standby. Previous metallurgical experimentation of actual cam gallery cracks in the original DG 103 engine block showed that the cam gallery cracks do not propagate. The original DG 103 block had more severe cracks in the cam gallery area than the DG 101 and 102 blocks as a result of the presence of Widmanstaeten graphite in its microstructure. Additionally, the original DG 103 cast iron had extremely poor fatigue properties and despite this fact, there was no observed growth of the cam gallery cracks. Cam gallery cracks will not propagate in other blocks that were manufactured of typical gray cast iron. Thus analytical results, metallurgical observations and now strain gage tests are all in agreement with the operating experience and all conclude that cam gallery cracks are benign and do not propagate. The TDI Diesel Generator Owners Group is issuing a block report under separate cover which includes a section describing the results of cam gallery analysis including results of the strain gage tests.

The cylinder heads of DG 103 were inspected upon completion of the confirmatory tests in accordance with the settlement agreement for the cylinder head contention. As a result, all heads were found to be operationally sound with no rejectable indications. However, one head was

( replaced in accordance with the provisions of the settlement agreement, because it contained a through wall weld repair in the injector bore area.

Inspections of other components in the engine were conducted as follows:

(1) Engine Block

(1) Liquid penetrant (LP), and eddy current (EC), as appropriate, were performed on the complete top of the cylinder block and in the cam gallery in the two strain gage locations.

(2) If LP inspections were to exhibit crack indications between stud holes of adjacent cylinders then all studs on all affected cylinders were to be removed and EC inspections of the stud holes performed. Otherwise, only the four stud holes between cylinders 4 and 5 were to be inspected by Eddy Current examinations.

(ii) All connecting rod bearings were subjected to liquid penetrant inspection.

(iii) All wrist pin and wrist pin bushings were subjected to liquid penetrant inspections.

(iv) Turbocharger:

(1) Visual inspections were performed of the nozzle ring vanes and capscrews and the turbocharger mounting flange bolts.

(v) Crankshaft:

Liquid penetrant and eddy current testing, as appropriate, were performed on all fillet areas and on all oil holes of the crankshaft except at main bearings 1, 2, 10, and 11.

- (vi) Front end gears and gear teeth as accessible received a complete visual inspection for excessive wear or other distress.
- (vii) Visual examination of cylinder liners was performed for excessive scuffing. Deglazing was performed as per standard procedure.
- (viii) Liquid penetrant inspection was performed for all stud boss areas of all of the AE pistons. Eddy current inspections were to be conducted to investigate any indications found by liquid penetrant inspection. A visual inspection of the crown to skirt contact surfaces was performed to determine if excessive fretting had occurred.

All of these inspections showed acceptable results and the components were released for reinstallation in the engine. New piston rings were installed in the pistons (standard practice at Shoreham) and the cylinder liners were re honed under LILCO's QA program to facilitate break-in of the new piston rings in accordance with normal reassembly practice. Also, two connecting rod bearing shell halves which were damaged during handling were replaced. Detailed results of all inspections, including copies of the inspection reports, are provided as part of this report.

In conclusion, engine parameters monitored during the confirmatory test, strain gage measurements in the cam gallery of the block taken during the test and all post-test inspections support the previous conclusion reached by the TDI Owners Group that the R48 engines at Shoreham are suitable for service as nuclear standby units. Further, this conclusive confirmatory test has shown that the crankshafts are capable of infinite fatigue life at

the qualified load of 3300 KW. Upon completion of the reassembly and post-inspection testing of DG 103 as set forth in SNRC-1094, Exhibit A, the three TDI diesel generator sets at Shoreham will stand ready to serve their intended function as emergency back-up power supplies.



## II. BACKGROUND

### TDI Diesel Generator Owners Group

In late 1983 LILCO replaced the original 13 X 11 crankshafts in the three TDI Diesel Generators at Shoreham with 13 X 12 crankshafts due to failure of the original crankshaft in EDG-102. Following the crankshaft failure, the TDI Diesel Generator Owners Group was established. From November, 1983 through June, 1984 extensive engine tests and investigations of the design and manufacture of 168 component types in the TDI DSR-48 diesel generators at Shoreham were conducted. Based on the tests and investigations, the TDI Owners Group concluded in June, 1984 that the TDI Diesel Generators currently installed at Shoreham are fully capable of performing their intended safety function. Details of this investigation were provided to the NRC in the nine volume report "TDI Diesel Generator Design Review/Quality Revalidation Report - SNPS - Unit 1" dated June 29, 1984.

### Confirmatory Testing

In late August, 1984 the NRC stated in prepared testimony and their SER on the TDI Owners Group Program that the review of information available as of that time did not provide a basis "to reach an unequivocal conclusion regarding the overall adequacy of the Shoreham TDI Diesel Generators as emergency power sources for nuclear systems". The NRC concluded that, at rated load, Shoreham's crankshaft did not meet DEMA Standard Practices but may still perform satisfactorily. The NRC also expressed reservations on acceptability of the engine block based on unresolved questions on existing cracks in the cylinder block camshaft gallery.



To alleviate NRC concerns on the crankshaft and block, LILCO committed to perform confirmatory tests on TDI Diesel Generator 103. These tests and inspections are outlined in LILCO letter SNRC-1094 dated October 18, 1984 (attachment II-1) and involved accumulating a total of  $10^7$  stress cycles (740 hours) on the replacement crankshaft at or above Shoreham's qualified load. The qualified load, as defined in the NRC SER "Interim Basis for Licensing", is the load which meets or exceeds the maximum emergency service load requirements. This load has been determined by LILCO to be 3300 KW. Shoreham's TDI Diesel Generator qualified loading is discussed in LILCO letter SNRC-1094 and was submitted as an FSAR revision in LILCO letter SNRC-1092, dated October 22, 1984 (attachment II-2). Additionally, during a portion of the confirmatory test, strain gage measurements were taken in the area of the cylinder block cam gallery at cam saddles 2 and 8. Post test inspections for various components were then performed as indicated in the Executive Summary.

Cylinder head inspections, as provided for in the settlement agreement of Suffolk County Diesel Generator Contention regarding cylinder heads (Attachment II-3), were performed during this inspection outage and are included as part of this report. Inspections on the cylinder heads were as follows:

1. Liquid penetrant inspection of the intake and exhaust valve seat areas and the fire deck area between the exhaust valves.
2. Ultrasonic inspection for thickness of the fire deck area if not previously inspected.

3. Visual inspection for through wall weld repairs of the fire deck where repairs are welded from one side only.

Evaluations of inspection results were performed by LILCO and Stone & Webster. In addition, LILCO requested the assistance of consultants from Failure Analysis Associates and Forschungsgesellschaft fur Energietechnik und Verbrennungsmotoren mbH (FEV) to perform inspections and provide their evaluation and assessment of certain components.

To demonstrate operability upon reassembly after the inspections, additional testing will be performed as detailed in SNRC-1094 and indicated below:

1. Ten modified starts to at least 1400 KW, but not to exceed 3300 KW.
2. Two fast starts to 3300 KW run for a minimum of four hours after each fast start.
3. One 16 hour test at load levels stepping up to and then down from 3300 KW. This includes a total of four hours at each of the following loads: 3300 KW, 2625 KW, 1750 KW and 875 KW.

Detailed inspection plans, results of inspections, tests and conclusions by component are included in following sections of this report.



**LONG ISLAND LIGHTING COMPANY**

**SHOREHAM NUCLEAR POWER STATION**

P.O. BOX 618, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

JOHN D. LEONARD, JR.  
VICE PRESIDENT - NUCLEAR OPERATIONS

October 18, 1984

SNRC-1094

Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

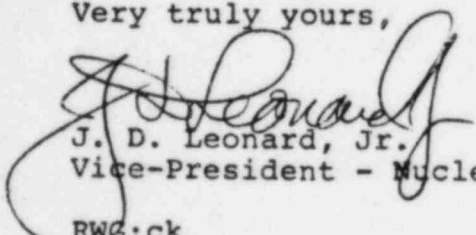
Confirmatory Testing of TDI Diesel Generators  
Shoreham Nuclear Power Station - Unit 1  
Docket No. 50-322

Dear Mr. Denton:

As you know, LILCO has committed to do certain confirmatory testing of one of Shoreham's TDI diesels. The Staff concerns focus on the engine crankshaft and the cam gallery areas of the engine block. Extensive discussions between our staffs and consultants resulted in agreement on various aspects of the testing and associated post-test inspections and the attached document sets forth the testing protocol which has been agreed to. As you can see, this document includes detailed information concerning test duration, test instrumentation, strain gauges, post-test inspections and acceptance criteria. LILCO is currently conducting the confirmatory test at the qualified load of 3300 kw. The basis for the selection of this qualified load will be provided in an FSAR amendment to be submitted in the very near future.

I am confident that LILCO and the NRC can continue to work together to resolve any remaining concerns and that this confirmatory test will provide a mutually acceptable basis for finding these diesels reliable for their intended service.

Very truly yours,

  
J. D. Leonard, Jr.  
Vice-President - Nuclear Operations

RWG:ck

Enclosure

cc: P. Eselgroth  
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All Parties Listed in Attachment 1

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## Exhibit A

### Shoreham Nuclear Power Station Confirmatory Testing Protocol

Test Engine: EDG 103 will be tested.

Test Duration: The test duration will be for seven hundred and forty hours total, with credit to be given for all hours accumulated at the test load identified below, since the installation of the replacement crankshaft. Two hundred and nineteen hours (219) have been accumulated at or above the test load since the installation of the replacement crankshaft. Therefore, 521 hours of operation at the test load remain for completion of the test. These 521 hours need not be the result of continuous operation. It is understood and contemplated that shutdowns during the 521 hours of operation may occur for a variety of reasons including routine maintenance and surveillance tests. Such shutdowns shall not affect the validity of the tests with respect to the crankshaft and block unless the shutdown is occasioned by a failure of that particular component.

Test Load: The test will be conducted at a load of 3300 kw (qualified load) as measured using normal plant instrumentation (i.e.  $\pm 100$  kw) which according to LILCO's letter dated September 11, 1984, (SNRC-1077) from J. D. Leonard to H. R. Denton, exceeds the maximum emergency service load requirements for Shoreham. No specific KVAR loading is required. The basis for this reduced load requirement will be formally submitted to the NRC for its review and approval via an amended Section 8.3.1 of the FSAR.

Test Instrumentation: Normal control room instrumentation will be used to verify the load, and the load output in kilowatts will be logged every 30 minutes. Peak firing pressure will be measured by a Kiene gauge at the start and end of the remaining 521 hour test run.

Strain Gauge Measurements: Strain gauge measurements will be taken at two locations within the cam gallery area. Strain gauges will be installed near the cam saddle inward of the number 1 and number 8 cylinders and data will be recorded during an engine heatup to standby temperature, at several steady state operating levels, and during the performance of an engine start and loading. The two saddle areas in the cam gallery where the strain gauges are to be installed will be inspected by the magnetic particle or liquid penetrant technique prior to the installation of the strain gauges.

Pre-Test Inspections: Pre-test inspections will be at the discretion of LILCO. It is understood that the NRC staff will consider any indications found during post-test inspections to be new indications occurring as a result of the engine test unless LILCO has direct inspection evidence that the indications were present prior to the test.

Post Test Inspections

(i) Engine Block:

- (1) Liquid penetrant (LP), and eddy current (EC), as appropriate, will be performed on the complete top of the cylinder block and in the cam gallery in the two locations of strain gauges.
- (2) If LP inspections above indicate crack indications between stud holes of adjacent cylinders then all studs on all affected cylinders will be removed and EC inspections of the stud holes will be performed. Otherwise, only the four stud holes between cylinders 4 and 5 will be inspected by EC.

(ii) All connecting rod bearings will be subjected to liquid penetrant inspection.

(iii) All wrist pin and wrist pin bushings will be subjected to liquid penetrant inspections.

(iv) Turbocharger:

- (1) Visual inspections will be performed of the nozzle ring vanes and capscrews and the turbocharger mounting flange bolts.

(v) Crankshaft:

Liquid penetrant and eddy current testing, as appropriate, will be performed on all fillet areas and on all oil holes of the crankshaft except at main bearings 1 and 2, and 10 and 11.

(vi) Front end gears and gear teeth as accessible will receive a complete visual inspection for excessive wear or other distress.

(vii) Visual examination of cylinder liners will be performed for excessive scuffing with deglazing to be performed where appropriate.

(viii) Liquid penetrant inspection will be performed for all stud boss areas of all of the AE pistons. Eddy current inspections will be conducted to investigate any indications found by liquid penetrant inspection. A visual inspection of crown to skirt contact surfaces will be performed to determine if excessive fretting has occurred.

Inspection Acceptance Criteria: LILCO will use the acceptance criteria based upon the TDI Owners Group acceptance criteria. In cases where these criteria have not been explicitly stated in Owners Group reports or in the Component Revalidation checklist submitted as part of the Shoreham DRQR package (e.g., engine block, pistons), LILCO will identify its quantitative criteria for evaluating indications as being acceptable and/or relevant, and provide the technical basis for these criteria.



Post-Inspection Testing: Following engine reassembly, "hot" and "cold" crankshaft deflection measurements shall be taken to verify that the crankshaft alignment is within manufacturer's recommendations. To the extent not already included as part of the manufacturers recommendations or plant Technical Specification requirements, the following engine tests shall be performed to demonstrate operability of the engine:

- Ten modified starts to at least 1400 kw, but not to exceed 3300 kw
- Two fast starts to 3300 kw
- One 16 hour test at load levels stepping up to and then down from 3300 kw. This should include a total of four hours at each of the following loads: 3300kw, 2625 kw, 1750 kw and 875 kw.

A modified start is defined as a start including a prelube period as recommended by the manufacturer and a 3 to 5 minute loading to the specified load level, with operation at the level for a minimum of one hour. A fast start is one conducted from the control room on simulation of an Engineered Safety Feature (ESF) signal with the engine on ready standby basis. The engine should be run for four hours for each fast start test. The 16 hour run is recommended to detect abnormal temperatures, pressures and/or temperature excursions that might indicate abnormal engine behavior. Either a modified or a fast start may be utilized.

Reporting Requirements: A test/inspection report will be submitted for NRC staff evaluation. Abnormalities observed during the engine test, and any corrective actions will be discussed. The report will also address all relevant indications and other unusual findings during the post-test inspection. The engineering disposition of all indications will be discussed and repairs/replacements identified and justified.

The above reporting requirements notwithstanding, any significant problems encountered, either during testing or inspection, will be immediately reported to the NRC staff in order to permit a timely evaluation by the staff regarding their significance and the adequacy of remedial actions by LILCO.



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October 22, 1984

SNRC-1092

Mr. Harold R. Denton, Director  
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Submittal of FSAR Revision  
Qualified Load - TDI Diesel Generators  
Shoreham Nuclear Power Station - Unit 1  
Docket No. 50-322

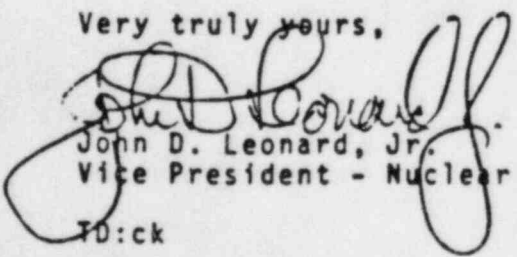
Dear Mr. Denton:

In response to item one (1) of section 4.6 entitled "Interim Basis for Licensing" of the Safety Evaluation Report on Transamerica Delaval, Inc. (TDI) Owners Group Program Plan, we have developed a "qualified load" by a combination of analysis and testing utilizing results of a recent pre-operational test performed on October 5 and 6, 1984. Applicable sections of the FSAR were revised to provide your staff with the detailed technical bases and methods utilized in developing a qualified load of 3300 kW.

Five (5) advance copies are attached herewith for your information. Revision bars, located in the margins, are used primarily to denote substantive text changes. These revisions, as submitted, will be included as part of the forthcoming Revision 34 to the FSAR.

If any additional information is required, please contact this office.

Very truly yours,

  
John D. Leonard, Jr.  
Vice President - Nuclear Operations

TD:ck

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ATTACHMENT I

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TDI



## SNPS-1 FSAR

4. Reactor vessel pressure
5. Drywell pressure
6. Drywell temperature
7. Suppression pool level
8. Suppression pool temperature
9. Core cooling flows
10. Emergency power system operation and load status

Plant components are designed to shut down safely on loss of nuclear steam so the operator's attention can be directed to the core and containment cooling surveillance without undue concern for the balance of plant (BOP).

Ten minutes has been judged to be ample time for an operator to assess the situation, to determine trends of temperature and pressure, and to decide whether the containment spray should be started or whether the suppression pool cooling should be initiated. Action will depend upon the extent of the primary system break, but in no case is action required in less than ten minutes, and in general a longer time would be available.

The large number of possible variables (i.e., leak size, leak location, loss of offsite power, etc.) that must be considered after the reactor level has automatically been returned to a safe condition can best be judged and acted upon by trained operators using information displayed in the main control room in conjunction with established operating procedures rather than depending on the necessarily complex logic scheme required for automatic initiation.

The design evaluations are all based on these rather long operator delays, and indicate that considerable safety margin is still available.

### 6.3.2.18 Process Instrumentation

Sufficient instrumentation is available to the operator in the main control room to assist him in accurately assessing the post LOCA conditions if one should occur. Basically, these indications are of two varieties: those that indicate the pressures, temperatures, and levels in the reactor vessel and primary containment, and those that provide indication of operation of the ECCS; position of valves and circuit breakers, flows, temperatures, and pressures of ECCS.

## SNPS-1 FSAR

The RB service water pumps C and D and their associated discharge valves are powered from Division III. One of these pumps will be maintained in manual standby and the remaining pump in automatic standby.

### 7.3.1.8.3 Equipment Design

Control switches and indicating lights for the motors of the service water pumps and the motor-operated valves are provided in the main control room. Three of the four RB service water pumps start automatically if there is a start signal from the emergency bus program. The remaining pump can be manually started from the main control room. Instrumentation in the main control room allows monitoring of the:

1. Discharge header pressure for each loop.
2. Flow to each RHR heat exchanger.

A high radiation alarm is provided in the discharge of each RHR heat exchanger. Automatic indication, accompanied by an audible alarm, is provided in the main control room when the system has been deliberately rendered inoperative by intentional operator action.

The motor operated valves used to isolate noncritical portions of the system and the two redundant portions of the system are closed automatically on a LOCA signal or LOOP.

The service water system logic is shown on Figs. 7.3.1-33A through AD.

### 7.3.1.8.4 Environmental Considerations

The safety related instrumentation and controls of the service water system are designed to remain functional in the environmental conditions as discussed in Section 3.11.

### 7.3.1.8.5 Operational Considerations

The portion of the instrumentation and controls of the service water system used during plant operation is verified for operability by their normal use. The operability of the standby diesel generator controls is proven whenever the standby diesel generators are tested. The remainder of the system actuated by automatic signals is given a full operational test during every refueling period. The operability of the instrumentation required for safe shutdown is verified by periodic tests.

### 7.3.1.9 Containment Spray Cooling Mode (RHR System) Instrumentation and Controls

#### 7.3.1.9.1 System Identification

The containment spray cooling mode is an integral part of the RHR system and is used to aid in reducing drywell pressure and mixing containment air following a LOCA. The containment spray cooling

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supply. One source is derived from the normal station service (NSS) transformer which is connected between the unit generator circuit breaker and the 138 kV switchyard. This design makes the NSS transformer independent of the main generator and allows it to be bused during startup and shutdown of the unit. A second transformer which is connected to the 69 kV transmission circuit described above. Additionally, an onsite 55 MW gas-turbine generator will be available to supply auxiliary power to the RSS transformer in the event the 69 kV transmission circuit is out of service. Spare RSS and NSS transformers are provided on site to replace the installed transformers in the event of a transformer failure.

### 8.1.4 Onsite A-C Power Systems

The station electrical power system will include electrical equipment and connections required to generate and deliver power at 138 kV to the transmission system. It will also include the facilities for providing power to and controlling the operation of electrically-driven station auxiliary equipment.

Three fast starting, onsite standby diesel generators, arranged so that any two have sufficient capability to provide all necessary power for operation of engineered safety features, will assure safe shutdown in the event that all normal sources of offsite station service power are lost. Each diesel generator has a qualified load of 3,300 kW. The nameplate ratings are retained in the FSAR as these ratings were used in the design and initial testing phases. In the future however the new qualified load will be used for all purposes.

The station electrical connections are shown on the main one line diagram, Fig. 8.2.1-1. Ratings of major equipment are given in Table 8.1.4-1.

### 8.1.5 Onsite D-C Power Systems

Three d-c systems are provided. One safety related system consists of three separate, and independent 125 V batteries, each with its own charger and distribution board. Further, each battery is located in a separate, ventilated room of a building designed as Seismic Category I and the racks on which they are mounted are designed to meet Seismic Category I requirements. The batteries are sized to supply emergency loads for a minimum of two hr. The loss of one of the batteries will not preclude the operation of the minimum required engineered safety features.

The second system, nonsafety related, consists of two separate and independent 124 V d-c service, two battery chargers, and a distribution panel. This system provides power to the source and intermediate range nuclear instruments and process radiation monitoring equipment.



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metal-enclosed switchgear with incoming main circuit breaker. The 480 V emergency buses are physically isolated and electrically independent.

The normal and safety related 4,160-480 V transformers are rated 1,000/1,333 kVa, 3 ph, 60 Hz. The circuit breakers used as bus ties in the double ended load centers and all incoming main circuit breakers are rated 1,600 amp continuous and have an interrupting capacity of 50,000 amp symmetrical. All other feeder breakers are rated 600 amp continuous and have an interrupting capacity of 30,000 amp symmetrical with instantaneous trips and 22,000 amp symmetrical without instantaneous trips. All load center breakers are air-magnetic, drawout type.

Power for motors approximately 100 hp and smaller and other small power requirements are, in general, fed from motor control centers (MCCs) supplied from the normal or emergency 480 V unit substations. The MCCs are self-supporting metal-clad structures with circuit breaker type combination magnetic reversing or nonreversing motor starters and molded case circuit breakers. Breakers used in combination starters have a 14,000 amp symmetrical interrupting capacity. Breakers used for branch feeders have 22,000 amp symmetrical interrupting capacity.

Emergency MCCs are physically separated such that any design basis event which may affect one redundant system shall not jeopardize proper operation of the other system. Class IE circuits are designed to operate as required under lowest postulated transmission system conditions.

Essential nonsafety related 480 V loads required during the loss of offsite power are supplied from the emergency 480 V system through two circuit breakers connected in series and physically separated from each other. Certain nonsafety loads are tripped free of the emergency buses at the time of a LOCA (see Table 8.3.1-1 for details).

### 8.3.1.1.5 Onsite Standby Power Supply

The following is a glossary of load and rating terms used in this section of the text:

2 hour nameplate rating - Maximum design rating. This term is equivalent to the short term rating, as defined in IEEE 387, 1977.

Continuous nameplate rating - Normal design rating.

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Maximum emergency service load - Is the maximum load which would exist during a LOOP/LOCA. This load is a combination of equipment nameplate loads and actual measured loads. Loads in Table 8.3.1-1A which are preceded by an asterisk (\*) are actual measured loads.

Qualified load - An upper bound of the maximum emergency service load of all three TDI diesels.

Connected loads - Any equipment load which can be powered by the diesels.

Maximum coincident demand - Maximum nameplate loads of equipment required to operate during a LOOP/LOCA.

The nameplate rating of each diesel generator set is as follows:

Continuous (8,760 hr)	3,500 kW
2,000 hr	3,500 kW
160 hr	3,500 kW
2 hr per 24 hr period	3,900 kW
30 min	3,900 kW

The 2 hr nameplate rating in any 24 hr period is the rating without reducing the maintenance interval established for the continuous rating.

In response to item number one of Section 4.6 in the Nuclear Regulatory Commission's Safety Evaluation Report on the Transamerica Delaval, Inc. Diesel Generator Owners Group Program Plan, a qualified load defined as an upper bound of the maximum emergency service load requirements for the Shoreham diesel engines was developed. The use of this qualified load will result in design margin when compared to operation at the nameplate ratings. The qualified load was developed by engineering analysis and actual load measurements taken at Shoreham during testing of the diesels. As a result of these considerations, the qualified load of each diesel generator set is 3300 kW.

Table 8.3.1-1 was developed during initial design of the plant and therefore establishes a maximum design load for each diesel generator. The values in this table are conservative in that they reflect individual equipment loading based upon nameplate data.

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As such, the resulting loads (kilowatts) are summations of nameplate values rather than the electrical loads representative of an operating plant. Values in Table 8.3.1-1 (as shown in revision 31 dated August 1983) were the basis for Diesel Generator Factory Tests, as described in Section 8.3.1.1.8.

Table 8.3.1-1A provides a more representative listing of actual diesel loads during a LOOP/LOCA and was derived by analysis and field testing. The purpose of this review was to confirm that the SNPS maximum emergency service load requirement for a LOOP/LOCA is substantially below the diesel generator continuous nameplate rating, and also to justify a more appropriate "qualified load". The use of these test results to establish more appropriate diesel generator loads at the operating license stage of review is consistent with Regulatory Guide 1.9 and the T.D.I. Owners Group SER. Table 8.3.1-1A represents the maximum emergency service load prior to any operator action being taken. Intermittent/Cycle loads (i.e. MOV's MOD's etc) are not continuous loads and therefore are not included.

The evaluation of diesel generator loads made use of measured load values obtained during Integrated Electrical Testing and included individual system/component tests. Loads in table 8.3.1-1A (column entitled maximum emergency service load) which are preceded by an asterisk (\*) are measured/actual loads; all other values are equipment nameplate loads. A brief description of each test used to obtain these actual loads is discussed below:

Measured values were obtained from the results of a test duplicating the system configuration which would exist after a LOOP/LOCA. The respective diesel generator for the equipment under test was utilized as the power source. Testing was performed with the equipment under test and associated systems mechanically and/or electrically loaded to the steady state levels.

The 480 volt ac LPCI MG Sets were tested at steady state conditions after the LPCI MOV's were placed in the closed (isolation) position and with the protection and control circuits only loading the motor generator. All four MG sets with all possible 480 V motor control center configurations were tested and the largest load value obtained during testing is shown in the table.

The load shown for the RHR pump was determined via an engineering test which evaluated the motor load under all limiting operational conditions. The maximum value shown represents pump runout conditions obtained when operating each RHR pump in the suppression pool-to-suppression pool test mode with the test valve wide open. This value is comparable to the design flow expected when a single RHR pump is operating and injecting flow into a broken recirculation loop and also assumes a concurrent single failure of the alternate RHR pump or power train.

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In addition, during design LOCA/LOOP conditions two RHR pumps would initially operate resulting in a further reduction of individual pump flow and motor loading.

The emergency switchgear room, relay and computer ventilation system was tested with either the "A" or "B" train energized for emergency mode operation of the exhaust fan and air conditioning unit. The actual measured value is included in Table 8.3.1-1A.

The load shown for the RBSVS Chiller chilled water pump was determined via an engineering test which evaluated the motor load under all limiting operational conditions. The maximum value shown represents motor loading during single pump/loop operation with an assumed concurrent single failure of the associated pump or power main. Each chiller/pump combination was operated singularly and in the fully loaded condition by allowing the chilled water temperature to increase above 65 F prior to starting the test. Expected system operation would result in 2 pump operation and would further reduce the loading.

Additionally, an analysis was performed to verify the feasibility of inhibiting the automatic start logic from one of the two reactor building service water pumps on diesel generator 103. This review resulted in substantial decreases in both the maximum coincident demand for diesel generator 103. It should be noted that the previous 2 hour nameplate rating of 3,900 kW for all three diesel generators was based upon the maximum coincident demand on diesel generator 103, which was formerly 3,881 kW. Maximum coincident demand on the other two diesels have always been below 3,500 kW.

Analysis of the above test results and the removal of one service water pump from the automatic start logic results in maximum emergency service loads for diesel generators 101, 102 and 103 (representing conservative LOOP/LOCA service load requirements) of 3,253, 3,209, and 3,226 kW, respectively. Table 8.3.1-1A provides additional details on the development of these loads. Therefore, a qualified load of 3,300 kW will bound all three machines.

Even 3,300 kW is conservative because many loads were assumed to be at their maximum levels while in actuality this is unlikely to be the case. Moreover, within 20 minutes after the start of an accident, loads lower than 3,200 kW for all three engines would likely be achieved by operator action to reduce core spray and RHR flow from runout to rated flow conditions.



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The emergency diesel generators are automatically started on:

1. Loss of voltage to the respective 4,160 V bus to which each generator is connected.
2. High drywell pressure.
3. Low reactor coolant level signal.

If the preferred (offsite) power source is not available, the emergency diesel generators are automatically connected to the 4,160 V emergency buses and sequentially loaded. The capacity of any two emergency diesel generators is sufficient to meet the safety-related load required by a loss of coolant accident and loss of offsite ac power. The loading sequence prevents system instability during motor starting. A fast responding exciter and a voltage regulator ensure quick voltage recovery after any load step. The generators use field flashing for quick voltage buildup during the starting sequence. Each diesel generator has independent start control circuits. The emergency diesel generator units are housed in separate Seismic Category I rooms.

Cooling water for each emergency diesel generator is supplied by the service water system. For a complete description, refer to Section 9.5.5.

Each diesel engine has redundant, independent air starting systems. Engine cranking is accomplished by two stored air supplies with sufficient capacity for each of the two supplies to start the engine at least five times without using an air compressor. Fast starting and load pickup are facilitated by electric heaters which keep the engines warm when they are not running. For a complete description, refer to Section 9.5.6.

Each diesel generator is equipped with protective relays which shut the unit down automatically in the event of unit faults. During operation under emergency conditions, trip conditions are limited to those, which if allowed to continue, would rapidly result in the loss of the emergency diesel generator. The emergency diesel generators are tripped automatically under the following conditions:

Function	Trip	
	Exercise Mode	DBA
1. Reverse Power	X	
2. Loss of Excitation	X	
3. Overcurrent - Voltage Restrained	X	X
4. Generator Differential	X	X
5. Lube Oil Low Pressure	X	

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	<u>Alarm</u>	
	<u>Local</u>	<u>Control Room</u>
32. Generator Heater Loss of Control	X	
33. F.O. Suction Strainer High		
Differential Pressure	X	
34. Jacket Water Conductivity High	X	
35. Motor Driven Fuel Pump Running	X	
36. Field Flash Inoperative	X	
37. Fuel Oil Transfer Pump Locked Out	X	
38. Fuel Oil Booster Pump Strainer High	X	
Differential Pressure		

Note: Alarm No. 24 includes Local Alarm Nos. 2 through 10, 17, 18, 19, 20, 27, 28, and 34. Alarm No. 23 includes Local Alarm No. 21 and 36. Alarm No. 22 includes Local Alarm No. 32.

The emergency generators and the offsite power sources are synchronized only during periodic testing or restoration of service. Synchronization is done manually, through synchronization check relays, and automatic synchronization is not provided.

Onsite fuel storage is adequate for operating each emergency diesel generator for 7 days at the qualified load initially, followed by the post LOCA load profile for the remainder of the 7 days. This includes one day tank for each diesel, with capacity for 2 hours of operation with the generator fully loaded.

A separate underground fuel oil storage tank for each emergency diesel generator is provided. Each storage tank has two full capacity transfer pumps that are operated automatically at preset level points in the corresponding day tank. For complete information on the fuel oil system, refer to Section 9.5.4.

The criteria used to size the emergency diesel generators were:

1. The capacity of any two diesels is adequate to meet the safety features demand caused by a loss of coolant accident.
2. The maximum continuous load imposed on the diesel is less than the continuous rating of the machine, defined as the output the unit is expected to maintain for a minimum of 8,760 hours. The maximum coincident demand in the first 60 seconds (approx) during the operation of the motor-operated valves is also less than 3,500 kW. These loads are given in Table 8.3.1-1.
3. Each generator is capable of starting and accelerating to rated speed, in the required sequence, all of its

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largest ESF motor used) with a load of 1,550 kW (approximately 50 percent of the steady state emergency load) already on the diesel generator. One test was performed on each of the three diesel generators.

### b. Test Description and Results

Preliminary tests were conducted (during the testing of each unit) to establish a load of 1,550 kW on water rheostat "B" and a load of 1,254 kW on water rheostat "A" (to simulate motor full load). The test panel gauge readings were verified against the calibrated laboratory instruments for kW, frequency, amps, and voltage.

The diesel generator was allowed to carry a load as set on rheostat "B" while the timers on the load control panel were set to simultaneously pick up the load on rheostat "A" and the induction motor load.

When temperature stabilization was reached, the added resistive load and motors were cut in and voltage, frequency, current, and kW load were recorded on the visicorder tape.

The results are shown in Table 8.3.1-4.

The tests demonstrate the ability of the generators and the excitation systems to accept a load approximately 30 percent higher than the most severe step load change in the plant design without experiencing instability resulting in generator voltage collapse or inability of the voltage to recover, and that there is sufficient engine torque available to prevent engine stall and to permit the engine speed to recover. These tests satisfy the requirements for factory margin testing stated in IEEE-387-1977 in that the same acceptance criteria are demonstrated even though IEEE-387 specifies a step load only 10 percent higher than the most severe step load.

### 3. Load Carrying Capability (Maximum Capability) Test Perform at the Factory

#### a. Purpose

To demonstrate that the unit is capable of carrying a load 15 percent higher than the estimated continuous load of the plant which was based on nameplate load values of individual equipment. One test was performed on each of the three diesel generators.

#### b. Test Description and Results

With engine (2 hr nameplate rating) at operating temperature, a load of 3,939 kW was established using water rheostats.

Test panel gauge readings for load and frequency were verified against the calibrated laboratory instruments.



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The engine was run for a period of 1 hour with a 3,939 kW load and maintaining a 60 cycle per second frequency. Pertinent data was recorded.

No abnormalities were noted with respect to engine operating parameters, noise, or vibration during operation in the overload condition.

In addition to the above tests the following specific operational functions were examined and verified at the factory:

- Automatic starting
- Fast start capability
- Synchronous operation capability
- Load rejection capability
- Proper adjustment and operation of system alarm and safety functions
- Proper operation of system redundancy functions

For a discussion of the emergency diesel generators preoperational test, see Section 14.1.3.7.24. Emergency diesel generator performance and surveillance tests during operation will be in accordance with the SNPS technical specifications.

#### 8.3.1.1.9 Equipment Criteria

##### Motor Size

The criterion for safety related motor size is that the motor develop sufficient horsepower to drive the mechanical load under runout or maximum expected flow and pressure, whichever is greater. Safety related motors are sized to permit the driven equipment to develop its specified capacity without exceeding the temperature rise rating of the motor when operated at the duty cycle of the driven equipment.

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severe load of diesel generators because the equivalent of starting plus running load is imposed initially.

The factory sequential step-load tests for diesel generators 102 and 103 were performed approximately as closely as possible to the sequential loading shown in Table 8.3.1-2 for diesel generator 101 loading as this is the most severe loading. Also, this served to confirm the results obtained from the tests performed on diesel generator 101 (the first one tested) which were not in full accordance with the requirements of Table 8.3.1-2 (see description below).

The results of the test of diesel generators 102 and 103 are given in Tables 8.3.1-5 and 6, respectively.

The test results show that voltage dip, frequency dip, voltage recovery and frequency recovery at any step load are well within the requirements stated in Regulatory Position C.4 of Regulatory Guide 1.9.

Diesel generator 101 was first tested to demonstrate its capability to start and accelerate to rated speed the loads of the original specification. The test confirmed the unit's ability to do so.

The following additional tests were performed on diesel generator 101 to simulate load increases which occurred after the award of contract. The loads are shown in Table 8.3.1-2.

Test 2A - Inrush kVa Test - To prove that the generator capacity and the voltage regulator response will meet the maximum inrush kVa requirements of any step load. This test was conducted by establishing a 500 kW base load on the unit and then starting simultaneously one 1000 hp and two 300 hp motors.

The voltage dip was 24.28 percent and the time of voltage recovery to 90 percent of rated was 0.45 sec.

The voltage dip and recovery were within the requirements of Regulatory Guide 1.9.

Test 2B - Inrush kW and Running kW Test - To prove that the engine governor system is capable of responding within the specification for the maximum inrush for the load sequencing. This test was conducted by applying motor loads and resistive loads in accordance with the required time intervals. However, only inrush kW and running kW of each load step was simulated.

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### 2. Load Rejection Test

The load rejection test was conducted on each diesel generator by loading it to 3,500 kW, i.e. continuous nameplate rating of the diesel generator, and dropping the entire load instantaneously.

Voltage, current, frequency, and kW load were recorded on the visicorder tape.

The change in speed and voltage on the rejection of the entire load is shown below:

	<u>Diesel Generator</u>		
	<u>101</u>	<u>102</u>	<u>103</u>
Overspeed on load rejection, percent rated speed.	3.0	2.66	2.83
Overvoltage on load rejection, percent rated.	2.4	2.4	2.4 (Approximately)

The results show that the overspeed is well within the requirements stated in Regulatory Position C.4. of Regulatory Guide 1.9 and the voltage change is negligible.

All loads connected to the diesel generator (see Tables 8.3.1-1 and 8.3.1-1A) are not included in the maximum coincident demand analysis and maximum emergency service loads for one or more of the following reasons:

1. The equipment is not normally operating and receives no automatic start signal after a LOCA.
2. The equipment is operating during normal plant conditions but has a seal-in type control circuit that drops out on loss of offsite power sources prior to connecting the diesel generators to their associated buses, and does not restart automatically.

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3. The equipment is tripped intentionally (automatically) on a LOCA signal.

Table 8.3.1-1 identifies equipment being tripped. Disconnecting of load is based on a one-of-two logic of LOCA contacts - one each from the RHR and core spray system actuation logics - acting on Class IE 4 kV switchgear breakers, Class IE 480 V load center switchgear breakers, or 480 V shunt-trip molded case circuit breakers installed in Class IE motor control centers.

Except for the control rod drive pumps, all nonsafety related loads are connected to the diesel generator bus through two series connected breakers (for those 480 V loads that are disconnected on LOCA, one of these breakers is the molded case shunt-trip or switchgear breaker discussed above). The magnetic breakers have been installed to limit detrimental effects on the emergency buses due to faults and overloads on nonsafety related equipment. The power and control circuits for the control rod drive pumps are treated as Class IE circuits, and the power circuits to 480 V nonsafety loads fed through two series connected breakers are treated as Class IE circuits up to the second breaker. Generally, Class IE and non-Class IE circuits do not share the same raceways. Wherever Class IE and non-Class IE circuits share the same raceways, these non-Class IE circuits remain with and follow the same rules as Class IE circuits of respective separation division and are uniquely marked.

The emergency diesel generators are not used for the purpose of supplying additional power to the utility power system (peaking).

Each emergency diesel generator unit has its own independent auxiliary system. Separate fuel oil storage tanks are provided to independently supply each diesel engine. The onsite fuel oil storage capacity provides for at least seven days operation of the emergency diesel generators at the qualified load initially, followed by a projected post LOCA load profile.

The onsite power system satisfies GDC 17 and 18, IEEE 308-1971, and Regulatory Guide 1.9.

The design of diesel generator protective trip circuit bypasses satisfies Branch Technical Position EICSB 17 except for the following.

Paragraph B 1 of EICSB 17 states that the design of standby diesel generator systems should retain only the engine overspeed and the generator differential trips and bypass all other trips under an accident condition. The voltage-restrained time overcurrent trip (device 51V) is also retained during the accident conditions for the following reasons:



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water condensers. One of the supply pipes provides cooling water to two chilled water condensers while the remaining pipe supplies the other two. A separate, return pipe per diesel cooler ensures that a continuous flow of service water can be passed through the coolers at all times. The full flow of water through each cooler is controlled by an air operated valve. Two separate return pipes are used to discharge cooling water from the RBSVS chilled water condensers through temperature control valves. Service water from the diesel engine coolers and the RBSVS and CRAC chilled water system is discharged to the circulating water discharge tunnel.

A single pipe connected to each of the supply pipes to the RBSVS and CRAC chilled water condensers is used to provide water to the main chilled water condensers. Service water supply to the main chilled water condensers is not safety related. During an accident, service water supply to the main chilled water condensers is automatically isolated by double isolation valves.

During normal operation, two of the four RB service water pumps are in operation to supply cooling water to one of the RBCLCW heat exchangers, one of the four RBSVS and CRAC chilled water condensers, one of the two drywell cooling booster heat exchangers, and to the main chilled water condensers. No service water is required for residual heat removal or diesel engine cooling during normal operation. The third reactor building service water pump is kept on automatic standby. The remaining service water pump is placed in manual standby and shall be a Division III pump.

During a normal or scheduled shutdown, two or three RB service water pumps operate to supply cooling water to one of the RBCLCW heat exchangers, to one or both RHR heat exchangers, to one of the RBSVS and CRAC chilled water condensers, to one of the drywell cooling booster heat exchangers, and to the main chilled water condensers. The fourth pump remains in manual standby.

Radiation monitors are installed on the secondary (service water) side of the RHR heat exchangers, on the primary (demineralized water) side of the RBCLCW heat exchangers, and on the service water drains subsystem. Effluents from the service water system are diluted in the circulating water discharge tunnel. The environmental acceptance of these effluents is discussed in Section 2.4.12.

Since the service water system utilizes seawater directly from Long Island Sound, the only practical means of corrosion control is the selection of suitable materials. Thus, all safety related piping and the internals of all service water system components are fabricated from corrosion resistant materials that are designed for service in a seawater environment.



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### Turbine Building Service Water Subsystem

The turbine building service water subsystem is shown on Figure 9.2.1-1B. Service water supply to the turbine building consists of three 50 percent capacity motor-driven pumps, each rated at 8,000 gpm and associated piping, valves, and instrumentation. The three pumps discharge to a common header that branches off to each of the two TBCLCW heat exchangers. Service water supply to the TB is not safety related. Service water supply to the TB is isolated from the RB service water system by double isolation motor operated valves. During normal operation these valves are locked closed. In an absolute necessity, RB service water flow could be supplied by the TB system. However, the double isolation motor-operated valves receive signals to close during a loss-of-coolant accident or a loss of offsite power.

During normal operation, two of three TB service water pumps are in operation to supply cooling water to the TBCLCW heat exchangers. The third pump remains in automatic standby. During a normal or scheduled shutdown, one of the three TB service water pumps is in operation to supply cooling water to the TBCLCW heat exchangers. One of the two non-operating pumps remains in automatic standby.

A list of components by the TB service water system is provided in Table 9.2.1-1.

#### 9.2.1.3 Safety Evaluation

The RB service water subsystem is capable of cooling essential equipment through two redundant headers. It is designed so that no single failure of any component will prevent the system from performing its intended safety function. During a design basis accident, each supply pipe is capable of providing sufficient cooling water to the following equipment, essential to the safe shutdown of the plant:

1. One residual heat removal (RHR) exchanger required for long-term core and containment cooling as described in Section 6.3.2.

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2. One reactor building closed loop cooling water (RBCLCW) heat exchanger.
3. All three diesel engine coolers.
4. Two reactor building standby ventilation system (RBSVS) and control room air conditioning (CRAC) chilled water condensers.

The RB service water subsystem is designed so that, following an accident, not less than two service water pumps will be in operation to cool the equipment listed above.

No service water is supplied to the TB or the main chilled water system following an accident.

The design margin for the above mentioned components is based on the maximum duty required for each. In addition, sufficient redundancy is provided in the individual systems to accommodate loss of a component.

On an accident signal, such as low reactor coolant level or high primary containment pressure, the following automatic operations take place:

1. The isolation valves on the service water pump discharge header close, dividing the main supply pipes.
2. Service water supply to the RHR and drywell cooling booster heat exchangers and the main chilled water system is isolated.
3. The TB service water system is isolated from the RB service water system.
4. The motor operated valves in the supply pipes to both RBCLCW heat exchangers are interlocked in the open position.
5. Three RB service water pumps are signaled to start. The fourth service water pump, powered from Division III, remains in manual standby.
6. All RBSVS and CRAC condensing water pumps start.

After the above automatic operations, operator action is required to supply service water to the RHR heat exchanger when it becomes necessary.

Upon loss of all offsite power without LOCA, the following operations take place automatically:

1. Service water pumps are tripped.
2. The standby diesel generators are started.

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3. When diesel generator operating voltage is reached, the diesel generators are connected to their respective buses. (Safety related instrumentation is supplied from the emergency buses as soon as power from standby diesel generators is available.)
4. The RB service water pumps on each emergency bus start 12 sec after the diesel generator is connected to the bus, except for the service water pump on manual standby.
5. Valve operators move automatically into the position for post-accident condition with the exception of the drywell cooling booster heat exchangers which remain in position.

In the event of an accident, followed by loss of offsite power, all operations described above take place automatically. In addition, the following events take place:

1. Valve operators move automatically into the proper position for post-accident condition.
2. Operator action is necessary to supply service water to the RHR heat exchangers.

The RB service water subsystem is designed so that it is capable of accommodating any single failure of a component within the system or of a component in another related system without affecting the overall system capability of effecting plant shutdown and cooldown or post-accident heat dissipation. Operator actions may be required to isolate a given failed component from the remainder of the service water system and to transfer cooling to the redundant cooling subsystem.

A single active or passive failure of a component in the service water system initiates an alarm, e.g., diesel generator trip, flow, level, pressure or temperature condition in the control room. Upon annunciation, the operator responds by remote manual initiation of the necessary valve action to isolate the failed component and to make use of the proper independent redundant subsystem.

Following a design basis accident with coincident loss of offsite power, the maximum heat load on the service water system, with minimum safeguard equipment operating, would be 129,300,000 Btu/hr resulting from the following safety related sources:

#### 9.5.4 Diesel Generator Fuel Oil Storage and Transfer System

##### 9.5.4.1 Design Bases

The plant is provided with three standby generators separately driven by three diesel engines operating on No. 2 fuel oil. Each engine is supplied by a separate diesel generator fuel oil storage and transfer system design to allow for 7 days operation of the diesel engine at qualified load/post LOCA load profile. All safety-related portions of the diesel generator fuel oil storage and transfer systems are designed to ASME III, Code Class 3, and Seismic Category I requirements.

The system design incorporates sufficient redundancy to prevent a malfunction or failure of any single active or passive component from impairing the capability of the system to supply fuel oil to at least two of the diesel engines.

The diesel generator fuel oil storage and transfer systems are designed so that makeup fuel oil may be transferred from the auxiliary boiler fuel oil storage tanks to the fill piping for the diesel generator fuel oil storage tanks. Auxiliary boiler fuel will be compatible with diesel generator fuel requirements. Missile protection is provided for the fuel oil storage and transfer systems in accordance with General Design Criterion 4 of 10CFR50, Appendix A.

##### 9.5.4.2 System Description

The diesel generator fuel oil storage and transfer system (Fig. 9.5.4-1) located in and adjacent to the diesel generator rooms in the control building, consists of:

1. Three buried diesel fuel oil storage tanks - one for each diesel engine. Each storage tank has a capacity of 42,000 gal., providing sufficient fuel oil for 7 days of operation initially at the qualified load followed by a projected post LOCA load profile. Each tank is vented to atmosphere.
2. Six 10 gpm full-capacity, electric motor driven rotary positive displacement fuel oil transfer pumps (two pumps for each diesel generator fuel oil storage tank) are provided. Each pump is provided with a relief valve discharging back to its associated suction line. Each diesel generator fuel oil transfer pump is mounted directly above its associated fuel oil storage tank.
3. A diesel generator fuel oil day tank for each diesel engine is situated in the associated diesel generator room. Each diesel generator fuel oil day tank is sized to store 550 gal. of fuel oil. Each diesel generator fuel oil day tank is supplied with a flame arrestor on the vent.



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4. Two 13 gpm, full capacity, positive displacement fuel oil booster pumps per diesel engine. The shaft driven and d-c motor driven booster pumps are piped in parallel and mounted on the diesel engine skid. Each pump discharge is equipped with a relief valve back to the pump suction. A large mesh Y type fuel oil strainer is located upstream of each booster pump.

### 9.5.4.3 Safety Evaluation

As a result of the redundancy incorporated in the system design, the diesel generator fuel oil system provides its minimum required safety function under any of the following conditions:

1. Loss of offsite power coincident with failure of one diesel generator.
2. Loss of offsite power coincident with maintenance outage or failure of one diesel generator fuel oil transfer pump or one diesel generator fuel oil booster pump associated with each diesel generator.

Each diesel generator fuel oil storage tank is sized to store sufficient diesel fuel oil for a minimum of 7 days of operation initially at the qualified load followed by a projected post LOCA load profile. Additional fuel oil may be readily delivered to the site by truck on short notice. The fuel oil storage tanks are buried 2 1/2 ft below grade, with a 4 ft separation between the sides of each tank. The tanks rest on, and are covered by compacted sand. Six in. above the top of the tanks, supported by the compacted soil, is a 2 ft thick concrete slab, designed to Seismic category I requirements. The fuel oil transfer pumps are mounted above this slab, and take suction through the top of the tanks. A seismic Category I concrete block house is provided above each tank to enclose the two fuel oil transfer pumps, associated discharge piping, instrumentation, and manhole into the tank. The blockhouse and slab together provide the fuel oil storage and transfer system with adequate protection against potential missiles due to tornadoes or hurricanes. This arrangement meets the intent of General Design Criterion 4.

The diesel generator fuel oil storage tanks are adequately protected against long term corrosion by the following means.

1. The tank interior is coated with an epoxy finish.
2. The tank exterior is coated with a zinc rich polyamide primer and a coal tar epoxy material.

The diesel fuel oil storage tanks will be inspected periodically. The tanks are sloped a minimum of 1/26 in. per ft, or 2 in. total, to accumulate any moisture at the low end of the tanks, away from the fuel oil pumps. The fuel oil will be sampled as



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described in Section 9.5.4.4. If excessive amounts of moisture are found accumulating in the tank, a portable sump pump will be used to remove the water via the sounding tube.

Each of the diesel generator fuel oil day tanks is sized to store a maximum 550 gal. of diesel fuel oil, as allowed by National Fire Protection Association (NFPA) standards, Vol.1, 1971-1972. This storage capacity provides for 2 hr. of continuous operation of the diesel generator at qualified load. The sulfur content of the diesel fuel oil is specified at 1.05 percent maximum, by weight, to minimize corrosiveness of sulfur compounds in the diesel engine exhaust gas.

### 9.5.4.4 Testing and Inspection Requirements

The diesel generator fuel oil supply piping is hydrostatically tested during construction. All active system components and controls are functionally tested during startup and periodically thereafter. The diesel fuel oil is sampled periodically to determine possible contamination or deterioration of the oil in the storage tank. The diesel fuel oil inventory is periodically checked. The Y strainer located on each fuel oil booster pump suction line is cleaned quarterly, after 100 hr. of operation, or upon a high differential pressure alarm, whichever occurs first.

### 9.5.4.5 Instrumentation Application

Each of the diesel generator fuel oil storage tanks is provided with a connection for manual determination of the diesel fuel oil level. A level transmitter is also provided to give a continuous computer monitored reading of the tank level in the main control room. On low fuel level, a low level alarm, initiated by a level switch independent from the level transmitter, is annunciated in the diesel generator room, and a diesel trouble alarm is annunciated in the main control room.

Each diesel generator fuel oil day tank is provided with local indication of the day tank level. A level switch is provided to alarm high and low diesel generator fuel oil day tank level on the standby diesel generator panel, and diesel trouble in the main control room. The level of the fuel oil day tanks is controlled by the automatic starting and stopping of the corresponding preferred diesel generator fuel oil transfer pump. Should the preferred transfer pump fail to start, a redundant level switch will automatically start the second fuel oil transfer pump. Manual pump control is also provided on the standby diesel generator panel for starting or stopping either the preferred or secondary fuel oil transfer pumps. In the event that the pumps fail to stop, a gravity drain overflow is provided from the day tank back to the diesel fuel oil storage tank. An interlock is provided to automatically shut off the fuel oil transfer pumps when the carbon dioxide fire protection system is actuated in the associated diesel generator room.

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TABLE 8.3.1-1

EMERGENCY DIESEL GENERATOR SYSTEM  
REQUIRED LOADS AND MAXIMUM COINCIDENT DEMAND

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Hot Standby)	Maximum Demand DG-101	Coincident (Kilowatt) DG-102	(1) (2)	
			Design Basis Loss of Coolant Accident					DG-103	DG-103
			0-10 Min	10 Min on					
Core Spray Pump	1250	2	1 (6)	1	-	998	998	-	
Residual Heat Removal Pump	1250	4	2 (6)	1	2 (3)	999	999	1998 (4)	
Service Water Pump	450	4	2	2	3 (3)	358	358	716 (3)	
RBSVS and CRAC Water Chiller	292	4	2	2	2	235	235	470 (4)	
RBSVS and CRAC Water Chiller Lube Oil Pump	0.25	4	2	2	2	0.2	0.2	0.4 (4)	
RBSVS Chiller Circ. Water Pump	75	4	2	2	2	60	60	120 (4)	
RBSVS Chiller Cond. Water	20	4	2	2	2	16	16	32 (4)	
RBSVS Unit Cooler	30	8	4	4	4	96	96	-	
RBSVS Exhaust Fan	100	3	2	2	2	82.5	82.5	82.5	
Reactor Building Exhaust Booster Fan	7.5	2	1	1	1	6	6	-	
RBSVS Filter Reheat Coil	6.6 kW	2	1	1	1	6.6	6.6	- (14)	
RECLON Circ. Pump	100	3	2	2	2	80	80	80	
Diesel Generator Air Compressor	10	6	-	-	-	12	12	12	
Diesel Generator Fuel Oil Transfer Pump	0.5	6	2	2	2	0.4	0.4	0.4	
Diesel Generator Jacket Water Heater	36 kW	6	-	-	-	72 (13)	72 (13)	72 (13)	
Diesel Generator Jacket Water Keep Warm Pump	2.5 kW	3	-	-	-	2.5 (13)	2.5 (13)	2.5 (13)	
Diesel Generator Lube Oil Heater	20 kW	3	-	-	-	20 (13)	20 (13)	20 (13)	
Diesel Generator Before & After Lube Oil Pump	5	3	-	-	-	4 (13)	4 (13)	4 (13)	

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TABLE 8.3.1-1

**EMERGENCY DIESEL GENERATOR SYSTEM  
REQUIRED LOADS AND MAXIMUM COINCIDENT DEMAND**

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Not Standby)	Maximum Demand DG-101	Coincident (Kilowatt) DG-102	(1) DG-103	(2)
			Design Basis Loss of Coolant Accident						
			0-10 Min	10 Min on					
Diesel Generator Heater	4.2 kW (15)	3	-	-	-	4.2 (13)	4.2 (13)	4.2 (13)	
Battery Charger (125 V)	60 kVa	3	2	2	2	20	25	17	
120 V ac Instrument Power	100 kVa DG 101	3	2	2	2	80	80	40	
	100 kVa DG 102								
	50 kVa DG 103								
120 V Nonemergency Feeds	65 kVa	-	-	-	X (7)	-	-	52 (8)	
Diesel Generator Room Vent Supply Fan	20	3	2	2	2	16	16	16	
Battery Room Vent Supply Fan	2	3	2	2	2	1.6	1.6	1.6	
Control Room Air Condition- ing Unit	40	2	1	1	1	33.9	33.9	-	
Control Room Vent Booster Fan	7.5	2	1	1	1	6.0	6.0	-	
Emergency Switchgear, Relay & Computer Rooms Air Condi- tioning Unit	40	2	1	1	1	33.9	33.9	-	
TSC Air Conditioning Unit	40 kW	1	-	1	1	-	-	40 (9, 14)	
TSC Air Cooled Condenser	30 kW	1	-	1	1	-	-	30 (9, 14)	
Emergency Switchgear, Relay & Computer Rooms Exhaust Fan	10	2	1	1	1	8.0	8.0	-	
RHSVS Chiller Room Exhaust Fan	3	2	1	1	1	2.4	2.4	-	
Screenwell Exhaust Fan	10	2	1	1	1	8.0	8.0	-	
Screenwell Interposing Relay Panel	1 kVa	1	1	1	1	-	0.6	-	
MLC Room Ventilation	0.75	2	1	1	1	0.5	0.5	-	

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TABLE 8.3.1-1

EMERGENCY DIESEL GENERATOR SYSTEM  
REQUIRED LOADS AND MAXIMUM COINCIDENT DEMAND

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Not Standby)	Maximum Demand DG-101	Coincident (Kilowatt) DG-102		
			Design Basis Loss of Coolant Accident					(1)	(2)
			0-10 Min	10 Min on				DG-103	DG-103
LPCE M-G Set Room Venti- lation	3	4	2	2	2	2.4	2.4	4.8	
Unit Cooler MCC CBI Room	1.5	1	1	1	1	-	1.2	-	
Spent Fuel Pool Cooling Water Pump	30	2	1	1	1	24 (14)	24 (14)	-	
Loop Level Pump (CS, RHR, HPCI, RCIC)	7.5	4	4	2	4	12.0	12.0	-	
Atmosphere Cont. - Hyd. Recombiner	109 kW	2	-	1	-	109 (9)	109 (9)	-	
MSIV-LCS Heaters	6.6 kW	4	-	-	-	-	26.4 (9)	-	
MSIV-LCS Blowers	4.4	3	-	-	-	7 (9)	3.5 (9)	-	
Radiation Monitoring	1	10	-	-	-	4.8 (8)	3.2	-	
Lighting (Equivalent kW)	407.2 kW	-	-	-	X (7)	180 (8)	-	227.2 (8)	
Fence Security Lighting	60 kW	-	-	-	X (7)	34	-	26	
Reactor Protection System M-G Set (5)	25	2	-	-	2	20 (10)	20 (10)	-	
Reactor Protection System Backup Transformer	25 kVa	1	-	-	1	-	-	20 (8)	
Battery Charger 124 V	3 kVa	4	-	-	-	2.4 (8)	2.4 (8)	-	
Uninterruptible Power (Vital Bus) (5)	37.5 kVa	1	1	1	1	-	-	30	
Uninterruptible Power (Security & Communi- cations) 20 kVa	1		1	1	-	-	16		
Battery Charger (Security and Communication) 20 kVa (1 5)	1		-	-	-	-	-	4	
Uninterruptible Power (Computer Bus) (5)	20 kVa	1	1	1	1	16	-	-	
Control Rod Drive Pump (5)	250	2	-	-	1	206.1 (8)	206.1 (8)	-	
Drywell Cooling System Fan (5)	25	8	-	-	4	80 (8)	80 (8)	-	

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TABLE 8.3.1-1

**EMERGENCY DIESEL GENERATOR SYSTEM  
REQUIRED LOADS AND MAXIMUM COINCIDENT DEMAND**

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Hot Standby)	Maximum Demand DG-101	Coincident (Kilowatt) DG-102		
			Design Basis Loss of Coolant Accident					(1)	(2)
			0-10 Min	10 Min on					
Primary Containment	2 kVa	2	-	-	1	1.6 (8)	1.6 (8)	-	
Air Cooler Subfeed									
Reactor Water Cleanup									
Recirc. Pump (5)	60	2	-	-	1	-	48 (8)	48 (8)	
Suppression Pool Pump									
Back Pump	25	1	-	-	-	20 (9)	-	-	
Main Turbine Turning Gear (5)	60	1	-	-	1	-	-	48 (8)	
Main Turbine Piggyback									
Turning Gear Drive	0.5	1	-	-	1	-	-	0.4 (8)	
Main Turbine Turning Gear (5)									
Oil Pump	40	1	-	-	1	-	-	32 (8)	
Main Turbine Bearing Lift									
Pump (5)	5	7	-	-	7	8 (8)	8 (8)	12 (8)	
Feedwater Turbine Turning									
Gear (5)	1.5	2	-	-	2	1.2 (8)	1.2 (8)	-	
Feedwater Turbine Turning									
Gear Oil Pump (5)	10	2	-	-	2	8 (8)	8 (8)	-	
RFP EHC Control	1.5 kVa	2	-	-	2	1.2 (8)	1.2 (8)	-	
Transformer									
Standby Liquid Control									
Pump	40	2	-	-	-	32 (8)	32 (8)	-	
Standby Liquid Control									
Main Heater (5)	10 kW	1	-	-	-	-	10 (8)	-	
Standby Liquid Control									
Mixing Heater (5)	45 kW	1	-	-	-	45 (8)	-	-	
Standby Liquid Control									
Heat Tracing	3 kVa	2	-	-	-	3 (8)	3 (8)	-	
Heat Tracing Trans-	25 kVa	2	1	1	2	20	20	-	
former									
480 V M-G Set	200 (12)	4	2	2	2	160	160	214	



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TABLE 8.3.1-1

EMERGENCY DIESEL GENERATOR SYSTEM  
REQUIRED LOADS AND MAXIMUM COINCIDENT DEMAND

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Not Standby)	Maximum Demand DG-101	Coincident (Kilowatt)		(1) DG-103	(2) DG-103
			Design Basis Loss of Coolant Accident							
			0-10 Min	10 Min on						
Refueling Jib Crane	3.25	2	-	-	-	2.5 (8)	2.5 (8)	-	-	-
Refueling Platform Assembly	3.5	1	-	-	-	2.8 (8)	-	-	-	-
Motor Operated Valves	-	-	X (7)	-	-	19.7	18.3	-	-	0.7
Nonoperating MCV's (11)	-	-	-	-	-	95.9	75.3	-	-	-
Total connectable Loads						4381.3	4147.8	-	-	4493.7
Minus Notes 3 and 11 Loads						- 95.9	- 75.3	-	-	358
Minus Note 8 Loads						4285.4	4072.5	-	-	4135.7
Minus Note 10 Loads						-573.8	- 404.0	-	-	439.6
Minus Notes 9 and 14 Loads						3711.6	3668.5	-	-	3696.1
Minus Note 13 Loads						- 20	- 20	-	-	0
Total kW (60 seconds approx)						3691.6	3648.5	-	-	3696.1
Minus Operating MCV's						-136.0	- 138.9	-	-	150.0
Total kW (Prior to 10 minutes)						3555.6	3509.6	-	-	3546.1
Minus Note 4 Loads						-102.7	- 102.7	-	-	102.7
Plus Note 14 Loads						3452.9	3406.9	-	-	3443.4
Total kW (After 10 Minutes)						- 19.7	- 18.3	-	-	0.7
						3433.2	3388.6	-	-	3442.7
						- 0	- 0	-	-	1310.2
						0	0	-	-	150
						3433.2	3388.6	-	-	2282.5

TABLE 8.3.1-1 (CONT'd)

## NOTES:

- (1) Maximum coincident demand shown occurs during the 0-10 minute period after a design basis loss of coolant accident (LOCA).
- (2) Kilowatt loads given are from manufacturer's data for the CS, RHR service water pumps, motor-generator sets, RRGVS chiller units, and all motor greater than 100 Hp.
- (3) 3 service water pumps are required for hot standby. On loss of offsite power, it is necessary to go to a cold shutdown condition if DG-103 does not start, since the three required service water pumps will not be available. Note that only two service water pumps are required for a design basis LOCA condition. (Only one pump is connected automatically to DG-103, the other may be connected manually only.)
- (4) Two units are started on DG-103. One unit is shut down when it is determined which section of the system will be used.
- (5) These nonclass IE components are not required for a safe shutdown. Loading indicated for various modes of operation is desirable, although not essential. All remaining components are Class IE.
- (6) Minimum safe shutdown requirements for a suction line break. Actual pump requirements depend on break location (see Section 6.3.3).
- (7) X indicates load required.
- (8) These loads are tripped intentionally (automatically) on a LOCA.
- (9) These loads are not normally operating and received no automatic start signal after a LOCA.
- (10) These nonsafety related loads have seal-in type control circuits that drop out on a loss of offsite power prior to connecting to the diesel generators.
- (11) These MOV's are connected to their respective diesel buses but do not operate upon a LOCA.
- (12) The load to be carried by the M-G sets consists of certain motor-operated valves. On Unit 103, one set operates at full load and one set operates unloaded.
- (13) These loads are automatically tripped when diesel generator starts.
- (14) These loads are prevented from starting until 10 minutes after a LOCA signal.
- (15) Loads imposed by battery chargers are based on the dc loading of the battery chargers.

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TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM  
MAXIMUM EMERGENCY SERVICE LOADS

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Hot Standby)	Maximum Emergency Service Load (kW)			Remarks
			Design Basis Loss of Coolant Accident 0-10 Min	10 Min on		DG-101	DG-102	DG-103	
Core Spray Pump	1250	2	1	1	-	998	998	C	1
Residual Heat Removal Pump	1250	4	2	1	2	*1022	*1022	*1955.2	2
Service Water Pump	450	4	2	2	3	358	358	358	3
RBSVS and CRAC Water Chiller	292	4	2	2	2	235	235	470	1
RBSVS and CRAC Water Chiller Lube Oil Pump	0.25	4	2	2	2	0.2	0.2	0.4	1
RBSVS Chiller Circ. Water Pump	75	4	2	2	2	*32	*32	*64	4
RBSVS Chiller Cond. Water	20	4	2	2	2	16	16	32	1
RBSVS Unit Cooler	30	8	4	4	4	96	96	C	1
RBSVS Exhaust Fan	100	3	2	2	2	82.5	82.5	82.5	1
Reactor Building Exhaust Booster Fan	7.5	2	1	1	1	6.0	6.0	C	
RBSVS Filter Reheat Coil	6.6 kW	2	1	1	1	6.6	6.6	C	1
RBCLOW Circ. Pump	100	3	2	2	2	80	80	E	1
Diesel Generator Air Compressor	10	6	-	-	-	-	-	-	5
Diesel Generator Fuel Oil Transfer Pump	0.5	6	2	2	2	-	-	-	5
Diesel Generator Jacket Water Heater	36 kW	6	-	-	-	D	D	D	
Diesel Generator Jacket Water Keep Warm Pump	2.5 kW	3	-	-	-	D	D	D	
Diesel Generator Lube Oil Heater	20 kW	3	-	-	-	D	D	D	
Diesel Generator Before & After Lube Oil Pump	5	3	-	-	-	D	D	D	

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TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM  
MAXIMUM EMERGENCY SERVICE LOADS

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Hot Standby)	Maximum Emergency Service Load (kW)			Remarks
			Design Basis Loss of Coolant Accident			DG-101	DG-102	DG-103	
			0-10 Min	10 Min on					
Diesel Generator Heater	4.2 kW	3	-	-	-	D	D	D	
Battery Charger (125 V)	60 kVa	3	2	2	2	20	25	17	6
120 V ac Instrument Power	100 kVa DG 101	3	2	2	2	80	80	40	6
	100 kVa DG 102								
	50 kVa DG 103								
120 V Nonemergency Feeds	65 kVa	-	-	-	X	A	B	D	
Diesel Generator Room Vent Supply Fan	20	3	2	2	2	16	16	16	1
Battery Room Vent Supply Fan	2	3	2	2	2	1.5	1.6	1.6	1
Control Room Air Condition- ing Unit	40	2	1	1	1	33.9	33.9	C	
Control Room Vent Booster Fan	7.5	2	1	1	1	6.0	6.0	C	
Emergency Switchgear, Relay & Computer Rooms Air Condi- tioning Unit	40	2	1	1	1	*36.4	*36.4	C	
TSC Air Conditioning Unit	40 kW	1	-	1	1	A	B	40	1
TSC Air Cooled Condenser	30 kW	1	-	1	1	A	B	30	1
Emergency Switchgear, Relay & Computer Rooms Exhaust Fan	10	2	1	1	1	8.0	8.0	C	
RBSVS Chiller Room Exhaust Fan	3	2	1	1	1	2.4	2.4	C	1
Screenwell Exhaust Fan	10	2	1	1	1	8.0	8.0	C	1
Screenwell Interposing Relay Panel	1 kVa	1	1	1	1	A	0.8	C	1
MCC Room Ventilation	0.75	2	1	1	1	0.5	0.5	C	1

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TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM  
MAXIMUM EMERGENCY SERVICE LOADS

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Not Standby)	Maximum Emergency Service Load (kW)			Remarks
			Design Basis Loss of Coolant Accident 0-10 Min	10 Min on		DG-101	DG-102	DG-103	
LPCI M-G Set Room Ventilation	3	4							
Unit Cooler MCC Oil Room	1.5	1	2	2	2	2.4	2.4	4.8	1
Spent Fuel Pool Cooling Water Pump	30	1	1	1	1	A	1.2	C	1
Loop Level Pump (CS, NR, HPCI, RCIC)	7.5	2	-	1	1	F	F	C	
Atmosphere Cont. - Hyd. Recombiner	109 kW	4	4	2	4	12.0	12.0	C	1
MSIV-LCS Heaters	6.6 kW	2	-	1	-	D	D	C	
MSIV-LCS Blowers	4.4	4	-	-	-	A	D	C	
Radiation Monitoring	1	3	-	-	-	D	D	C	
Lighting (Equivalent kW)	407.2 kW	10	-	-	-	4.8	3.2	C	
Fence Security Lighting	60 kW	-	-	-	X	D	B	D	6
Reactor Protection System M-G Set	25	-	-	-	X	34	B	26	6
Reactor Protection System Backup Transformer	25 kVa	2	-	-	2	D	D	C	9
Battery Charger 24 V	3 kVa	1	-	-	1	A	B	D	
Uninterruptible Power (Vital Bus)	37.5 kVa	4	-	-	-	D	D	C	
Uninterruptible Power (Security & Communications)	20 kVa	1	1	1	1	A	B	30	6
Battery Charger (Security and Communication)	20 kVa	1	1	1	1	A	B	16	6
Uninterruptible Power (Computer Bus)	20 kVa	1	-	-	-	A	B	4	6
Control Rod Drive Pump	250	1	1	1	1	16	B	C	
Drywell Cooling System Fan	25	2	-	-	1	D	D	C	6
		8	-	-	4	D	D	C	



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TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM  
MAXIMUM EMERGENCY SERVICE LOADS

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Hot Standby)	Maximum Emergency Service Load (kW)			Remarks
			Design Basis Loss of Coolant Accident			DG-101	DG-102	DG-103	
			0-10 Min	10 Min on					
Primary Containment Air Cooler Subfeed Reactor Water Cleanup Recirc. Pump Suppression Pool Pump Back Pump Main Turbine Turning Gear Main Turbine Piggyback Turning Gear Drive Main Turbine Turning Gear Oil Pump Main Turbine Bearing Lift Pump Feedwater Turbine Turning Gear Feedwater Turbine Turning Gear Oil Pump RFP EHC Control Transformer Standby Liquid Control Pump Standby Liquid Control Main Heater Standby Liquid Control Mixing Heater Standby Liquid Control Heat Tracing Heat Tracing Trans- former 480 V M-G Set	2 kVa   60 25 60  0.5 40 5 1.5 10 1.5 kVa  40 10 kW 45 kW 3 kVa 25 kVa 200	2  2 1 1  1 1 7 2 2 2  2 1 1 2 2 4	-  - - -  - - - - - - - - - - 1 2 2	-  - - -  - - - - - - - - - - 1 1 2	1   1 - 1 1 7 2 2 2  - - - - - 2 2 2	C   A D D A B A B A D D D D A D D D A D			

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TABLE 8.3.1-1A

EMERGENCY DIESEL GENERATOR SYSTEM  
MAXIMUM EMERGENCY SERVICE LOADS

Function	Nameplate Rating (Hp)	Total Plant Number	Number Required		Loss of Offsite Power (Not Standby)	Maximum Emergency Service Load (kW)			Remarks
			Design Basis Loss of Coolant Accident			DG-101	DG-102	DG-103	
			0-10 Min	10 Min on					
Refueling Jib Crane	3.25	2	-	-	-	D	D	C	
Refueling Platform Assembly	3.5	1	-	-	-	D	B	C	
Motor Operated Valves	-	-	X	-	-	-	-	-	0
Nonoperating MOV's	-	-	-	-	-	-	-	-	0
Total Maximum Emergency Service Loads (LOOP/LOCA)						3,253.3	3,208.7	3,225.5	

Remarks:

1. Nameplate Value
2. Maximum load (1022 kW) corresponds to one RHR pump at run-out flow into a broken Recirc. loop.  
Maximum load (1955.2 kW) for DG-103 corresponds to one RHR pump at run-out flow into a broken Recirc. loop and the other pump operating at expected flow conditions into the intact loop.
3. 1 Div. III pump in pull to lock (i.e.) no auto start.
4. Actual test data showed load value of 32 kW vs. 60 kW nameplate.
5. Loads are cyclic and not continuous, therefore not included in total.
6. Not an actual measured load. Load obtained from Table 8.3.1-1.
7. MG set will be unloaded after LPCI valves have stroked.
8. Not a continuous load.
9. RPS MG set de-energizes on LOOP/LOCA.

NOTES:

- A. Not a DG-101 load
- B. Not a DG-102 load
- C. Not a DG-103 load
- D. Tripped on a LOCA/Loss of Offsite Power/DG Start
- E. Locked out for 10 min. on LOCA, manual start and manual line-up
- F. Administratively de-energized not required during first cycle of operation, (no spent fuel).
- \* Actual measured loads

## SNPS-1 PSAR

TABLE 8.3.1-2

Sequence	SEQUENTIAL LOADING OF DIESEL GENERATOR SETS PERFORMED AT THE FACTORY					Cumulative kW (4)
	Time (Sec) (3)	Rated Horsepower	Brake Horsepower	Starting kVa (4)	Running kW (4)	
<u>Diesel 101</u>						
1. Initial Load - Motor load, including MOVs, Ltq., etc. on 1,000/1,333 kVa, 4,160-480 V, transformer with 8% impedance	0	-	-	4,742	838.9	838.9
2. Start NHR Pump	2	1,250	1,250	5,644	999	1,837.9
3. Start CS Pump	7	1,250	1,250	5,638	998	2,835.9
4. Start Service Water Pump and RBSVS Chiller	12 <sup>(2)</sup>	450	450	2,022	358.0	-
	-	-	292	1,327	235.0	3,428.9
5. MOVs Complete Operation	60 (Approx)	-	-	-	(19.7)	3,409.2
6. Manually stop loads not required and add additional loads as required within the rating of the diesel generator	600 - On	-	-	-	-	-
<u>Diesel 102</u>						
1. Initial Load - Motor load, including MOV's, Ltq., etc. on 1,000/1,333 kVa, 4,160-480 V, transformer with 8% impedance	0	-	-	4,449	792.9	792.9
2. Start NHR Pump	2	1,250	1,250	5,644	999	1,791.9
3. Start CS Pump	7	1,250	1,250	5,638	998	2,789.9
4. Start Service Water Pump and RBSVS Chiller	12 <sup>(2)</sup>	450	450	2,022	358.0	-
	-	-	292	1,327	235.0	3,382.9
5. MOVs Complete Operation	60 (Approx)	-	-	-	(18.3)	3,364.6

SN-1 FSAR

TABLE 8.3.1-2 (CONT'D)

Sequence	Time (Sec) (3)	Rated Horsepower	Brake Horsepower	Starting kVa (4)	Running kW (4)	Cumulative kW (4)
<u>Diesel 102 (cont'd)</u>						
6. Manually stop loads not required and add additional loads as required within the rating of the diesel generator	600 - On	-	-	-	-	-
<u>Diesel 103</u>						
1. Initial Load - Motor load, including MCVs, Ltq., etc. on 1,000/1,333 kVa, 4,160-480 V, transformer with 8% impedance	0	-	-	3,931	697.4	697.4
2. Start RHR Pump	2	1,250	1,250	5,644	999	1,696.4
3. Start MSR Pump	7	1,250	1,250	5,644	999	2,695.4
4. Start two Service Water Pumps and two RBSVS Chiller	12 <sup>(2)</sup>	450	400	4,044	716	-
	-	-	584	2,654	470	3,881.4
5. MCVs Complete Operation	60 (Approx)	-	-	-	(0.7)	3,880.7
6. Stop RHR PP, Stop 1 CRAC and RBSVS Water Chiller and assoc. aux. equipment, start TSC air conditioning.	600 - On	-	-	-	(1,240.2)	2,640.5

- (1) All large motors and a majority of small motors are squirrel cage induction motors.
- (2) Service water pumps and RBSVS ch'lers receive start signals from the bus program at 12 sec as shown. However, other interlocks may delay motor start beyond this point.
- (3) The time shown in table is time after the diesel generator breaker closes to its associated 4 KV bus.
- (4) Load values calculated from nameplate data.



## SNPS-1 FSAR

### 14.1.3.7.24 Emergency Diesel Generators Preoperational Test

#### Objective

To verify the capability of the emergency diesel generator system to start upon receiving a start signal from the various modes, come up to operating speed, phase on to its bus, and carry its rated load.

#### Prerequisites

1. The applicable general prerequisites, as listed in Section 14.1.3.4, will be met.
2. Emergency diesel generator room ventilation system operational.
3. Sufficient load available for full loading of system.
4. Emergency diesel generator auxiliaries available and ready for diesel operation.

#### Test Method

1. Each emergency diesel generator was started under simulated loss of ac power conditions, ECCS initiating signals, and proper starting and automatic bus stripping demonstrated.
2. The emergency diesel generators were started simultaneously under simulated loss of ac power conditions, ECCS initiating signals, and proper starting and automatic bus stripping demonstrated.
3. The ability of the emergency diesel generators to accept their rated load and maintain proper voltage and frequency within design requirements was demonstrated.
4. The ability of the emergency diesel generators to maintain a load equal to the continuous rating for the time required to reach a temperature equilibrium plus 1 hr was demonstrated.
5. The ability of the emergency diesel generators to maintain a load at least equal to 3500 kW for 2 hr has been demonstrated for DG-101 on March 7, 1984, DG-102 on January 30, 1984, and DG-103 on August 6, 1984. This was accomplished prior to the issuance of the SER on the TDI Owners Group Plan and the development of a qualified load as described in section 8.3.
6. The ability of the emergency diesel generators to maintain a load at least equal to the qualified load (3,300 kW) for a time required to reach a temperature equilibrium plus 1 hr was demonstrated.

#### SNPS-1 FSAR

7. The ability of the emergency diesel generators to reject a load at least equal to the qualified load will be demonstrated.
8. During the plant preoperational test program, the diesel generators shall be tested in accordance with the intent of Regulatory Positions C.2.a and C.2.b of Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used as Onsite Power at Nuclear Power Plants" (Revision 1, August 1977) in that the diesel generators will be tested enveloping the load conditions that would be expected if actual demand were placed on the system, in accordance with Section 8.3.1.1.5.
9. A confirmatory test will be performed to establish the adequacy of the TDI diesel engines at the 3300 kW qualified load.

#### Acceptance Criteria

1. The applicable general acceptance criteria, as listed in Section 14.1.3.6, will be met.
2. The emergency diesel generators can supply and maintain rated load and voltage in accordance with design requirements.
3. The emergency diesel generators will start and supply the 4,160 V ac emergency buses in all operating modes.
4. Bus stripping will be in accordance with design requirements.
5. The emergency diesel generators can reject load without tripping.
6. The TDI Owners Group acceptance Criteria will be applied at the conclusion of the test described in item nine (9) above. In case where these criteria have not been explicitly stated in Owners Group reports or in the Component Revalidation checklist submitted as part of the Shoreham DRQR package (e.g., engine block, pistons), LILCO will identify its quantitative criteria for evaluating indications as being acceptable and/or relevant, and provide the technical basis for these criteria.

#### 14.1.3.7.25 Primary Containment Local Leak Rate Test Types B and C

#### Objective

To verify that the leakage rate of primary containment isolation valves and testable penetrations is less than the allowable value specified in 10CFR50 Appendix J - "Reactor Containment Leakage Testing for Water Cooled Power Reactors."

## SNPS-1 FSAR

### Prerequisites

1. The applicable general prerequisites, as listed in Section 14.1.3.4, will be met.
2. All piping penetrations sufficiently complete to facilitate testing their isolation valves.
3. Isolation valves operable and seated by normal remote means.
4. Fluid piping drained adjacent to tested valves, wherever possible.
5. Nonpiping penetration construction complete.

### Test Method

1. Primary containment penetrations will be pressurized to the maximum calculated post-accident primary containment internal pressure.

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
LONG ISLAND LIGHTING COMPANY	)	Docket No. 50-322 (OL)
	)	
(Shoreham Nuclear Power Station,	)	
Unit 1)	)	

RESOLUTION OF SUFFOLK COUNTY  
DIESEL GENERATOR CONTENTION REGARDING CYLINDER HEADS

After submission of pre-filed testimony on the Suffolk County diesel generator contention concerning cylinder heads, discussions were held between the parties that have resulted in resolution of the contention. The parties have agreed to do the following:

(1) Suffolk County will withdraw its diesel generator contention concerning cylinder heads from consideration in this ASLB proceeding.

(2) In return, LILCO will do the following with respect to all cylinder heads currently in use at Shoreham:

(a) Perform an ultrasonic inspection of the firedeck of all the cylinder heads at six locations to verify that the minimum thickness requirement of .400 inch is met. The six locations are specified as follows:

(i) The first location is on the firedeck between the exhaust gas ports approximately directly between the two exhaust gas ports.

(ii) The second location is approximately 1 1/2" from the first location in a direction toward the exhaust side of the cylinder head.

(iii) The third location is approximately 2" from the first location in a direction toward the intake side of the cylinder head.

(iv) The fourth location is approximately midway between the injector port and the exhaust port on the governor side of the head.

(v) The fifth location is approximately directly between the two intake gas ports.

(vi) The sixth location is approximately midway between the injector and exhaust port on the flywheel side of the head.

Cylinder heads not meeting this thickness requirement will be replaced. Credit for previous inspections conducted by the Owners Group and the NRC on the Shoreham cylinder heads is acceptable to meet this requirement.

(b) Perform surface inspection (either liquid penetrant or magnetic particle) of intake and exhaust valve seats and the firedeck area between the exhaust valves to verify that they are free of unacceptable



surface defects. LILCO will be permitted to take credit for previous DRQR inspections of the existing cylinder heads provided those inspections were performed after the cylinder heads had completed 100 hours of operation at greater than or equal to full load (3500 kw). Cylinder heads with unacceptable and irreparable surface defects will be replaced. Acceptance criteria are as specified in ASME § III, paragraph NE-5350.

(c) Ascertain from shop records or otherwise whether any heads have through-wall weld repairs of the firedeck where the repair is performed from one side only. Any such heads will be replaced.

(d) Cylinder heads purchased as replacements will be inspected in accordance with paragraphs 2(a) and (b) and subject to paragraph 2(c) above.

(e) LILCO will bar the engines over with the barring device and roll the engines over with the air start system prior to any planned starts, unless that planned start occurs within four hours of a shutdown. In addition, after engine operation, the engines will be barred and rolled over on air after four hours but not more than eight hours after engine shutdown and then

barred and rolled over once again approximately 24 hours after each shutdown. In the event an engine is removed from service for any reason other than the barring and rolling over procedure prior to expiration of the eight hour or 24 hour periods noted above, that engine need not be barred or rolled over while it is out of service. Once the engine is returned to service, LILCO will bar the engine over and roll it over with air once at the time that it is returned to service.

(f) In addition, LILCO will bar over and roll on air each engine on a once per week basis for a period ending six months after the engines are turned over to Plant Staff and monthly surveillance testing begins. If no leakage from cylinder heads is detected during this period, this procedure will be discontinued for each engine as to which this is the case. If cylinder head leakage is detected during this period in any engine, this procedure will be continued for another six month period only for that engine. This weekly barring and rolling over is not required with respect to an engine that is out of service for any reason other than the barring and rolling over procedure. Any engine that has been out of service for any reason other than the barring and rolling over

procedure will be barred over and rolled over with air once at the time it is returned to service. The requirements of this subparagraph (f) will cease for all three engines at such time as at least 740 hours of operation at the FSAR continuous load\* are accumulated on any one engine while it has the currently installed cylinder heads and all the cylinder heads are inspected after the 740 hours are accumulated in accordance with paragraph 2(b) above and found to be free of unacceptable surface defects. In determining whether the 740 hours have been accumulated, credit may be taken for any hours of operation at or above the FSAR continuous load accumulated since the installation of the currently installed cylinder heads.

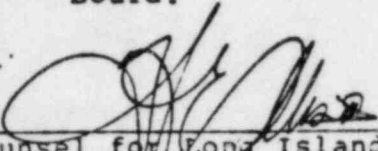
(g) Any head which leaks due to a crack will be replaced.

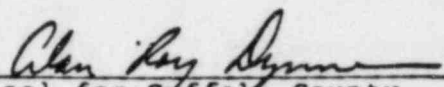
(h) The obligations of LILCO set forth in this agreement become effective immediately upon the

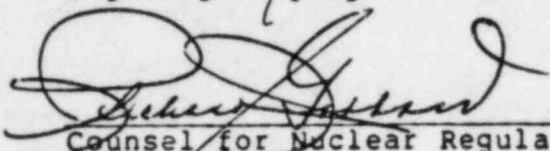
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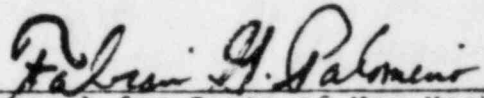
\* The current FSAR continuous load is 3500 kw. At present, LILCO is preparing an FSAR amendment that redefines the continuous load as 3300 kw. LILCO expects to submit this FSAR amendment to the Staff for approval in the near future. It is contemplated by the parties that this revised continuous load of 3300 kw will be the "FSAR continuous load" for purposes of this agreement provided that the amendment is approved by the NRC Staff. In the event this or a similar amendment is not approved by the NRC Staff, the parties contemplate that the FSAR continuous load to be used for purposes of this paragraph is 3500 kw.

acceptance of this settlement agreement by the Licensing  
Board.

  
Counsel for Long Island  
Lighting Company

  
Counsel for Suffolk County

  
Counsel for Nuclear Regulatory  
Commission

  
Counsel for State of New York

DATED: September 21, 1984

### III. 10<sup>7</sup> CYCLE CONFIRMATORY TEST RUN

Emergency Diesel Generator 103 commenced the 525 hour segment of the long duration run at 3300  $\pm$  100 KW at 10:00 PM, October 8, 1984. As of that time, the following history had been accumulated on that engine since crankshaft replacement:

Total hours @ 3300 KW or greater - 220 hours, 18 minutes

Hours remaining to accumulate 740 hours at 3300 KW  $\pm$  100 KW -

519 hours, 42 minutes.

Earlier the same day, engine runs with strain gauges installed in the cam gallery area in the vicinity of number 2 and number 8 cam saddles had been completed. Results of the strain gauge testing are addressed separately in a TDI Owners Group Block Report.

The long duration run was performed under LILCO Repair Rework R43-2055 in accordance with the guidelines developed during discussions with NRC. A copy of this Repair Rework was provided to the NRC Shoreham Senior Resident Inspector (P. Eselgroth) for information. The basis for the test was later formalized in LILCO letter SNRC-1094, dated October 18, 1984. Readings of engine load and other engine parameters were taken every half hour using Control Room and other normally installed instrumentation during the 525 hour run. A copy of the typical data taken is enclosed as Attachment III-1.



One set of cylinder firing pressure readings was obtained within the first eight hours of the 525 hour run. A copy of the readings is enclosed as Attachment III-2.

On October 9, 1984, it was noted that a newly installed drain valve on the air inlet line to the intercooler had broken off. The engine continued to operate after the incident. LILCO Deficiency Report LDR-2511 was written to document this deficiency. This deficiency was identified as being caused by vibration of the valve as a result of the support configuration. A design change to install a line cap instead of a valve was implemented during the October 17, 1984 outage. A copy of the LDR is enclosed as Attachment III-3. A review of DG 101 and 102 conditions indicated that the supports on those engines were satisfactory because of a different support configuration.

The engine was shutdown at 3:30 PM on Wednesday, October 17, 1984 due to a leak at a junction between the main lube oil supply header to the engine and a 1½ inch branch line which ran to the turbocharger. At this time approximately 429 hours and 3 minutes had been accumulated towards the 740 hours. The engine had been operating for over eight days. Subsequent investigation of the leak indicated that a hanger installed on the line above the area of the leak required modification and resulted in an additional stress being placed on the line. LDR-2519 was issued to document this discrepancy. A subsequent review of this condition on all three engines indicated that the hanger in this location could be deleted. A copy of the LDR is enclosed as Attachment III-4. The lube oil line

repairs were made, strain gages were removed from the cam gallery as previously scheduled, and the cam gallery re-inspections were completed on Friday, October 19, 1984. The long duration run was recommenced that evening at 10:30 PM. From that point until the completion of the run thirteen days later, the engine operated without incident.

As of 8:27 PM Thursday evening, November 1, 1984, 740 hours of operation at 3300 kW had been accumulated. However, the engine run was continued to accumulate additional hours. The engine was brought below 3300 KW at 2:00 AM, November 2, 1984, and fully shutdown at 3:15 AM, the same morning. At that time, the engine had accumulated 745 hours and 46 minutes at or above 3300 kW. A set of firing pressure readings was obtained within the eight hours preceding the final shutdown at the end of the run and crankshaft web deflection readings were taken with acceptable results fifteen minutes after engine shutdown. A copy of the firing pressure data is enclosed as Attachment III-5 and the web deflection data are enclosed as Attachment III-6. Engine firing pressures taken at the start and end of the 525 hour run showed no unacceptable trends.

Operating data from the run has been reviewed, found acceptable, and is being retained as part of the LILCO permanent records.

TABLE 1

Pg. 10F2

TIME:	1830	1900	1930	2000	2030	2100
DATE:	10/9/84					→
HR. METER READING START/FIN.	$\frac{2111.5}{2115.5}$	$\frac{2111.8}{2111.9}$	$\frac{2112.3}{2112.5}$	$\frac{2112.8}{2112.8}$	$\frac{2113.3}{2115.4}$	$\frac{2113.8}{2113.8}$
GEN. LOAD KW/KVAR	$\frac{3300}{1000}$	$\frac{3300}{1000}$	$\frac{3300}{1000}$	$\frac{3300}{1000}$	$\frac{3300}{1000}$	$\frac{3300}{1000}$
LUBE OIL TEMP. IN/OUT	$\frac{156}{177}$		$\frac{156}{177}$		$\frac{156}{177}$	
LUBE OIL PRESS. ENG./TURBO	$\frac{56}{34.5}$		$\frac{56}{34.5}$		$\frac{56}{34.5}$	
LUBE OIL SUMP TK. LEVEL	6.5"					
LUBE OIL SUMP TK. PRESS.	0					
LUBE OIL FILT. DIFF. PRESS. <sup>North</sup>	~H					
LUBE OIL STRAIN. DIFF. PRESS. <sup>North</sup>	~1					
JACKET WATER TEMP. IN/OUT	$\frac{152}{162}$		$\frac{152}{161}$		$\frac{152}{161}$	
JACKET WATER PRESSURE	23.5		23.5		23.5	
JACKET WATER LEVEL	12.00					
COMBUSTION AIR PRESSURE	49		49		49	
COMBUSTION AIR TEMPERATURE	147		147		147	
F. O. PRESS. P.I. AT DG PANEL	27.5		27.5		27.5	
FUEL PUMP DISCHARGE PRESS.	31					
F. O. STRAINER DIFF. PRESS.	2.5					
CRANKCASE PRESSURE	-0.3"		.3"		-0.3"	
STARTING AIR PRESSURE	223					
GROUP 1 SHUTDOWN PRESSURE	51					
TURBO EXHAUST TEMPERATURE	848		847		843	
DAY TANK LEVEL START/FINISH	$\frac{33}{31}$					
DATA TAKEN BY	AKS	AKS	AKS	AKS	AKS	N/A



TIME OF READING	1830	1900	1930	2000	2030	2100
FUEL RACK POSITION CYL. #1	39		39		39	
GEN. PEDESTAL BRG. TEMP.	117.4		112		111	
GENERATOR WINDING TEMP.	167		167		166	
GENERATOR FIELD CURRENT	198		200		205	
GENERATOR FIELD VOLTAGE	70		71		72	
GENERATOR STATOR CURRENT	475		475		485	
GENERATOR VOLTAGE	4200		4200		4200	
SERV. WTR. PRESSURE/FLOW	53.5 64.5		53.5 64.5		53 64.5	
SERV. WTR. TO J.W. COOL. TEMP. <sup>IN/OUT</sup>	64 86		64 86		64 85	
ROOM TEMPERATURE	76.5°F					
ROOM HUMIDITY	48%					
OUTSIDE BAROMETRIC PRESS.	30.37					
CYL. EXHAUST TEMP, CYL. #1	980		978		976	
CYL. #2	916		910		910	
CYL. #3	981		983		976	
CYL. #4	919		918		913	
CYL. #5	945		941		939	
CYL. #6	941		942		939	
CYL. #7	899		895		895	
CYL. #8	918		917		917	
DATA TAKEN BY :	JJS	N/A	80	N/A	JJS	JJS

COMMENTS:

John K. Krafz

10/9/84

PREPARED BY

PM

Attachment III-2

SUBJECT

103 - FIRING PRESSURES

SHEET

OF

@ 3300 RPM / 1200 VARS

CYL #	RACK MM	PRESS PSIG	TEMP ° F
-------	------------	---------------	-------------

1	40	1520	987
---	----	------	-----

2	39	1480	918
---	----	------	-----

3	39.5	1480	967
---	------	------	-----

4	40	1520	933
---	----	------	-----

5	39.5	1480	958
---	------	------	-----

6	39	1500	945
---	----	------	-----

7	39	1490	915
---	----	------	-----

8	39	1470	927
---	----	------	-----

AVG		1492.5	943.8
-----	--	--------	-------

TURBO EXHAUST TEMP. 856° F

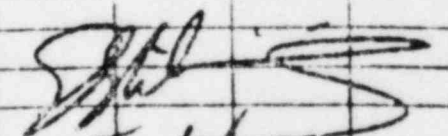
COMBUSTION PRESS. 50" Hg

COMBUSTION AIR TEMP. 148° F

FUEL OIL PRESS. 27 PSIG

ENGINE HOUR METER @ 1622.7 HRS

TEST GOVERN # 1

  
10/9/84 ECHS



1	<b>LILCO</b> <b>DEFICIENCY REPORT</b>		<input checked="" type="checkbox"/> FIELD <input type="checkbox"/> OTHER	LDR RESPONSIBILITY M. Herlihy LSU	LDR NUMBER 2511	
2	SYSTEM/COMPONENT Emer. Diesel Gen.		SYSTEM DESIGNATOR IR43	MARK NO. IR43*ENG-03	DATE 10/9/84	Q CLASS <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III
3	MFG./CONTRACTOR Stone & Webster		P.O. N/A	MATERIAL LOCATION EDG 103	REJECT TAG NO. N/A	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
4	SPEC. VIOLATED SHI-089		DRAWING VIOLATED N/A	PROCEDURE VIOLATED N/A	CODE/STANDARD VIOLATED N/A	
5	CONDITION DETAILS  Drain valve added per E&DCR F46529 has fallen off. Tubing broke at connection to male run tee (See attached sketch)					
6	ORIGINATOR <i>Michael E. Brown</i> 10/9/84 SIGNATURE DATE			OQAE <i>[Signature]</i> 10/10/84 SIGNATURE DATE		
7	RESPONSIBILITY <input type="checkbox"/> LSU <input checked="" type="checkbox"/> S & W ENG <i>[Signature]</i> SIGNATURE LEAD SU ENG			DATE 9/17/84		
8	ACTION <input type="checkbox"/> ACCEPT AS IS <input type="checkbox"/> SCRAP <input checked="" type="checkbox"/> REWORK <input type="checkbox"/> REPAIR <input type="checkbox"/> MANUAL <input type="checkbox"/> PROCEDURE <input type="checkbox"/> FSAR <input type="checkbox"/> OTHER					
9	DISPOSITION DETAILS THE BROKEN 1/4" TUBE APPEARS TO BE A RESULT OF EXCESSIVE VIBRATION OF THE PIPE SUPPORT DUE TO THE LONG CANTILEVERED DISTANCE (1'-5 1/4") BETWEEN THE PIPE FLANGE AT THE BUTTERFLY VALVE AND THE DRAIN VALVE. THIS IS UNLIKE SUPPORTS ON DG 101 AND DG 102 WITH A DISTANCE OF LESS THAN 6" <sup>WHICH</sup> DO NOT REQUIRE ANY ACTION TO BE TAKEN AT THIS TIME. A PIPE SUPPORT REDESIGN WOULD RESULT IN A LARGE AND HEAVY MASS ATTACHED TO THE 14" TURBO DISCHARGE PIPE. IT IS RECOMMENDED THAT THE VALVE, REDUCER AND PIPE SUPPORT BE REMOVED AND A FITTING PLUG INSTALLED ON THE RUN END OF THE TEE CONNECTION. (CONT ON PG 3)					
10	APPROVALS <i>[Signature]</i> 10/16/84 S & W LEAD ENG./LSU TEST ENG./DATE			<i>[Signature]</i> 10/17/84 PROJECT ENGINEER DATE		
11	LILCO SU ENG. <i>[Signature]</i> 10/17/84 DATE		LILCO SITE OQA <i>[Signature]</i> 10/18/84 DATE		REPAIR/REWORK REQUEST NO. R/R R43 2045	
12	ENG. COMPLETE/DATE SEO 10/17/84		RRR COMPLETE N/A		REWORK INSPECTION <input checked="" type="checkbox"/> SAT. <input type="checkbox"/> UNSAT. <i>[Signature]</i> LILCO SITE OQA/DATE	
13	LDR CLOSED <i>[Signature]</i> 11/14/84 LILCO SITE OQA/DATE		NEW LDR REPORT NO. ISSUED N/A		REMARKS Supervisor Work Summary Sheet Attached	

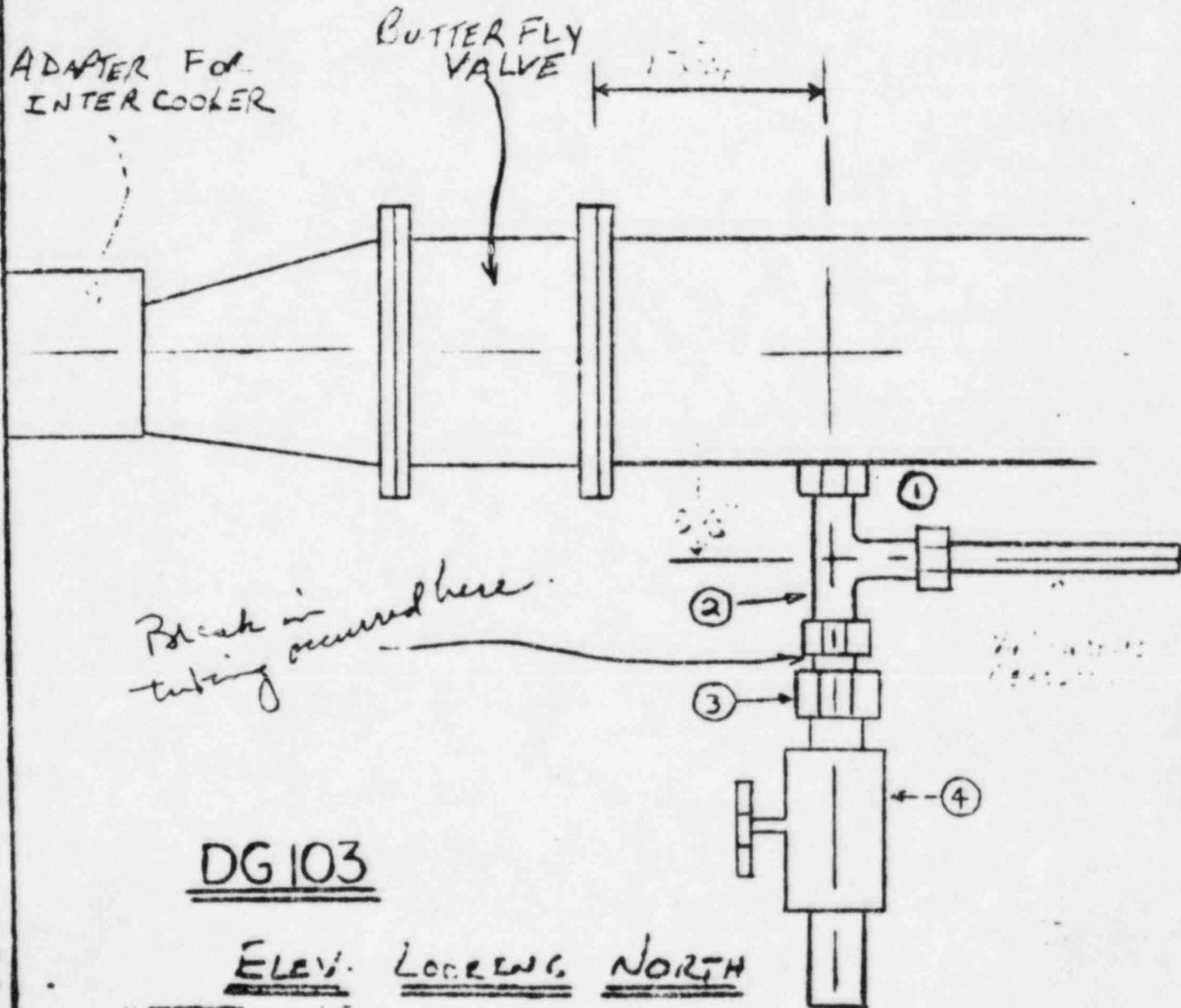
# CALCULATION SHEET

LDR 2577

PG 2 of 5

CALCULATION IDENTIFICATION NUMBER			
J.O. OR W.O. NO	DIVISION & GROUP	CALCULATION NO	OPTIONAL TASK LIST

ATTACHMENT TO E&D OR R. 2577  
PAGE 2 OF 5



Break in  
tubing  
occurred here.

DG 103

ELEV. LOCKING NORTH

## BILL OF MATERIALS

- COUPLERS FOR 1/4" TUBING (CONTINUED)
- SWAGelok 1/4" MALE RHT TEE
- 1/2" TO 1/4" REDUCER
- 1/2" BALL VALVE OR 1/4" FLOW VALVE

LDR 2511

PG 3 of 5

HOWEVER, THE DAILY AND BEFORE ENGINE START MAINTENANCE REQUIREMENT SHALL REMAIN, WITH THE EXCEPTION OF DG 103, WHICH IS TO REMOVE PLUG RATHER THAN OPEN DRAIN VALVE.

SEO SHALL ISSUE E&DCR F-46524C TO DOCUMENT THIS CHANGE.

SEE PAGE 4 FOR TDI CONCURRENCE.

*William J. Brown* 10/16/84

11600.02

DATE: 10/16/84SEO - TELEPHONE MEMORANDUM

STONE & WEBSTER ENGINEERING CORPORATION  
 SHOREHAM NUCLEAR POWER STATION - UNIT 1  
LONG ISLAND LIGHTING COMPANY

SUBJECT: AIR INTAKE PIPE DRAIN VALVE DG 103BETWEEN: M. LONERY OF TDI, OAKLANDBILL BROWN OF SWEC.

CONVERSATION: I DISCUSSED WITH MR. LONERY THE  
DRAIN VALVE FALLING OFF THE PIPE ~~AND~~ AS IDENTIFIED  
BY LDR 25H. I SUGGESTED THAT THE TEE BE PLUGGED  
AND VALVE AND SUPPORT ELIMINATED.

HE CONCURRED WITH THIS SUGGESTION AND STATED THAT  
THE MAINTENANCE REQUIREMENT STILL BE FOLLOWED BY  
REMOVING THE PLUG

*William J. Brown*  
 10/16/84

\_\_\_ W.R. Sheridan 245/4  
 \_\_\_ E. J. Brabazon 245/4  
 \_\_\_ J. Carney 245/4  
 \_\_\_ S. J. Yerardi 245/4  
 \_\_\_ R. C. Wiesel 245/4  
 \_\_\_ J. McCormick 245/4  
 \_\_\_ J. Pizzi 245/4  
 \_\_\_ C. A. Malovrh 245/4  
 \_\_\_ S. Wakefield 245/4  
 \_\_\_ R. Kohli 245/4  
 \_\_\_ R. Najuch 245/4  
 \_\_\_ P. Czarnowski 245/4

\_\_\_ K. A. Howe Site  
 \_\_\_ E. W. Tesko Site  
 \_\_\_ M. Milligan LPO  
 \_\_\_ W. J. Museler Site  
 \_\_\_ R. J. Jaquinto SEO  
 \_\_\_ J. C. Karmeyer SEO  
 \_\_\_ D. Esiellionis SEO  
 \_\_\_ P. W. Martin SEO  
 \_\_\_ J. A. Wright SEO  
 \_\_\_ R. J. Priest SEO  
 \_\_\_ C. F. Ng SEO  
 \_\_\_ P. Baker SEO

# Swagelok

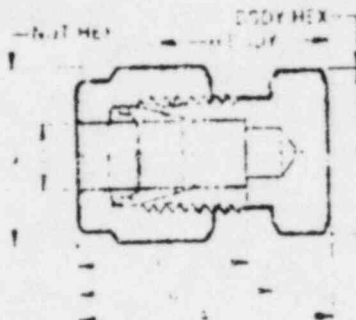
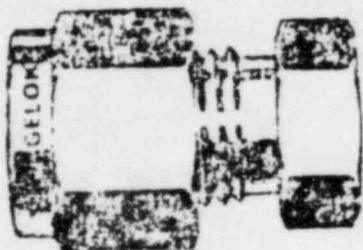
## Tube Fittings

LUX 2011  
PG 5 of 5

AVAILABLE IN ALL MACHINEABLE METALS  
AND PLASTICS FOR PRESSURE AND VACUUM SERVICE

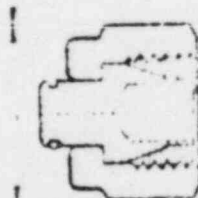
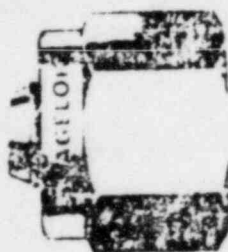
Component parts of SWAGELOK Tube Fittings are all made of the same material

### CAP (FOR CAPPING END OF TUBE)



NOTE—A-D dimensions are finger tight / G-F dimensions are across hex flats

### PLUG (FOR PLUGGING UNUSED PORT OF FITTING)



NOTE—G dimension is across hex flats

NOTE  
To tighten plug properly  
from finger tight position,  
loosening plug with wrench  
only 1/4 turn

CATALOG  
NUMBER

1/4" P  
1/2" P  
3/4" P  
1" P  
1 1/2" P  
2" P  
2 1/2" P  
3" P  
4" P  
6" P

All dimensions in inches. Dimensions for reference only. Subject to change

CRAWFORD FITTING COMPANY / 29500 SOLON ROAD / SOLON, OHIO 44139



SHUREHAM 1  
NUCLEAR POWER STATION  
RTUP FORM 7.6

September 4, 1979  
REVISION 10

ATTACHMENT TO RFR 2045

REWORK SUPERVISOR WORK SUMMARY

BRIEF DESCRIPTION OF WORK:

- ① Remove support
- ② Remove tubing, fitting and valve
- ③ install tubing cap

witness OQA [Signature] 10/18/84

COMPONENTS REPLACED (IF APPLICABLE):

T.E. Bart Sartton 10/18/84

CALIBRATED TOOLS UTILIZED:


Tubing cap PO 378 491

ADDITIONAL COMMENTS:

observed cleanliness

Engine 103 completed its 525 hour endurance run with pipe plug installed.

M Kelley 10-18-84  
Rework Supervisor Signature/Date

1	 <b>DEFICIENCY REPORT</b>		<input checked="" type="checkbox"/> FIELD <input type="checkbox"/> OTHER	LDR RESPONSIBILITY <u>M. Herlihy</u> LSU	LDR NUMBER <u>2519</u>	
2	SYSTEM/COMPONENT Emer. Diesel	SYSTEM DESIGNATOR 1R43	MARK NO. 1R43*ENG-03	DATE 10/17/84	Q CLASS <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III	
3	MFG./CONTRACTOR Transamerica Delaval	P.O. 310552	MATERIAL LOCATION EDG 103	REJECT TAG NO <u>N/A</u>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
4	SPEC. VIOLATED SH1-089	DRAWING VIOLATED N/A	PROCEDURE VIOLATED N/A	CODE/STANDARD VIOLATED N/A		
5	CONDITION DETAILS  Lube oil supply pipe to turbocharger has developed a crack just above the connection to the <u>three</u> inch header. <i>Fail 4/10</i>					
6	ORIGINATOR <u>Michael Brown F.T. Brown</u> 10/17/84 SIGNATURE DATE		OQAE <u>P. J. Jones</u> 10/17/84 SIGNATURE DATE			
7	RESPONSIBILITY <input type="checkbox"/> LSU <input checked="" type="checkbox"/> S & W ENG <u>P. J. Jones</u> SIGNATURE LEAD SU ENG			DATE <u>10/17/84</u>		
8	ACTION <input type="checkbox"/> ACCEPT AS IS <input type="checkbox"/> SCRAP <input checked="" type="checkbox"/> REWORK <input type="checkbox"/> REPAIR <input type="checkbox"/> MANUAL <input type="checkbox"/> PROCEDURE <input type="checkbox"/> FSAR <input type="checkbox"/> OTHER					
9	DISPOSITION DETAILS  <u>SEE ATTACHED FOR DISPOSITION DETAILS.</u>					
10	APPROVALS <u>P. J. Jones</u> 10/17/84 S & W LEAD ENG./LSU TEST ENG./DATE		<u>P. J. Jones for Jones</u> 10/17/84 PROJECT ENGINEER DATE			
11	<u>10/18/84</u> LILCO SU ENG. DATE		<u>10/18/84</u> LILCO SITE OQA DATE		REPAIR/REWORK REQUEST NO. <u>R43-2043, SUPPL #1</u>	
12	ENG. COMPLETE/DATE <u>SEO</u> <u>10/17/84</u>		RRR COMPLETE <u>N/A</u>		REWORK INSPECTION <input type="checkbox"/> SAT. <input type="checkbox"/> UNSAT. LILCO SITE OQA/DATE	
13	LDR CLOSED LILCO SITE OQA/DATE		NEW LDR REPORT NO. ISSUED		REMARKS	

## CALCULATION SHEET

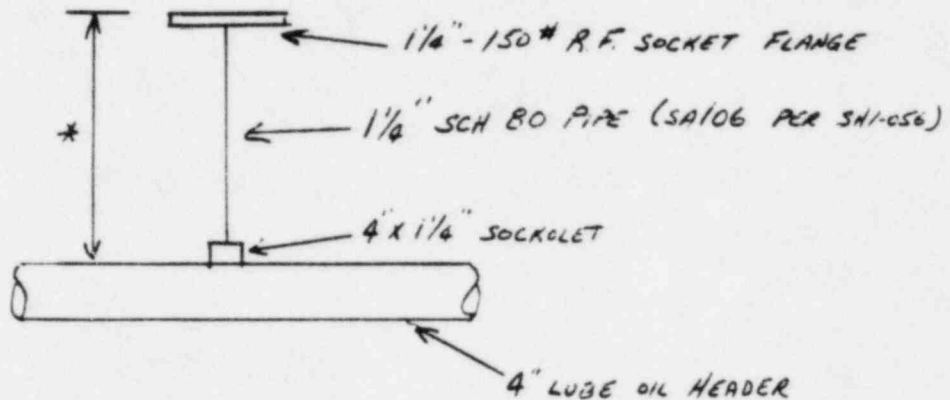
▲ 5010.05

CALCULATION IDENTIFICATION NUMBER				PAGE <u>    </u>
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	

LDR 2519

Pg 2 of 3

Dwg NOT TO SCALE.



\* EXISTING DIMENSION FROM 4"  $\phi$  PIPE  
TO FLANGE FACE SHALL BE MAINTAINED.

ALL MATERIAL CAT I  
USE AWS P1 WELDING PROCEDURE

THE 1 1/4"  $\phi$  BRANCH PIPE IS TO BE REMOVED FROM THE 4"  $\phi$  PIPE WITH  
EXTREME CARE TO AVOID ANY DAMAGE TO THE 4"  $\phi$  PIPE, AND TO ALLOW  
FOR SUBSEQUENT INSPECTION/EXAMINATION OF 1 1/4" PIPE.

THE NEW CONNECTIONS IS TO BE FABRICATED/INSTALLED IN ACCORDANCE  
WITH THE ABOVE SKETCH.

ALL WELD SLUG IS TO BE REMOVED FROM THE INSIDE OF PIPE CONNECTION  
AND INTERIOR OF PIPE THOROUGHLY CLEANED PRIOR TO USE.

ALL WELDS TO BE LP EXAMINED AND AN ISLT PERFORMED

UPON REINSTALLATION OF 1 1/4" PIPING TO THE ENGINE SKID THE  
FOLLOWING IS REQUIRED: IN SEQUENCE.

1. REMOVE PIPE STRAP FROM EXISTING SUPPORT L0352
2. FITUP FLANGE TO CHECK VALVE
3. INSTALL MISSING TDI SUPPORT L0353 PER EDCIR F-46513  
TAKING CARE TO PREVENT COLD-SPRINGING PIPE.

OQA SHALL WITNESS DISASSEMBLY OF FAILED CONNECTION AND  
REASSEMBLY OF NEW CONNECTION.

William J Brown 10/1/04

11600.02

DATE:

10/17/84

SEO - TELEPHONE MEMORANDUM

STONE & WEBSTER ENGINEERING CORPORATION  
SHOREHAM NUCLEAR POWER STATION - UNIT 1  
LONG ISLAND LIGHTING COMPANY

SUBJECT: REPLACEMENT OF 1/4" PIPE ON D5103

BETWEEN: M LONERY OF TDI, OAKLAND

N BROWN OF SWTC

CONVERSATION: SE EXPLAINED TO MR LONERY THE  
SITUATION OF THE FAILED 1/4" PIPE AND THE  
SOLUTION OUTLINED IN LDR 2519.

MR LONERY CONCURRED WITH THE SOLUTION OF  
PIPE REPLACEMENT. HE STATED THAT THE PICKLING  
OF THE PIPE, AS RECOMMENDED IN THE TDI MANUAL,  
IS NOT REQUIRED IF THE PIPE IS THOROUGHLY CLEANED  
AND HE SAW FROM THE WELDS EXIST INSIDE THE  
PIPES.

*William J. Brown*  
10/17/84

___ W.R. Sheridan	245/4
___ E. J. Brabazon	245/4
___ J. Carney	245/4
___ S. J. Yerardi	245/4
___ R. C. Wiesel	245/4
___ J. McCormick	245/4
___ J. Pizzi	245/4
___ C. A. Malovrh	245/4
___ S. Wakefield	245/4
___ R. Kohli	245/4
___ R. Najuch	245/4
___ P. Czarnowski	245/4

___ K. A. Howe	Site
___ E. W. Teske	Site
___ M. Milligan	LPO
___ W. J. Museler	Site
___ R. J. Jaquinto	SEO
___ J. C. Karmeyer	SEO
___ D. Esielionis	SEO
___ P. W. Martin	SEO
___ J. A. Wright	SEO
___ R. J. Priest	SEO
___ C. F. Ng	SEO
___ P. Baker	SEO

EDG# 103

Pg. 1 of 1  
Attachment III-5

TIME: 2030 PERIODIC OPERATIONAL SURVEILLANCE LOG DATE: 11/1/84

CYL. FIRING PRESS./RACK POSITION CYL. #1

1550 / 39

CYL. #2

1540 / 39

CYL. #3

1530 / 40

CYL. #4

1550 / 40

CYL. #5

1520 / 39

CYL. #6

1540 / 39

CYL. #7

1540 / 39

CYL. #8

1500 / 39

REMARKS, COMMENTS OR ADDITIONAL DATA: AVG 1539

K'EVE GAUGE SNIPPS #1 DATE CPL 10/31/84 14-0124/8

DATA TAKEN BY: R. L. Lee



SHOREHAM I  
NUCLEAR POWER STATION

September 4, 1979  
REVISION 10

STARTUP FORM 7.6

PAGE 2

R43-2033  
STEP # 7.2

REWORK SUPERVISOR WORK SUMMARY

BRIEF DESCRIPTION OF WORK:

REMOVED CRANKCASE DOORS AND TOOK CRANKSHAFT  
DEFLECTION READINGS PER TABLE 5. 15 MIN AFTER ENGINE S/D.  
REINSTALLED TEMPORARY PLASTIC DOORS

R911-2-84

COMPONENTS REPLACED (IF APPLICABLE):

M&TE, CALIBRATED TOOLS UTILIZED:

MTE # 448 (DD 8/11/85) FOR CYL # 5, 6, 7, 8

DOG-1 CYL # 1, 2, 3, 4 (SEE ATTACHED IOC)

ADDITIONAL COMMENTS:

William Mc 11/2/84  
Rework Supervisor Signature/Date

TABLE 5

## CRANKSHAFT WEB DEFLECTION AND THRUST CLEARANCE RECORD

CUSTOMER EDG-103 ENGINE MODEL \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

Use this form to record crankshaft deflection and thrust clearance information. Thrust clearance should be measured by the dial indicator method. Deflection and thrust clearance should be checked and recorded immediately after grouting or chocking the unit, the day before unit start up, after 7 days (168 hours) of continuous operation, and each 6 months thereafter. Deflection and thrust clearance checks made after the unit is in service should be made while the engine is hot, i.e., within 4 hours after the unit has been shut down. Record the temperature of the oil in the engine lube oil sump tank or engine base.

When an engine in which the connecting shaft is solidly coupled to the flywheel is grouted on a concrete foundation, the desired deflection at crank position No. 3 is zero to plus (+) 1 mil (one thousandth) in all cranks except the crank adjacent to the flywheel which should be minus (-) 1.2 mil. This deflection allows for thermal distortion of the concrete foundation.

When an engine is mounted on a steel foundation, i.e., marine installations, appropriate compensations for thermal distortions of the foundation will be based on the locations and temperatures of fuel and lubricating oil tanks adjacent to the engine foundation.

If the deflection in any crank in an engine in service exceeds 3 mils, corrective action must be taken. Also, if the total deflection value in any two adjacent cranks exceeds 3 mils, corrective action must be taken. Example, a +2 mils in any crank with a -2 mils in the next adjacent crank adds up to a total of 4 mils deflection between these adjacent cranks. The exception to the above will be engines that have a flexible coupling between the flywheel and the connecting shaft. These engines may have in excess of 2 mils deflection at position No. 3 in the crank adjacent to the flywheel. In engines with solidly coupled connecting shafting, excessive deflection at positions No. 2, 3, or 4 in the crank adjacent to the external shafting usually indicates misalignment between the connecting shafting and the engine crankshaft.

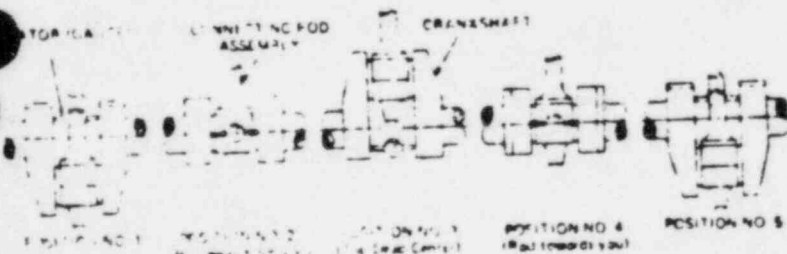
Set the deflection gauge at zero at position No. 1 and turn the crankshaft in the direction of normal rotation.

Position No. 1 for placing the deflection gauge is as follows: ALL INLINE ENGINES 15° AFTER BOTTOM CENTER  
HV, HVA & GVB ENGINES 38° AFTER VERTICAL BOTTOM CENTER  
RV ENGINES 52° AFTER VERTICAL BOTTOM CENTER

Record oil sump temperature and thrust clearance and sign the form.

MTE 448 (8/11/85) CYL # 5, 6, 7, 8

SUS DDG-1 CYL # 1, 2, 3, 4



DATE	SUMP TANK TEMP	THRUST CLEAR	SIGNATURE
11/2/84	165	N/A	<i>[Signature]</i>

Record readings in mils, i.e., 1/4 rather than 0.00125 inches.

POSITION	CYLINDER NUMBER STARTING AT GEARCASE END										DATE
	1	2	3	4	5	6	7	8	9	10	
	0	0	0	0	0	0	0	0			11/2/84
	0	+3/4	+3/4	0	-1	-3/4	0	-3/4			11/2/84
	0	+1 1/2	+1	0	-1 3/4	+1	+1 1/4	0			11/2/84
	-1/2	+1/4	+1/4	-1/4	-1	0	+1	0			11/2/84
	-1	-1/2	-3/4	-1/4	-1/2	0	-1/2	-1/2			11/2/84

#### IV. INSPECTION RESULTS

This section contains the reports for each component pursuant to SNRC-1094 and, in addition, a report on the cylinder heads. The individual component reports include a description of the inspections that were performed, the results of the inspections and conclusions regarding each component. Copies of the inspection plans and inspection reports for each component are also provided in this section of the Confirmatory Test Report.

## CRANKSHAFT

Component Number 03-310A

### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, Attachment CS-1, are 1) liquid penetrant testing of all crankshaft fillet areas and external radius of oil holes except for fillets and oil holes at main bearings 1, 2, 10 and 11; 2) eddy current inspection for evaluation of all recordable linear indications; and 3) eddy current inspection of oil holes to three inches from the journal surface except oil holes at main bearings 1, 2, 10 and 11. Recording and acceptance criteria are as indicated in attachment CS-1.

### II. Inspection Results

Copies of all inspection reports are provided in Attachment CS-2, and Failure Analysis Associates Report "Eddy Current Examination of Shoreham Nuclear Power Station Unit 1 Emergency Diesel Generator EDG 103 Post Endurance Run", November 29, 1984.

#### Main Bearing Journals

Liquid penetrant inspections and eddy current evaluations of main bearing journal oil holes and fillet areas were performed in accordance with Attachment CS-1 with satisfactory results. All recordable liquid penetrant indications were evaluated and found to be non-relevant and acceptable.

Eddy current inspections of main bearing oil holes were performed in accordance with Attachment CS-1 with satisfactory results.

#### Connecting Rod Journals

Liquid penetrant inspections and eddy current evaluations of connecting rod oil holes and fillet areas were performed in accordance with Attachment CS-1 with satisfactory results. All recordable liquid penetrant indications were evaluated and found to be non-relevant and acceptable.

Eddy current inspections of connecting rod oil holes were performed in accordance with Attachment CS-1 with satisfactory results.

### III. Conclusions

All crankshaft inspections required in accordance with SNRC-1094 and Attachment CS-1, which include the most highly stressed areas of the crankshaft, have been satisfactorily completed.

The 13 X 12 replacement crankshaft has successfully passed the confirmatory test program. Completion of the 10<sup>7</sup> cycle endurance test at the qualified load proposed for Shoreham of 3300 KW demonstrates that these crankshafts exhibit infinite fatigue life at the qualified load. Further, it fulfills

the NRC's requirement of  $10^7$  cycle testing of the crankshaft as described in the NRC staff's SER.

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the crankshaft is acceptable for nuclear service. Further, the crankshaft has successfully completed confirmatory testing.



POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-310ACOMP. NAME CrankshaftTYPE OF INSPECTION:☒ LP      ☐ MT      ☒ ET      ☐ UT      ☐ VISUAL  
(fluorescent)AREA TO BE EXAMINED/EXAMINATION DETAILS:

1. Perform liquid penetrant testing of all fillet areas and external radius of oil holes except for fillets and oil holes at main bearings 1,2,10 and 11.
2. Perform eddy current evaluation of all recordable linear indications found by liquid penetrant test.
3. Perform eddy current test of oil holes to 3 inches from the journal surface except oil holes at main bearings 1, 2, 10 and 11.

RECORDING CRITERIA:

1. In accordance with NDE 6.3, photograph any recordable indications
2. In accordance with NDE 11.1 or 11.6 for fillet areas. In accordance with NDE 11.3 and Tables 1 or 2 (attached) for oil holes.
3. In accordance with NDE 11.3 and Tables 1 or 2 (attached)

ACCEPTANCE CRITERIA:

1. Linear indications recorded in accordance with NDE 6.3 may be evaluated by eddy current testing for acceptance.
- 2&3. In accordance with NDE 11.1 or 11.6 for fillet areas. In accordance with NDE 11.3 and Tables 1 or 2 for oil holes. For oil holes only (not including external radius on journal surface) - if initial eddy current test results exceed Tables 1 or 2 dimple or depress area of indication  $\leq 1/32"$ , reperform eddy current test and replicate. If the indication still exists in excess of Tables 1 or 2, report on an LDR.

REFERENCE DOCUMENTS:

- |                     |                                   |
|---------------------|-----------------------------------|
| 1. CODES, STANDARDS | ASME III NB 5000, ASME V, ASME IX |
|                     | ASTM A668E, A456-71, A503-75      |
| 2. TDI O.G.         | NDE 11.6, NDE 11.3, NDE 11.1      |
| 3. LILCO            | NDE 6.1, 6.3, F-46109M            |

COMMENTS:

**TABLE 1**  
Main Journal Oil Hole Inspections for Shoreham

Journal Location	Depth of Notch* (mils)		
	0" to 1" from Journal Surface	1" to 2" from Journal Surface	2" to 3" from Journal Surface
Front End	+	+	+
Between Cylinders 1 and 2	40	+	+
Between Cylinders 2 and 3	40	+	+
Between Cylinders 3 and 4	15	30	40
Between Cylinders 4 and 5	10	20	30
Between Cylinders 5 and 6	10	10	20
Between Cylinders 6 and 7	10	15	30
Between Cylinders 7 and 8	10	15	30
Flywheel End	10	20	30

**TABLE 2**  
Crankpin Oil Hole Inspections for Shoreham

Crankpin Location	Depth of Notch* (mils)		
	0" to 1" from Journal Surface	1" to 2" from Journal Surface	2" to 3" from Journal Surface
Cylinder 1	+	+	+
Cylinder 2	+	+	+
Cylinder 3	20	40	+
Cylinder 4	15	20	40
Cylinder 5	10	15	20
Cylinder 6	10	15	20
Cylinder 7	15	20	30
Cylinder 8	15	20	40

\* Width of notch is twice the depth.

+ Inspection not anticipated.

ATTACHMENT CS-2

November 28, 1984

NPD-84-1061

A. Muller

NED Evaluation of Crankshaft Inspections  
DC-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

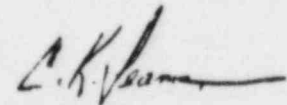
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the requirements of the confirmatory test as provided for in E&DCR F-46548 and appropriate revisions.

All inspection results are satisfactory. No LDR's are required or were generated as a result of these inspections.

The following consultant personnel concur with this evaluation:

. FAA Dr. L. Swanger  
. FAA L. Bisbee



C. K. Seaman  
Project Engineer

MS/tls

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger  
L. Bisbee



Station Operational Quality Assurance

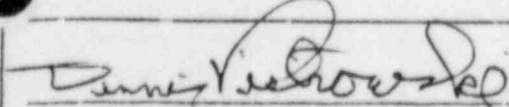

VERIFICATION REPORT

File: 1A11.920-

Activity Verified: R/R 1A43-2055	Responsible Group: LSU	Syst/Struct/Comp: 1A43*E/G-103 CRANKSHAFT
Reference Procedure/No. E+1 CR F-46548A		
Reference Spec/No./Addendum/Date SH1-089		
Reference Drawing/Revision N/A		

Verification Description:

THIS VERIFICATION REPORT IS BEING WRITTEN TO CLARIFY ACTUAL AREA'S OF FLUORESCENT PENETRANT EXAMINATION THAT WAS PERFORMED ON 1A43\*E/G-103, CONNECTING ROD JOURNALS CYL. #1, 2, 3, 4, 5, 6, 7, #8 AND MAIN BEARING JOURNALS #3, 4, 5, 6, 7, 8, #9, SURFACES L.P. EXAMINED WERE THRUST FACE, FILLET RADIUS, JOURNAL AREA 1" ADJACENT TO FILLET RADIUS AND EXTERNAL RADIUS OF OIL HOLES (SEE ATTACHED SKETCH). THE ABOVE STATEMENT APPLIES TO THE ATTACHED LIQUID PENETRANT EXAMINATION REPORTS DATED BETWEEN 11/7/84 THRU 11/12/84

 Preparer/OQA	11/15/84 Date	 OQAE	11/15/84 Date
--	------------------	--	------------------



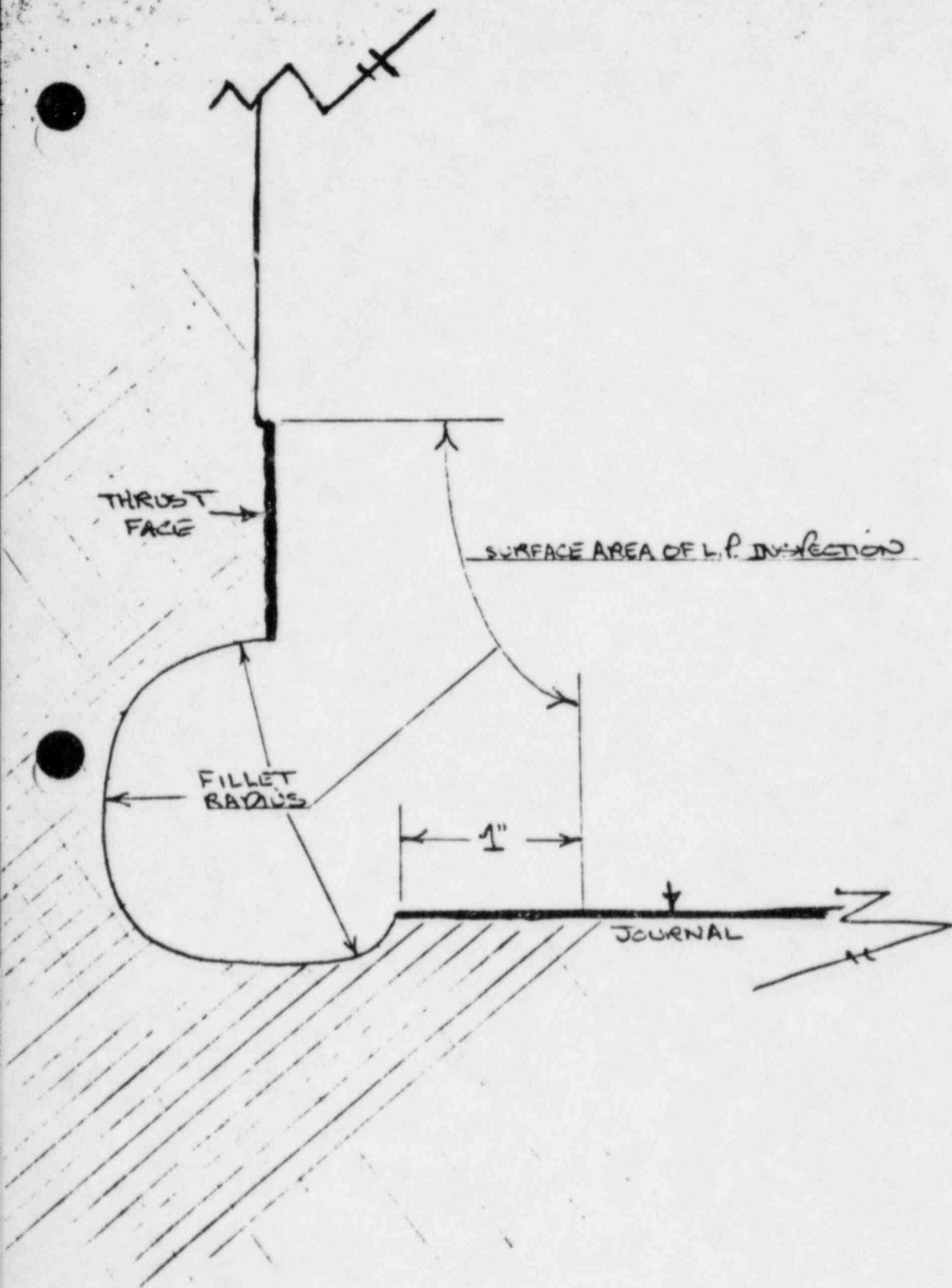
THRUST  
FACE →

SURFACE AREA OF L.P. IN SECTION

FILLET  
RADIUS

1"

JOURNAL





## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL <i>N/A</i>		TYPE <i>Carbon Steel</i>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER:
CROSS SECTION THICKNESS	MAX <i>N/A</i> MIN	PIPE DIA. <i>N/A</i>	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input checked="" type="checkbox"/> AS FABRICATED
				<input type="checkbox"/> OTHER		

B. NDE PROCEDURE No. <i>6.3</i>	SURFACE/MAT'L. TEMP. <i>72°</i>	METE. NO. <i>365</i>	MWR/RR. No. <i>R43-2055</i>
---------------------------------	---------------------------------	----------------------	-----------------------------

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	<i>MagnaFlux</i>	<i>SKC-NF/ZC-7B</i>	<i>82J083</i>
2. PENETRANT	<i>MagnaFlux</i>	<i>Z-F22A</i>	<i>83F043</i>
3. EMULSIFIER AND/OR REMOVER	<i>MagnaFlux</i>	<i>SKC-NF/ZC-7B</i>	<i>82J083</i>
4. DEVELOPER	<i>MagnaFlux</i>	<i>SKC-NF</i>	<i>82D111</i>
5. POST EXAMINATION CLEANER	<i>MagnaFlux</i>	<i>SKC-NF/ZC-7B</i>	<i>82J083</i>

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

*Light bleed out in radius area due to round surface condition.*

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1. <i>CON Rod Journal #1</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>
2. <i>CON Rod Journal #3</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>
3			
4			

## D. ACCEPTANCE CRITERIA

*NDE 6.3 Para 4.2.1*

OPERATOR

Level

Date *11-10-84*

## E. ATTEST

REGISTRY CERTIFIED DEGREE

T. S. 101

PLATE

COMPONENT I.D.

*1 + 3*  
*Crankshaft Filet area and oil holes cyl*

SYSTEM

PLANT/LOCATION

*EL22*



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE <u>C.S</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED
CROSS SECTION THICKNESS		MAX MIN	PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND
					<input checked="" type="checkbox"/> AS FABRICATED	<input type="checkbox"/> OTHER
B. NDE PROCEDURE No. <u>6.3</u>		SURFACE/MAT'L. TEMP. <u>72</u>		M&T. NO. <u>365</u>		MWR/RR. No. <u>R43-2055</u>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.		
1. PRE-CLEANER		MAGAFLEX	SKC-NF12C-7B	82J083		
2. PENETRANT		MAGAFLEX	Z-L22A	83F003		
3. EMULSIFIER AND/OR REMOVER		MAGAFLEX	SKC-NF12C-7B	82J083		
4. DEVELOPER		MAGAFLEX	3KD-NF	82D111		
5. POST EXAMINATION CLEANER		MAGAFLEX	SKC-NF12C-7B	82J083		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>Light bleed out occurred in shadow due to finish surface condition</i> <i>#2 CYL. CONNECTING ROD JOURNAL.</i>						
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.				
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)			
<u>1 CYL. #2 JOURNAL</u>	<u>N/A</u>	<u>N/A</u>	<u>ACCEPT</u>			
<u>2</u>	<u>/</u>	<u>/</u>	<u>/</u>			
<u>3</u>	<u>/</u>	<u>/</u>	<u>/</u>			
<u>4</u>	<u>/</u>	<u>/</u>	<u>/</u>			
D. ACCEPTANCE CRITERIA	<u>NDE 6.3 PARA 42.1</u>		OPERATOR <u>Rodney S. Borne</u> Level <u>II</u> Date <u>11-7-84</u>			
E. ATTEST	<u>Rodney S. Borne</u>		<u>II</u> <u>11-7-84</u>			

P

COMPONENT I.D. CRANK SHAFT PISTON  
FROM 403 DIESEL  
CYL #2 JOURNAL

SYSTEM

1 R43

PLANT/LOCATION

Shoebam 403 Diesel Gen. R

E.L. 22



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE <u>C.S.</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>CRANK SHAFT</u>
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	
	<u>N/A</u>	<u>N/A</u>		<input checked="" type="checkbox"/> AS FABRICATED	<input type="checkbox"/> OTHER	

B. NDE PROCEDURE  
No. 6.3SURFACE/MAT'L.  
TEMP. 73M&TE. NO. 365MWR/RR.  
No. R43-2055

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/2C-7B	84 J012
2. PENETRANT	MAGNAFLUX	2L-22A	83 F003
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/2C-7B	84 J012
4. DEVELOPER	MAGNAFLUX	SKD-NF	82 D111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/2C-7B	84 J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

LIGHT BLEED OUT OCCURRED IN RADIIUS DUE TO POOR SURFACE CONDITION  
#4 AND #5 CONNECTING ROD JOURNALS

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 CYL. 4 JOURNAL	N/A	N/A	ACCEPT
2 CYL. 5 JOURNAL	N/A	N/A	ACCEPT
3			
4			

D. ACCEPTANCE CRITERIA

NDE 6.3 Para 4.2.1

OPERATOR

Level

Date 11-9-84

E. ATTENTION

Rodney S. BorneII11-9-84COMPONENT I.D. CRANK SHAFT - PILELOT SYSTEM  
CYL #4 AND #5 JOURNALS  
IR43PLANT/LOCATION  
Shelburne 163 DIESEL GEN R.  
EL. 2C



A. MATERIAL		TYPE <u>Steel</u>	FABRICATED PROCESS	
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:	
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION	<input type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER

B. NDE PROCEDURE No. <u>6.3</u>	SURFACE/MAT'L. TEMP. <u>72°F</u>	M&T. NO. <u>365</u>	MWR/RR. No. <u>B43-2055</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	<u>MagnaFlux</u>	<u>3KC-NF/2C-7B</u>	<u>B2J0B3</u>
2. PENETRANT	<u>MagnaFlux</u>	<u>Z-L22A</u>	<u>B3F003</u>
3. EMULSIFIER AND/OR REMOVER	<u>MagnaFlux</u>	<u>3KC-NF/2C-7B</u>	<u>B2J0B3</u>
4. DEVELOPER	<u>MagnaFlux</u>	<u>3KC-NF</u>	<u>B2J0B3</u>
5. POST EXAMINATION CLEANER	<u>MagnaFlux</u>	<u>3KC-NF/2C-7B</u>	<u>B2J0B3</u>

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

*Light Bleedout occurred due to uneven surface condition in radius area.*

*\* see attached sheet*

### C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1. #7. CON ROD Journal	<u>1/4"</u>	<u>Linear</u>	<u>Subject to Eddy Current</u>
2.			
3.			
4.			

### D. ACCEPTANCE CRITERIA

NDE 6.3 Para 4.2.1

OPERATOR

Level II

Date 11-7-84

### E. ATTEST

Rodney S. Borne

FI

11-7-84

COMPONENT I.D. Crankshaft Fillet area and oil holes  
Cyl #7 Journal

SISTEM

1243

PLANT/LOCATION

EL 22

Shoreham #103 Diesel Engine Room





## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 2

A. MATERIAL		TYPE	FABRICATED PROCESS	
N/A		Steel	<input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED	
GEOMETRY		<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:		
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
	N/A	N/A		

B. NDE PROCEDURE No.	SURFACE/MAT'L. TEMP.	M&T. NO.	MWR/RR. No.
6.3	72°F	365	RH3-2055

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MagnaFlux	3KC-NF/2C-7B	82J083
2. PENETRANT	MagnaFlux	2-L32A	83F003
3. EMULSIFIER AND/OR REMOVER	MagnaFlux	3KC-NF/2C-7B	82J083
4. DEVELOPER	MagnaFlux	3KC-NF	82D111
5. POST EXAMINATION CLEANER	MagnaFlux	3KC-NF/2C-7B	82J083

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

Light Bleedout occurred due to surface condition in radius area.

\* See attached sheet

\* Linear Indication Determined to be a scratch by Eddy Current

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
# 2. Control Journal	1/4"	* Linear	Subject to Eddy Current
2			
3			
4			

## D. ACCEPTANCE CRITERIA

NDE 6.3 Para 4.2.1

OPERATOR

Level

Date 11-7-84

## E. ATTEST

RESPONSIBLE CERTIFIED PERSONNEL

LEVEL

DATE

F.

COMPONENT I.D. Crankshaft Fillet area and oil lines

Cyl # 7 Journal

SYSTEM

1243

PLANT/LOCATION

EL 22

Shoreham #103 Diesel Gen Rm



## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 6

A. MATERIAL		TYPE <u>Steel</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>Crank-Shaft</u>
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input checked="" type="checkbox"/> OTHER: <u>Shot peened</u>
				<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>6.3</u>	SURFACE/MAT'L. TEMP. <u>69°F</u>	M&T. NO. <u>365</u>	MWR/RR. No. <u>RR R43 2055</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012
2. PENETRANT	Magnaflux	ZL-22A	83F003
3. EMULSIFIER AND/OR REMOVER	Magnaflux	SKC-NF/ZC-7B	84J012
4. DEVELOPER	Magnaflux	SKD NF	82D111
5. POST EXAMINATION CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

See attached sketches

Note Con rod journals "7" thrust face examined only

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES) <sup>N/A</sup> SEE ATTACHED	DESCRIPTION <sup>N/A</sup> LINEAR	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 #6 con rod journal	N/A	N/A	subject to eddy current exam
2 #7 con rod journal (thrust face)	N/A	N/A	subject to eddy current exam
3 #8 con rod journal (thrust face)	N/A	N/A	subject to eddy current exam
4 N/A	N/A	N/A	N/A

## D. ACCEPTANCE CRITERIA

NDE 6.3 para 4.2-1

OPERATOR Art Purnan Michael L. L...  
Level PT II Date 11-9-84

## E. ATTEST

Art Purnan Michael L. L...  
RESPONSIBLE CERTIFIED PERSONNELPT II  
LEVEL11-9-84  
DATECOMPONENT I.D. Crankshaft  
R43# EDC 103

SYSTEM

IR43

PLANT/LOCATION EDC room-103



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL <i>N/A</i>		TYPE <i>Steel</i>	FABRICATED PROCESS <input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED		
		GEOMETRY <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:			
CROSS SECTION THICKNESS	MAX MIN <i>N/A</i>	PIPE DIA. <i>N/A</i>	SURFACE CONDITION <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER		
B. NDE PROCEDURE No. <i>63</i>		SURFACE/MAT'L. TEMP. <i>22°F</i>		M&T. NO. <i>365</i>	MWR/RR. No. <i>PH3-2055</i>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		<i>Agwayflex</i>	<i>SKC-XF/2C-7B</i>	<i>Q251043</i>	
2. PENETRANT		<i>Agwayflex</i>	<i>2-L22P</i>	<i>Q251043</i>	
3. EMULSIFIER AND/OR REMOVER		<i>Agwayflex</i>	<i>SKC-XF/2C-7B</i>	<i>Q251043</i>	
4. DEVELOPER		<i>Agwayflex</i>	<i>SKC-XF</i>	<i>Q251043</i>	
5. POST EXAMINATION CLEANER		<i>Agwayflex</i>	<i>SKC-XF/2C-7B</i>	<i>Q251043</i>	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>Light Seepage occurred due to beveled surface condition in 2 holes</i>					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
<i>#8 CON</i> <i>2nd Turned</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>		
<i>2</i>					
<i>3</i>					
<i>4</i>					
D. ACCEPTANCE CRITERIA	<i>NDE 6.3 Para 4.2.1</i>		OPERATOR <i>Rodney S. Garner</i> Level <i>P</i> Date <i>11-7-84</i>		
E. ATTEST	<i>Rodney S. Garner</i> <i>Richard J. Smith</i>		RESPONSIBLE CERTIFIED PERSONNEL LEVEL <i>P</i> DATE <i>11-7-84</i>		

H.

COMPONENT I.D.

*Crossshaft Filet area  
and oil holes  
Cyl # 8 Tourmal*

SYSTEM

PLANT/LOCATION

*Shoreham #103 Resel Area*

E-22



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL <i>N/A</i>	TYPE <i>Steel</i>	FABRICATED PROCESS <input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED
	GEOMETRY <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:	
CROSS SECTION THICKNESS MAX <i>N/A</i> MIN	PIPE DIA. <i>N/A</i>	SURFACE CONDITION <input type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER

B. NDE PROCEDURE No. <i>6.3</i>	SURFACE/MAT'L. TEMP. <i>70°</i>	MATE. NO. <i>365</i>	MWR/RR. No. <i>PH3-3255</i>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	<i>Magnaflux</i>	<i>5KC-NE/2C-7B</i>	<i>83T083</i>
2. PENETRANT	<i>Magnaflux</i>	<i>Z-L22A</i>	<i>83F003</i>
3. EMULSIFIER AND/OR REMOVER	<i>Magnaflux</i>	<i>5KC-NE/2C-7B</i>	<i>83T083</i>
4. DEVELOPER	<i>Magnaflux</i>	<i>5KC-NE</i>	<i>83D111</i>
5. POST EXAMINATION CLEANER	<i>Magnaflux</i>	<i>5KC-NE/2C-2R</i>	<i>83T083</i>

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

*Light bleed occurred due to parallel surface condition - Examine area*

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
<i>1<sup>st</sup> 3 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>
<i>2<sup>nd</sup> 4 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>
<i>3<sup>rd</sup> 5 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>
<i>4<sup>th</sup> 6 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>
D. ACCEPTANCE CRITERIA	<i>NDE 6.3 Para 4.2.1</i>		OPERATOR <i>Richard J. Smith</i> Level <i>II</i> Date <i>11-10-84</i>

## E. ATTEST

*Richard J. Smith*  
*Richard J. Smith*

RESPONSIBLE CERTIFIED EDDGEMAN

I certify

DATE

PT.

COMPONENT I.D. and Oil Mark on

*3436*

SYSTEM

*18413*

PLANT/LOCATION

*Shelburne #103 Base / Area 10*

EX 22





## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE	FABRICATED PROCESS		
		GEOMETRY	OTHER:		
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	OTHER	
	N/A	N/A			

B. NDE PROCEDURE No.	SURFACE/MAT'L. TEMP.	MATE. NO.	MWR/RR. No.
6.3	73°F	365	43-3055

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MagnaFlux	SKC-NE/2C-7B	BHT013
2. PENETRANT	MagnaFlux	2L-226	BSE003
3. EMULSIFIER AND/OR REMOVER	MagnaFlux	SKC-NE/2C-7B	BHT013
4. DEVELOPER	MagnaFlux	SKD-NE	BAD111
5. POST EXAMINATION CLEANER	MagnaFlux	SKC-NE/2C-7B	BHT013

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

Area Examined all oil lines and fillet areas and thrust pins

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
Main Bearing #7	See attached sketch	Linear	Subject to Eddy Current For Acceptance
Main Bearing #8	See attached sketch	Linear	Subject to Eddy Current For Acceptance
Main Bearing #9	See attached sketch	Linear	Subject to Eddy Current For Acceptance
N/A	N/A	N/A	N/A At Runway
D. ACCEPTANCE CRITERIA	OPERATOR: [Signature] Level Pt II Date: 11-12-84		
E. ATTEST	[Signature] 6.3 Para 4.3.1 [Signature] Pt II 11-12-84		

COMPONENT I.D. 1843 + Fdg 103

SYSTEM

PLANT/LOCATION

Fdg Room #103





## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 2

A. MATERIAL		TYPE	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED	COMPONENT I.D. Crankshaft F-157 area and oil holes cyl #7 Journal	SYSTEM
CROSS SECTION THICKNESS	MAX MIN	GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER:		
		PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input checked="" type="checkbox"/> AS FABRICATED		
B. NDE PROCEDURE No. 6.3		SURFACE/MAT'L. TEMP. 72°F		MATE. NO. 365		MWR/RR. No. RH3-2055		
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.				
1. PRE-CLEANER		MagnaFlux	3KC-NF/2C-7B	B2J0B3				
2. PENETRANT		MagnaFlux	2-L22A	B3F003				
3. EMULSIFIER AND/OR REMOVER		MagnaFlux	3KC-NF/2C-7B	B2J0B3				
4. DEVELOPER		MagnaFlux	3KC-NF	B2D111				
5. POST EXAMINATION CLEANER		MagnaFlux	3KC-NF/2C-7B	B2J0B3				
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY								
Light Bleedout occurred due to pitted surface condition in Radius area.								
* See attached sheet								
* Linear Indication determined to be a scratch by Eddy Current								
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.						
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)					
1 #7. Conrod Journal	1/4"	* Linear	Subject to Eddy Current					
2								
3								
4								
D. ACCEPTANCE CRITERIA		NDE 6.3 Para 4.2.1		OPERATOR Rodney S. Borne		Date 11-7-84		
E. ATTEST		Rodney S. Borne		LEVEL II		DATE 11-7-84		
		RESPONSIBLE CERTIFIED PERSONNEL		LEVEL		DATE		

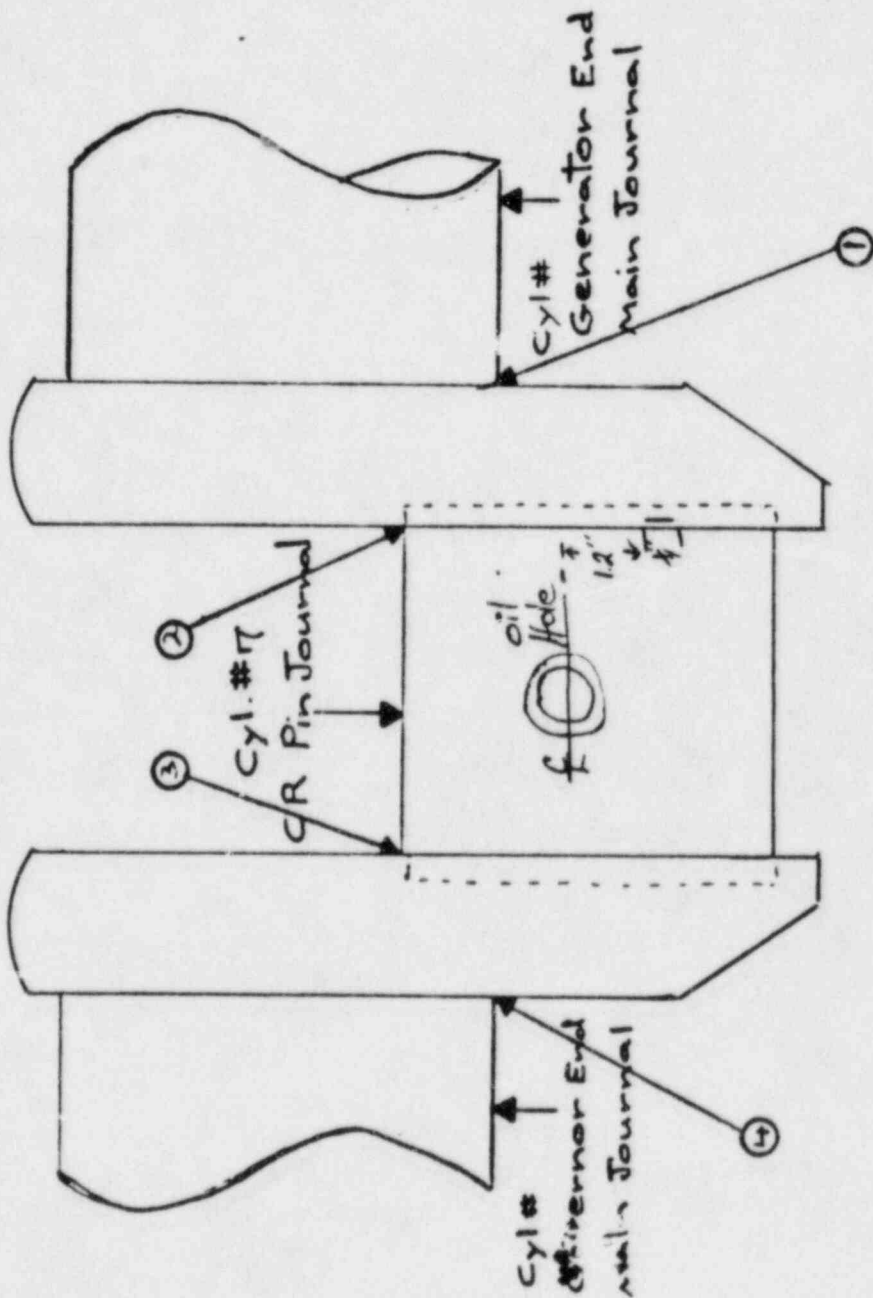
PLANT/LOCATION

Shoreham #103 Diesel Engine

FL 22

Journal #7

Connecting Rod Pin + Main Journal Critical Areas



Rodney S. Brown

Richard G. Smith 442  
Date 11-7-84



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE	FABRICATED PROCESS	PT			
N/A		Steel	<input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED	COMPONENT I.D. <i>Cylinder #8 Journal</i> Crackshaft Filet Area and oil holes SYSTEM			
GEOMETRY		<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:					
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION				
	N/A	N/A	<input type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER				
B. NDE PROCEDURE No. <u>63</u>		SURFACE/MAT'L. TEMP. <u>72°F</u>		M&T. NO. <u>365</u> MWR/RR. No. <u>R43-3055</u>			
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.			
1. PRE-CLEANER		<i>Agarflex</i>	<i>5KC-RE/20-76</i>	<i>925043</i>			
2. PENETRANT		<i>Agarflex</i>	<i>2-L22A</i>	<i>925043</i>			
3. EMULSIFIER AND/OR REMOVER		<i>Agarflex</i>	<i>5KC-RE/20-76</i>	<i>925043</i>			
4. DEVELOPER		<i>Agarflex</i>	<i>5KC-RE</i>	<i>925043</i>			
5. POST EXAMINATION CLEANER		<i>Agarflex</i>	<i>5KC-RE/20-76</i>	<i>925043</i>			
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>Light Bleedout occurred due to pitted surface condition in Radios area</i>							
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.					
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)				
<i>#8 Con Rod Journal</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>				
<i>2</i>	<i>/</i>	<i>/</i>	<i>/</i>				
<i>3</i>	<i>/</i>	<i>/</i>	<i>/</i>				
<i>4</i>	<i>/</i>	<i>/</i>	<i>/</i>				
D. ACCEPTANCE CRITERIA		OPERATOR <i>Robney &amp; Byrne</i>		Date <i>11-1-64</i>			
E. ATTEST		RESPONSIBLE CERTIFIED PERSONNEL <i>Robney &amp; Byrne</i>		DATE <i>11-1-64</i>			



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL <i>N/A</i>		TYPE <i>Carbon Steel</i>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER:
CROSS SECTION THICKNESS	MAX <i>N/A</i> MIN	PIPE DIA. <i>N/A</i>	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input checked="" type="checkbox"/> AS FABRICATED
B. NDE PROCEDURE No. <i>6.3</i>		SURFACE/MAT'L. TEMP. <i>72°</i>		M&TE. NO. <i>365</i>		MWR/RR. No. <i>R43-2055</i>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.		
1. PRE-CLEANER		<i>MagnaFlux</i>	<i>5KC-NF/ZC-7B</i>	<i>82J083</i>		
2. PENETRANT		<i>MagnaFlux</i>	<i>Z-L22A</i>	<i>83F003</i>		
3. EMULSIFIER AND/OR REMOVER		<i>MagnaFlux</i>	<i>5KC-NF/ZC-7B</i>	<i>82J083</i>		
4. DEVELOPER		<i>MagnaFlux</i>	<i>5KD-NF</i>	<i>82D111</i>		
5. POST EXAMINATION CLEANER		<i>MagnaFlux</i>	<i>5KC-NF/ZC-7B</i>	<i>82J083</i>		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>Light Bleed out in radius area due to pitted surface condition.</i>						
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.				
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)			
1 <i>Con Rod Journal #1</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>			
2 <i>Con Rod Journal #3</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>			
3						
4						
D. ACCEPTANCE CRITERIA	<i>NDE 6.3 Para 4.2.1</i>		OPERATOR <i>Richard J. Smith</i> Level <i>II</i> Date <i>11-10-84</i>			
E. ATTEST	<i>Richard J. Smith</i> RESPONSIBLE CERTIFIED PERSONNEL		<i>II</i> LEVEL		<i>11-10-84</i> DATE	

PT

COMPONENT I.D.

*Crankshaft Filet area and oil holes cyl*

SYSTEM

PLANT/LOCATION

E422





## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE <i>C.S</i>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED
CROSS SECTION THICKNESS		MAX MIN <i>N/A</i>	PIPE DIA. <i>N/A</i>	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND
					<input checked="" type="checkbox"/> AS FABRICATED	<input type="checkbox"/> OTHER
B. NDE PROCEDURE No. <i>6.3</i>		SURFACE/MAT'L. TEMP. <i>72</i>		M&TE. NO. <i>365</i>		MWR/RR. No. <i>R43-2055</i>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.		
1. PRE-CLEANER		<i>MAGAFLEX</i>	<i>SKC-NF1ZC-7B</i>	<i>82J083</i>		
2. PENETRANT		<i>MAGAFLEX</i>	<i>Z-L22A</i>	<i>83F003</i>		
3. EMULSIFIER AND/OR REMOVER		<i>MAGAFLEX</i>	<i>SKC-NF1ZC-7B</i>	<i>82J083</i>		
4. DEVELOPER		<i>MAGAFLEX</i>	<i>SKD-NF</i>	<i>82D111</i>		
5. POST EXAMINATION CLEANER		<i>MAGAFLEX</i>	<i>SKC-NF1ZC-7B</i>	<i>82J083</i>		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>Light bleed out occurred in Radius due to Rensel surface condition</i> <i>#2 CYL. CONNECTING ROD JOURNAL.</i>						
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.				
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)			
<i>1 CYL. #2 JOURNAL</i>	<i>N/A</i>	<i>N/A</i>	<i>ACCEPT</i>			
<i>2</i>						
<i>3</i>						
<i>4</i>						
D. ACCEPTANCE CRITERIA	<i>NDE 6.3 PARA 4.2.1</i>		OPERATOR <i>Rodney S. Borne</i> Level <i>II</i> Date <i>11-7-84</i>			
E. ATTEST	<i>Rodney S. Borne</i>		<i>II</i>		<i>11-7-84</i>	
RESPONSIBLE CERTIFIED PERSONNEL		LEVEL		DATE		

COMPONENT I.D. CRANK SHAFT FIDET  
AREA 4 OIL HOLES  
CYL #2 JOURNAL

SYSTEM

1R43

PLANT/LOCATION

Shoelham #103 Diesel Gen. Rm

EL. 22





## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE	FABRICATED PROCESS		
		C.S.		<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: CRANK SHAFT	
CROSS SECTION THICKNESS	MAX	PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND
	MIN N/A	N/A		<input checked="" type="checkbox"/> AS FABRICATED	<input type="checkbox"/> OTHER
B. NDE PROCEDURE No. 6.3		SURFACE/MAT'L. TEMP. 73		M&TE. NO. 365	MWR/RR. No. R43-2055
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/2C-7B	84 J012	
2. PENETRANT		MAGNAFLUX	2L-22A	83 F003	
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-NF/2C-7B	84 J012	
4. DEVELOPER		MAGNAFLUX	SKD-NF	82 D111	
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/2C-7B	84 J012	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY					
LIGHT BLEED OUT OCCURRED IN RADIUS DUE TO POORER SURFACE CONDITION					
#4 AND #5 CONNECTING ROD JOURNALS					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
1 CYL. 4 JOURNAL	N/A	N/A	ACCEPT		
2 CYL. 5 JOURNAL	N/A	N/A	ACCEPT		
3					
4					
D. ACCEPTANCE CRITERIA	NDE 63 PARA 4.2.1		OPERATOR	Date 11-9-84	
			Level H		
E. ATTEST	RESPONSIBLE/CERTIFIED PERSONNEL		LEVEL	DATE	
			II	11-9-84	

PT

COMPONENT I.D. CRANK SHAFT FILED  
ALLEN & OIL HOLES  
CYL #4 AND 5 JOURNAL  
SYSTEM

CYL #4 AND 5 JOURNAL

IR 43

PLANT/LOCATION

Sheffield 103 Diesel Gen. Rm

EL 2C



## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 6

A. MATERIAL		TYPE	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED	
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <i>Crank-Shaft</i>	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> AS FABRICATED	<input type="checkbox"/> GROUND <input checked="" type="checkbox"/> OTHER: <i>Shot peened</i>
No. <u>6.3</u>		SURFACE/MAT'L. TEMP. <u>69°F</u>		MATE. NO. <u>365</u> MWR/RR. No. <u>RR R43 2055</u>	
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		Magnaflux	SKC-NF/ZC-7B	84J012	
2. PENETRANT		Magnaflux	ZL-22A	83F003	
3. EMULSIFIER AND/OR REMOVER		Magnaflux	SKC-NF/ZC-7B	84J012	
4. DEVELOPER		Magnaflux	SKD-NF	82D111	
5. POST EXAMINATION CLEANER		Magnaflux	SKC-NF/ZC-7B	84J012	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY					
See attached sketches. Note: Con rod journals #7 & #8 thrust face examined only					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES) <sup>AP 11-18-84</sup> SEE ATTACHED	DESCRIPTION <sup>AP 11-18-84</sup> LINEAR	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
1 #6 con rod journal	<u>N/A</u>	<u>N/A</u>	subject to eddy current exam		
2 #7 con rod journal (thrust face)	<u>N/A</u>	<u>N/A</u>	subject to eddy current exam		
3 #8 con rod journal (thrust face)	<u>N/A</u>	<u>N/A</u>	subject to eddy current exam		
4 N/A	<u>N/A</u>	<u>N/A</u>	N/A		
D. ACCEPTANCE CRITERIA	NDE 6.3 para 4.2.1		OPERATOR <u>At Purnam</u> <u>M. L. Lohr</u> Level <u>PT II</u> Date <u>11-9-84</u>		
E. ATTEST	<u>At Purnam</u> <u>M. L. Lohr</u> RESPONSIBLE CERTIFIED PERSONNEL		PT II LEVEL DATE <u>11-9-84</u>		

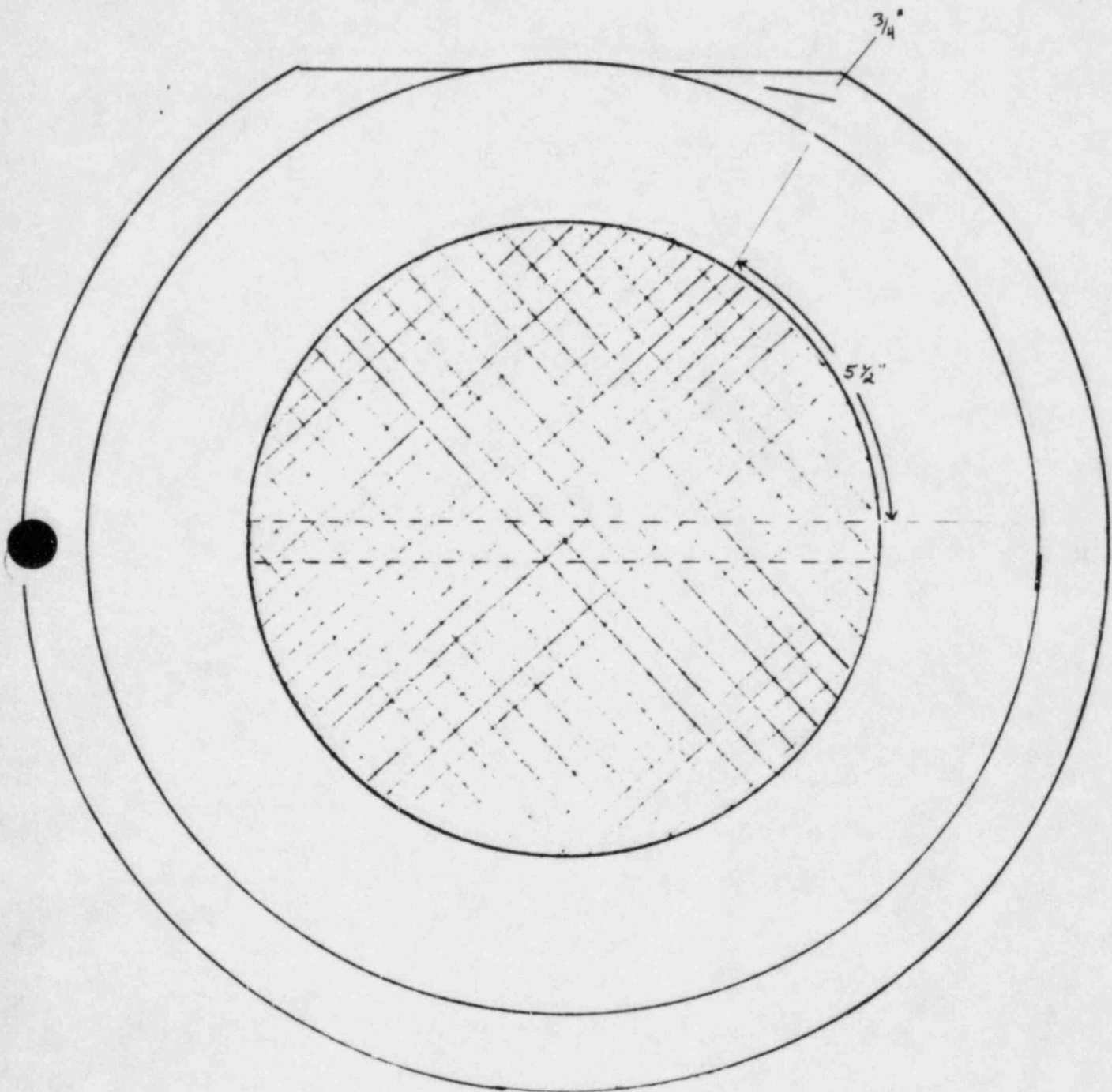
COMPONENT I.D. Crankshaft  
R43#EDG-103

SYSTEM 1R43

PLANT/LOCATION EDG room-103

# 6 CRANK PIN JOURNAL  
GENERATOR END FILLET &  
THRUST FACE

PAGE 2 OF 6



EXPLODED VIEW OF FILLET RADIUS AREA

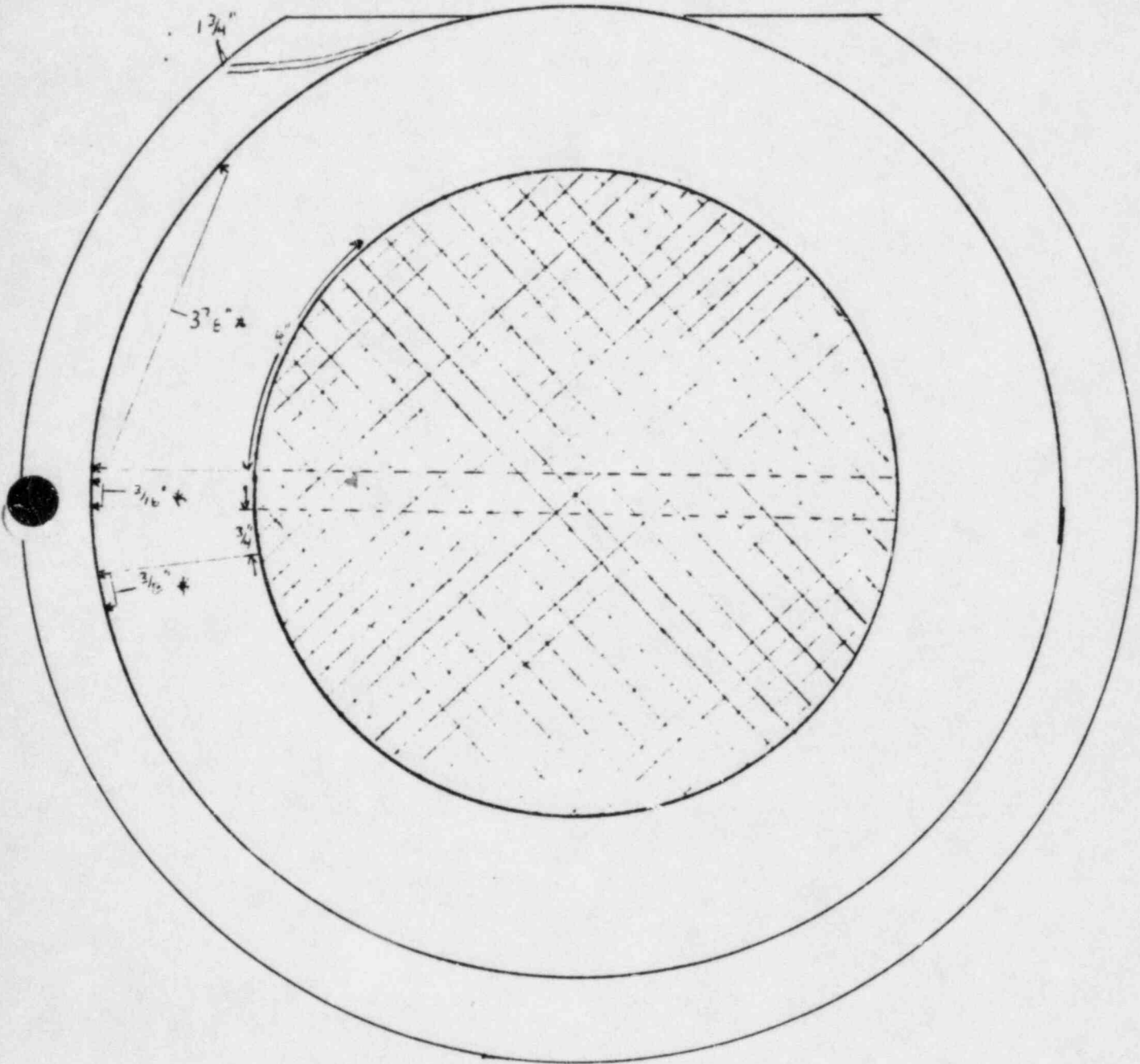
Art P...  
Michael ... PT# 11-9-84  
PT# 11-9-84

# 7 CRANK PIN JOURNAL

PAGE 3 OF 6

TURBO END THRUST

FACE ONLY



ENLARGED VIEW OF FILLET RADIUS AREA

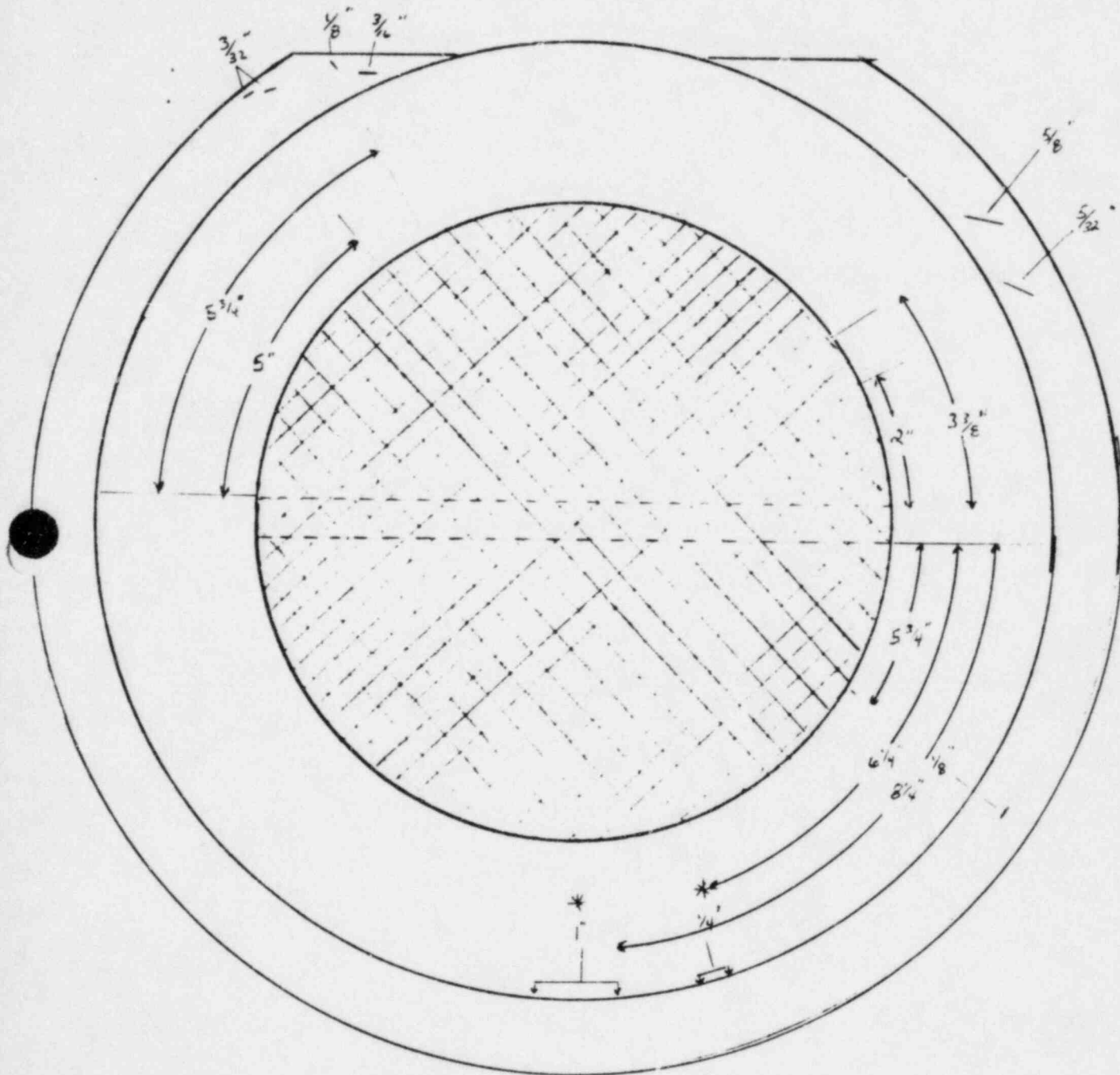
\* SEE DETAIL "A"

Art. Pinner PT. II  
11-9-54  
Michael Appel PT. I  
11-9-54



#7 CRANK P.N JOURNAL  
 GENERATOR END THRUST  
 FACE ONLY

PAGE 4 OF 6



EXPLODED VIEW OF FILLET RADIUS AREA

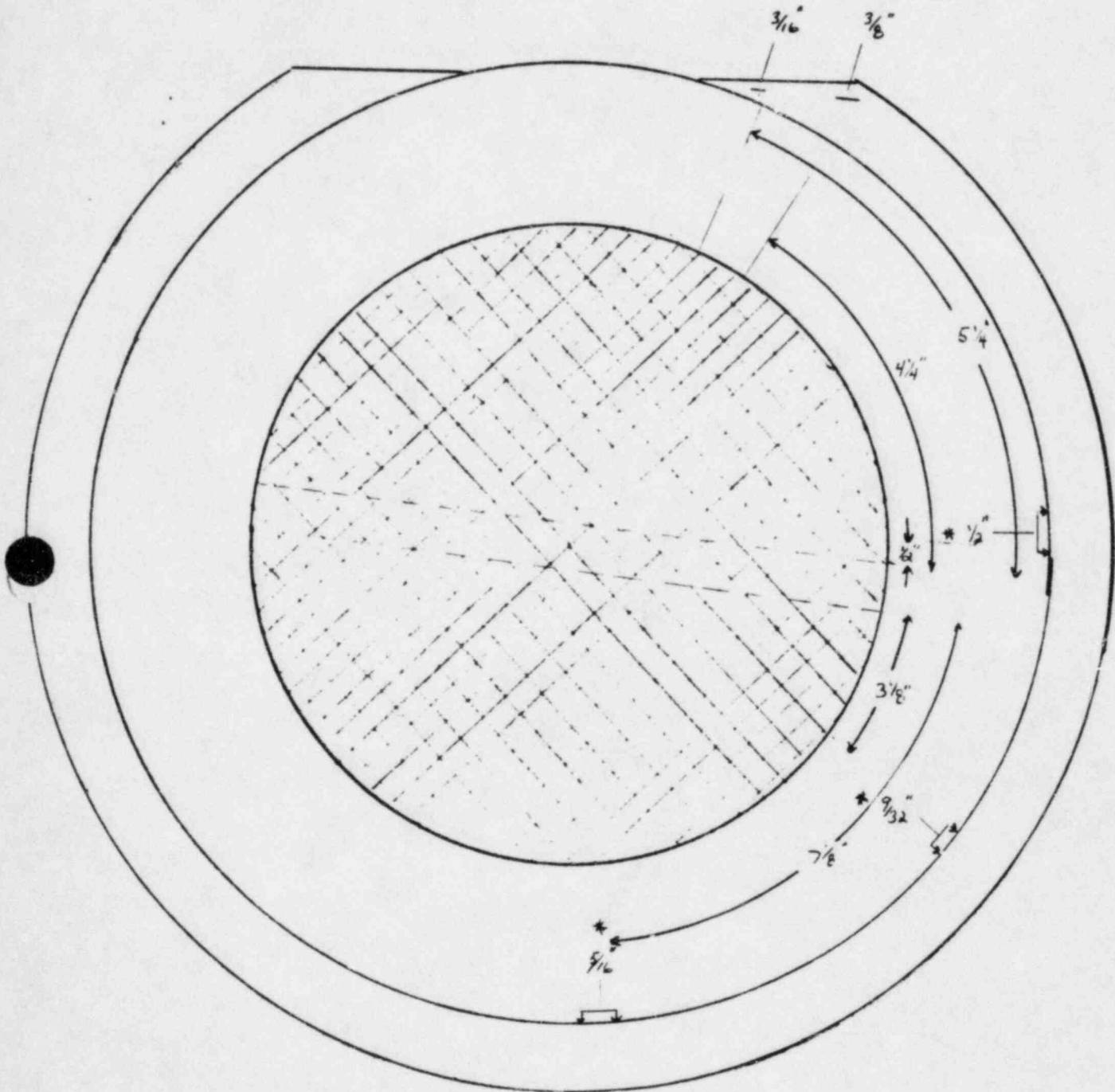
\* SEE DETAIL "A"

Out Run PT II  
 11-9-84  
 Michael Sybil PT II 11-9-84



#8 CRANK PIN JOURNAL  
 GENERATOR END THRUST  
 FACE ONLY

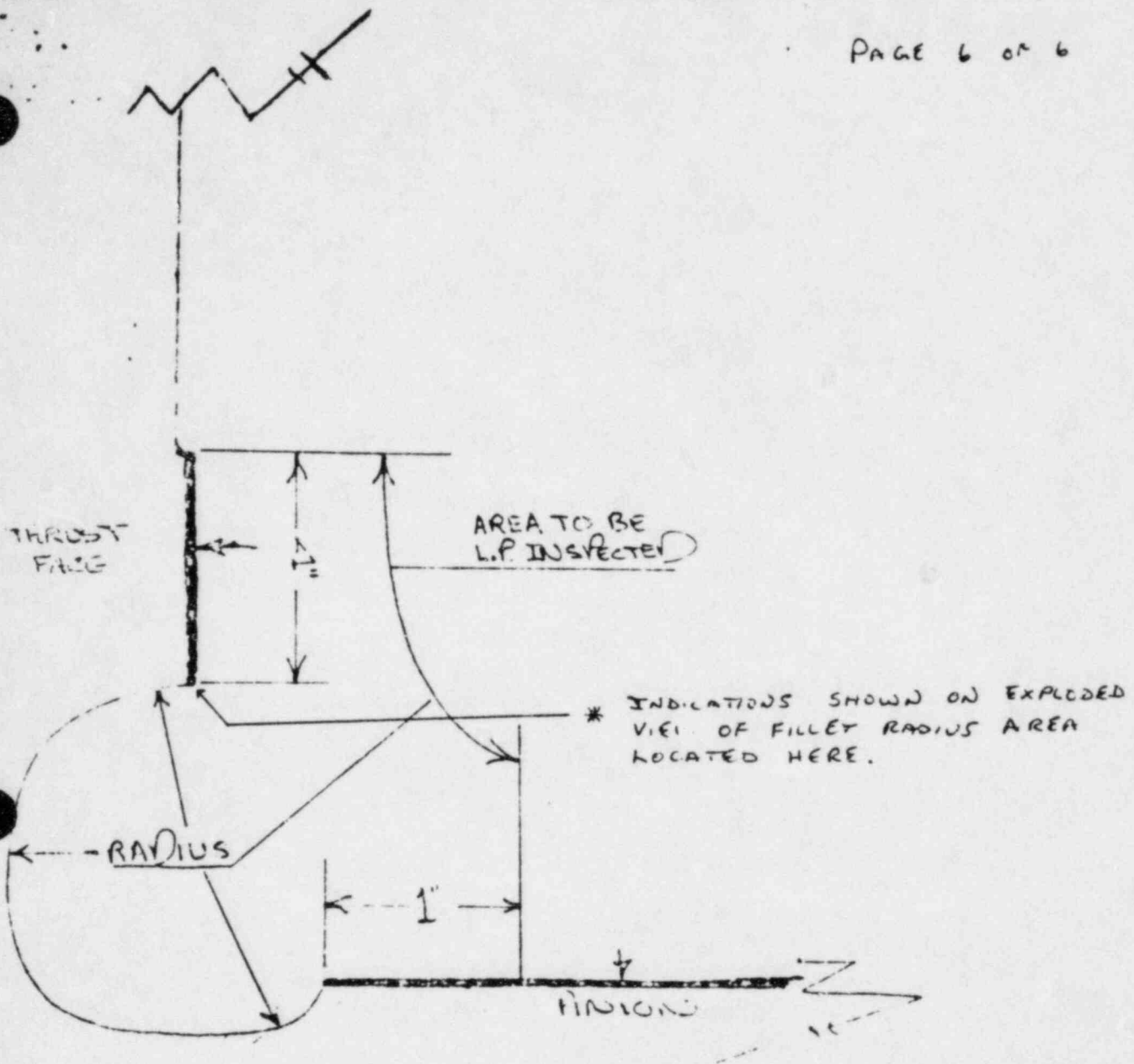
PAGE 5 OF 6



EXPLODED VIEW OF FILLET RADIUS AREA

\* SEE DETAIL "A"

Art. P. 11-9-84 PT II  
 Mutual Supply PT II 11-9-84



DETAIL "A"

Art. Pinner PT II  
11-9-84  
Michael L. Lipp PT II 11-9-84



## LIQUID PENETRANT EXAMINATION REPORT

PAGE 1 OF 4

A. MATERIAL		TYPE STEEL	FABRICATED PROCESS		<input type="checkbox"/> WELDED	<input type="checkbox"/> CAST	<input checked="" type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: CRANK SHAFT	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER	
	N/A	N/A		<input type="checkbox"/> AS FABRICATED	<input type="checkbox"/> OTHER		
B. NDE PROCEDURE No. 6.1 & 6.3		SURFACE/MAT'L. TEMP. 72°F		M&T. NO. 365	MWR/RR. No. RR R43-2055		
INSPECTION MATERIALS		BRAND	DESIGNATION		BATCH NO.		
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/ZC-7B		84 J012		
2. PENETRANT		MAGNAFLUX	ZL-22A		83 F003		
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-N/ZC-7B		84 J012		
4. DEVELOPER		MAGNAFLUX	SKD-NF		82 D111		
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/ZC-7B		84 J012		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY  REINSPECTED AREAS INDICATED ON ATTACHMENTS AFTER LIGHT SURFACE PREP. THESE WERE AREAS THAT COULD NOT BE EVALUATED BY EDDY CURRENT TESTING							
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.					
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)				
CON ROD							
#7 CRANK 1 PIN	N/A	N/A	ACCEPT THOSE AREAS AS INDICATED ON ATTACHMENTS				
#8 CRANK 2 PIN	N/A	N/A	ACCEPT THOSE AREAS AS INDICATED ON ATTACHMENTS				
3	N						
4	A						
D. ACCEPTANCE CRITERIA		MS 11-13-84 -1 NDE 6.3 PARA 4.2.2		OPERATOR <u>Art R...</u> Level <u>PT II</u> Date <u>11-13-84</u>			
E. ATTEST		<u>Art R...</u> RESPONSIBLE CERTIFIED PERSONNEL		LEVEL <u>PT II</u> DATE <u>11-13-84</u>			

PT

COMPONENT I.D.  
1 R43 # EDG 103CON ROD  
CRANK PIN  
JOURNALS

SYSTEM

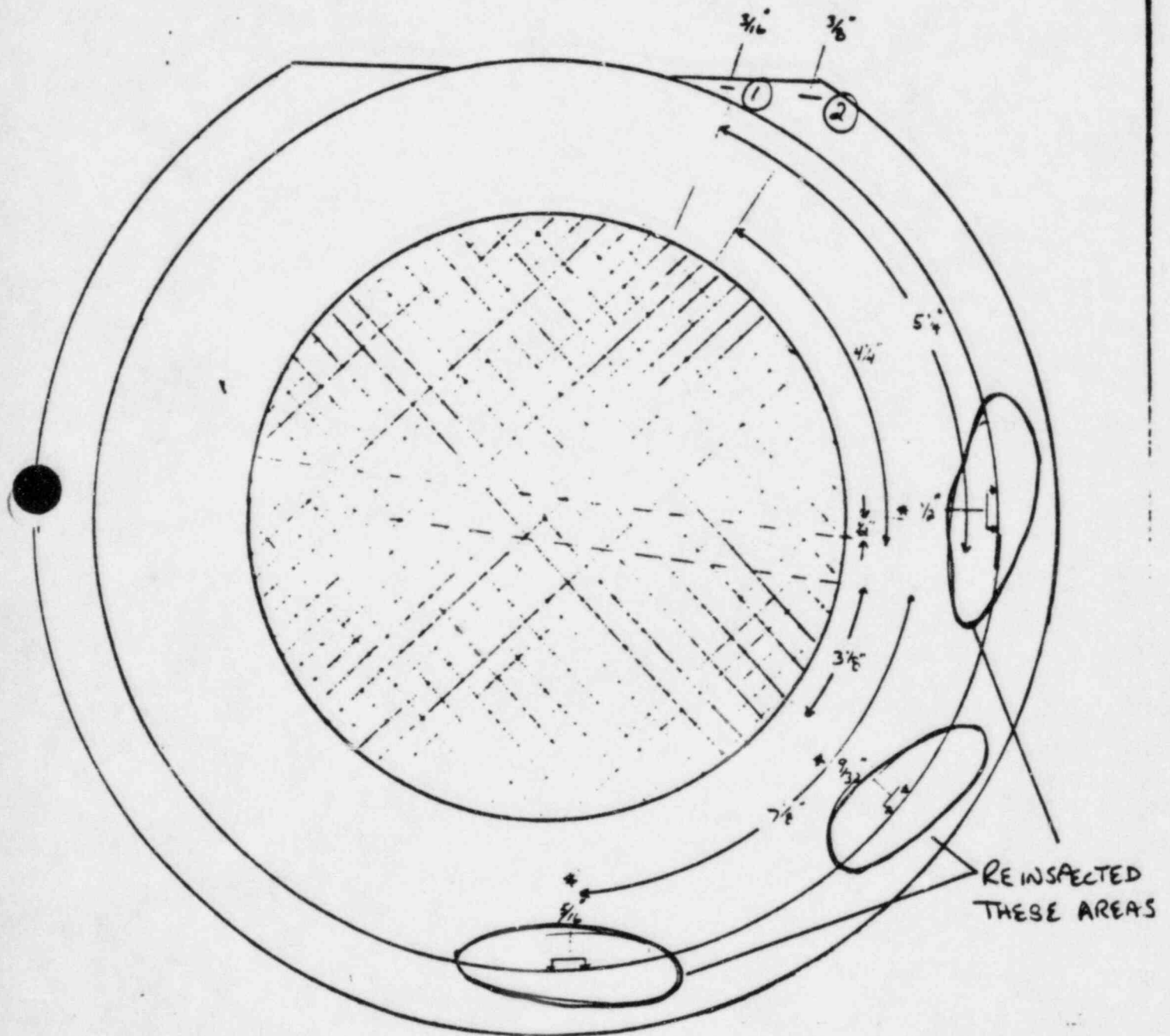
1 R43

PLANT/LOCATION

EDG Room 103

\* 8 CRANK PIN JOURNAL  
GENERATOR END THRUST  
FACE ONLY

PAGE 2 OF 4

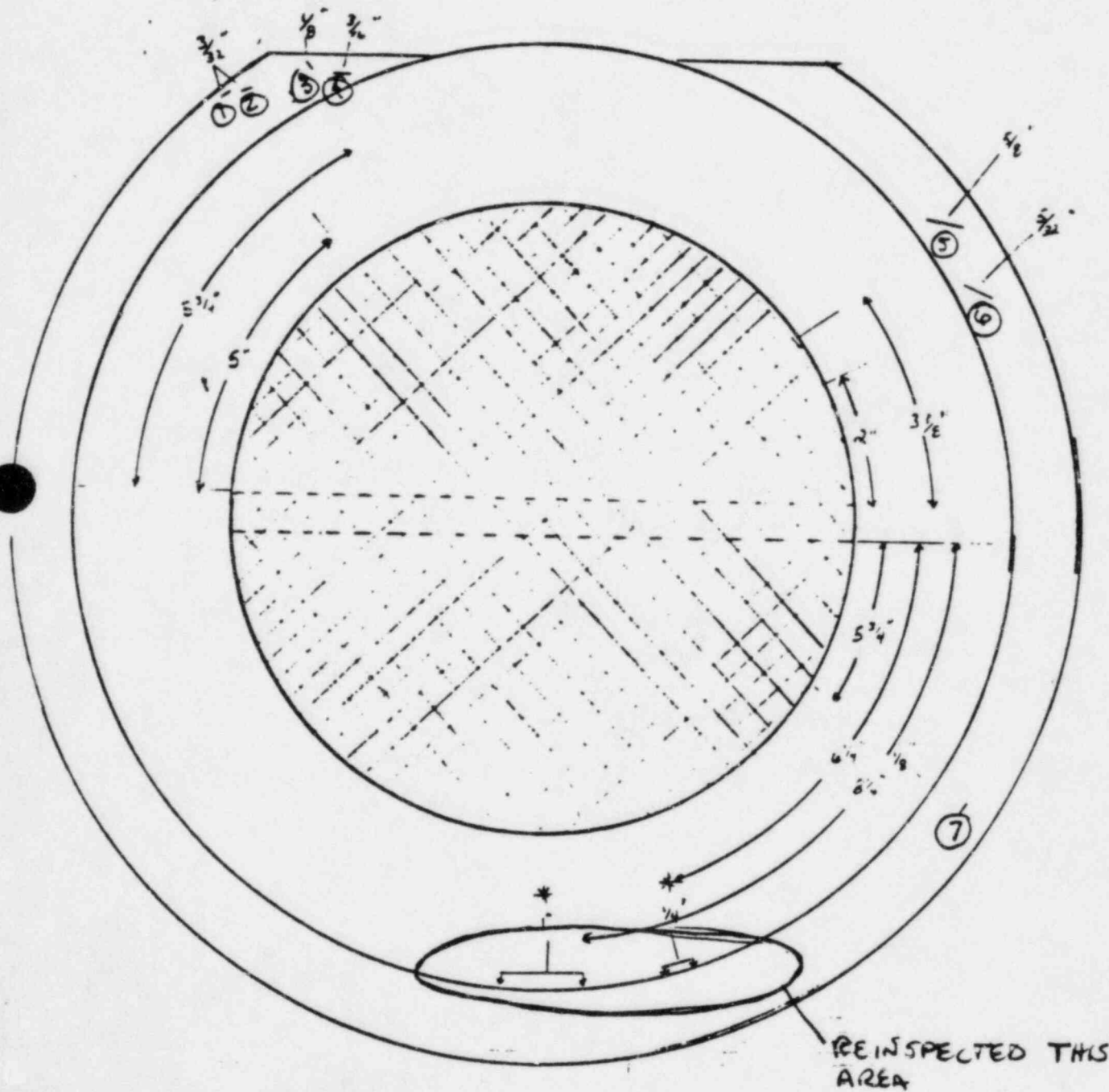


EXPLODED VIEW OF FILLET RADIUS AREA

Art Pinner  
 PT II  
 11-13-84

\* 7 CRANK P.I.N JOURNAL  
GENERATOR END THRUST  
FACE ONLY

PAGE 4 OF 4

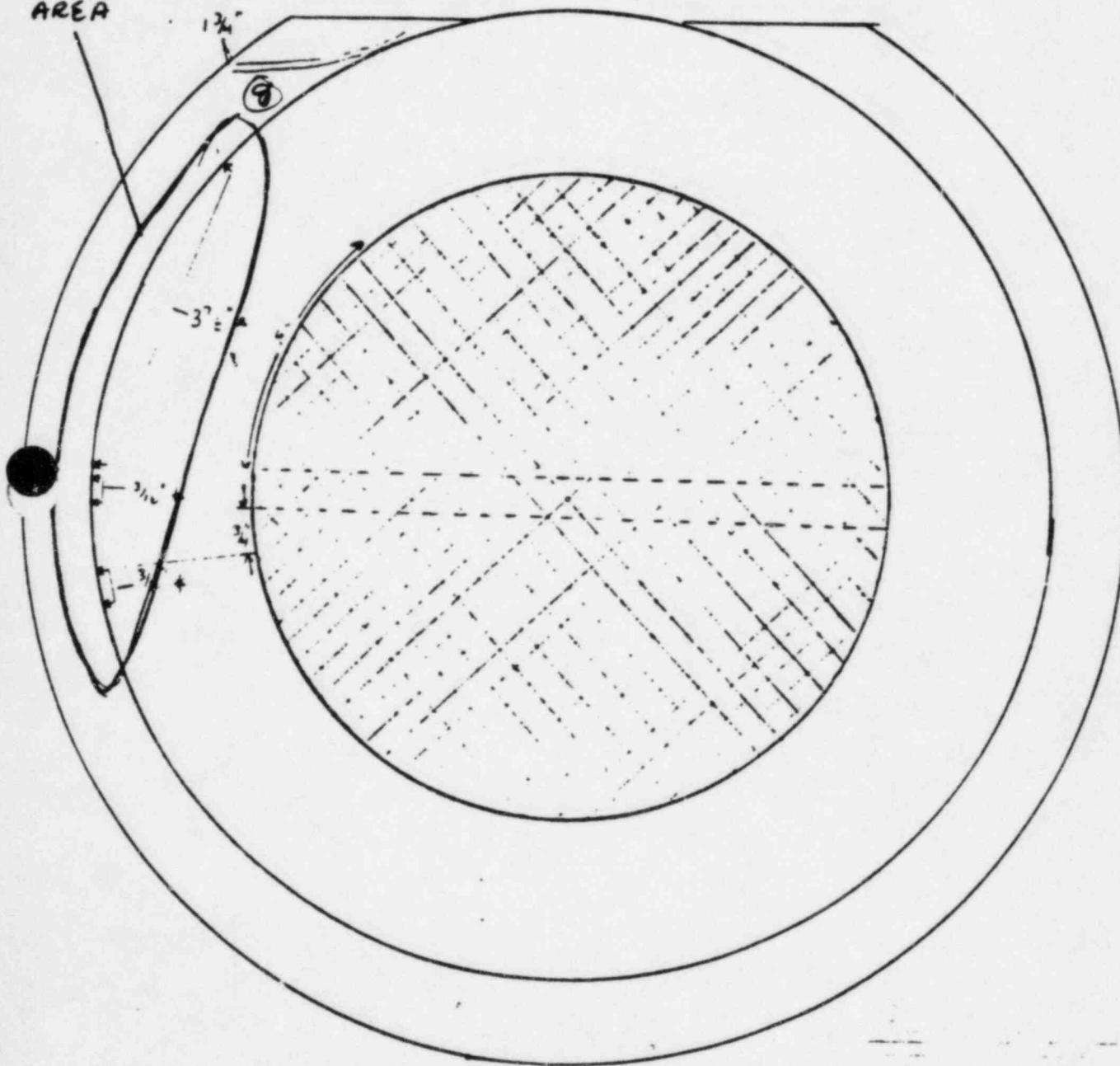


ENLARGED VIEW OF FILLET RADIUS AREA

Art. Pennam PT II  
 11-13-84



PAGE 3 of 4



EXPANDED VIEW OF FILLET RADIUS AREA

Art Review P. II  
n-13-84



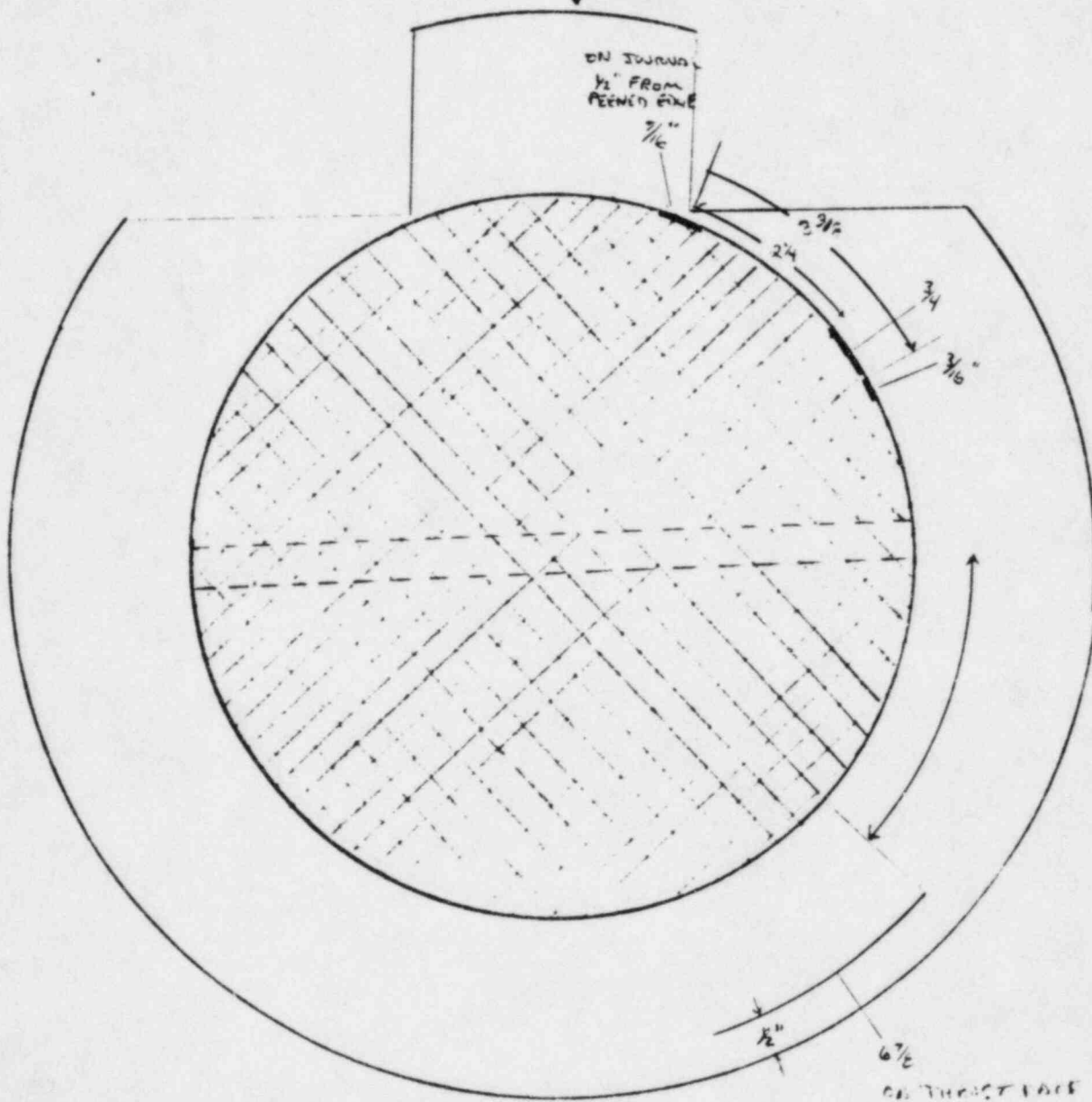
## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE	FABRICATED PROCESS	COMPLEMENT I.D. 1843 * EDC 103	
		<u>Steel</u>	<input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED	Crack'shaft (Main Bearings)	
		GEOMETRY <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:			
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER	
	<u>N/A</u>	<u>N/A</u>			
B. NDE PROCEDURE No. <u>6.3</u>		SURFACE/MAT'L. TEMP. <u>73°F</u>		M&TE. NO. <u>365</u>	MWR/RR. No. <u>43-2055</u>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		<u>magnaflux</u>	<u>SKC-DE/ZC-7B</u>	<u>BHJ013</u>	
2. PENETRANT		<u>magnaflux</u>	<u>ZL-22A</u>	<u>B8F003</u>	
3. EMULSIFIER AND/OR REMOVER		<u>magnaflux</u>	<u>SKC-DE/ZC-7B</u>	<u>BHJ012</u>	
4. DEVELOPER		<u>magnaflux</u>	<u>SKD-DE</u>	<u>B2D111</u>	
5. POST EXAMINATION CLEANER		<u>magnaflux</u>	<u>SKC-DE/ZC-7B</u>	<u>BHJ012</u>	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <u>Area Examined all oil holes and fillet areas AND THRUST FACE</u>					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
Main Bearing #7	See attached sketch	Linear	Subject to Eddy Current For Acceptance		
Main Bearing #8	see attached sketch	Linear	Subject to Eddy Current For Acceptance		
Main Bearing #9	See attached sketch	Linear	Subject to Eddy Current For Acceptance		
4 N/A	N/A	N/A	N/A (Lit. Range)		
D. ACCEPTANCE CRITERIA		6.3 Para 4.3.1		OPERATOR <u>Richard J. Brown</u> Date <u>1-12-84</u>	
E. ATTEST		Responsible Certified Personnel <u>Richard J. Brown</u>		LEVEL <u>PT II</u>	DATE <u>1-12-84</u>

SYSTEM

PLANT/LOCATION

#7 MAIN BEARING FILLET, JOURNAL, OIL HOLES  
 # THRUST FACE GENERATOR SIDE  
 #124L  
 TDC



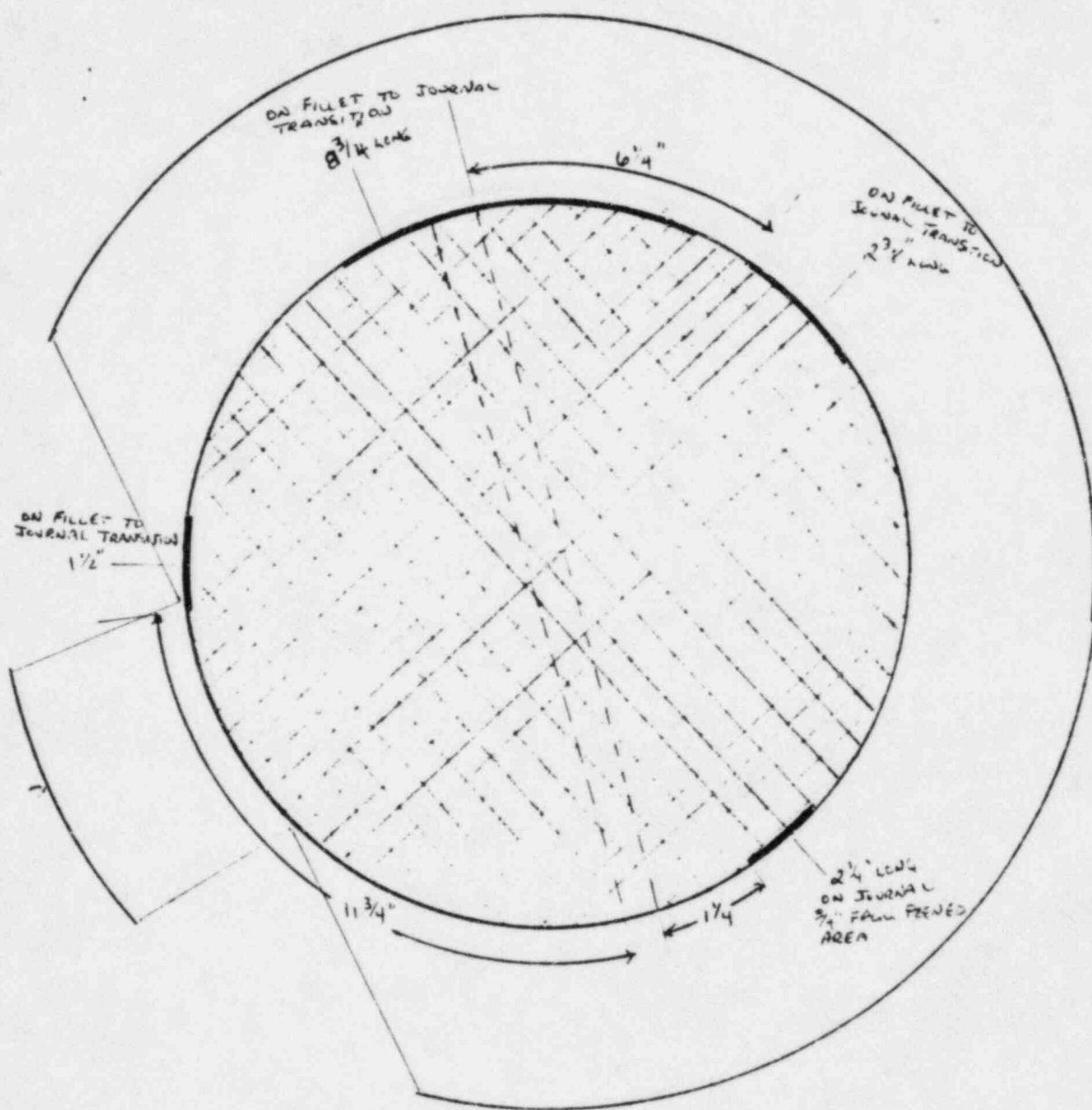
EXPLODED VIEW OF FILLET RADIUS AREA

Art. R...  $\rho_1 \bar{u}$   
 11-12-84

# 8 MAIN BEARING FILLET, OIL HOLES

JOURNAL & THRUST FACE

GENERATOR SIDE

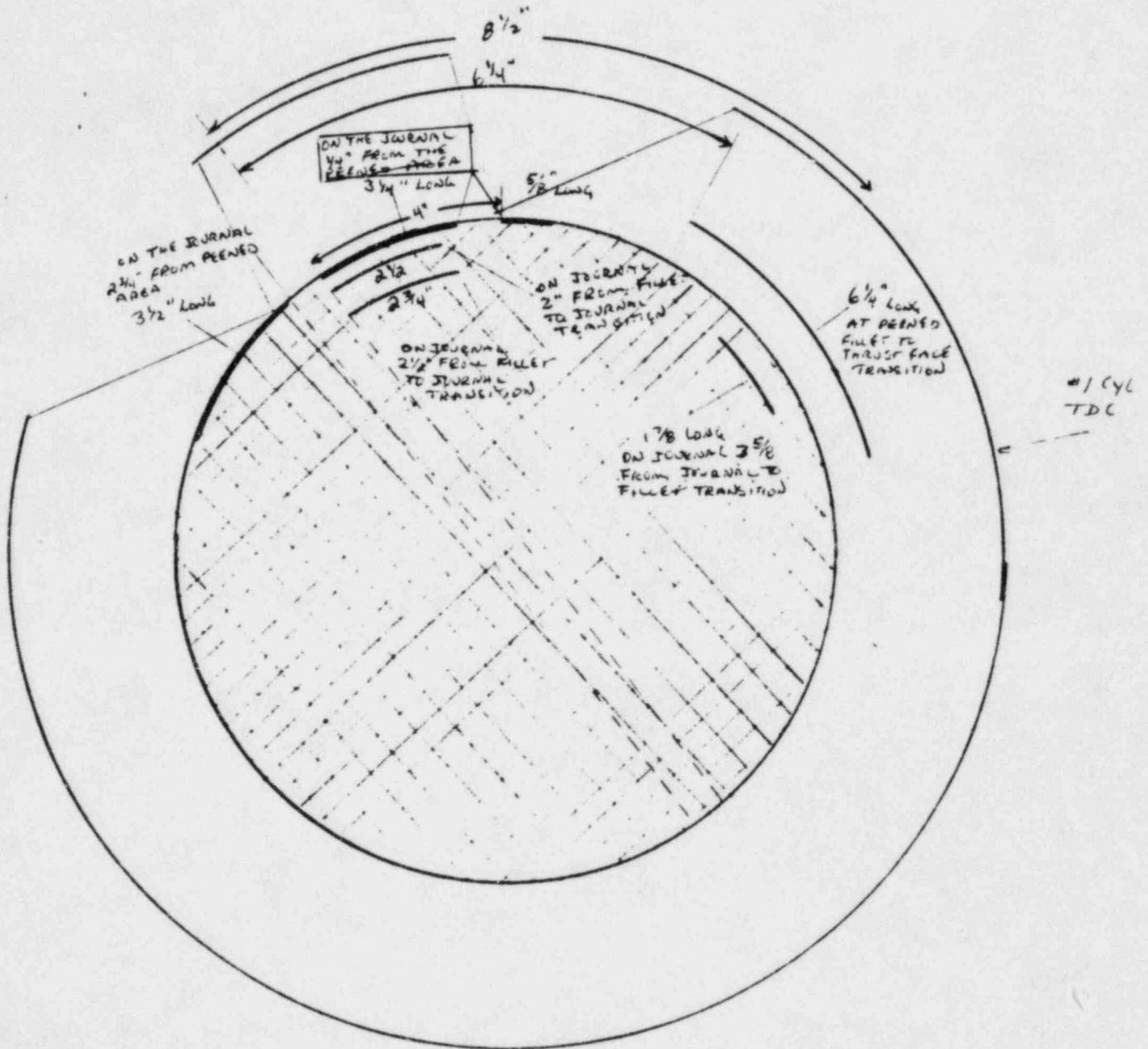


EXPLODED VIEW OF FILLET RADIUS AREA

Act Rec

PT II  
11-12-84

"B" MAIN BEARING FILLET, OIL HOLES,  
JOURNAL AND THRUST FACE  
TURBOCHARGER SIDE



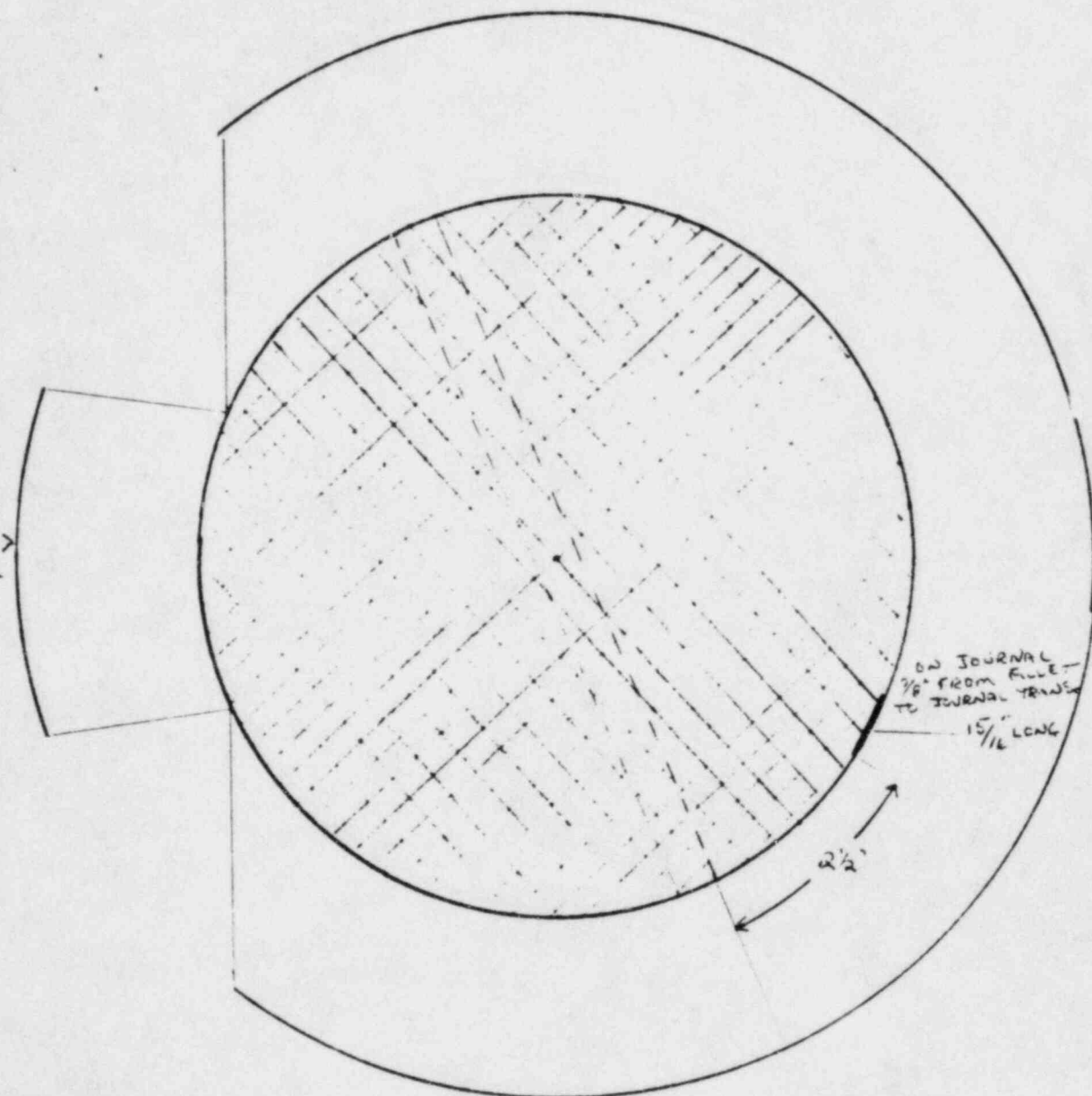
EXPLODED VIEW OF FILLET RADIUS AREA

$$A + R$$

47. 11-12-54



\* 9 MAIN BEARING FILLET, OIL HOLES  
 JOURNAL AND THRUST FACE  
 TURBO CHARGER SIDE



EXPLODED VIEW OF FILLET RADIUS AREA

Art. Pinner — PT. 31  
 1.17.54

"9" MINIMUM BEARING FILLET, OIL HOLES

JOURNAL AND THRUST FACE

GENERATOR SIDE

$\frac{1}{2}"$  FROM EDGE OF  
THRUST FACE

$2\frac{1}{2}"$  LONG

$\frac{1}{2}"$  FROM EDGE OF  
THRUST FACE

$2\frac{3}{8}"$  LONG

$2\frac{1}{2}"$

$4\frac{3}{4}"$

STARTS AT GEN EDGE  
OF OIL HOLE

$1\frac{3}{16}"$   
LONG

$2\frac{1}{2}"$  LONG

AT EDGE OF FILLET  
TO JOURNAL TRANSIT ON  
 $4\frac{7}{8}"$  LONG

#1 CYL  
TDC

EXPLODED VIEW OF FILLET RADIUS AREA

Art Ramey  
PT. II  
11-12-84



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL <i>N/A</i>		TYPE <i>Steel</i>	FABRICATED PROCESS <input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED		PT COMPONENT I.D. and Section <i>3436</i> Main Bearing Flange
		GEOMETRY <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:			
CROSS SECTION THICKNESS	MAX <i>N/A</i>	PIPE DIA. <i>N/A</i>	SURFACE CONDITION <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER	<input type="checkbox"/> MACHINED <input type="checkbox"/> GROUND	SYSTEM <i>1343</i>
B. NDE PROCEDURE No. <i>6.3</i>		SURFACE/MAT'L. TEMP. <i>70°</i>		M&TE. NO. <i>365</i> MWR/RR. No. <i>PL3-3055</i>	
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	PLANT/LOCATION <i>Shoreham #103 / 100-100-10</i> <i>54-22</i>
1. PRE-CLEANER		<i>Magnaflux</i>	<i>5KC-NE/2C-7B</i>	<i>83T083</i>	
2. PENETRANT		<i>Magnaflux</i>	<i>Z-L22A</i>	<i>83F003</i>	
3. EMULSIFIER AND/OR REMOVER		<i>Magnaflux</i>	<i>5KC-NE/2C-7B</i>	<i>83T083</i>	
4. DEVELOPER		<i>Magnaflux</i>	<i>5KD-NE</i>	<i>83D111</i>	
5. POST EXAMINATION CLEANER		<i>Magnaflux</i>	<i>5KC-NE/2C-7B</i>	<i>83T083</i>	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>Light Bleed occurred due to pitted surface condition on Radius area</i>					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		EVALUATOR <i>Robert J. Smith</i> Date <i>11-10-91</i>
<i>#3 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>		
<i>#4 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>		
<i>#5 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept</i>		
<i>#6 main bearing</i>	<i>N/A</i>	<i>N/A</i>	<i>Accept Radius &amp; Bolts</i>		
D. ACCEPTANCE CRITERIA		NDE 6.3 Para 4.2.1		OPERATOR <i>Robert J. Smith</i> Level <i>II</i> Date <i>11-10-91</i>	
E. ATTEST		RESPONSIBLE CERTIFIED PERSONNEL <i>Robert J. Smith</i>		LEVEL <i>II</i>	DATE <i>11-10-91</i>

"9" MAIN BEARING FILLET, OIL HOLES

JOURNAL AND THRUST FACE

GENERATOR SIDE

$\frac{1}{2}$ " FROM EDGE OF THRUST FACE

$7\frac{1}{2}$ " LONG

$\frac{1}{2}$ " FROM EDGE OF THRUST FACE  
 $2\frac{3}{8}$ " LONG

$2\frac{1}{2}$ "

$4\frac{3}{4}$ "

STARTS AT GEN EDGE OF OIL HOLE

$1\frac{3}{16}$ " LONG

$2\frac{1}{4}$ " LONG

AT EDGE OF FILLET TO JOURNAL TRANSITION  
 $4\frac{7}{8}$ " LONG

#1 CYL  
TDC

EXPLODED VIEW OF FILLET RADIUS AREA

Art R...  
PT. II  
11-12-84

## CYLINDER BLOCK

Component Number 03-315A

### I. Introduction

Confirmatory testing in accordance with SNRC-1094 and the inspection plans, attachments CB-1A, CB-1B and CB-1C require:

- 1) liquid penetrant or magnetic particle examination of the cylinder block top surface;
- 2) eddy current examination of all stud holes that have stud-to-stud indications;
- 3) eddy current examination of four adjacent head stud holes between cylinders 4 and 5 if no ligament cracks exist; or, if no ligament cracks exist on any bolt holes on cylinders 4 and 5 but exist elsewhere, then perform the inspection on a sample of four adjacent stud holes between the cylinders with the ligament cracks;
- 4) liquid penetrant and magnetic particle examination of cam saddles 2 and 8 and the areas adjacent to the through bolts;
- 5) depth measurements of all linear indications in the cam gallery area noted in 4) above using surface resistance probe;
- 6) visual examination of cam saddles 2 and 8 and the areas adjacent to the through bolts in accordance with MSS SP-55.

Recording and acceptance criteria are as indicated in attachment CB-1.

### II. Inspection Results

Copies of the inspection reports are provided in attachment CB-2, and Failure Analysis Report "Eddy Current Examination of Shoreham Nuclear Power Station Unit 1, Emergency Diesel Generator DG 103 Post Endurance Run", November 29, 1984.

#### Cylinder Block Top Surface

Florescent magnetic particle examination of the block top surface revealed no recordable indications. Eddy current examination of the four adjacent stud holes between cylinders 4 and 5 revealed no recordable indications.

#### Cylinder Block Cam Gallery

Prior to the endurance run, liquid penetrant and magnetic particle examination of cam saddles 2 and 8 and the areas adjacent to the through bolts was performed. The indications were mapped on inspection reports. A surface resistance probe was used to measure the depth of the indications. These examinations were repeated following confirmatory



testing. Results of these inspections confirmed that the indications did not grow. The deepest indication measured 0.010 inches. The remaining indications were all 0.004 inches or less. These results demonstrate that the indications did not grow as a result of confirmatory testing. Engineering evaluated the areas visually in accordance with inspection standard MSS-SF-55 and reported no relevant indications.

### III. Conclusion

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the cylinder block is acceptable for nuclear service. Further, the cylinder block has successfully completed confirmatory testing.

## POST ENDURANCE RUN INSPECTION

COMPONENT DESCRIPTION:TDI O.G. NO. 03-315ACOMP. NAME Cylinder BlockTYPE OF INSPECTION:☒ LP or ☒ MT ☒ ET ☐ UT ☐ VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

Perform either liquid penetrant or magnetic particle examination of the cylinder block top surface in accordance with LILCO NDE Procedures 6.2 or 7.2 as appropriate. If stud-to-stud indications are found remove the studs and perform eddy current examinations of the stud holes to determine the depth of the cracks.

RECORDING CRITERIA:

Map and photograph all linear indications. Record depth of stud-to-stud linear indications.

ACCEPTANCE CRITERIA:

Linear indications from stud hole to cylinder liner counterbore are acceptable.

Linear indications from stud-to-stud  $\leq 1.5$ " deep are acceptable

REFERENCE DOCUMENTS:

- |                     |   |
|---------------------|---|
| 1. CODES, STANDARDS | ASME Sections V, IX; ASME NB 5000                       |
| 2. TDI O.G.         | FaAA procedure NDE 11.8 Phase I and<br>Phase II reports |
| 3. LILCO            | LILCO Procedures NDE 6.2, 7.2                           |

COMMENTS:

POST ENDURANCE TEST RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-315ACOMP. NAME Cylinder Block Stud HolesTYPE OF INSPECTION:\_LP      \_MT      X ET      \_UT      \_VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

If no ligament cracks are noted during the block top inspection perform eddy current examination of four adjacent cylinder head stud holes between cylinders 4 and 5 (see attachment). If no ligament cracks exist on any bolt holes on cylinders 4 and 5 but exist elsewhere, then perform the inspection on a sample of four adjacent stud holes between the cylinders with the ligament cracks.

RECORDING CRITERIA:

Map indications in accordance with FaAA procedure NDE 11.8.

ACCEPTANCE CRITERIA:

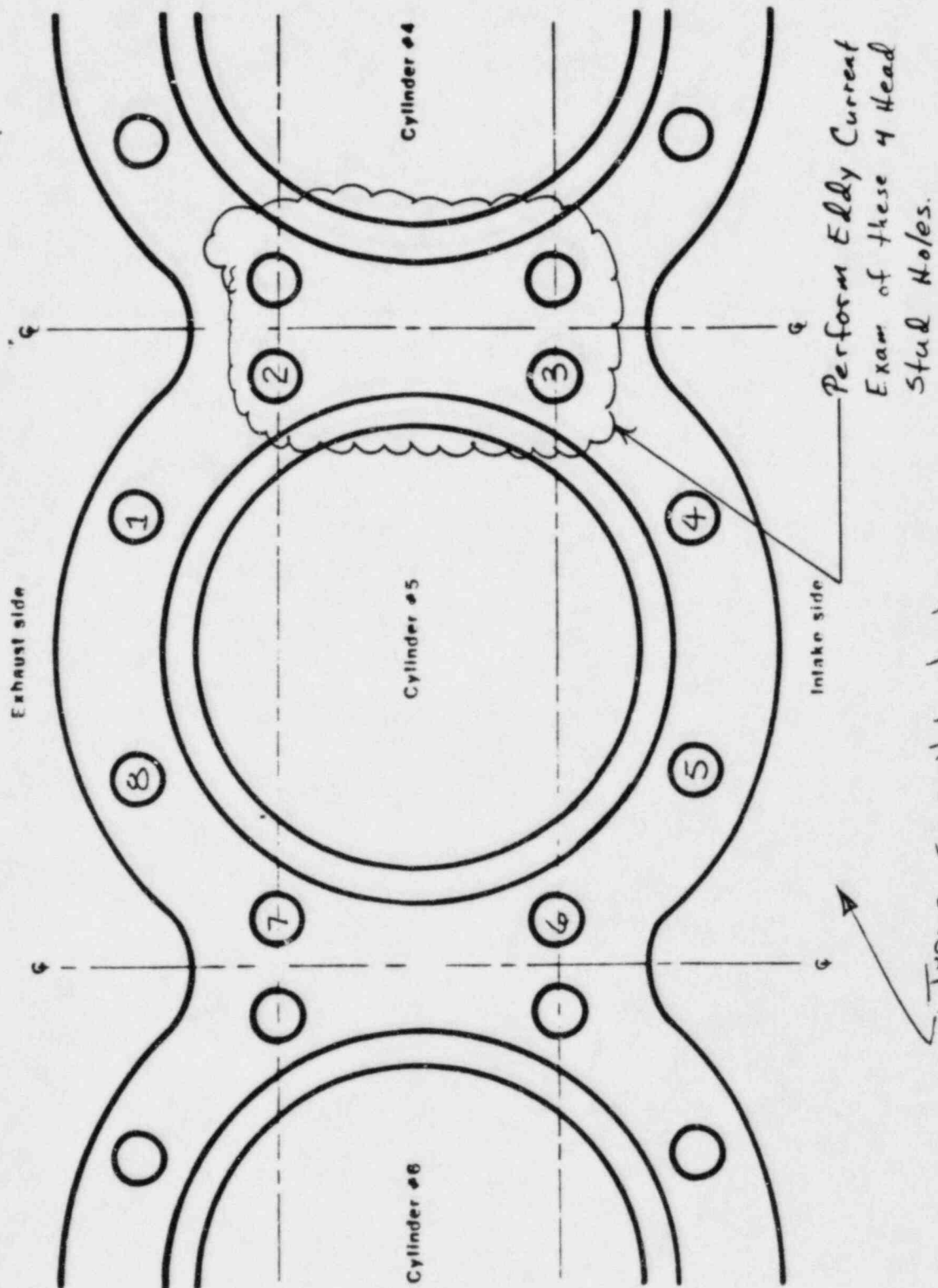
Stud-to-stud Linear indications  $\leq 1.5$ " deep are acceptable.

REFERENCE DOCUMENTS:

1. CODES, STANDARDS
2. TDI O.G.
3. LILCO

FaAA Procedure NDE 11.8; Phase I & II ReportsCOMMENTS:

# Attachment



Rev. 1  
Date 11/13/84POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-315ACOMP. NAME Cylinder Block Cam SaddlesTYPE OF INSPECTION:☒ LP☐ XMT☐ ET☐ UT☒ VISUAL☒ OTHERAREA TO BE EXAMINED/EXAMINATION DETAILS:

Perform liquid penetrant and magnetic particle examinations of cam saddles 2,8 and the areas adjacent to the through bolts. Map depth of all linear indications using surface resistance probe.

RECORDING CRITERIA:

Map all indications and photograph results. Map depth of linear indications for comparative purposes with depth measurements taken on DG-101, DG-102 and previous inspections on replacement DG-103 block.

ACCEPTANCE CRITERIA:

Visual inspection in accordance with MSS SP-55. If evaluation is required for acceptance, NED representative will provide evaluation on the inspection report.

REFERENCE DOCUMENTS:

- |                     |   |
|---------------------|---|
| 1. CODES, STANDARDS | ASME Sections V, XI; ASME NB 5000, MSS SP-55                    |
| 2. TDI O.G.         | Phase I, II Reports   |
| 3. LILCO            | LILCO Procedures NDE 6.1, 6.2, LDR2507, CRACK DEPTH METER (QCI) |

COMMENTS:



ATTACHMENT 2

November 28, 1984

NPD-84-1058

A. Muller

NED Evaluation of Cylinder Block Inspections  
DC-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

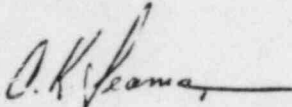
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the requirements of the confirmatory test as provided for in E&DCR F-46548 and appropriate revisions.

All inspection results are satisfactory. No LDR's are required or were generated as a result of these inspections.

The following consultant personnel concur with this evaluation:

. FAA Dr. L. Swanger



C. K. Seaman  
Project Engineer

MS/tis

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger



## MAGNETIC PARTICLE EXAMINATION REPORT

A. MATERIAL		TYPE GREY IRON	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
B. NDE PROCEDURE NO. 7.1 - 7.2		MWR/RR NO. RR R43-2055	EQUIPMENT I.D. S/N 6480 M&E NO. 365 11-6-84 872	
TECHNIQUE	<input type="checkbox"/> PRODS <input checked="" type="checkbox"/> YOKE <input type="checkbox"/> COIL <input type="checkbox"/> OTHER			
CURRENT	<input checked="" type="checkbox"/> AC <input type="checkbox"/> DC <input type="checkbox"/> HW/DC	<input checked="" type="checkbox"/> 10 lb PLATE <input type="checkbox"/> 40 lb PLATE		
AMPS N/A		PROD SPACING		
AMPS PER IN. N/A		YOKE 6" PRODS N/A		
MATERIALS	<input type="checkbox"/> DRY <input checked="" type="checkbox"/> WET	BRAND/DESIGNATION BATCH # 83H064		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY				
INSPECTED TOP SURFACE OF CYLINDER BLOCK AROUND CYLINDER LINERS, WATER HOLES, AND THROUGH BOLT HOLES. INSPECTION EXTENDED TO THE EDGE OF THE BLOCK.				
NO INDICATIONS WERE OBSERVED.				
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE		
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)	
Cylinder 1	N/A	N/A	ACCEPT	
1 Cylinder 2	N/A	N/A	ACCEPT	
2 Cylinder 3	N/A	N/A	ACCEPT	
2 Cylinder 4	N/A	N/A	ACCEPT	
Cylinder 5	N/A	N/A	ACCEPT	
3 Cylinder 6	N/A	N/A	ACCEPT	
4 Cylinder 7	N/A	N/A	ACCEPT	
Cylinder 8	N/A	N/A	ACCEPT	
D. ACCEPTANCE CRITERIA	NDE 7.2 PARA 4.2.2		OPERATOR <u>AT P...</u> LEVEL <u>II</u> MT DATE <u>11-6-84</u>	
E. ATTEST	<u>AT P...</u> RESPONSIBLE CERTIFIED PERSONNEL		LEVEL <u>II</u> MT DATE <u>11-6-84</u>	

MT

COMPONENT I.D.

1 R43 \* EDC - 103

CYLINDER  
BLOCK

SYSTEM

1 R43

PLANT/LOCATION

EDC Room - 103



## LIQUID PENETRANT EXAMINATION REPORT

PAGE 1 OF 3

A. MATERIAL		TYPE <u>GREY IRON</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>CAM SADDLE</u>
CROSS SECTION THICKNESS	MAX <u>N/A</u> MIN	PIPE DIA. <u>N/A</u>	SURFACE CONDITION	<input type="checkbox"/> MACHINED	<input checked="" type="checkbox"/> GROUND	<input type="checkbox"/> AS FABRICATED
				<input type="checkbox"/> OTHER		

B. NDE PROCEDURE No. <u>6.2</u>	SURFACE/MAT'L. TEMP. <u>78°F</u>	M&TE. NO. <u>365</u>	MWR/RR. No. <u>RR R43-2055</u>
------------------------------------	-------------------------------------	----------------------	-----------------------------------

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	82J083
2. PENETRANT	MAGNAFLUX	SKL-HF/S	836018
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/ZC-7B	82J083
4. DEVELOPER	MAGNAFLUX	SKD-NF	82D111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	82J083

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

SEE ATTACHED 2 PAGES

C. EVALUATION	REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.
---------------	--

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 CAM SADDLE #2	SEE ATTACHED PAGE 1 FOR LINEAR	INDICATIONS	REJECT
2 CAM SADDLE #8	SEE ATTACHED PAGE #2 FOR LINEAR	INDICATIONS	REJECT
3			
4			

D. ACCEPTANCE CRITERIA	NDE 6.2 PART 4.2.2.	OPERATOR <u>JAMES A. MOSBY</u> Level <u>II</u> Date <u>11/5/84</u>
---------------------------	---------------------	---

E. ATTEST	<u>James A. Mosby</u> RESPONSIBLE CERTIFIED PERSONNEL	<u>II</u> LEVEL	<u>11/5/84</u> DATE
-----------	--	--------------------	------------------------

COMPONENT I.D.  
1R43\*EDG-103  
#2 & #8  
AREAS OF  
CAM SADDLESSYSTEM  
1R43PLANT/LOCATION  
EDG Room - 103

1R43\*EDG 103 RR R43-2055

L.P. EXAMINATION

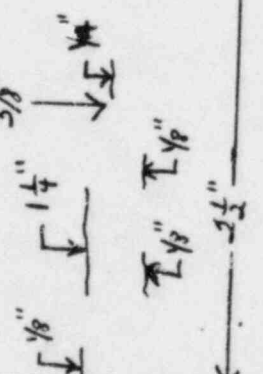
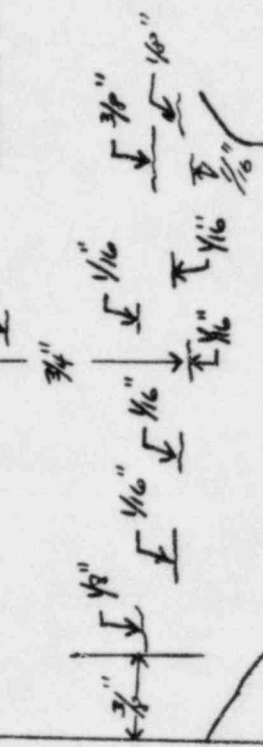
PENETRANT DWELL TIME - 10 MIN.

DEVELOPER DWELL TIME - 7 MIN.

MAIL Temp. 78°F

LINEAR INDICATIONS

LINEAR INDICATIONS



THRU  
BOLT

CAM SADDLE #2



1R43\* EDB-103 RR R43-2055

L. P. EXAMINATION

PENETRANT DWELL TIME - 10 MIN.

DEVELOPER DWELL TIME - 7 MIN.

MATL. Temp. 78°F

LINEAR INDICATIONS

$\frac{1}{4}$ "

$\frac{1}{4}$ "

$\frac{1}{8}$ "

$\frac{3}{16}$ "

$\frac{1}{16}$ "

$\frac{1}{16}$ "

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$\frac{1}{16}$ "

THRU  
BOLT

CAM SADDLE #8



## MAGNETIC PARTICLE EXAMINATION REPORT

PAGE 1 OF 3

A. MATERIAL	TYPE <u>GREY IRON</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
	GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>CAM SADDLE</u>
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION <input type="checkbox"/> MACHINED <input checked="" type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER

B. NDE PROCEDURE NO. <u>7.1 &amp; 7.2</u>	MWR/RR NO. <u>RR R43-2055</u>	EQUIPMENT I.D. S/N <u>6480</u> MATE NO. <u>872</u>
---	-------------------------------	---

TECHNIQUE	<input type="checkbox"/> PRODS <input checked="" type="checkbox"/> YOKE <input type="checkbox"/> COIL <input type="checkbox"/> OTHER
-----------	--

CURRENT	<input checked="" type="checkbox"/> AC <input type="checkbox"/> DC <input type="checkbox"/> HW/DC	<input checked="" type="checkbox"/> 10 lb PLATE <input type="checkbox"/> 40 lb PLATE
---------	---	---

AMPS <u>N/A</u>	PROD SPACING
AMPS. PER. IN. <u>N/A</u>	YOKE <u>8"</u> PRODS <u>N/A</u>

MATERIALS	<input type="checkbox"/> DRY <input checked="" type="checkbox"/> WET	MAGNAGLO 14AM BRAND/DESIGNATION BATCH # <u>84B007</u>
-----------	--	--

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY  
SEE ATTACHED SHEETS

C. EVALUATION	REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE
---------------	---

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 <u>CAM SADDLE #2</u>	<u>SEE ATTACHED SKETCH FOR LINEAR INDICATIONS</u>		<u>REJECT</u>
2 <u>CAM SADDLE #8</u>	<u>SEE ATTACHED SKETCH FOR LINEAR INDICATIONS</u>		<u>REJECT</u>
3	<u>N/A</u>		
4			
D. ACCEPTANCE CRITERIA	<u>NDE 7.2 PARA 4.2.2</u>	OPERATOR <u>Alt Pomeroy</u> LEVEL <u>II</u> DATE <u>11-5-84</u>	
E. ATTEST	<u>Alt Pomeroy</u> RESPONSIBLE CERTIFIED PERSONNEL	<u>II</u> LEVEL	<u>11-5-84</u> DATE

COMPONENT I.D.

1 R43 \* EDG-103  
MAGN SADDLES  
#2 & 8.

SYSTEM

1 R43

PLANT/LOCATION

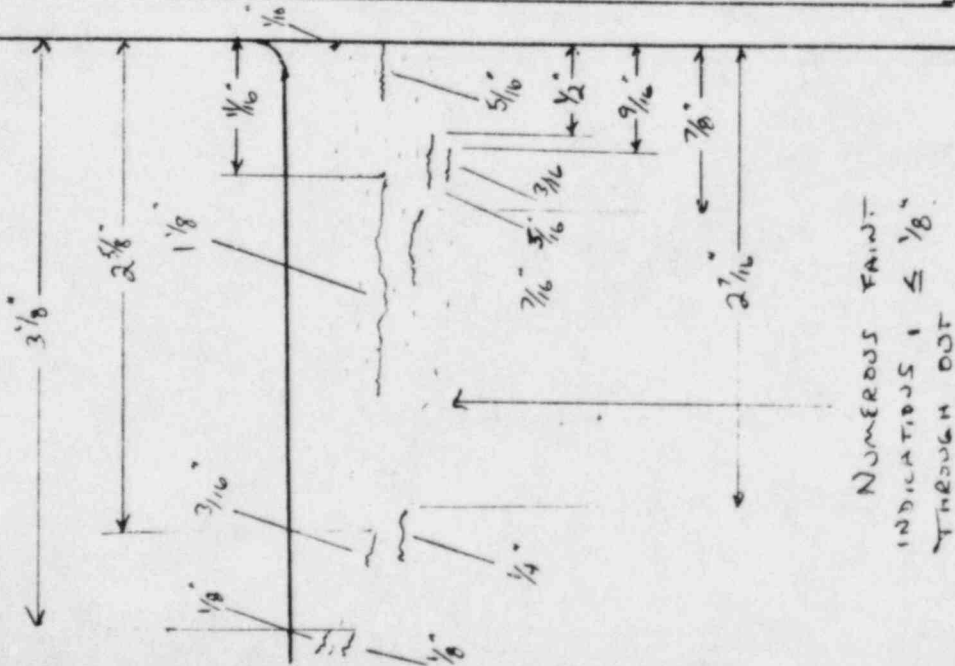
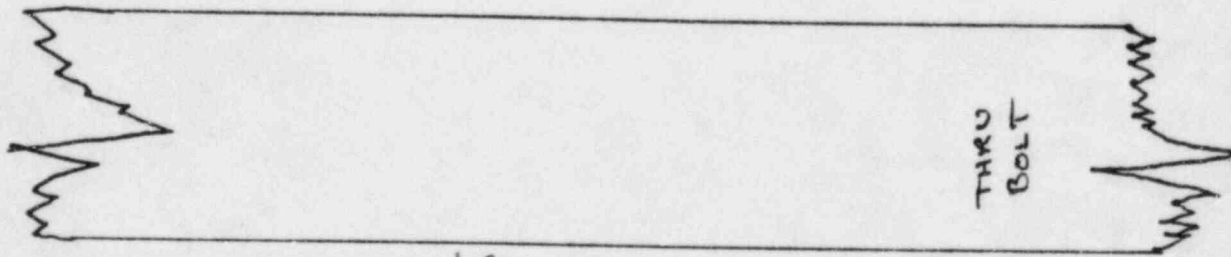
EDG-R43-103

Cylinder #2  
CAN SADDLE AREA

PAGE 2 OF 3

1R43 \* EDG 103

MIT EXAMINATION INDICATION PLOT



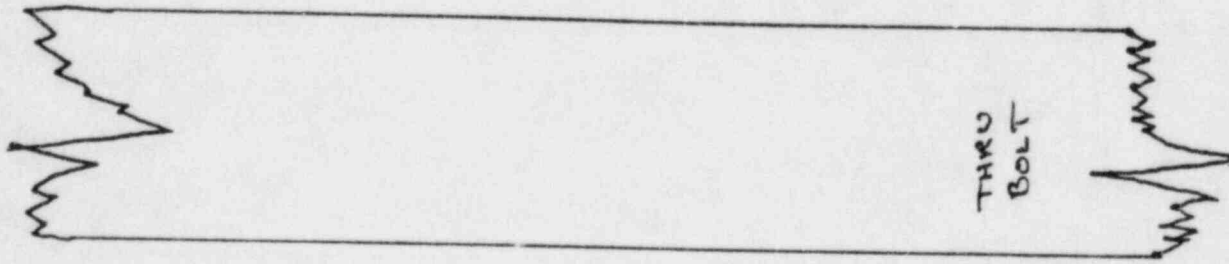
Art Runcen  
MIT  
11-5-84

CYL 1-2 # 8  
CAM SADDLE AREA

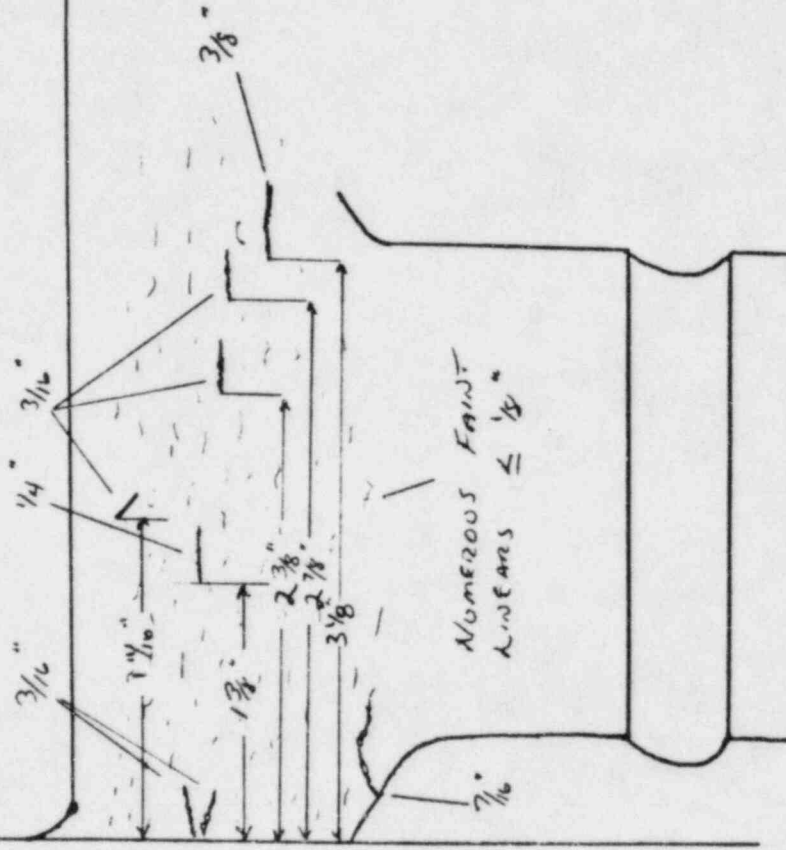
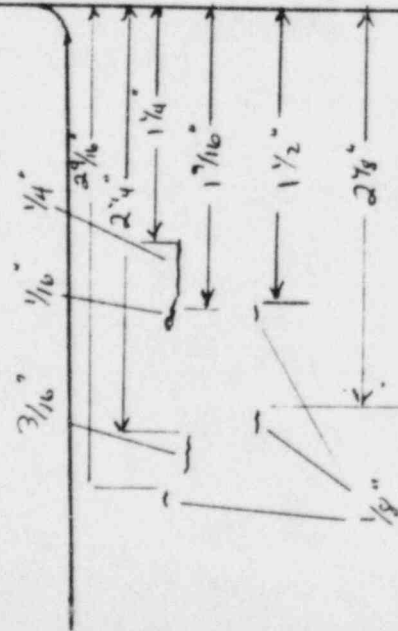
PAGE 3 of 3

1 R43 \* EDG 103

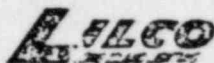
MT EXAM INDICATION - PLOT



THRU  
BOLT



Out Reman  
MT LII  
11-5-85



V-6.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK CAM  
SADDLES TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:  R413-2055		System/Struct/Comp:  R413 * ENG-103		Organization Responsible:  LSU		
Procedure/Rev.:  MSS-SP-55	Spec./Rev.:  SH1-089	Drawing/Rev.:		Other:  E&D CRF-46548B		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS		✓				
2 SUFFICIENT LIGHTING		✓				
3 CYLINDER BLOCK CAM SADDLES *		✓			TDI O.G. No. 03-315A	Flashlight and
					Acceptance criteria	Magnifier used
					MSS SP-55	18% Neutral Gray
					Map all indications	card 6" scale
					and photograph	
					results	

SKETCH OR DESCRIPTION OF EXAMINATION AREA See Attached sheets (Pages 2 of 3 &amp; 3 of 3)

or Indications noted:

## ① # 2 Cam SADDLE Area

A-① TYPE I indication, cracks.

B-② TYPE IV indication, porosity

## ② # 8 CAM SADDLE AREA

A-③ TYPE II Indications, shrinkage

B-④ TYPE IX Indications, scabbing

\* NED Evaluation required as per E&amp;D CRF-46548B

Prepared by:  William J. French	Date:  11/2/84	Approved for use:  C.D. Tows	Date:  11/2/84
OQA Inspector:  Linda Blt	Date:  11/6/84	OQAE Approval:  C.D. Tows	Date:  11/27/84

Remarks: \* AS Per NPD-84-1058 Indications NOTED were Found to be satisfactory by N.E.D. T. Blt 11/29/84

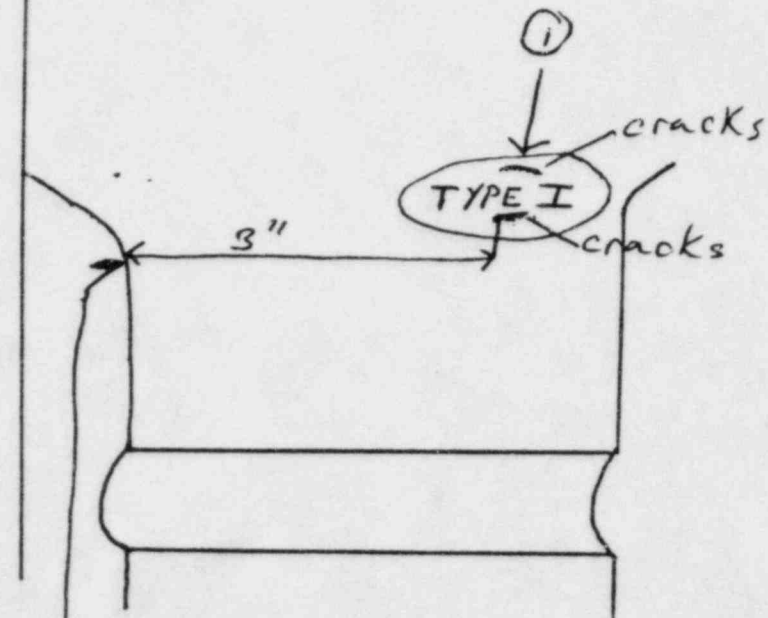
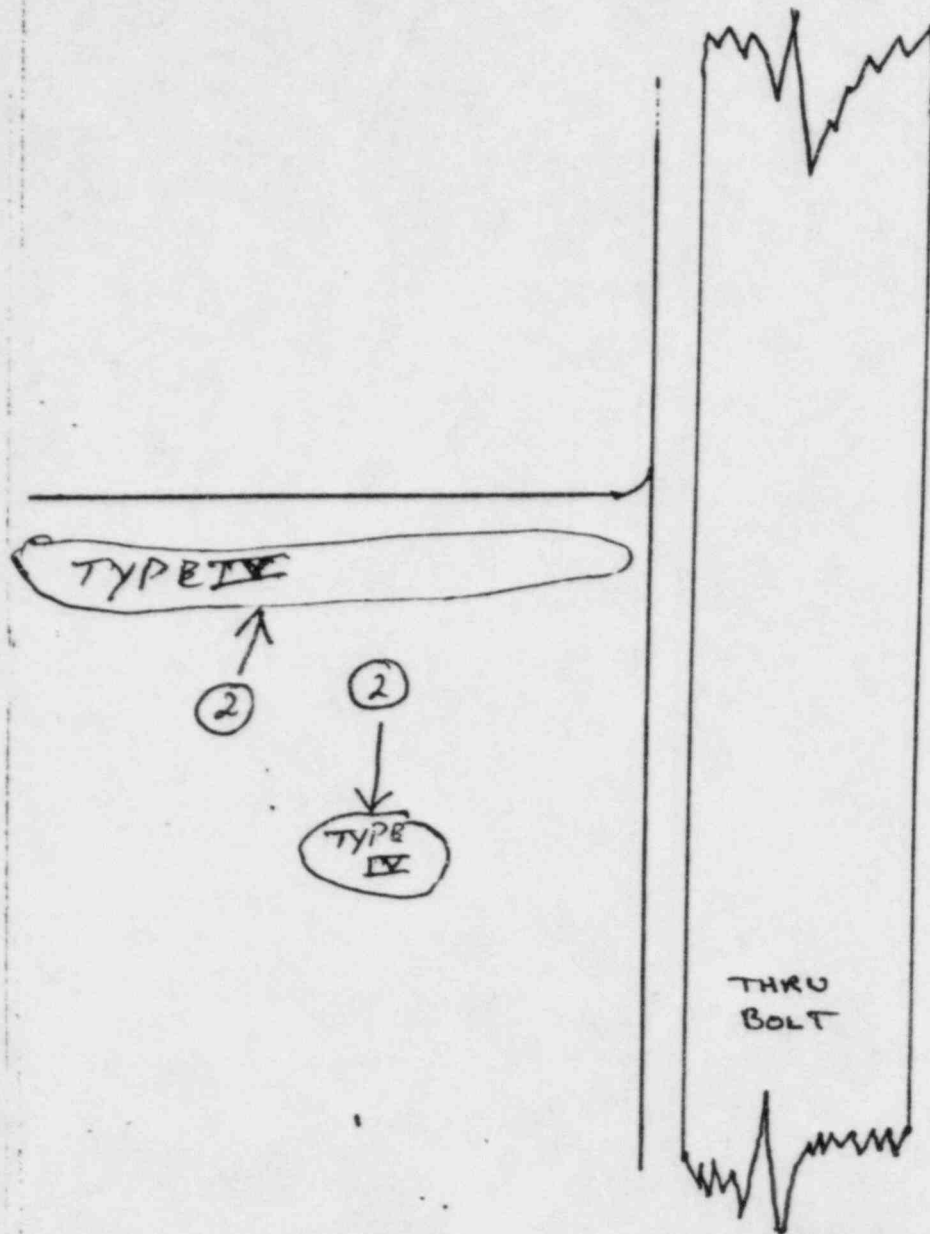


## # 2 CAM SADDLE AREA

Visual Inspection I.A.W. MSS-SP-55  
Acceptance Criteria

TYPE I indications (cracks)

TYPE IV indications (Porosity)



Reference Point

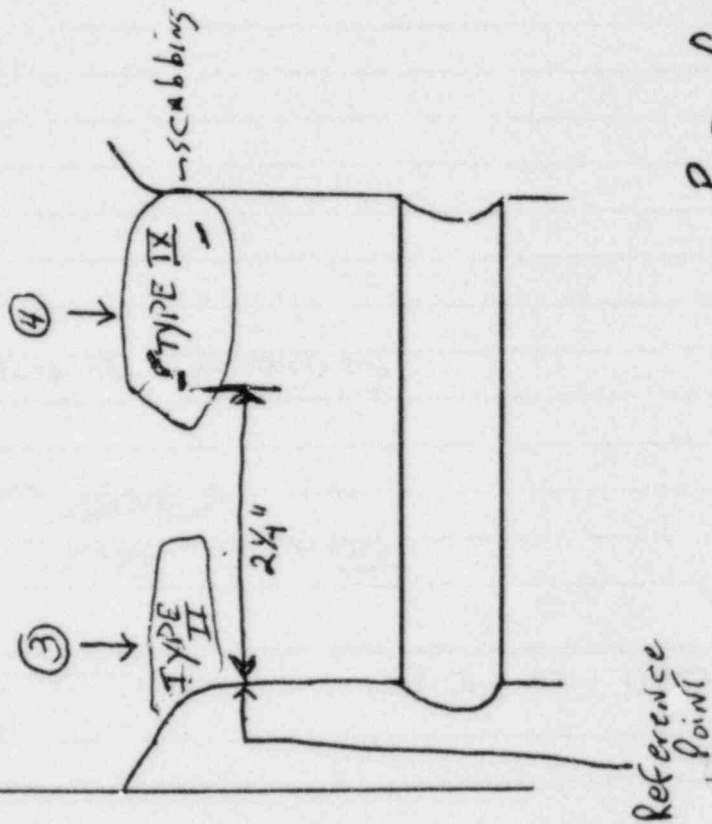
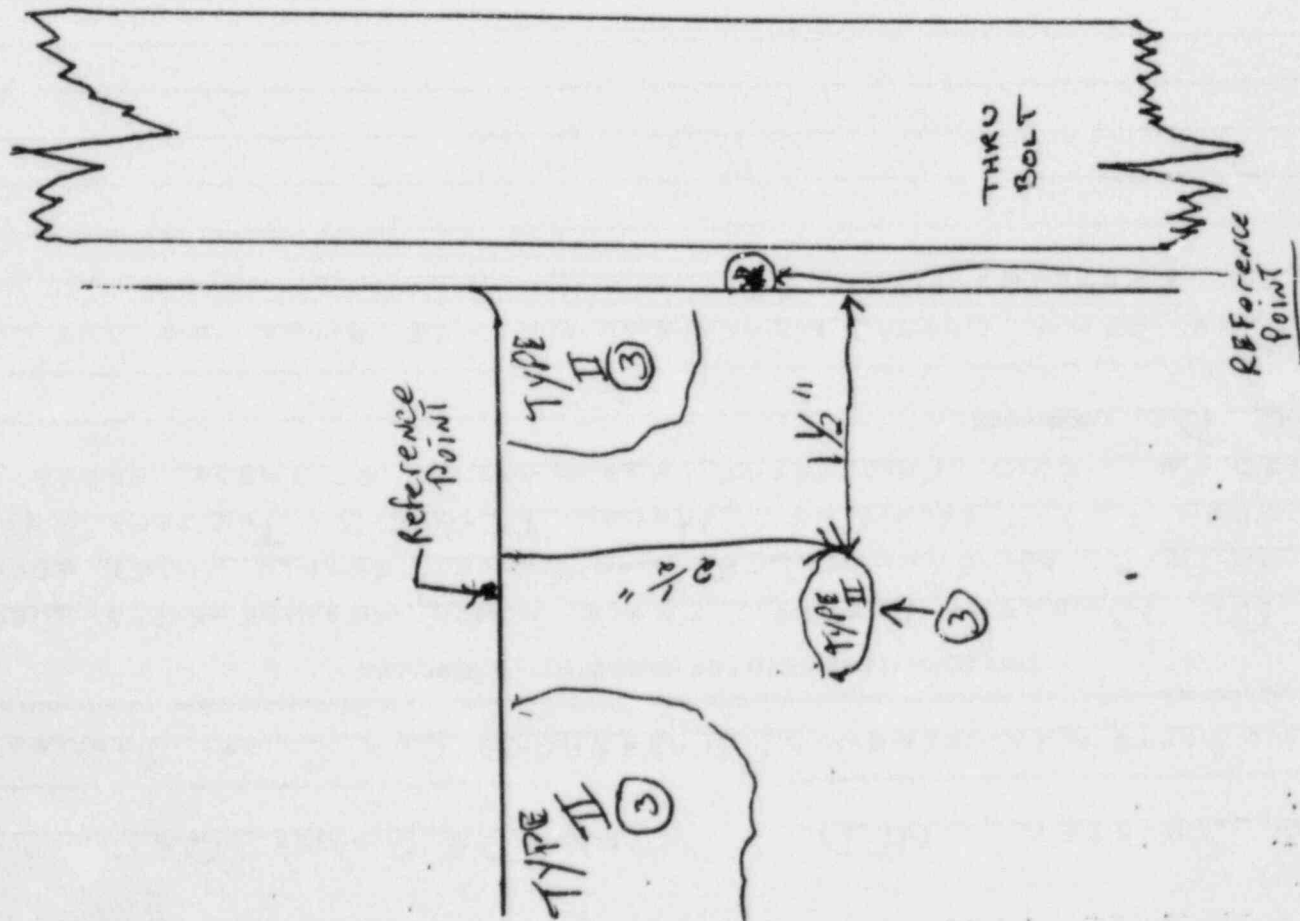
# #8 CAM SADDLE AREA

Visual Inspection I.A.W. MSS-SP-55

ACCEPTANCE CRITERIA

TYPE II INDICATIONS (shrinkage)

TYPE IX INDICATIONS (scabbing)



11/06/64

CRACK DEPTH MEASUREMENT  
PERFORMED BY: R.E. GLAZIER, JED

PROCEDURE: QAI 11.2.4 REV D

CALIBRATION: BLOCK No. 0003-315A

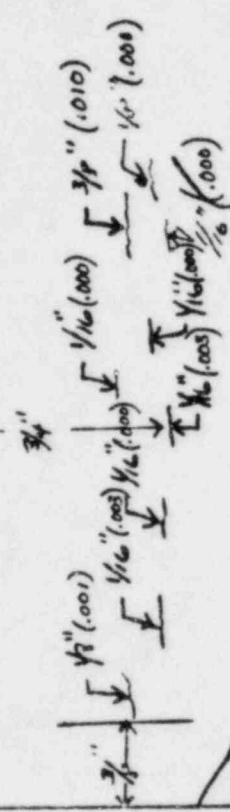
ZERO 972

CALIBRATE 166

PROBE MP4-B

CRACK DEPTHS IN PARENTHESES FOLLOW LENGTH OF INDICATION

LINEAR INDICATIONS



THRU BOLT

CAM SADDLE #2

11/06/84

PERFORMED BY: R.E. GLAZIER

Procedure: QAI 11.2.4 Rev. 0

CALIBRATION: Block No. PA03-315A

ZERO 972

CALIBRATE 166

PROBE MP4-B

CRACK DEPTHS IN PARENTHESES FOLLOW LENGTH OF INDICATION

## LINEAR INDICATIONS

 $\frac{1}{2}$ 
$$.44(.000) \cdot 49(.004)'' / 16(.000)$$
$$2/3^{\circ} (.001) \quad 1/4^{\circ} (.004)$$

C. AM SADDLE # 8

THRU  
BOLT

NOT ACCESSIBLE

MEL SCHUSTER  
LILCO

FROM:

BRIAN HOLCOMBE  
FAA

THIS FORM IS DESIGNED FOR HAND-WRITTEN MESSAGES

MESSAGE: THE ATTACHED INSPECTION REPORT IS PRELIMINARY  
PENDING CONFIRMATORY REVIEWS REQUIRED BY FAA'S  
QUALITY ASSURANCE PROCEDURES: DG 103 CRANKSHAFT  
REPORT # 84111210. INDICATIONS ON SHARP CORNERS  
CANNOT BE SCANNED WITH EDDY CURRENT DUE TO  
EDGE EFFECT. ALSO REPORT # 84110610, RABBIT AREA OF  
BEARING SHELLS.

#'S 2 & 8 CAM GALLERIES WERE VISUALLY INSPECTED  
PER MSS SP-55. I INSPECTED THESE AREAS PRE-  
VIOUSLY AND THERE IS NO APPARENT CHANGE. THERE  
ARE NO RELEVANT VISUAL INDICATIONS IN THESE  
AREAS.

PT INDICATIONS WERE NUMBERED ON THE PT DRAWINGS AS  
EY WERE CHECKED WITH EDDY CURRENT.

SIGNED

Brian Holcombe

DATE

11-13-84

REPLY:

SIGNED

DATE



TO: G LAURIE, NED

FROM: T. JOOS, QAD

CRACK DEPTH MEASUREMENTS: 1R43\*ENG-03 CAM GALLEY SADDLES

THIS FORM IS DESIGNED FOR HAND-WRITTEN MESSAGES

MESSAGE: On 10-18-84 CRACK DEPTH MEASUREMENTS WERE MADE IN THE  
#1 & #2 CAM GALLEY SADDLE FILLET AREAS USING THE TSI CRACK  
DEPTH INDICATOR MODEL CC-800B. THE MEASUREMENTS FOLLOWED  
A LIQUID PENETRANT EXAMINATION OF THESE AREAS BY QCD OCA  
AFTER THE REMOVAL OF THE STRAIN GAUGES AND THERMOCOUPLES.

THE CRACK DEPTHS MEASURED ARE SHOWN ON THE ATTACHED  
SKETCHES.

SIGNED



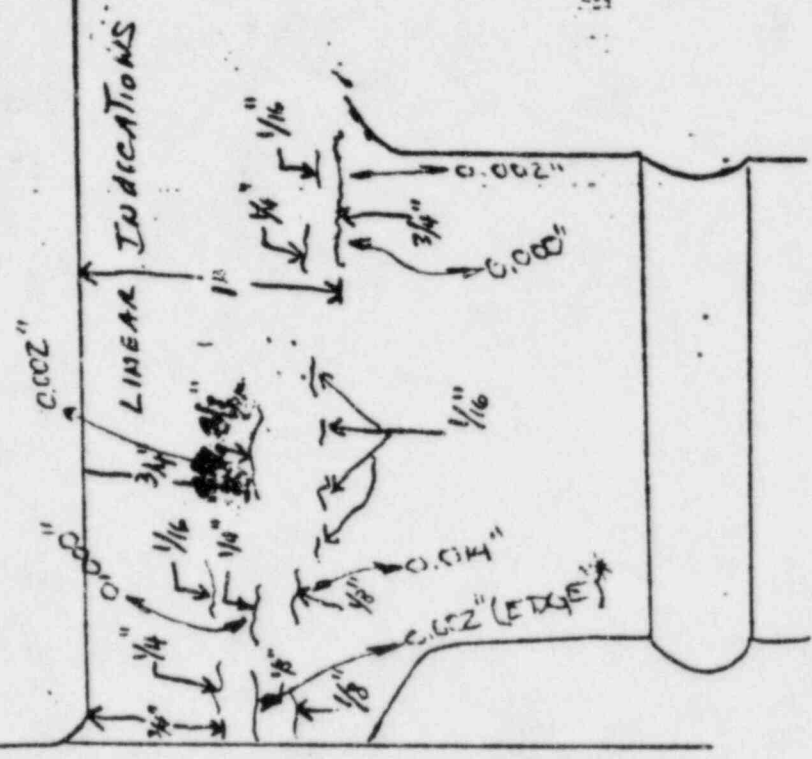
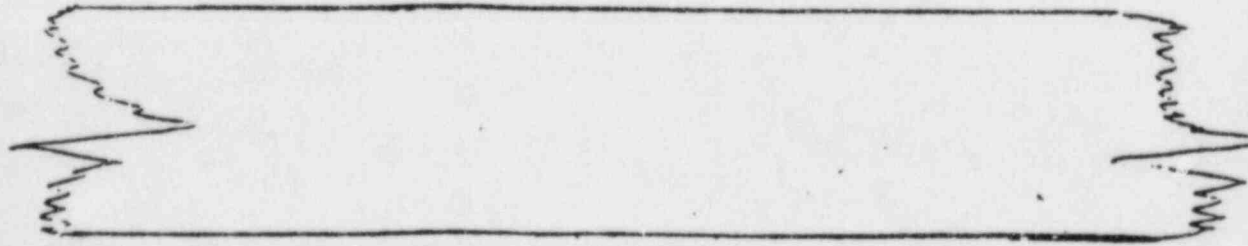
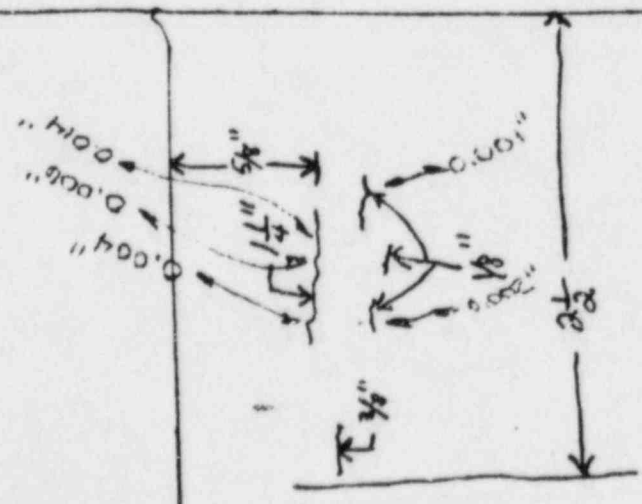
DATE 10-18-84

REPLY:

SIGNED

DATE

#2 CAM GALLEY  
 11/13/89-03



Inspector/Date 10-13-90

\* REF: GAL-1124 (REV. 0)



## PISTONS

Component Number 03-341A

### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, attachment P-1, require the following:

- 1) Visual inspection of pistons for scuffing, if scuffing is found on cylinder liners.
- 2) Record breakaway torques for crown to skirt attachment bolts.
- 3) Liquid penetrant inspection of piston skirt at the crown to skirt attachment bosses.
- 4) Evaluate recordable liquid penetrant indications with eddy current.
- 5) Visually inspect crown to skirt contact surfaces for signs of excessive or abnormal fretting.

Recording and acceptance criteria are as indicated in attachment P-1.

### II. Inspection Results

- 1) All 8 cylinder liners were visually inspected for scuffing. No scuffing was found.
- 2) Breakaway torques for crown to skirt attachment bolts revealed no degradation of original torque values.
- 3) Liquid penetrant tests of the piston skirt at the crown to skirt attachment bosses revealed no recordable indications.
- 4) No eddy current evaluations were required.
- 5) Visual inspections of crown to skirt contact areas for excessive and abnormal fretting reported minor, normal operational fretting in several small areas.

Copies of all inspection reports are provided in attachment P-2.

### III. Conclusion

All piston inspections required in accordance with SNRC-1094 and attachment P-1 were completed with satisfactory results. No relevant indications were found on the 32 skirt boss attachments of the 8 piston skirt assemblies by liquid penetrant tests. Therefore, no eddy current evaluations were requested or required. Review of breakaway torques for crown to skirt attachment bolts was satisfactory with no degradation of original bolt torquing found. No excessive or abnormal fretting was found as a result of endurance run testing, therefore, the results of this inspection were satisfactory.

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the pistons are acceptable for nuclear service. Further, the pistons have successfully completed confirmatory testing.



POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-341ACOMP. NAME PistonsTYPE OF INSPECTION:☒ LP      ☐ MT      ☒ ET      ☐ UT      ☒ VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

1) Match mark the piston to piston ring to cylinder liner orientation and perform inspection for scuffing if found on liners (see liner inspection) 2) Record breakaway torques for bolts attaching crown to skirt 3) Perform a liquid penetrant test of piston skirt at the bosses for bolt attachment to the crown 4) Perform an eddy current evaluation of all recordable linear indications found by liquid penetrant test. (5) Perform a visual inspection of the crown to skirt contact surfaces for excessive or abnormal fretting. 6) The above is required for all eight pistons.

RECORDING CRITERIA:

1. Inspector will document conditions found on applicable inspection report. Document with photographs.
- 1| 2. Record breakaway torques in accordance with NED direction.
- 1| 3. Map all linear indications on attach. 1 in accordance with NDE 6.2, document with photographs
4. Map all indications on attach. 2 in accordance with NDE 11.5
5. Inspector will document conditions found on applicable inspection report. Document with photographs.

ACCEPTANCE CRITERIA:

1. If evaluation of scuffing is required for acceptance, FaAA representative will provide evaluation on the inspection report. Excessive or abnormal scuffing is unacceptable.
2. For information only, no acceptance criteria required.
3. Linear indications recorded in accordance with NDE 6.2 may be evaluated by eddy current testing for acceptance.
4. Linear indications in accordance with NDE 11.5.
5. If evaluation of fretting is required for acceptance, FaAA representative will provide evaluation on the inspection report. Excessive or abnormal fretting is unacceptable.

REFERENCE DOCUMENTS:

1. CODES, STANDARDS
2. TDI O.G.
3. LILCO

ASME III NB 500, ASME V, ASME IX

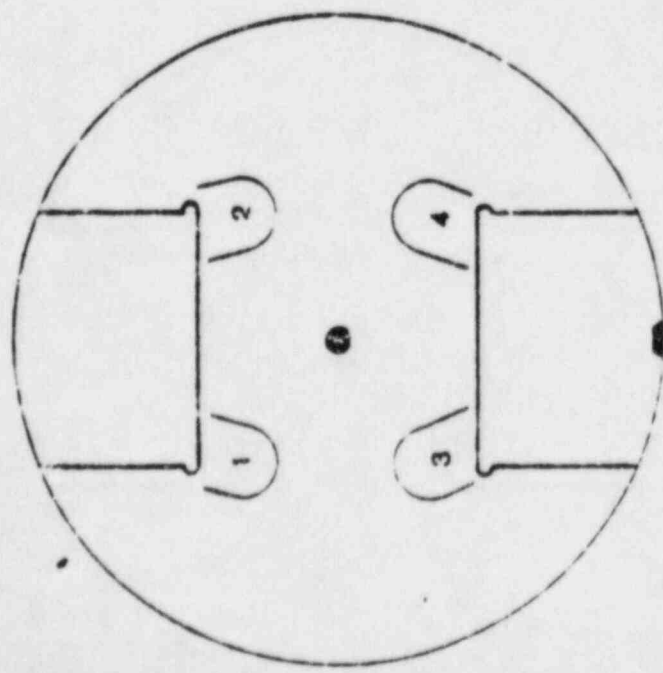
NDE 11.5, FaAA Report 84-5-18

NDE 6.1, 6.2

COMMENTS:

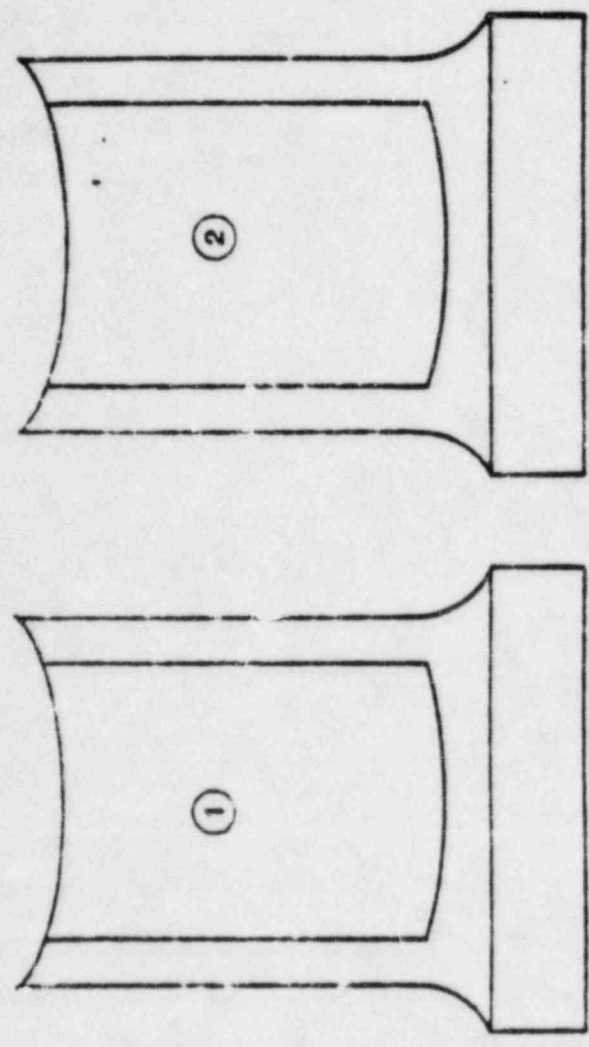
LIQUID TRANSPARENT TINT

Diesel engine # \_\_\_\_\_  
Piston # \_\_\_\_\_

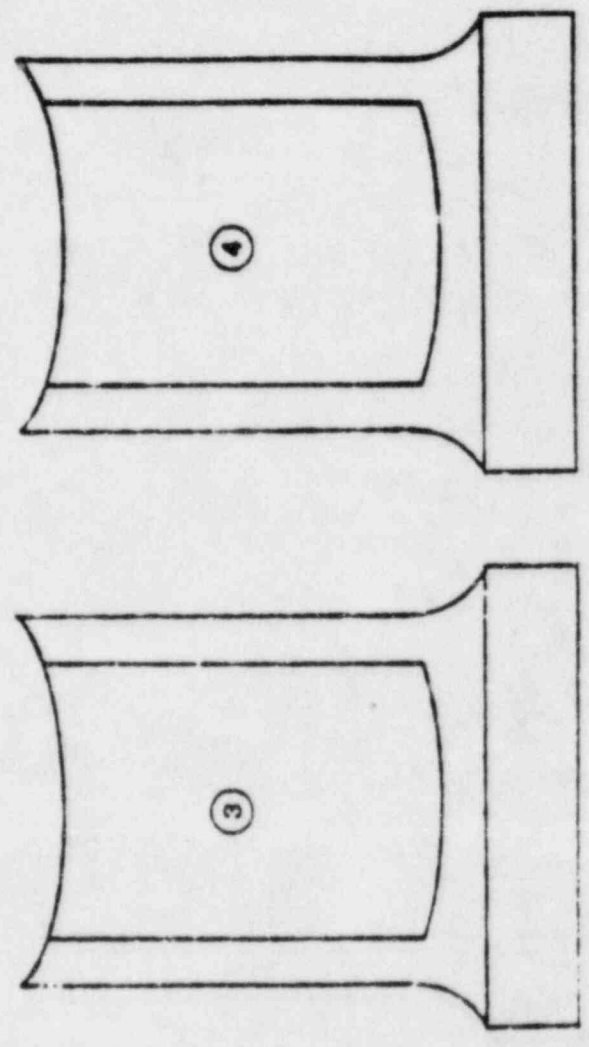


Notch side

Overhead view



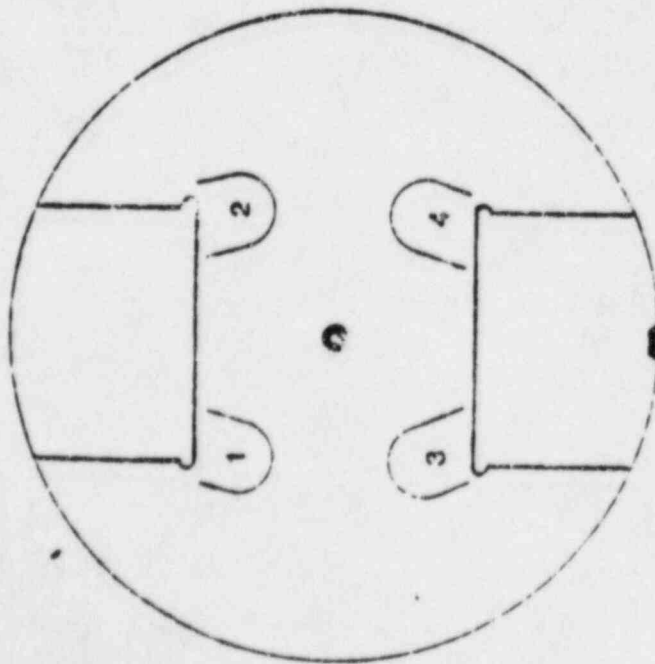
Side views, looking out from inside



Attach 1

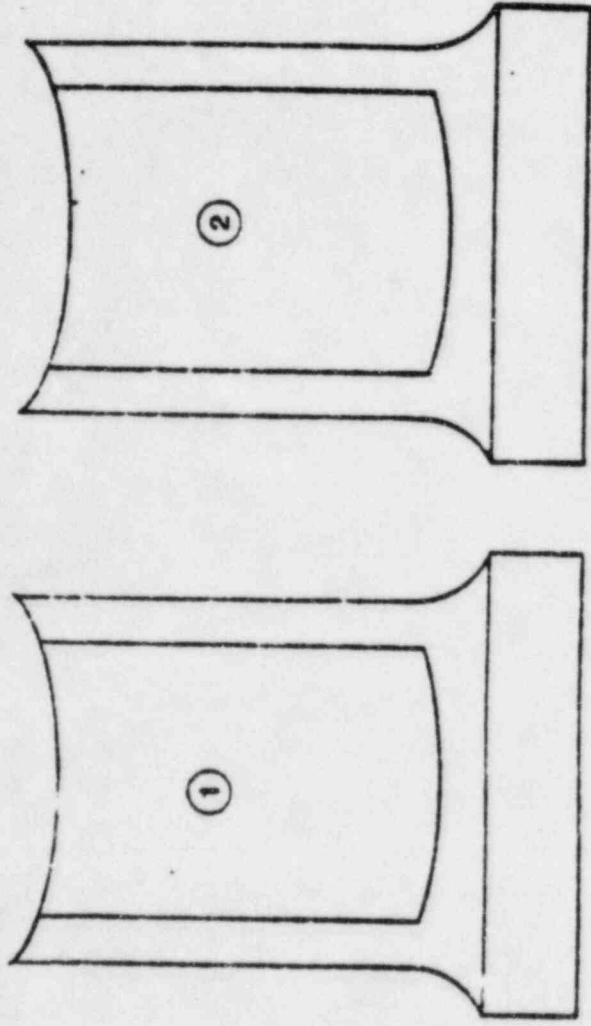
Diesel engine  $\blacklozenge$  \_\_\_\_\_

Piston  $\blacklozenge$  \_\_\_\_\_

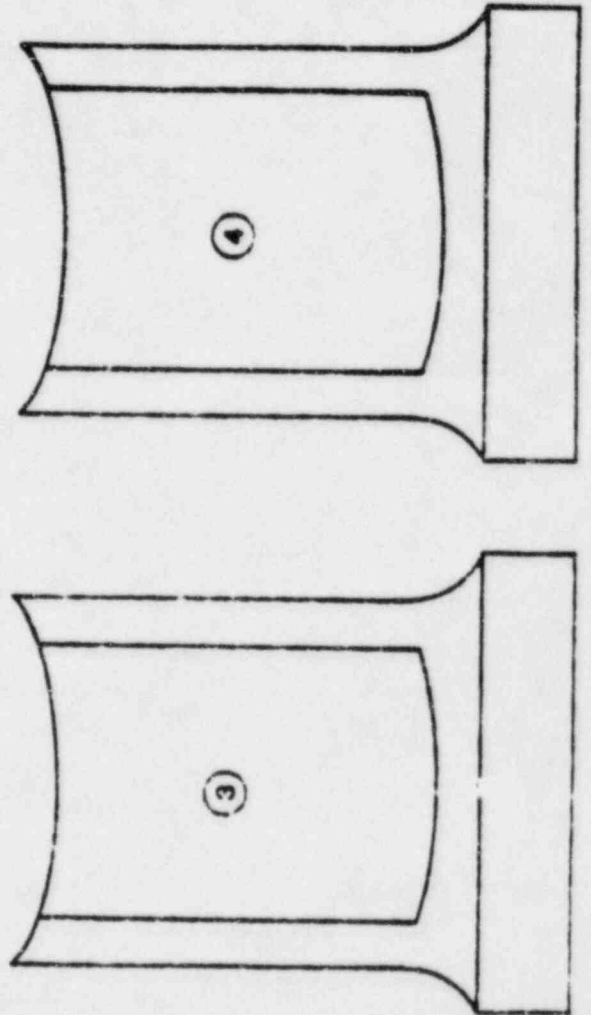


Notch side

Overhead view



Side views, looking out from inside



Attach 2

ATTACHMENT P-2



November 28, 2984

NPD-84-1062

A. Muller

NED Evaluation of Piston Inspections  
DG-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

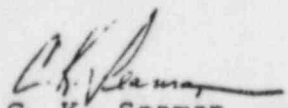
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the requirements of the confirmatory test as provided for in E&DCR F-46548 and appropriate revisions.

All inspection results are satisfactory. No LDR's are required or were generated as a result of these inspections.

The following consultant personnel concur with this evaluation:

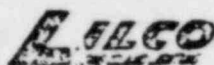
. FAA	Dr. L. Swanger
. FEV	Dr. F. C. Pischinger

  
C. K. Seaman  
Project Engineer

MS/tls

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger



V-4.0

## Operational Quality Assurance

## Visual Inspection Report - PISTONS

## TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:

System/Struct/Comp:

Organization

POST ENDURANCE RUN INSPECTION

1R43\* E-03

Responsible:

LSU

Procedure/Rev.:

Spec./Rev.

Drawing/Rev.:

Other: PISTON #

F-46548, A

SH1-089

TDI O.G. 03-341A

1

VISUAL INSPECTION DESCRIPTION  
(Check One)

SAT

UN-  
SAT

N/A

REFERENCES

REMARKS, VISUAL  
AIDS AND/OR NOTEREMOTE ☐DIRECT ☒

1 EXAMINATION AREA CLEANLINESS

2 SUFFICIENT LIGHTING

3 PISTONS

a. No excessive fretting at crown to skirt contact surfaces.

b. Skirt and ring wear patterns corresponding to liner scuffing indications. See liner V

Inspection Report V-3.0.

✓

✓

\* ✓

\* ✓

\* ✓

TDI O.G. No. 03-341A

Indications require

FaAA engineering

evaluation, note

indications with

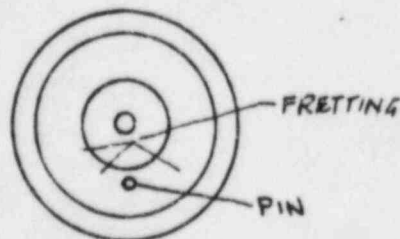
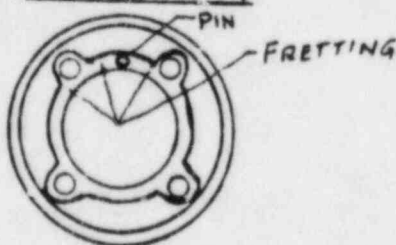
evaluation, FaAA

signature required.

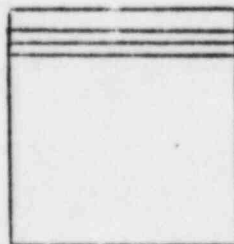
Photograph results

SKETCH OR DESCRIPTION OF EXAMINATION AREA

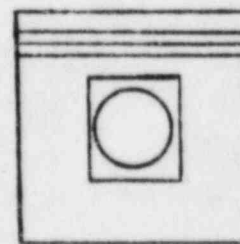
PISTON CROWN



SKIRT ASSY



VIEW



VIEW

Prepared by:

Date:

Approved for use:

Date:

William J. French

11/2/84

C.D. Tows

11/2/84

OQA Inspector:

Date:

OQAE Approval:

Date:

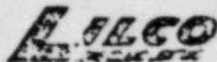
Alex Orishenko

11-8-84

D.C. Puth

11-3-84

Remarks: PHOTOS TAKEN OF CROWN & SKIRT CONTACT SURFACES  
NED TO EVALUATE - WAD-84-1062



V-4.0

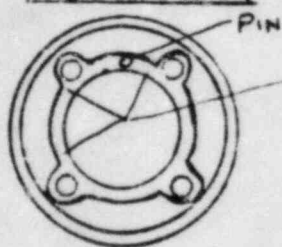
## Operational Quality Assurance

## Visual Inspection Report - PISTONS

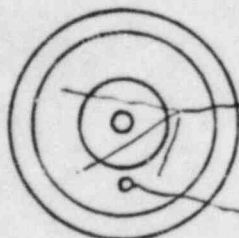
## TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1R43* E-03</b>		Organization Responsible: <b>LSU</b>	
Procedure/Rev.: <b>F-46548, A.</b> <b>TDI O.G. 03-341A</b>		Spec./Rev.: <b>SHI-089</b>		Drawing/Rev.: <b>Piston # 2</b>	
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES
1 EXAMINATION AREA CLEANLINESS		✓			
2 SUFFICIENT LIGHTING		✓			
3 PISTONS		*✓			TDI O.G. No. 03-341A
a. No excessive fretting at crown to skirt contact surfaces.		*✓			Indications require Photograph results
b. Skirt and ring wear patterns corresponding to liner scuffing indications. See liner V		*✓			FaAA engineering evaluation, note indications with evaluation, FaAA
Inspection Report V-3.0.					signature required.

## SKETCH OR DESCRIPTION OF EXAMINATION AREA

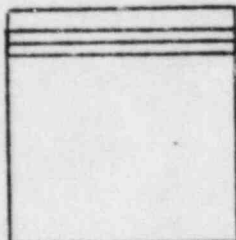
PISTON CROWN

FRETTING

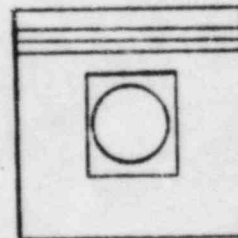


FRETTING

PIN

SKIRT ASSY

VIEW



VIEW

Prepared by:

*William J. French*

Date:

11/2/84

Approved for use:

*C.D. Thomas*

Date:

11/2/84

OQA Inspector:

*Alex Orishenko*

Date:

11-8-84

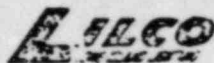
OQAE Approval:

*D. C. P.*

Date:

11/30/84

Remarks: PHOTOS TAKEN OF CROWN & SKIRT CONTACT SURFACES  
NED TO EVALUATE \*KPO-84-1062



V-4.0

## Operational Quality Assurance

## Visual Inspection Report - PISTONS

## TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:

System/Struct/Comp:

Organization  
Responsible:

POST ENDURANCE RUN INSPECTION

1R43\* E-03

LSU

Procedure/Rev.:

Spec./Rev.

Drawing/Rev.:

Other: PISTON #  
3

F-46548, A

SHI-089

TDI O.G. 03-341A

VISUAL INSPECTION DESCRIPTION  
(Check One)  
REMOTE ☐ DIRECT ☒

SAT

UN-  
SAT

N/A

REFERENCES

REMARKS, VISUAL  
AIDS AND/OR NOTE

1 EXAMINATION AREA CLEANLINESS

2 SUFFICIENT LIGHTING

3 PISTONS

a. No excessive fretting at crown to  
skirt contact surfaces.b. Skirt and ring wear patterns  
corresponding to liner scuffing  
indications. See liner V

Inspection Report V-3.0.

✓

✓

\*✓

\*✓

\*✓

TDI O.G. No. 03-341A

Indications require Photograph results

FaAA engineering

evaluation, note

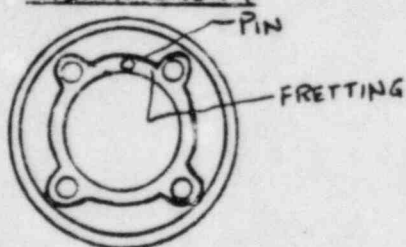
indications with

evaluation, FaAA

signature required.

## SKETCH OR DESCRIPTION OF EXAMINATION AREA

PISTON CROWN

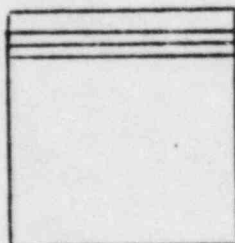


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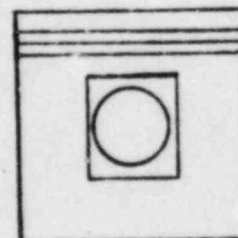
FRETTING

PIN

SKIRT ASSY



VIEW



VIEW

Prepared by:

Date:

Approved for use:

Date:

William J. French

11/2/84

C.D. Tows

11/2/84

OQA Inspector:

Date:

OQAE Approval:

Date:

Alex Dushenko

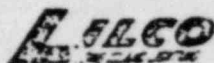
11-8-84

C.D. Tows

11/30/84

Remarks: PHOTOS TAKEN OF CROWN & SKIRT CONTACT SURFACES  
NED TO EVALUATE \*KAPD-84-1062





V-4.0

## Operational Quality Assurance

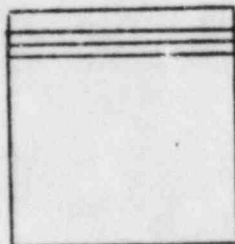
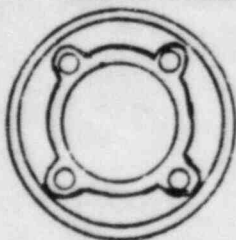
## Visual Inspection Report - PISTONS

## TDI EDG POST ENDURANCE RUN INSPECTION

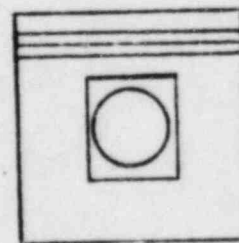
Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1R43* E-03</b>	Organization Responsible: <b>LSU</b>
Procedure/Rev.: <b>F-46548, A</b> <b>TDI O.G. 03-341A</b>	Spec./Rev.: <b>SHI-089</b>	Drawing/Rev.:	Other: <b>PISTON # 4</b>

VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1	EXAMINATION AREA CLEANLINESS	✓				
2	SUFFICIENT LIGHTING	✓				
3	PISTONS	*✓			TDI O.G. No.03-341A	
a.	No excessive fretting at crown to skirt contact surfaces.	*✓			Indications require	Photograph results
b.	Skirt and ring wear patterns corresponding to liner scuffing indications. See liner V	*✓			FaAA engineering evaluation, note indications with evaluation, FaAA	
	Inspection Report V-3.0.				signature required.	

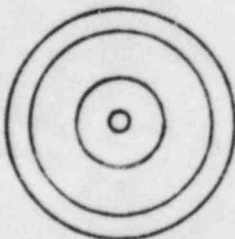
## SKETCH OR DESCRIPTION OF EXAMINATION AREA

PISTON CROWN

VIEW

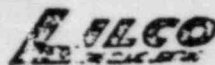


VIEW

SKIRT ASSY

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Tows</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>Alex Brishenko</b>	Date: <b>11-8-84</b>	OQAE Approval: <b>C.C. Peth</b>	Date: <b>11/30/84</b>
Remarks: <b>NO FRETTING INDICATIONS NOTED *NFD-84-1062</b>			





V-4.0

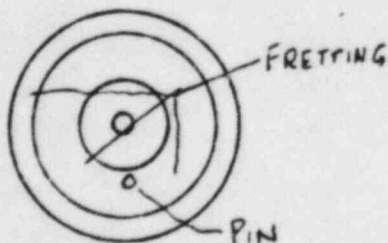
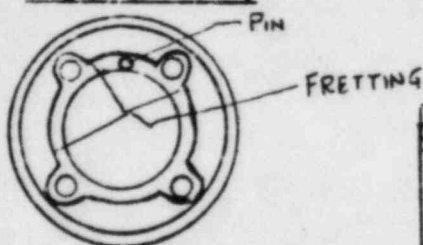
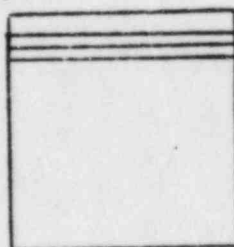
## Operational Quality Assurance

## Visual Inspection Report - PISTONS

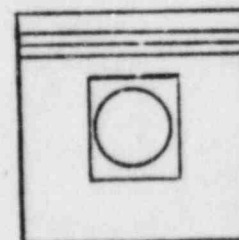
## TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1R43* E-03</b>		Organization Responsible: <b>LSU</b>		
Procedure/Rev.: <b>F-46548, A.</b>	Spec./Rev.: <b>SH1-089</b>	Drawing/Rev.:		Other: <b>PISTON # 5</b>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS		✓				
2 SUFFICIENT LIGHTING		✓				
3 PISTONS		*✓			TDI O.G. No. 03-341A	
a. No excessive fretting at crown to skirt contact surfaces.		*✓			Indications require	Photograph results
b. Skirt and ring wear patterns corresponding to liner scuffing indications. See liner V		*✓			FaAA engineering evaluation, note	
Inspection Report V-3.0.					indications with evaluation, FaAA	
					signature required.	

## SKETCH OR DESCRIPTION OF EXAMINATION AREA

PISTON CROWNSKIRT ASSY

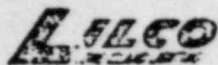
VIEW



VIEW

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Tams</b>	Date: <b>11/2/84</b>
QA Inspector: <b>Alex Orishenko</b>	Date: <b>11-8-84</b>	OQAE Approval: <b>S. C. P.</b>	Date: <b>11/30/84</b>

Remarks: PHOTOS TAKEN OF CROWN & SKIRT CONTACT SURFACES  
NED TO EVALUATE \*N.P. - 84-1062



V-4.0

## Operational Quality Assurance

## Visual Inspection Report - PISTONS

## TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:

System/Struct/Comp:

Organization  
Responsible:

POST ENDURANCE RUN INSPECTION

1R43\*E-03

LSU

Procedure/Rev.:

Spec./Rev.

Drawing/Rev.:

Other: PISTON #  
6

F-46548, A.

SH1-089

TDI O.G. 03-341A

VISUAL INSPECTION DESCRIPTION  
(Check One)REMOTE ☐DIRECT ☒

SAT

UN-  
SAT

N/A

REFERENCES

REMARKS, VISUAL  
AIDS AND/OR NOTE

1 EXAMINATION AREA CLEANLINESS

☒

2 SUFFICIENT LIGHTING

☒

3 PISTONS

☒

TDI O.G. No. 03-341A

a. No excessive fretting at crown to  
skirt contact surfaces.☒

Indications require Photograph results

b. Skirt and ring wear patterns  
corresponding to liner scuffing  
indications. See liner V☒

FaAA engineering

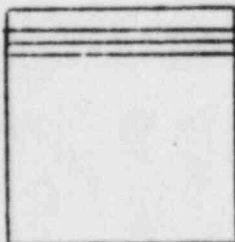
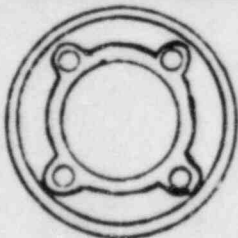
evaluation, note

indications with

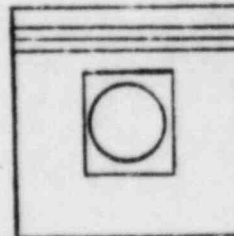
evaluation, FaAA

signature required.

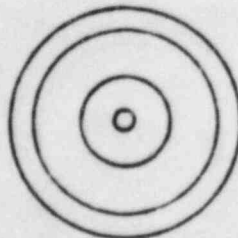
SKETCH OR DESCRIPTION OF EXAMINATION AREA

PISTON CROWN

VIEW



VIEW

SKIRT ASSY

Prepared by:

Date:

Approved for use:

Date:

William J. French

11/2/84

C.D. Toms

11/2/84

QA Inspector:

Date:

OQAE Approval:

Date:

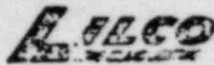
Alex Orishenko

11-8-84

A. P. P.

11/2/84

Remarks: No FRETTEING INDICATIONS NOTED - 11-8-84-1062



V-4.0

## Operational Quality Assurance

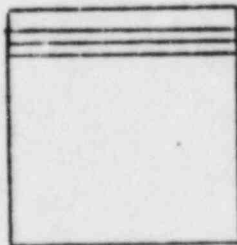
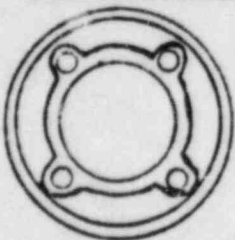
## Visual Inspection Report - PISTONS

## TDI EDG POST ENDURANCE RUN INSPECTION

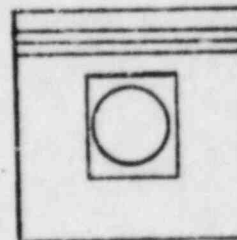
Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1R43* E-03</b>	Organization Responsible: <b>LSU</b>
Procedure/Rev.: <b>F-46548, A</b> <b>TDI O.G. 03-341A</b>	Spec./Rev.: <b>SH1-089</b>	Drawing/Rev.:	Other: <b>PISTON # 7</b>

VISUAL INSPECTION DESCRIPTION (Check One)		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
REMOTE <input type="checkbox"/>	DIRECT <input checked="" type="checkbox"/>					
1	EXAMINATION AREA CLEANLINESS	✓				
2	SUFFICIENT LIGHTING	✓				
3	PISTONS	* ✓			TDI O.G. No. 03-341A	
a.	No excessive fretting at crown to skirt contact surfaces.	* ✓			Indications require	Photograph results
b.	Skirt and ring wear patterns corresponding to liner scuffing indications. See liner V	* ✓			FaAA engineering evaluation, note indications with evaluation, FaAA	
	Inspection Report V-3.0.				signature required.	

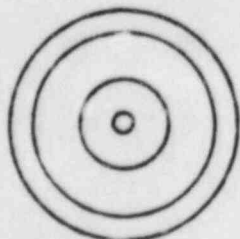
## SKETCH OR DESCRIPTION OF EXAMINATION AREA

PISTON CROWN

VIEW

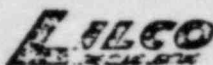


VIEW

SKIRT ASSY

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Tows</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>Alex Quisheuko</b>	Date: <b>11-8-84</b>	OQAE Approval: <b>A.C. P...</b>	Date: <b>11/3/84</b>
Remarks: <b>NO FRETTING INDICATIONS NOTED. *NFD-84-1062</b>			





V-4.0

## Operational Quality Assurance

## Visual Inspection Report - PISTONS

## TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:

POST ENDURANCE RUN INSPECTION

System/Struct/Comp:

1R43\* E-03

Organization

Responsible:

LSU

Procedure/Rev.:

F-46548, A

Spec./Rev.

SHI-089

Drawing/Rev.:

Other: PISTON #

8

## VISUAL INSPECTION DESCRIPTION

(Check One)

REMOTE ☐DIRECT ☒

SAT

UN-SAT

N/A

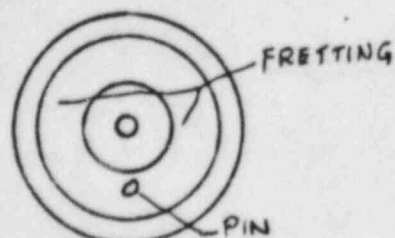
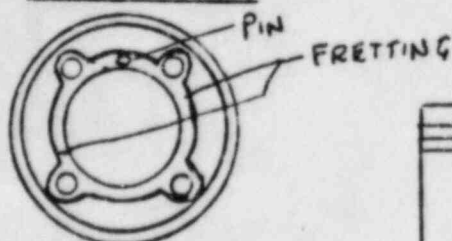
REFERENCES

REMARKS, VISUAL  
AIDS AND/OR NOTE

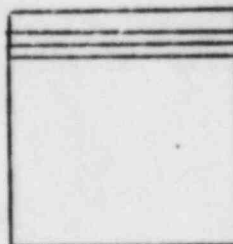
1	EXAMINATION AREA CLEANLINESS	✓				
2	SUFFICIENT LIGHTING	✓				
3	PISTONS	* ✓			TDI O.G. No. 03-341A	
a.	No excessive fretting at crown to skirt contact surfaces.	* ✓			Indications require	Photograph results
b.	Skirt and ring wear patterns corresponding to liner scuffing indications. See liner V	* ✓			FaAA engineering evaluation, note indications with evaluation, FaAA	
	Inspection Report V-3.0.				signature required.	

## SKETCH OR DESCRIPTION OF EXAMINATION AREA

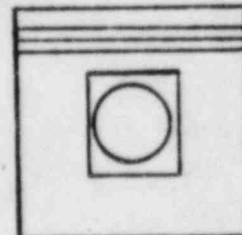
## PISTON CROWN



## SKIRT ASSY



VIEW



VIEW

Prepared by:

William J. French

Date:

11/2/84

Approved for use:

C.D. Toms

Date:

11/2/84

QA Inspector:

Alex Dushenko

Date:

11-8-84

OQAE Approval:

S.E. Pat

Date:

11/30/84

Remarks: PHOTOS TAKEN OF CROWN &amp; SKIRT CONTACT SURFACES.

NED TO EVALUATE \*NED-84-1062



## LIQUID PENETRANT EXAMINATION REPORT

COMPONENT I.D. Pistons  
IR43+EDG-103

SYSTEM IR43

PLANT/LOCATION EDG room-103

A. MATERIAL	TYPE <u>Steel</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
	GEOMETRY <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <u>Piston</u>		
CROSS SECTION THICKNESS	MAX <u>N/A</u> MIN	PIPE DIA. <u>N/A</u>	SURFACE CONDITION <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER

B. NDE PROCEDURE No. <u>6.2</u>	SURFACE/MAT'L. TEMP. <u>65°F</u>	MATE. NO. <u>365</u>	MWR/RR. No. <u>RR R43 2055</u>
---------------------------------	----------------------------------	----------------------	--------------------------------

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012
2. PENETRANT	Magnaflux	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	Magnaflux	SKC-NF/ZC-7B	84J012
4. DEVELOPER	Magnaflux	SKD-NF	82D111
5. POST EXAMINATION CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

Area examined. Piston skirt at base's for bolt attachment to crown

N

A

C. EVALUATION	REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.
---------------	--

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
Piston #1	N/A	N/A	Acceptable
1 Piston #2	N/A	N/A	Acceptable
Piston #3	N/A	N/A	Acceptable
2 Piston #4	N/A	N/A	Acceptable
Piston #5	N/A	N/A	Acceptable
3 Piston #6	N/A	N/A	Acceptable
Piston #7	N/A	N/A	Acceptable
4 Piston #8	N/A	N/A	Acceptable

D. ACCEPTANCE CRITERIA	NDE 6.2 para 4.2.2	OPERATOR <u>W. H. ...</u> Level <u>II</u> Date <u>11-8-84</u>
------------------------	--------------------	--

E. ATTEST	<u>Art ...</u> RESPONSIBLE CERTIFIED PERSONNEL	<u>II</u> LEVEL	<u>11-8-84</u> DATE
-----------	---	--------------------	------------------------



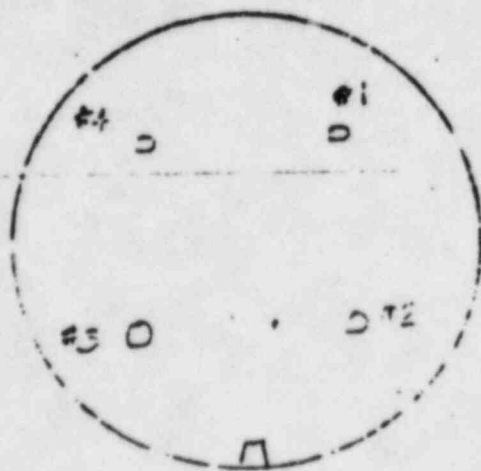
PISTON # ~~17~~ <sup>18A</sup> #1

CROWN TO SKIRT NOT EXCEEDING TORQUE

# NOTE! TORQUE MEASURED TO TIGHTEN  
BEFORE REMOVAL OF SKIRT AND  
ASSEMBLY

#4 160

190



#1 160

#2 175

332

4/30/88

TO: [illegible] FROM: [illegible]

Donald L. [illegible] 11/7/84

TE

ONE

Rich [illegible]

11/7/84

ODA

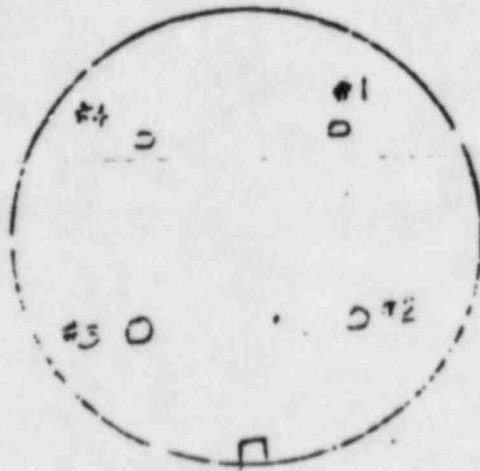
WT

PISTON # 2

CROWN TO SKIRT NUT BREAKING TORQUE

#4 150 F-1b

165 F-1b



#1 170 F-1b

#2 175 1b+1b

332

4/3/85

TO: DODGE 11-7-84

UL 11-7-84

Donald H. Schmitt

11/7/84

TE

UL

Vicki R. Schmitt

11/7/84

DDA

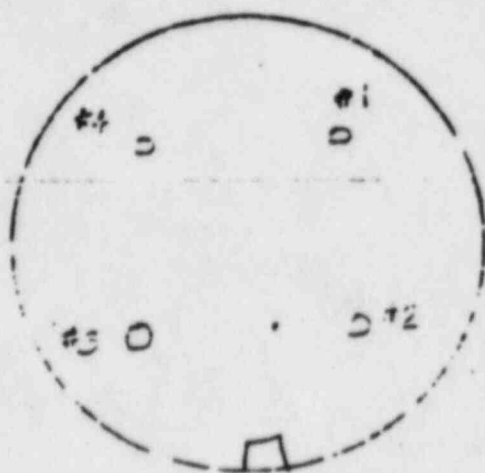
UL

PISTON # 3

CROWN TO SKIRT NUT BREAKING TORQUE

#4 175 Ft-lb

170 Ft-lb



#1 155 Ft-lb

#2 155 Ft-lb

332

~~330~~ AM

4/30/85

TO: WAVE NOTE

ON THE 15

Donald A. Schuch

11/7/84

TE

WAVE

ODP

Robert Perry

11/7/84

WAVE

PISTON # 4

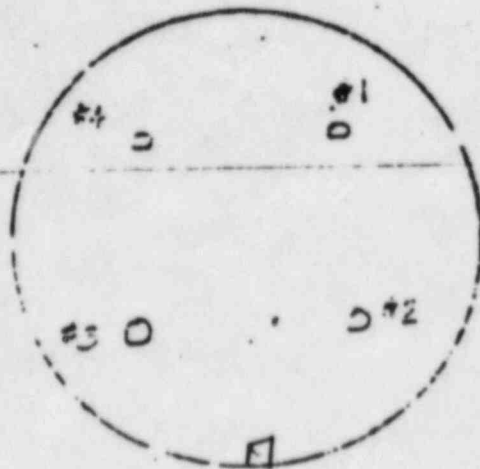
CROWN TO SKIRT NUT BREAKING TORQUE  
TORQUE HELD TO TIGHTEN NUT & STD ASSEMBLY

#4 170 DTL  
170 FT-lb

#1 180 FT-lb

170 FT-lb

#2 200 FT-lb



532-

4/30/85 DTL  
4/30/84

TO: LANCE HITE W CAL DATE 11/5

Donald H. Schuch 11/7/84  
TE LKE

John Perry 11/7/84  
ODA GT

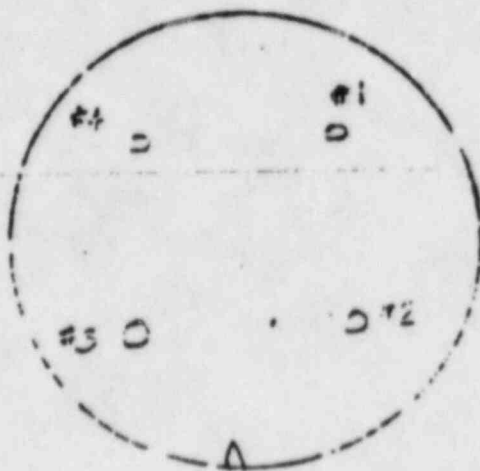
PISTON # 5

CROWN TO SKIRT NOT BREAKING TORQUE

NOTE:

#4 170 FT-lb

145N4  
145 FT-lb



#1 150 FT-lb

#2 200 FT-lb (GST)  
PIN STRENGTH

332 4/30/85  
TOD: WOOD NOTE W CUL FOR THE

Ronald H. Smith 11/7/84  
TE CKE

Vicki O'K 11/7/84  
ODA LKE

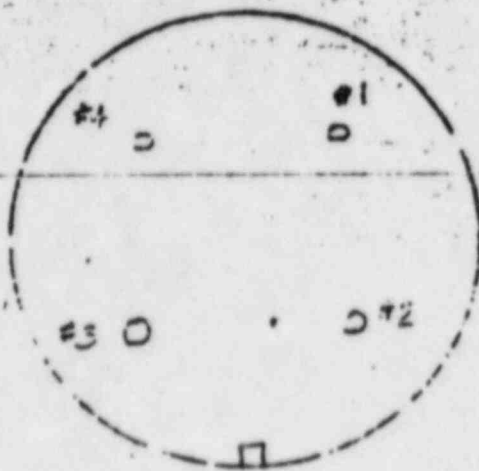


PISTON # 6

CROWN TO SKIRT NUT BREAKING TORQUE  
TORQUE MEASURED TO TIGHTEN NUT  
#5 NUT ASSEMBLY

#4 195 FT-LB

#5 160 FT-LB



#1 165 FT-LB

#2 160 FT-LB

332- 4/30/85  
TODAY: WORK: 11:00 AM - 5:00 PM

Donald H. Schuch 11/7/84  
TE YKE

Robert Cherry 11/7/84  
ODA LWT

PISTON # 7 DLS

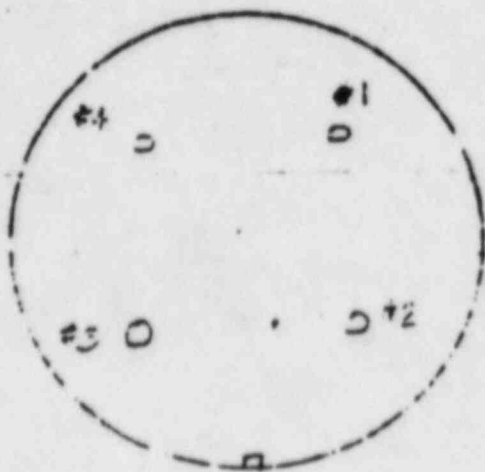
CROWN TO SKIRT NUT BREAKING TORQUE

\* NOTE: TORQUE TO TIGHTEN MEASUREMENT  
BEFORE REMOVING NUT & STUD ASSEMBLY

#4 125 FT-LB

170 FT-LB

190 FT-LB



#1 135 FT-LB

#2 160 FT-LB

332

4/30/85

TO: LIAISON 11/7/84

UL 11/7/84

Wendell R. Schmitt 11/7/84

TE

11/7/84

Rich B... 11/7/84

ODA

11/7/84

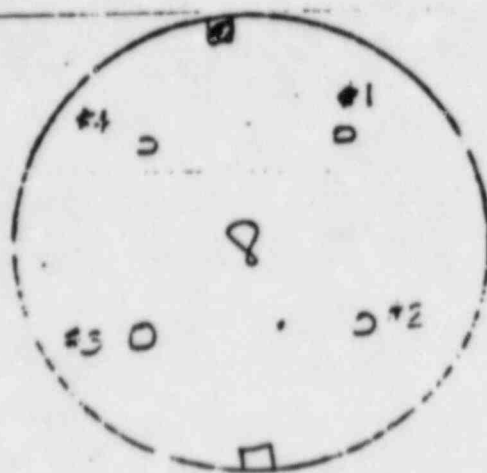
PISTON # 8

CROWN to SKIRT Nut BREAKING TORQUE

NOTE! TORQUE MEASUREMENT TO TIGHTEN

#4 200

200



#1 195

#2 180

332- 4/30/85  
TOTAL WORK HOURS CAL DATE HRS

Ronald L. Schmitt 11/7/84

TE

Paul Perry 11/7/84  
OQA

## CYLINDER HEADS

Component Number 03-360A

### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, attachment CH-1, the cylinder head settlement agreement titled "Resolution of Suffolk County Diesel Generator Contention Regarding Cylinder Heads" require:

- (a) Perform an ultrasonic inspection of the firedeck of all the cylinder heads at six locations to verify that the minimum thickness requirement of .400 inch is met. The six locations are specified as follows:
  1. The first location is on the firedeck between the exhaust gas ports approximately directly between the two exhaust gas ports.
  2. The second location is approximately 1½" from the first location in a direction toward the exhaust side of the cylinder head.
  3. The third location is approximately 2" from the first location in a direction toward the intake side of the cylinder head.
  4. The fourth location is approximately midway between the injector port and the exhaust port on the governor side of the head.
  5. The fifth location is approximately directly between the two intake gas ports.
  6. The sixth location is approximately midway between the injector and exhaust port on the flywheel side of the head.
- (b) Perform surface inspection (either liquid penetrant or magnetic particle) of intake and exhaust valve seats and the firedeck area between the exhaust valves to verify that they are free of unacceptable surface defects.
- (c) Inspect the heads to determine if any heads have through-wall weld repairs of the firedeck where the repair is performed from one side only.

Recording and acceptance criteria are as indicated attachment CH-1.

### II. Inspection Results

All cylinder heads were ultrasonic inspected and the minimum firedeck thickness of .400 inch was verified with satisfactory results. Cylinder head G-52-309J inspection results are included in NRC Report Inspection No. 50-322/83-25.

All cylinder heads, after minor surface clean up and evaluation in accordance with Acceptance Criteria as specified in ASME III, paragraph NB-5350, were found acceptable.

Cylinder head H-60 was found to have an injector plug weld repair and was replaced. The remaining cylinder heads were inspected for through wall weld repairs with satisfactory results.

Copies of inspection reports are provided in attachment CH-2.

### III. Conclusion

All the cylinder heads successfully passed the confirmatory tests including post test inspection requirements for liquid penetrant and ultrasonic testing as indicated in attachment CH-1.

One head (H-60) was replaced due to the weld repair noted above, although this head performed satisfactorily during the endurance run confirmatory test. As noted previously, this head was also confirmed to be performing satisfactorily by the post-test IP examination.

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the cylinder heads are acceptable for nuclear service. Further, the cylinder heads have successfully completed confirmatory testing.



POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-360ACOMP. NAME Cylinder HeadsTYPE OF INSPECTION:☒ LP      or      ☒ MT      ☐ ET      ☒ UTAREA TO BE EXAMINED/EXAMINATION DETAILS:

- 1) Perform an ultrasonic inspection, or verify through documentation that ultrasonic inspection has been performed, of the firedeck of all the cylinder heads at six locations to verify that the minimum thickness requirement of .400 inch is met. The six locations are specified as follows:
  - a. The first location is on the firedeck between the exhaust gas ports approximately directly between the two exhaust gas ports.
  - b. The second location is approximately 1½" from the first location in a direction toward the exhaust side of the cylinder head.
  - c. The third location is approximately 2" from the first location in a direction toward the intake side of the cylinder head.
  - d. The fourth location is approximately midway between the injector port and the exhaust port on the governor side of the head.
  - e. The fifth location is approximately directly between the two intake gas ports.
  - f. The sixth location is approximately midway between the injector and exhaust port on the flywheel side of the head.

Ultrasonic testing can be performed prior to completion of the 740 hour endurance run.

2. Perform surface inspection (either liquid penetrant or magnetic particle) of intake and exhaust valve seats and the firedeck area between the exhaust valves to verify they are free of unacceptable surface defects. Ref. E&DCR F-45089G
3. Visually inspect heads to determine if any heads have through wall weld repairs of the firedeck where the repair is performed from one side only.

RECORDING CRITERIA:

1. Record thickness at the above six locations.
2. In accordance with NDE 6.2 and E&DCR F-45089G.
3. Heads found with repairs as indicated above will be noted.

ACCEPTANCE CRITERIA:

1. UT reading of less than .400 inch are unacceptable (TDI documentation may not be used for this evaluation unless witnessed and documented by an independent agency i.e. S&W, LILCO, NRC).
2. In accordance with NDE 6.2 and F-45089G
3. Heads with through wall weld repairs of the firedeck where the repair is performed from one side only are unacceptable.

REFERENCE DOCUMENTS:

- |                     |                                   |
|---------------------|-----------------------------------|
| 1. CODES, STANDARDS | <u>ASME III N3 5350, 5351</u>     |
| 2. TDI O.G.         |                                   |
| 3. LILCO            | <u>NDE 6.2, F-45089G, NDE 8.2</u> |

COMMENTS:

ATTACHMENT CH-2

November 29, 1984

NPD-84-1064

A. Muller

NED Evaluation of Cylinder Head Inspections  
DG103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

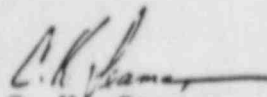
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the requirements of the confirmatory test as provided for in E&DCR F-46548D and E&DCR F-45089G.

#4 cylinder head Serial #H-60 has an Injector Bore Plug Weld. This condition is dispositioned on LDR # 2541.

The following consultant personnel concur with this evaluation:

. FAA Dr. L. Swanger  
. FAA L. Bisbee

  
C. K. Seaman  
Project Engineer

MS/tls

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger  
L. Bisbee



Station Operational Quality Assurance

VERIFICATION REPORT

File: 1A11.920-

Activity Verified:

Responsible Group:

Syst/Struct/Comp:

A/R R43-2055 SUPP#6

LSU

IR43\*606103 CYLINDER HEADS

Reference Procedure/No.

LIR 2541

Reference Spec/No./Addendum/Date

SHI-089

Reference Drawing/Revision

N/A

Verification Description:

A VISUAL INSPECTION WAS PERFORMED ON  
CYLINDER HEADS H32 CYL\*1, H66 CYL\*2, G50 CYL\*3  
H50 CYL\*5, G4 CYL\*6, G42 CYL\*7, AND G52 CYL\*8  
THERE WAS NO EVIDENCE OF INJECTOR BORE  
PLUG WELD REPAIR ON THE ABOVE STATE  
CYLINDER HEADS

Preparer/OQA

Date

OQAE

Date





## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 2

A. MATERIAL		TYPE	FABRICATED PROCESS	
		C/S	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED	
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <i>CYL. HEAD</i>	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
	N/A	N/A		
B. NDE PROCEDURE No. <u>6.2</u>		SURFACE/MAT'L. TEMP. <u>73°F</u>		MATE. NO. <u>3C5</u> MWR/RR. No. <u>R43-2055</u>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
2. PENETRANT		MAGNAFLUX	SKL-HF/S	48G018
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
4. DEVELOPER		MAGNAFLUX	SKD-NF	82D111
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>SEE ATTACHED Page 2 of 2</i>				
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.		
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)	
①	1/8"	Porosity	NON RELEVANT, ACCEPTED	
②	N/A	Porosity	SCATTERED Porosity Nonrelevant	
3				
4				
D. ACCEPTANCE CRITERIA	R43-2055 ASME SECTION III, NB 5350, 1983 EDITION		OPERATOR <u>VICTOR PLATANIA</u> Level <u>II</u> Date <u>11/8/84</u>	
E. ATTEST	<u>[Signature]</u> RESPONSIBLE CERTIFIED PERSONNEL		<u>II</u> <u>11/8/84</u> LEVEL DATE	

COMPONENT I.D.  
18434 ENG-103 #1 CYL HEAD (H-32)SYSTEM  
1843PLANT/LOCATION  
63 Turbine Deck / 5013-1

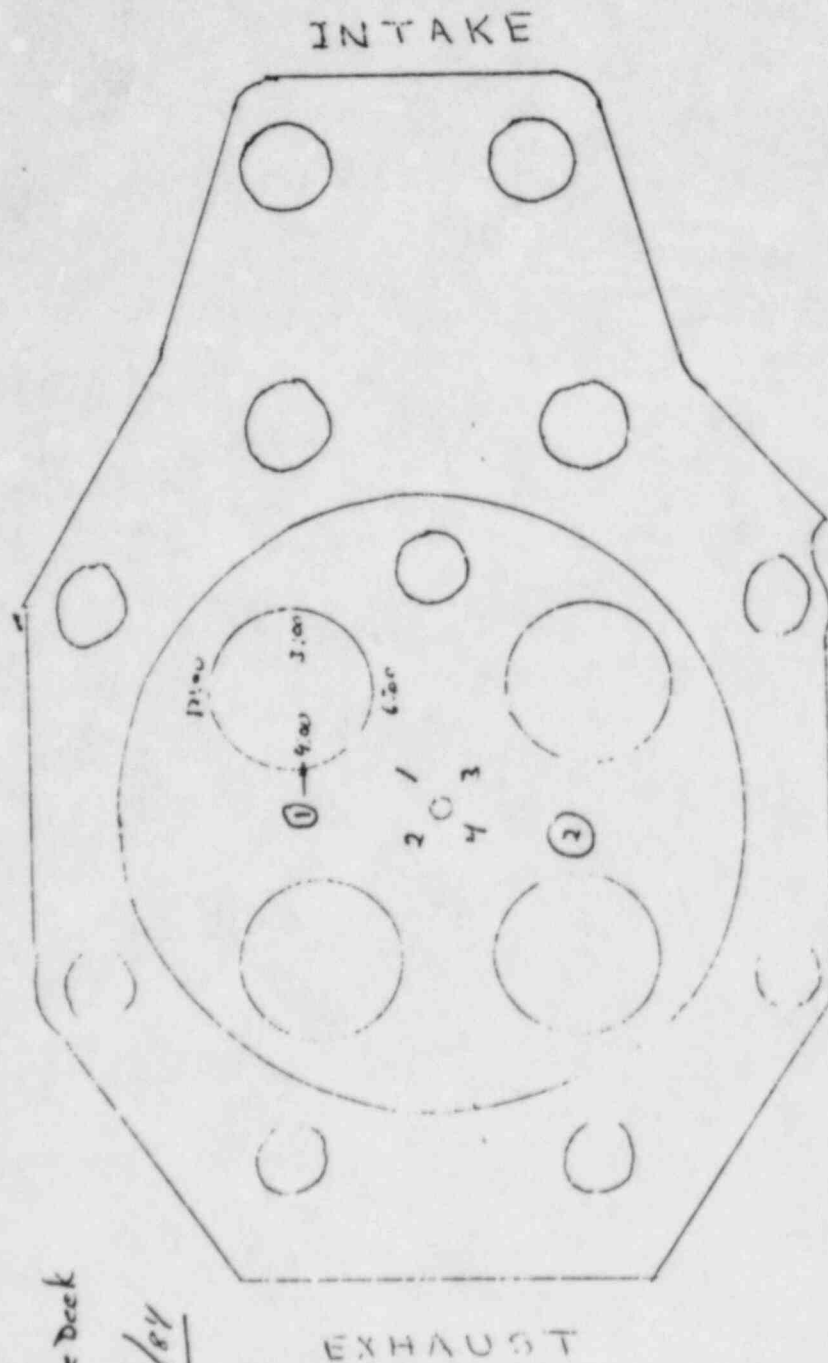
#1 CY Hens/H-32

TEMP 73° F  
10 min Dwell Time-Penetrant  
7 min Dwell Time-Developer

INDICATIONS: No Relevant Indications

- ① Porosity in Area of 1/8"
- ② Scattered Porosity in Fire Deck

Victor C. Hens 11/1/84





## LIQUID PENETRANT EXAMINATION REPORT

PAGE 1 OF 3

A. MATERIAL		TYPE STEEL CAST WITH STELLITE CLEADING	FABRICATED PROCESS	<input checked="" type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER: CYL. HEAD
No. 6.1 & 6.2		N/A	TEMP. 70°F	MATE. NO. 365 MWR/RR. No. RR 843-2055		
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.		
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/2C-7B	84J012		
2. PENETRANT		MAGNAFLUX	SKL-HF/S	836018		
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-NF/2C-7B	84J012		
4. DEVELOPER		MAGNAFLUX	SKD-NF	P2D111		
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/2C-7B	84J012		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY SEE ATTACHED SKETCH INSPECTED COUNTERBORE AREA OF VALVE SEATS #11 & #22 AS INDICATED ON SKETCH, FOR CYLINDER #2, 5/8 H-66						
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.				
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)			
CYL #2 2 VALVES 11 & 22	SEE ATTACHMENT	LINEARS	ACCEPT (NON-RELEVANT)			
2						
3						
4						
D. ACCEPTANCE CRITERIA	ASME SECTION III NB-5350		OPERATOR <u>Art Puma</u> Level <u>PT II</u> Date <u>11-16-84</u>			
E. ATTEST	<u>Michael T. Walcott</u> RESPONSIBLE CERTIFIED PERSONNEL		<u>III</u> LEVEL		<u>11/16/84</u> DATE	

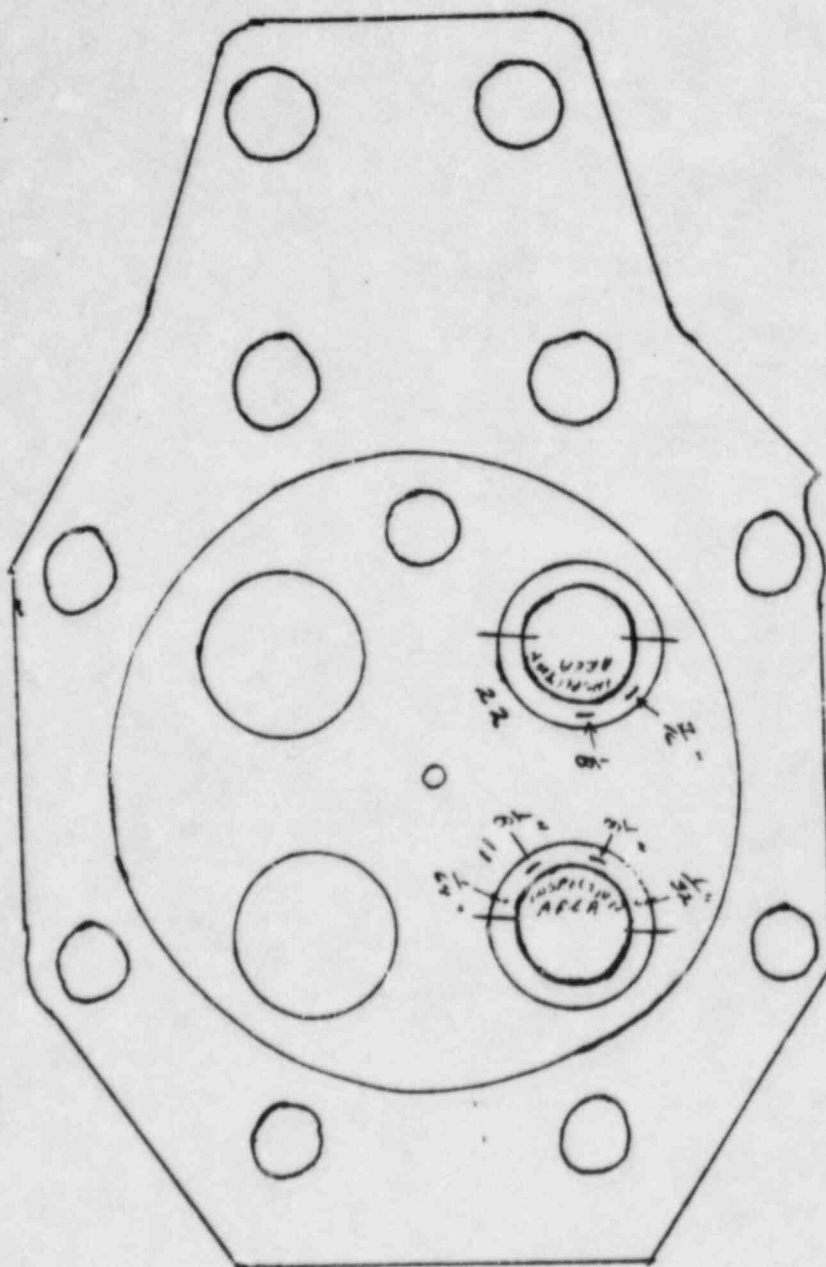
PT  
1 R43 + EDG 03  
COMPONENT I.D.  
CYLINDER HEAD  
VALVE SEATS  
SYSTEM  
1 R43EDG 103  
PLANT/LOCATION

CYLINDER HEAD # 2

PAGE 2 OF 3

EDG 103

INTAKE



EXHAUST

Michael P. Wateroff PT C-III

11/10/84

Evaluation of indications on  
Cylinder Head #2

PAGE 3 of 3

On 11/16/84 I witnessed a liquid penetrant examination of valve seats No.'s 22 + 11, Cyl # 2 on EDG. 103. The inspection area consists of a cast head with stellite cladding on the counterbore and seating area.

The inspection revealed the presence of several linear and rounded indications at the stellite to casting interface. These indications were evaluated in accordance with ASME section III, NB 5350. The indications were found to be acceptable as per NB 5351(a) and NB 5352(a).

Michael P. Walcott PTL-III

11/16/84





## LIQUID PENETRANT EXAMINATION REPORT

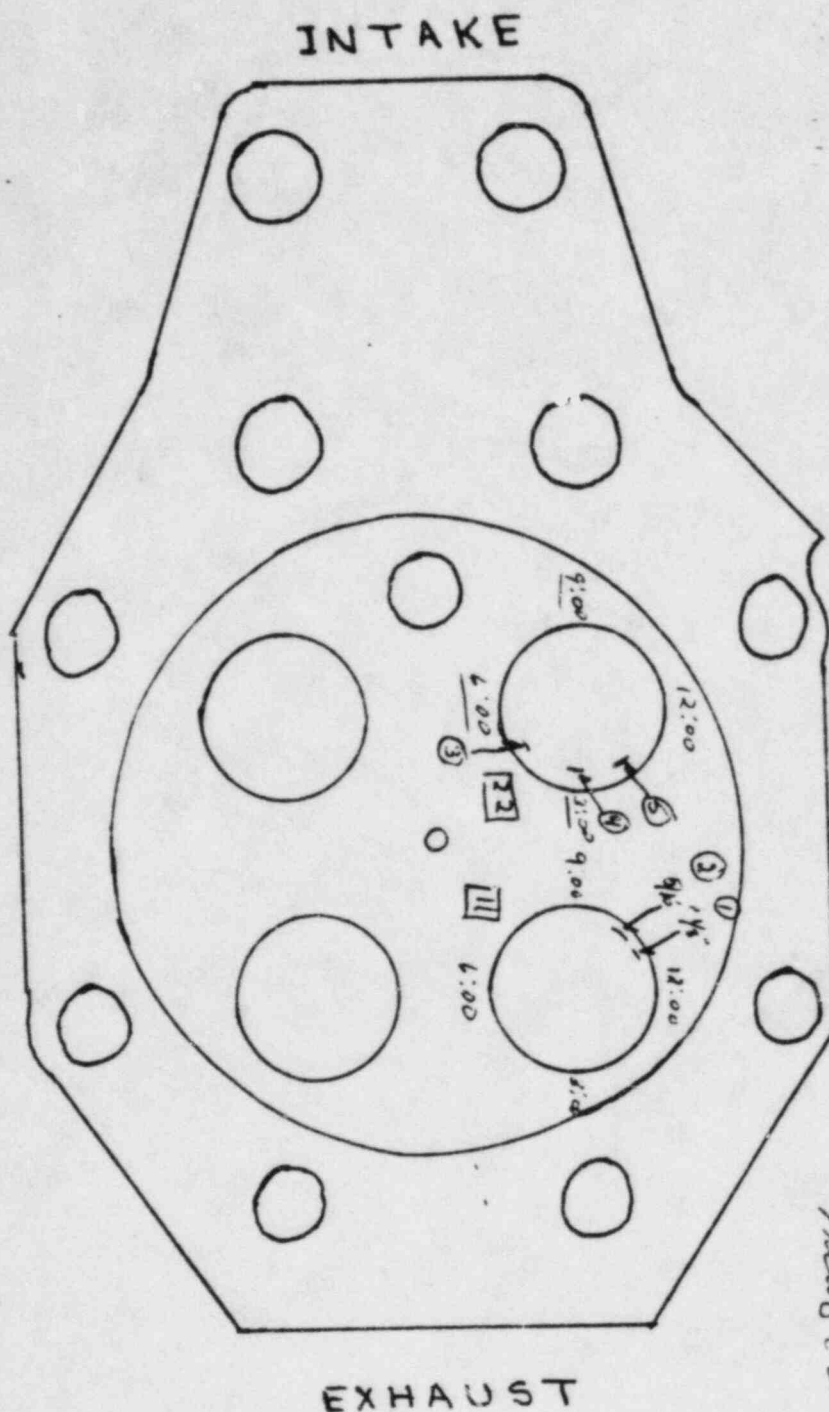
Pg 1 of 2

A. MATERIAL		TYPE	FABRICATED PROCESS	
		CS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED	
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: 97.5	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	
	N/A	N/A	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND	
			<input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER	
B. NDE PROCEDURE No. 6.2		SURFACE/MAT'L. TEMP. 74°F		M&TE. NO. 365
				MWR/RR. No. R-15-2055
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
2. PENETRANT		MAGNAFLUX	SKL-HF/S	83-G018
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
4. DEVELOPER		MAGNAFLUX	SKD-NF	82 D111
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY				
This is the results of LP Inspections After <sup>surface Prep of</sup> <del>removal</del> cyl. head valve sent Arcus. See ATTACHED Sketch Page 2 of 2 For Details.				
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.		
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)	
① VALVE SEAT	① 1/8" Liner	Liner	REJECTABLE AS Per NB 5350	
② EXHAUST VALVE SEAT	② 5/16"	Liner	REJECTABLE AS Per NB 5350	
③ INTAKE	1/16"	Liner	ACCEPTABLE AS Per NB 5350	
④	1/8"	Liner	REJECTABLE AS Per NB 5350	
⑤	3/32"	Liner	REJECTABLE AS Per NB 5350	
D. ACCEPTANCE CRITERIA	ASME SECTION III NB 5350 1983 EDITION		OPERATOR Victor Platanin	
			Level II Date 11/13/84	
E. ATTEST	[Signature]		II 11/13/84	
	RESPONSIBLE CERTIFIED PERSONNEL		LEVEL DATE	

COMPONENT I.D.

SYSTEM

PLANT/LOCATION



Handwritten signature and date: 11/13/84

- ① 1/8" Linear
- ② 5/16" Linear
- ③ 1/4" Linear
- ④ 1/8" Linear
- ⑤ 3/16" Linear

#2 cyl. Head (HCC)



## LIQUID PENETRANT EXAMINATION REPORT

Pg. 1 of 2

A. MATERIAL		TYPE <u>C/S</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>CY-HEAD</u>
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
				<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>6.2</u>	SURFACE/MAT'L. TEMP. <u>73°F</u>	M&TE. NO. <u>365</u>	MWR/RR. No. <u>R43-2055</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	84J012
2. PENETRANT	MAGNAFLUX	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/ZC-7B	84J012
4. DEVELOPER	MAGNAFLUX	SKP-NF	82/111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

See Attached Page 2 of 2

C. EVALUATION	REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.
---------------	--

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
①	3/8"	Linear	REJECTABLE as per NB-5350
②	1/4" & 1/8"	Linear	REJECTABLE as per NB-5350
INDICATION ⑦	Area of 3"	intermittent linear	REJECTABLE as per NB-5350
INDICATIONS ③ & ⑤	③ & ⑤	rounded	NON Relevant (per spec)
D. ACCEPTANCE CRITERIA	R/R R43-2055 ASME SECTION III, NB-5350, 1983 EDITION		OPERATOR <u>VICTOR PIATANIA</u> Level <u>II</u> Date <u>11/8/84</u>

E. ATTEST	<u>Victor Pitania</u>	<u>II</u>	<u>11/8/84</u>
	RESPONSIBLE CERTIFIED PERSONNEL	LEVEL	DATE

COMPONENT I.D.

SYSTEM

PLANT/LOCATION

7/21 2 cyl

73%F

10 min. Duell Penetrant

2 m.m. Dwell Developer

Indications

- ①  $3\frac{3}{8}$ " Linear

- ②  $\frac{1}{4}$ "  $\frac{1}{8}$ " liners

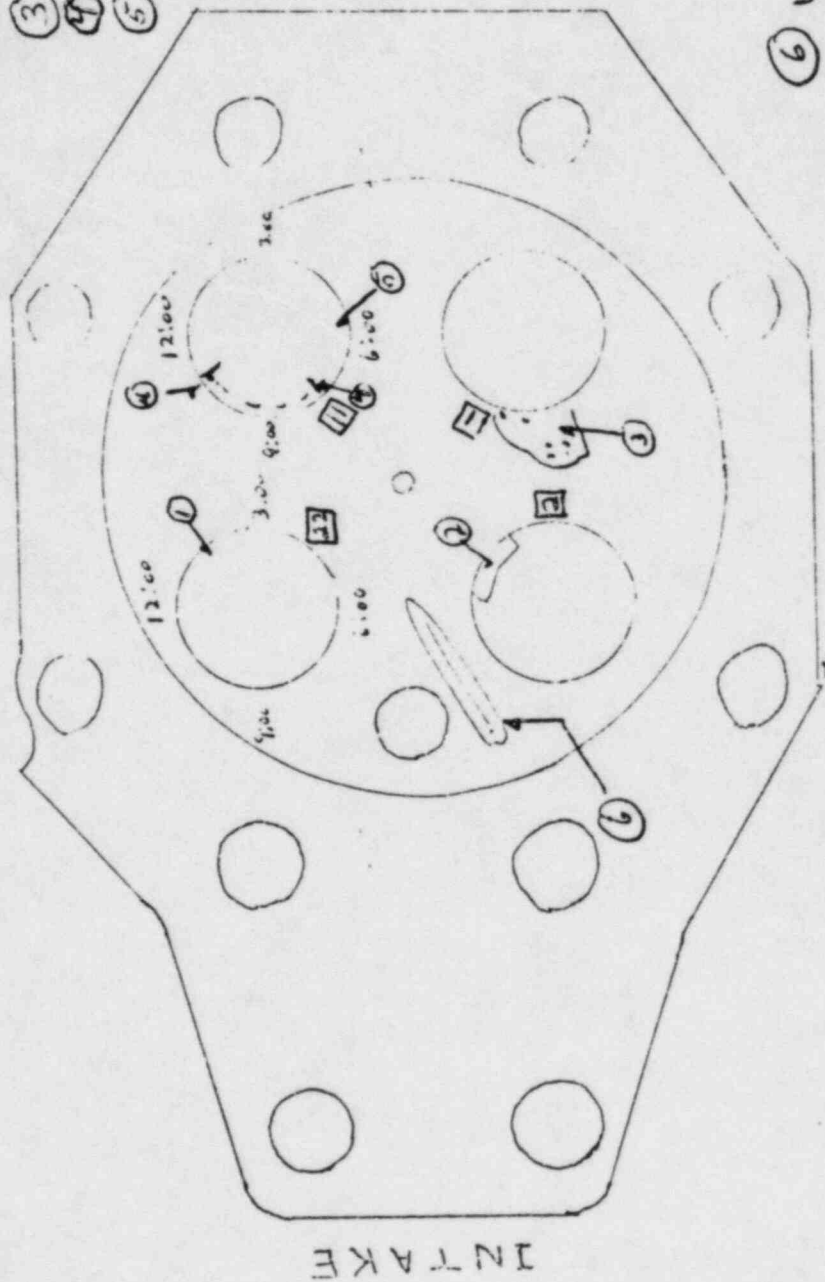
- ### 3) Rounded Indication (Recognizable)

- ### INTERMITTENT LINEAR

- (5) Rounded Indications in Line

Y<sup>58</sup> "ACCEPTABLE" of 11/8/81

EXH AUST



- ⑥ Visual Indication of Gauge  
4 1/2" Long x 1/8" Wide  
4/8/11 JLG

4 1/2" Long x 1/8" Wide

18/8/11 Cdo.





## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 3

A. MATERIAL		TYPE	FABRICATED PROCESS		
		CS		<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <i>CYL HEAD</i>	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> AS FABRICATED	<input type="checkbox"/> GROUND <input type="checkbox"/> OTHER
	N/A	N/A			
B. NDE PROCEDURE No. <u>6.2</u>		SURFACE/MAT'L. TEMP. <u>72°F</u>		M&E. NO. <u>365</u>	MWR/RR. No. <u>RY3-2055</u>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		MAGNA FLUX	SKC-NF/ZC-7B	84J012	
2. PENETRANT		"	SKL-HF/S	83G018	
3. EMULSIFIER AND/OR REMOVER		"	SKC-NF/ZC-7B	8-IJ012	
4. DEVELOPER		"	SKD-NF	82D111	
5. POST EXAMINATION CLEANER		"	SKC-NF/ZC-7B	84J012	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>This LP Report verifies Cylinder head surface Prep results were satisfactory. see ATTACHED LP report for Details P, 3 of 3</i>					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
1	N/A	N/A	No relevant Indications		
2			NOTED after surface Prep as		
3			Per NB 5350		
4					
D. ACCEPTANCE CRITERIA	ASME SECTION III NB 5350		OPERATOR <u>VICTOR PHOTANIA</u> Level <u>II</u> Date <u>11/13/84</u>		
E. ATTEST	<u>Victor Photania</u> RESPONSIBLE CERTIFIED PERSONNEL		<u>II</u> LEVEL		<u>11/13/84</u> DATE

COMPONENT I.D.

SYSTEM

PLANT/LOCATION

1843A ENC-103 Cyl. Head #3 (G50) 1843

ELC 31 Turbine Bldg





LIQUID PENETRANT EXAMINATION REPORT

Pg 2 of 2

A. MATERIAL		TYPE <u>CS</u> <u>* Stellite</u>	FABRICATED PROCESS	<input checked="" type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>Direct Head</u>
CROSS SECTION THICKNESS	MAX <u>N/A</u> INCH	MIN <u>N/A</u> INCH	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHISED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
				<input type="checkbox"/> AS FABRICATED		
<u>6.2</u>		TEMP. <u>72° F</u>		NOTE NO. <u>365</u>	<u>R43-2055</u>	
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.		
1. PRE-CLEANER		<u>Magnaflux</u>	<u>SKC-NF/ZC-7B</u>	<u>84 J 012</u>		
2. PENETRANT		"	<u>SKL-HF/15</u>	<u>836 018</u>		
3. EMULSIFIER AND/OR REMOVER		"	<u>SKC-NF/ZC-7B</u>	<u>84-J 012</u>		
4. DEVELOPER		"	<u>SKD-NF</u>	<u>82 D 111</u>		
5. POST EXAMINATION CLEANER		"	<u>SKC-NF/ZC-7B</u>	<u>84-J 012</u>		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY						
<p style="text-align: center;"><u>See Attached Sketch</u></p> <p>The inspection area is the Fire Deck, between the exhaust valves and all 4 stellite valve seats.</p>						
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.				
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)			
<u>1</u>	<u>1/8"</u>	<u>Linear</u>	<u>Reject / NB-5352 (ASME III)</u>			
<u>2</u>	<u>1/8"</u>	<u>Rounded</u>	<u>Accepted / " "</u>			
<u>3</u>	<u>1/16"</u>	<u>Rounded</u>	<u>Accepted / " "</u>			
<u>4</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>			
D. ACCEPTANCE CRITERIA	<u>ASME III NB-5352</u>		OPERATOR <u>William J. French / Mike Bowden</u> <u>II / Trance</u> DATE <u>11/8/84</u>			
E. ATTEST	<u>William J. French</u> RESPONSIBLE CERTIFIED PERSONNEL		<u>II</u> LEVEL		<u>11/8/84</u> DATE	

COMPONENT I.D.  
1R43# EDG-103  
CYL HEAD #3, 5/4 650

SYSTEM  
1R43

PLANT/LOCATION  
EDG-RM-103  
Installed on Turbine Deck-EL. 63.75

1243TED6-103  
CYL HEAD #3  
S/N G-50

TYP - 4 VALVE SEAT AS

Head Cast Steel Mat'l. (machined counter-bore)  
Note: Indication shown in circle which  
represents valve seat is located in  
cast mat'l.

Stellite Mat'l - Valve Seat

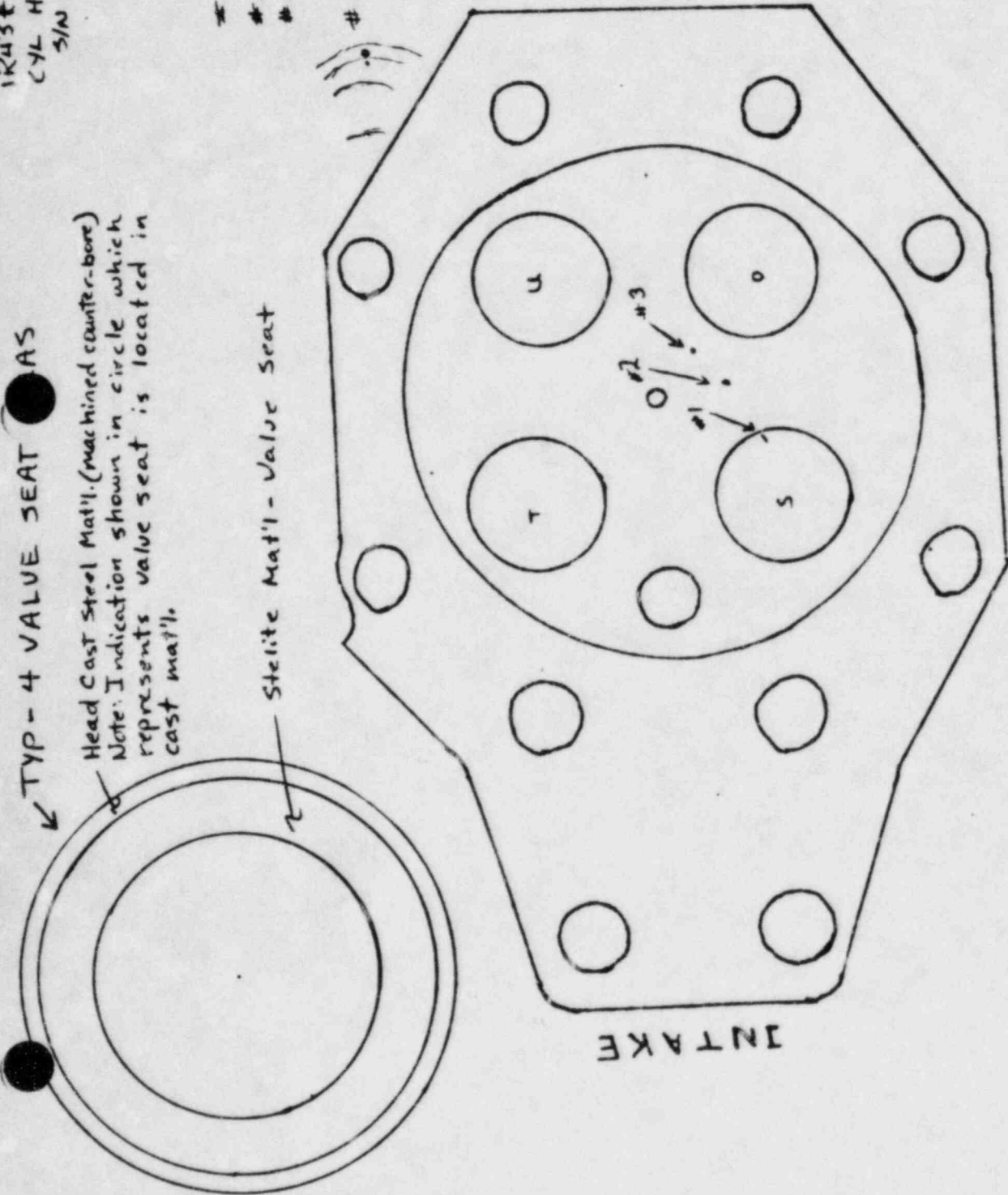
#1 -  $\frac{1}{16}$ " Rnd  
#2 -  $\frac{1}{8}$ " Rnd  
#3 -  $\frac{1}{16}$ " Rnd

#1 -  $< \frac{1}{16}$ " Rnd  
#4 -  $\frac{1}{16}$ " Rnd

EXHAUST

INTAKE

Note: No indications  
were observed in  
stellite seat mat'l.





## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE <i>CS</i> <i>&amp; Stellite</i>	FABRICATED PROCESS	<input checked="" type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
CROSS SECTION THICKNESS	MAX <i>N/A</i> INCH	MIN <i>N/A</i> INCH	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
B. NO. <i>6-2</i>		/MAT'L. TEMP. <i>72° F</i>		NOTE. NO. <i>365</i>		<i>R43-2055</i>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.		
1. PRE-CLEANER		<i>Magnaflux</i>	<i>SKC-NF/ZC-7B</i>	<i>84J012</i>		
2. PENETRANT		<i>"</i>	<i>SKL-HF/15</i>	<i>836018</i>		
3. EMULSIFIER AND/OR REMOVER		<i>"</i>	<i>SKC-NF/ZC-7B</i>	<i>84J012</i>		
4. DEVELOPER		<i>"</i>	<i>SKD-NF</i>	<i>82D111</i>		
5. POST EXAMINATION CLEANER		<i>"</i>	<i>SKC-NF/ZC-7B</i>	<i>84J012</i>		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY						
<p style="text-align: center;"><i>See Attached Sketch</i></p> <p><i>The inspection area is the Fire Deck, between the exhaust valves and all 4 stellite valve seats.</i></p>						
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.				
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)			
<i>1</i>	<i>1/8"</i>	<i>Linear</i>	<i>Reject/NB-5352 (ASME III)</i>			
<i>2</i>	<i>1/8"</i>	<i>Rounded</i>	<i>Accepted/ " "</i>			
<i>3</i>	<i>1/16"</i>	<i>Rounded</i>	<i>Accepted/ " "</i>			
<i>X</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>			
D. ACCEPTANCE CRITERIA		<i>ASME III NB-5352</i>				
E. ATTEST		<i>William J. French</i> RESPONSIBLE CERTIFIED PERSONNEL				
		<i>II</i> LEVEL				
		<i>11/8/84</i> DATE				

PT  
COMPONENT I.D.  
*1 R43# EDB-103*  
*CYL HEAD #3*  
*5/4 650*  
SYSTEM  
*1 R43*PLANT/LOCATION  
*EDB-RM-103*  
*Installed on Turbine Deck, EL. 63-78*

1R43TEDG-103  
CYL HEAD #3  
S/N G-50

EXHAUST

- #1 -  $\frac{1}{8}$ " Linear
- #2 -  $\frac{1}{8}$ " Rounded
- #3 -  $\frac{1}{16}$ " Rounded

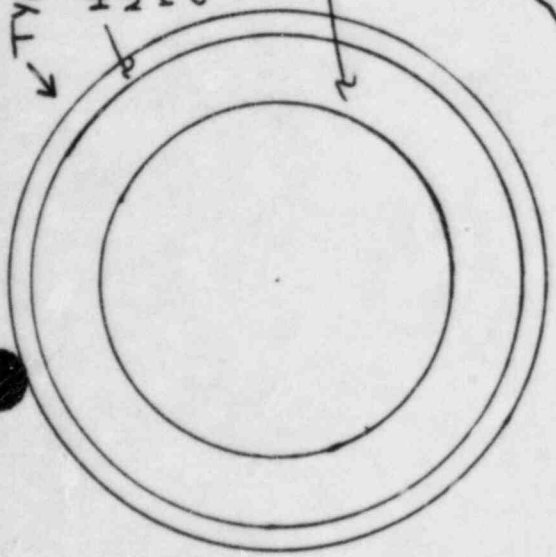
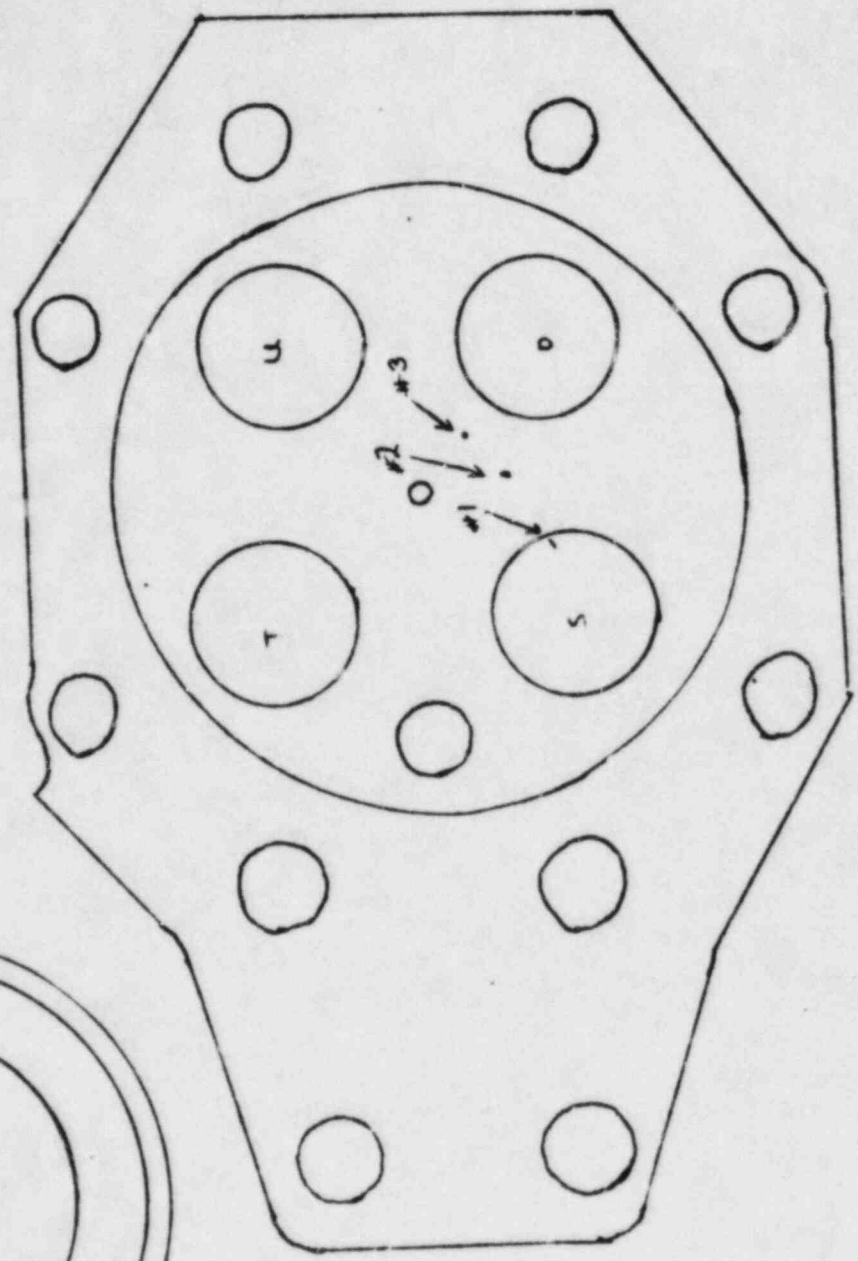
Note: No indications  
were observed in  
stellite seat mat'l.

TYP - 4 VALVE SEAT AREAS

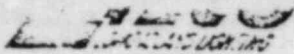
Head Cast Steel Mat'l. (machined counter-bore)  
Note: Indication shown in circle which  
represents valve seat is located in  
cast mat'l.

Stellite Mat'l - Valve Seat

INTAKE







## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 2

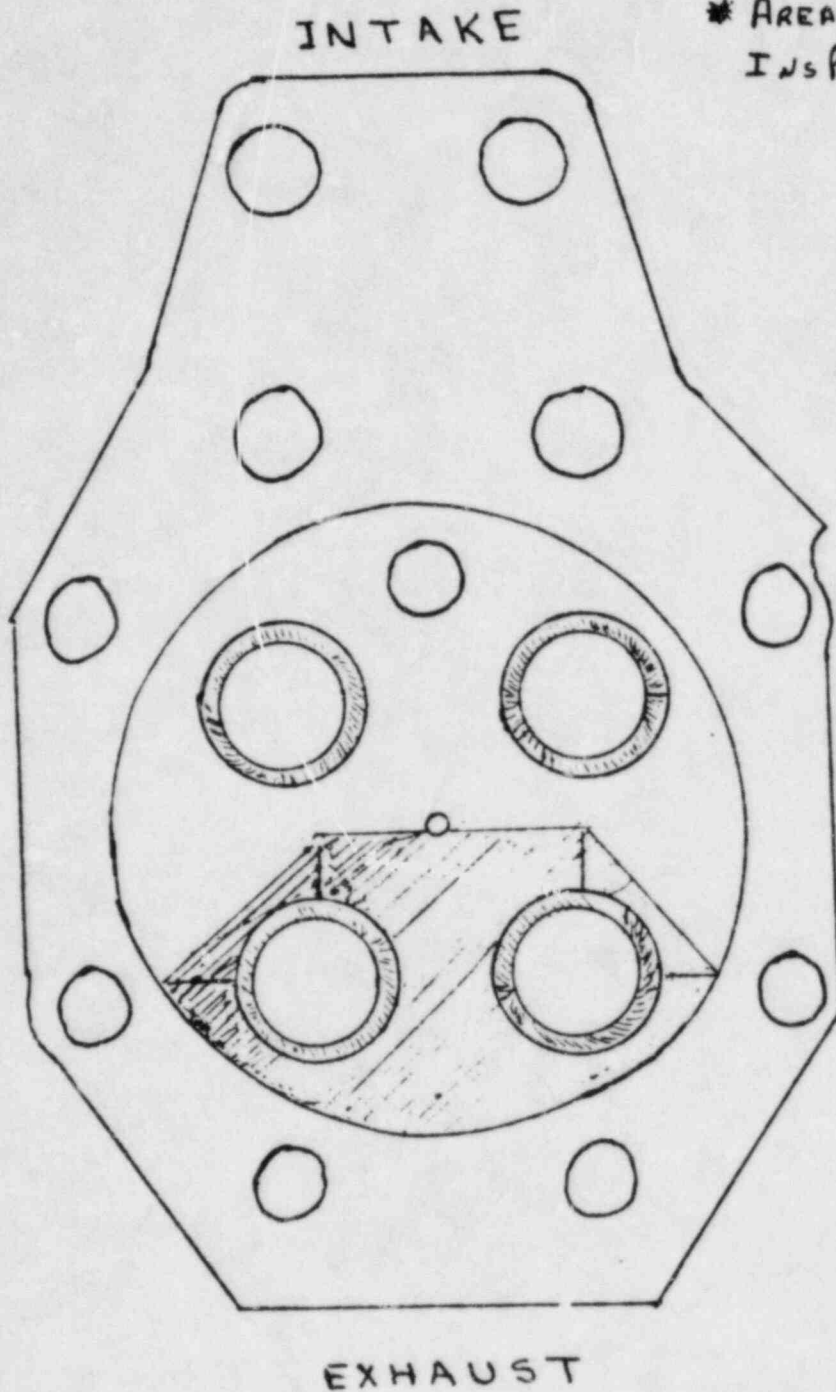
A. MATERIAL		TYPE	FABRICATED PROCESS	GEOMETRY	
		C/S		<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE
				<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: CYL HEAD
CROSS SECTION THICKNESS	MAX	MIN	SURFACE CONDITION		
	N/A INCH	N/A INCH			
				<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND
				<input type="checkbox"/> AS FABRICATED	<input type="checkbox"/> OTHER
6.2		TEMP. 70°F	MITE NO. 365	R43-2055	
INSPECTION MATERIALS		BRAND	DESIGNATION	PATCH NO.	
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012	
2. PENETRANT		MAGNAFLUX	SKL-HF/S	836018	
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-NF/ZC-7B	84J012	
4. DEVELOPER		MAGNAFLUX	SKD-NF	82D111	
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY					
SEE ATTACHED Page 2 of 2					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (W/ EXT/REFLECT, AND COMMENT AS NECESSARY)		
1 N/A	N/A	N/A	NON RELEVANT INDICATIONS AS		
2			Per ASME III NB-5350		
3					
4					
ASME SECTION III		Operator Victor NATANIA			
NB-5350 1983 EDITION		LEVEL II DATE 11/7/84			
E. ATTEST		REVIEWABLE CERTIFIED PERSONNEL			
Victor NATANIA		II 11/7/84			
		DATE			

COMPONENT I.D. :  
KVAENG-103 Cyl. Head (H-60)  
SIPSEN  
1R43

PLANT/LOCATION :  
EL-63 Turbine Deck



CYL. HEAD H-60  
10 min. Dwell - Penetrant  
7 min Dwell - Developer  
NO Relevant Indications NOTED  
*Victor H. K. 11/1/84*  
\* AREAS OF LIQUID PENETRANT  
INSPECTIONS ARE SHADED





## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 2

A. MATERIAL				TYPE	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED	
CROSS SECTION THICKNESS	MAX	PIPE DIA.	SURFACE CONDITION	GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: CYL HEAD	
	MIN N/A	N/A			<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> AS FABRICATED	<input type="checkbox"/> GROUND <input type="checkbox"/> OTHER	
B. NDE PROCEDURE No. 6.2		SURFACE/MAT'L. TEMP. 71°		M&T. NO. 365		MWR/RR. No. R43-2055	
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.			
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012			
2. PENETRANT		"	SKL-HF/S	83G018			
3. EMULSIFIER AND/OR REMOVER		"	SKC-NF/ZC-7B	84J012			
4. DEVELOPER		"	SKD NF	82D111			
5. POST EXAMINATION CLEANER		"	SKC-NF/ZC-7B	84J012			
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY. This LP Report verifies surface prep results of cyl. head results were satisfactory. See ATTACHED sketch Pg 2 of 2 For Details.							
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.					
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)				
1 N/A	N/A	N/A	NO REJECTABLE INDICATIONS				
2			NOTED AS PER NB5350				
3							
4							
D. ACCEPTANCE CRITERIA		ASME SECTION II NB5350		OPERATOR Victor Platovina Level II Date 11/13/84			
E. ATTEST		[Signature]		II		11/13/84	
		RESPONSIBLE CERTIFIED PERSONNEL		LEVEL		DATE	

COMPONENT I.D.

SYSTEM

PLANT/LOCATION

- ① Porosity  $\frac{1}{8}$ " Acceptable  
② Porosity  $\frac{1}{16}$ " Acceptable

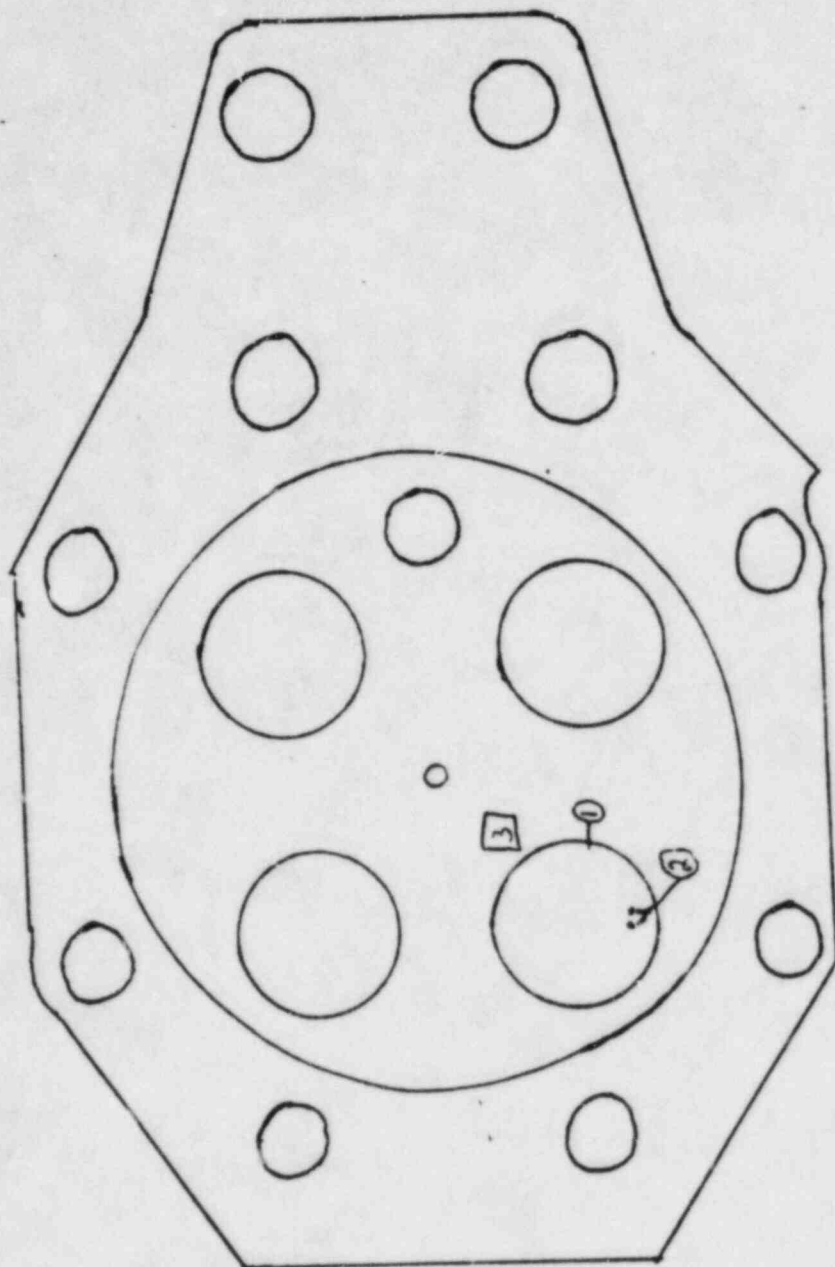
H 50

Pg 2 of 2

Visto *[Signature]*

11/13/84

INTAKE



EXHAUST



## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 2

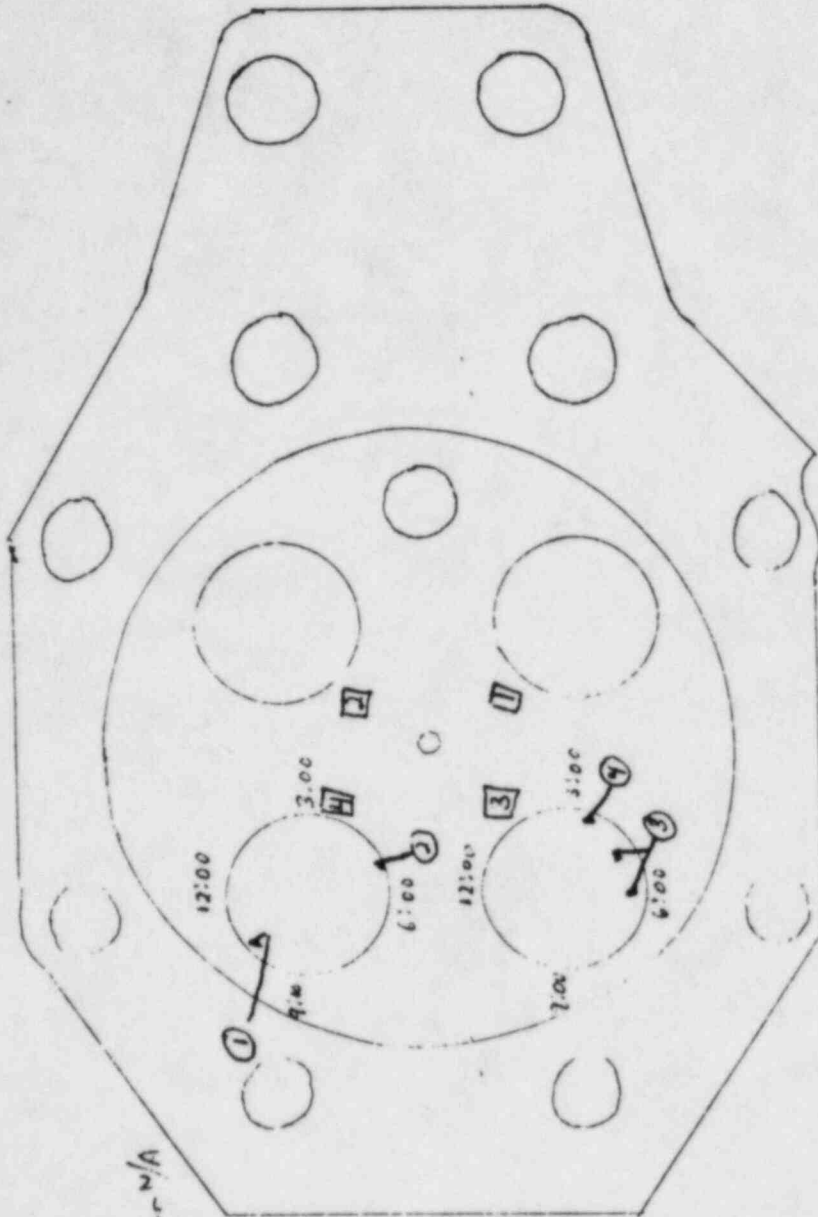
A. MATERIAL		TYPE <u>c/s</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
No. <u>6-2</u>		SURFACE/MAT'L. TEMP. <u>74°F</u>		MATE. NO. <u>365</u> MWR/RR. No. <u>R43-2055</u>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
2. PENETRANT		MAGNAFLUX	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
4. DEVELOPER		MAGNAFLUX	SKD-NF	82D111
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY  <u>SEE ATTACHED Page 2 of 2</u>				
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.		
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)	
①	1/8"	Rounded	Non Relevant as per NB-5350	
②	3/32"	Rounded	Acceptable as per NB-5350	
③	3/8"	Rounded	Rejectable as per NB-5350	
④	3/32"	Rounded	Acceptable as per NB-5350	
D. ACCEPTANCE CRITERIA	R/R R43-2055 ASME SECTION III, NB-5350, 1983 EDITION		OPERATOR <u>Victor Platania</u> Level <u>II</u> Date <u>11/8/84</u>	
E. ATTEST	<u>Nick G. [Signature]</u>		<u>II</u> <u>11/8/84</u>	
RESPONSIBLE CERTIFIED PERSONNEL		LEVEL		DATE

COMPONENT I.D.

SYSTEM

PLANT/LOCATION

INTAKE



EXHAUST

#1 L. HEAD / H-50

TEMP. 74°F

10 min Dwell - Penetrant

7 min Dwell - Developer

INDICATIONS:

- ① Porosity -  $\frac{1}{8}$ " rounded N/A
- ② Porosity -  $\frac{3}{32}$ " rounded N/A
- ③ Porosity -  $\frac{3}{16}$ " rounded
- ④ Porosity -  $\frac{3}{32}$ " rounded & clean N/A

Rich Olt  
11/8/84





## LIQUID PENETRANT EXAMINATION REPORT

Pg. 1 of 3

A. MATERIAL		TYPE	FABRICATED PROCESS	GEOMETRY	
		CS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED		
		<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: CYL HEAD		
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND	<input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
	N/A	N/A			
B. NDE PROCEDURE No. 6.2		SURFACE/MAT'L. TEMP. 72°F		MATE. NO. 365 MWR/RR. No. R43 2055	
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/2C-7B	84J012	
2. PENETRANT		"	SKL-HF/S	83G018	
3. EMULSIFIER AND/OR REMOVER		"	SKC-NF/2C-7B	84J012	
4. DEVELOPER		"	SKD-NF	82D111	
5. POST EXAMINATION CLEANER		"	SKC-NF/2C-7B	84J012	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY This LP Report Verifies; After Further Surface Prep of Cyl. Head results were satisfactory see ATTACH sheets pages 2 of 3 & 3 of 3 For Details.					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
1 NA	N/A	N/A	No Rejectable indications		
2			NOTED AS Per NB5350		
3					
4					
D. ACCEPTANCE CRITERIA	ASME SECTION III NB5350		OPERATOR Victor Platanin Level II Date 11/13/84		
E. ATTEST	[Signature]		[Signature]		
RESPONSIBLE CERTIFIED PERSONNEL		LEVEL	DATE		

COMPONENT I.D.

SYSTEM

PLANT/LOCATION



## LIQUID PENETRANT EXAMINATION REPORT

Pg 2 of 3  
2/11/84 history

A. MATERIAL		TYPE <i>CS</i> <i>*Stellite</i>	FABRICATED PROCESS	<input checked="" type="checkbox"/> WELDED <input type="checkbox"/> CAST <input type="checkbox"/> WORKED
CROSS SECTION THICKNESS	MAX <i>N/A</i> INCH	MIN <i>N/A</i> INCH	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
6.2		TEMP. <i>72° F</i>		MATE. NO. <i>365</i>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER		<i>Magnaflux</i>	<i>SKC-NF/2C-7B</i>	<i>84JC12</i>
2. PENETRANT		"	<i>SKL-HF/5</i>	<i>836C18</i>
3. EMULSIFIER AND/OR REMOVER		"	<i>SKC-NF/2C-7B</i>	<i>84JC12</i>
4. DEVELOPER		"	<i>SKD-NF</i>	<i>82D111</i>
5. POST EXAMINATION CLEANER		"	<i>SKC-NF/2C-7B</i>	<i>84JC12</i>
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY				
<p style="text-align: center;">See Attached Sketch</p> <p>The inspection area is the Fire Deck, between the exhaust valves and all 4 stellite valve seats.</p>				
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.		
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)	
#1	<i>1/16"</i>	<i>Rounded</i>	<i>Accepted</i>	<i>NB-5352 (ASME III)</i>
#2	<i>1/16"</i>	<i>Rounded</i>	<i>Accepted</i>	"
#3	<i>1/16"</i>	<i>Linear</i>	<i>Reject</i>	"
#4	<i>1/16"</i>	<i>Rounded</i>	<i>Accepted</i>	"
#5	<i>1/16"</i>	<i>Rounded</i>	<i>Accepted</i>	"
#6	<i>1/16"</i>	<i>Rounded</i>	<i>Accepted</i>	"
#7	<i>1/16"</i>	<i>Linear</i>	<i>Reject</i>	"
#8	<i>1/16"</i>	<i>Bladed - Indurmet</i>	<i>Accepted</i>	"
#9	<i>1/8"</i>	<i>Rounded</i>	<i>Accepted</i>	"
#10	<i>1/16"</i>	<i>Rounded</i>	<i>Accepted</i>	"
#11	<i>1/16"</i>	<i>Linear</i>	<i>Reject</i>	"
D. ACCEPTANCE CRITERIA		OPERATOR <i>William J. Zurek</i> / <i>Mike Bruden</i> <i>II</i> / <i>Trainer</i> <i>11/8/84</i>		
E. ATTEST		<i>William J. Zurek</i> RESPONSIBLE CERTIFIED PERSONNEL		

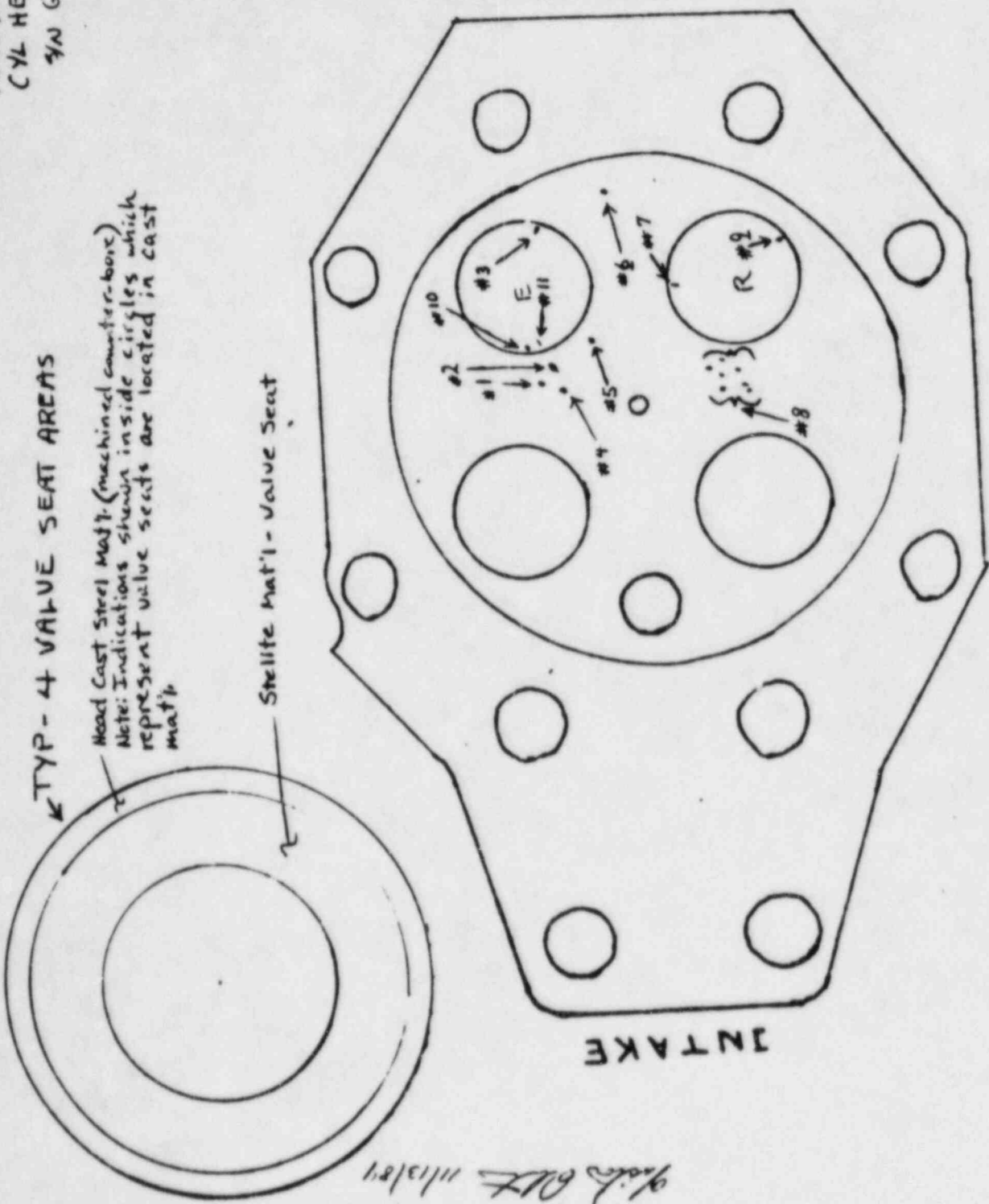
PT  
COMPONENT I.D.  
*1R43#E D6-103*  
*CYL HEAD #6 3/4 64*SYSTEM  
*1R43*PLANT/LOCATION  
*EDG - RM-103*  
*Inspected on Turbine Deck - 11/8/84*

1R43#EDG-103  
CYL HEAD#6  
4N G4

TYP - 4 VALVE SEAT AREAS

Head Cast Steel Mat'l. (machined counter-bore)  
Note: Indications shown inside circles which represent valve seats are located in cast mat'l.

Stellite Mat'l - Valve Seat



- #1 -  $\frac{1}{16}$ " Rounded
- #2 -  $\frac{3}{16}$ " Rounded
- #3 -  $\frac{1}{32}$ " Linear
- #4 -  $\frac{1}{16}$ " Rounded
- #5 -  $\frac{1}{16}$ " Rounded
- #6 -  $\frac{1}{16}$ " Rounded
- #7 -  $\frac{1}{16}$ " Linear
- #8 -  $\frac{1}{16}$ " Rounded - 7 ind

tations, separated more than  $\frac{1}{16}$ "

- #9 -  $\frac{1}{8}$ " Rounded
- #10 -  $\frac{1}{16}$ " Rounded
- #11 -  $\frac{1}{16}$ " Linear

T S C D I X W

Note: No indications were observed in stellite seat mat'l.  
#3 <  $\frac{1}{16}$ " rounded  
#7 - no indication  
#11 <  $\frac{1}{16}$ " rounded

8, 3 of 3  
11/13/81



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE <u>CS</u> <u>Stellite</u>	FABRICATED PROCESS	<input checked="" type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
CROSS SECTION THICKNESS	MAX <u>N/A</u> INCH	MIN <u>N/A</u> INCH	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
3. <u>6.2</u>		TEMP. <u>72° F</u>		DATE. NO. <u>365</u>		<u>P43-2055</u>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.		
1. PRE-CLEANER		<u>Magnaflux</u>	<u>SKC-NF/2C-7B</u>	<u>84J012</u>		
2. PENETRANT		"	<u>SKL-HF/5</u>	<u>836018</u>		
3. EMULSIFIER AND/OR REMOVER		"	<u>SKC-NF/2C-7B</u>	<u>84J012</u>		
4. DEVELOPER		"	<u>SKD-NF</u>	<u>820111</u>		
5. POST EXAMINATION CLEANER		"	<u>SKC-NF/2C-7B</u>	<u>84J012</u>		
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY						
<p style="text-align: center;">See Attached Sketch</p> <p>The inspection area is the Fire Deck, between the exhaust valves and all 4 stellite valve seats.</p>						
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.				
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)			
#1	<u>1/16"</u>	<u>Rounded</u>	<u>Accepted</u>	<u>NR-5352 (ASME III)</u>		
#2	<u>1/16"</u>	<u>Rounded</u>	<u>Accepted</u>	"		
#3	<u>1/16"</u>	<u>Linear</u>	<u>Reject</u>	"		
#4	<u>1/16"</u>	<u>Rounded</u>	<u>Accepted</u>	"		
#5	<u>1/16"</u>	<u>Rounded</u>	<u>Accepted</u>	"		
#6	<u>1/16"</u>	<u>Rounded</u>	<u>Accepted</u>	"		
#7	<u>1/16"</u>	<u>Linear</u>	<u>Reject</u>	"		
#8	<u>1/16"</u>	<u>Rounded - Indented</u>	<u>Accepted</u>	"		
#9	<u>1/8"</u>	<u>Rounded</u>	<u>Accepted</u>	"		
#10	<u>1/16"</u>	<u>Rounded</u>	<u>Accepted</u>	"		
#11	<u>1/16"</u>	<u>Linear</u>	<u>Reject</u>	"		
D. ACCEPTANCE CRITERIA		<u>ASME III NB-5352</u>		<u>II / Truice 11/8/84</u>		
E. ATTEST		<u>William J. Lusk</u>		<u>11/8/84</u>		
		RESPONSIBLE CERTIFIED PERSONNEL		DATE		

PT  
COMPONENT I.D.  
1R43#ED6-103  
CYL HEAD #6, 3IN G4

SYSTEM

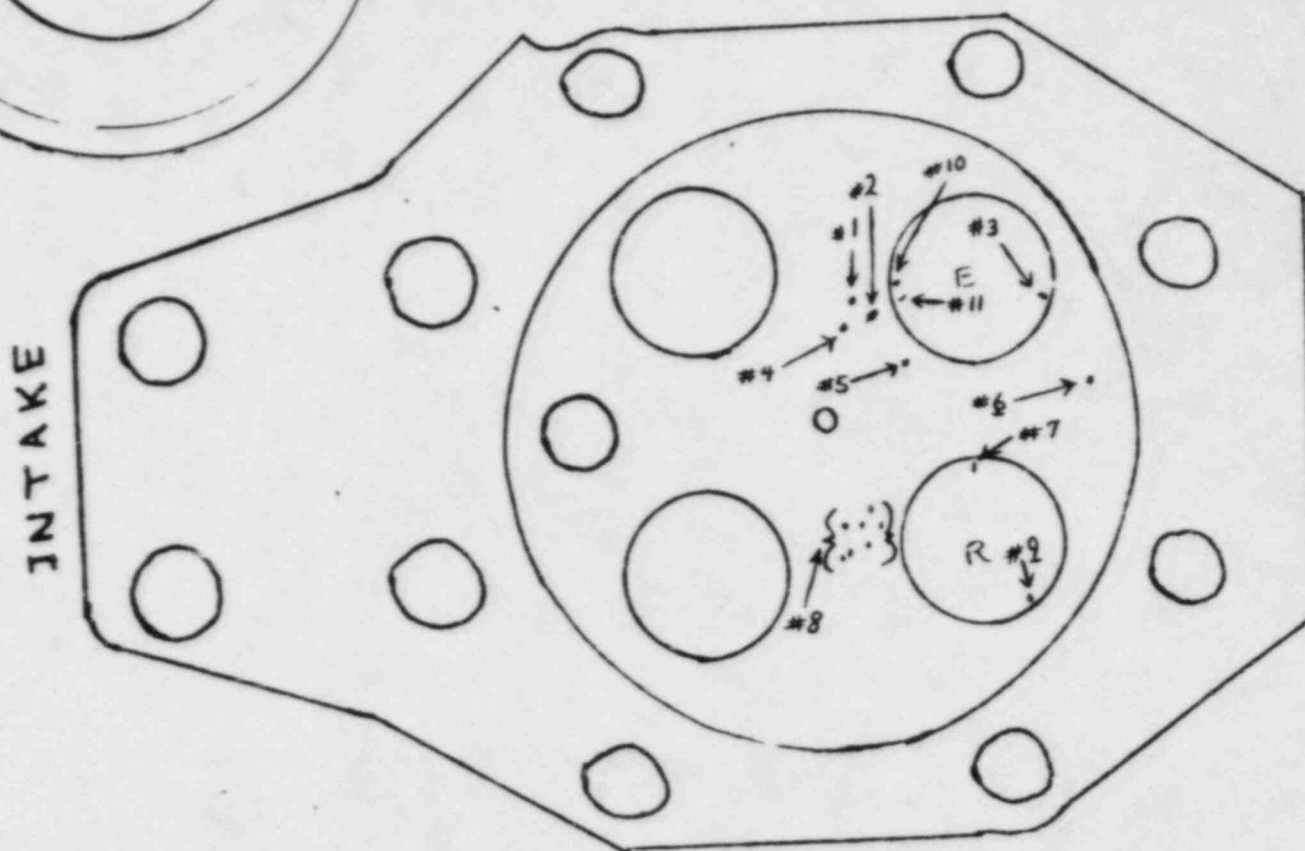
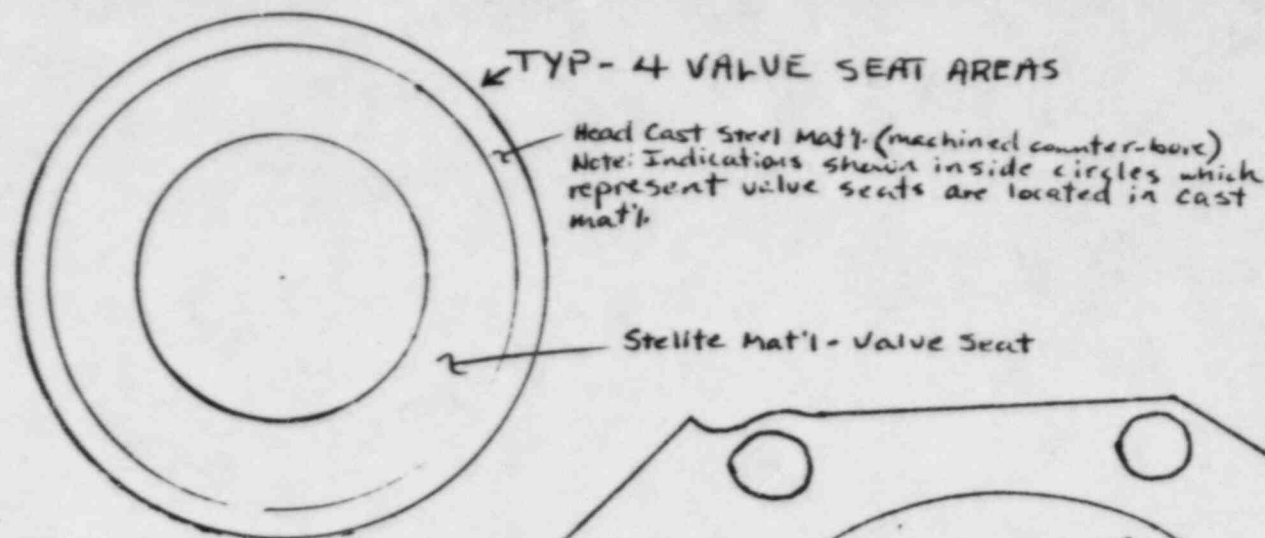
1R43

PLANT/LOCATION

EDG - R41 - 103  
Inspected on Turbine Deck - 11/8/84



1K43 #EDG-103  
CYL HEAD #6  
3/4 N G 4



- #1 -  $\frac{1}{16}$ " Rounded
- #2 -  $\frac{3}{16}$ " Rounded
- #3 -  $\frac{3}{32}$ " Linear
- #4 -  $\frac{1}{16}$ " Rounded
- #5 -  $\frac{1}{16}$ " Rounded
- #6 -  $\frac{1}{16}$ " Rounded
- #7 -  $\frac{1}{16}$ " Linear
- #8 -  $\frac{1}{16}$ " Rounded - 7 indications, separated more than  $\frac{1}{16}$ "

- T  
S  
C  
A  
I  
X  
E
- #9 -  $\frac{1}{8}$ " Rounded
  - #10 -  $\frac{1}{16}$ " Rounded
  - #11 -  $\frac{1}{16}$ " Linear

Note: No indications were observed in stellite seat mat'l.





## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 2

A. MATERIAL		TYPE <u>c/s</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>CYL. HEAD</u>
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
				<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>6.2</u>	SURFACE/MAT'L. TEMP. <u>71°F</u>	M&TE. NO. <u>365</u>	MWR/RR. No. <u>R43-2055</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	84J012
2. PENETRANT	MAGNAFLUX	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/ZC-7B	84J012
4. DEVELOPER	MAGNAFLUX	SKR-NF	82D111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

SEE ATTACHED Page 2 of 2

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
①	3/32"	Rounded	ACCEPTABLE AS PER NB-5350
②	1/16"	Linear	REJECTABLE AS PER NB-5350
③	1/32"	Rounded	ACCEPTABLE AS PER NB-5350
4			

D. ACCEPTANCE CRITERIA	R/R R43-2055 ASME SECTION III NB-5350, 1983 EDITION	OPERATOR <u>VICTOR PLATANIA</u> Level <u>II</u> Date <u>11/8/84</u>
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E. ATTEST	<u>Victor Platania</u> RESPONSIBLE CERTIFIED PERSONNEL	<u>II</u> LEVEL	<u>11/8/84</u> DATE
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COMPONENT I.D. #72112/201

R43\* EFG-03 47 CYL HEAD (642)

SYSTEM

R43\*

PLANT/LOCATION

SUS-1/63 TURBINE DECK

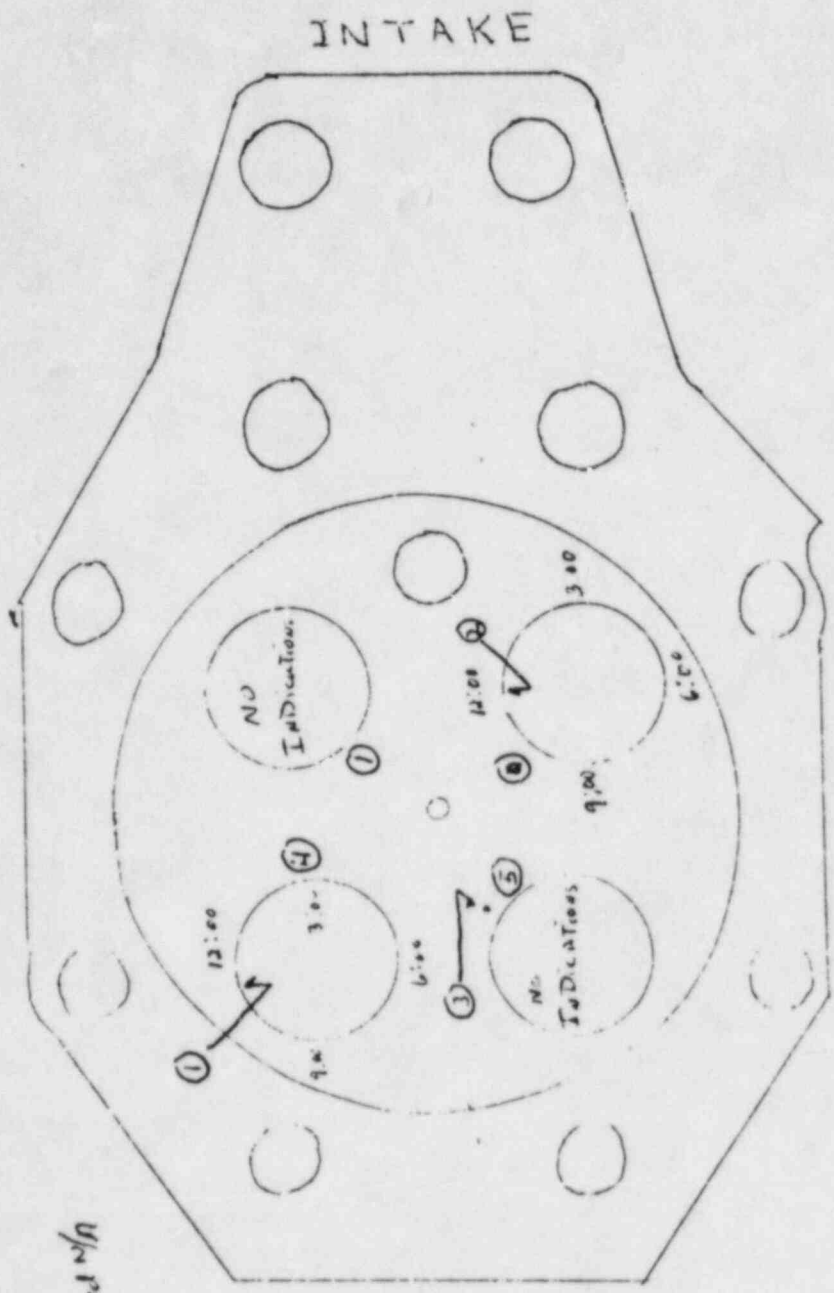
#4 Cyl G-42  
71°F

10 min Dwell Penetrant  
7 min Dwell Developer

INDICATIONS:

- ① -  $\frac{3}{32}$ " Linear w/ Rounded ends
- ② -  $\frac{1}{16}$ " Linear
- ③ -  $\frac{1}{32}$ " Rounded ends

*Rich Oltz 11/5/84*





## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 2

A. MATERIAL		TYPE <u>CS</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>Cyl. Head</u>
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
				<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>G.2</u>	SURFACE/MAT'L. TEMP. <u>72° F</u>	MATE. NO. <u>365</u>	MWR/RR. No. <u>R43 2055</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	<u>MAGNA FLUX</u>	<u>SKC-NF/ZC-7B</u>	<u>845012</u>
2. PENETRANT	<u>"</u>	<u>SKL-HF/15</u>	<u>836018</u>
3. EMULSIFIER AND/OR REMOVER	<u>"</u>	<u>SKC-NF/ZC-7B</u>	<u>845012</u>
4. DEVELOPER	<u>"</u>	<u>SKD-NF</u>	<u>82D111</u>
5. POST EXAMINATION CLEANER	<u>"</u>	<u>SKC-NF/ZC-7B</u>	<u>845012</u>

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

This LP Report Verifies; After Further Surface Prep of Cyl. Head, The results were found satisfactory. See attached sheets Pages 2 of 2 For Details.

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 <u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>NO REJECTABLE INDICATIONS</u>
2			<u>NOTED AS Per NB5350</u>
3			
4			

## D. ACCEPTANCE CRITERIA

ASME SECTION III  
NB5350OPERATOR VICTOR PLATANIN  
Level II Date 11/13/81

## E. ATTEST

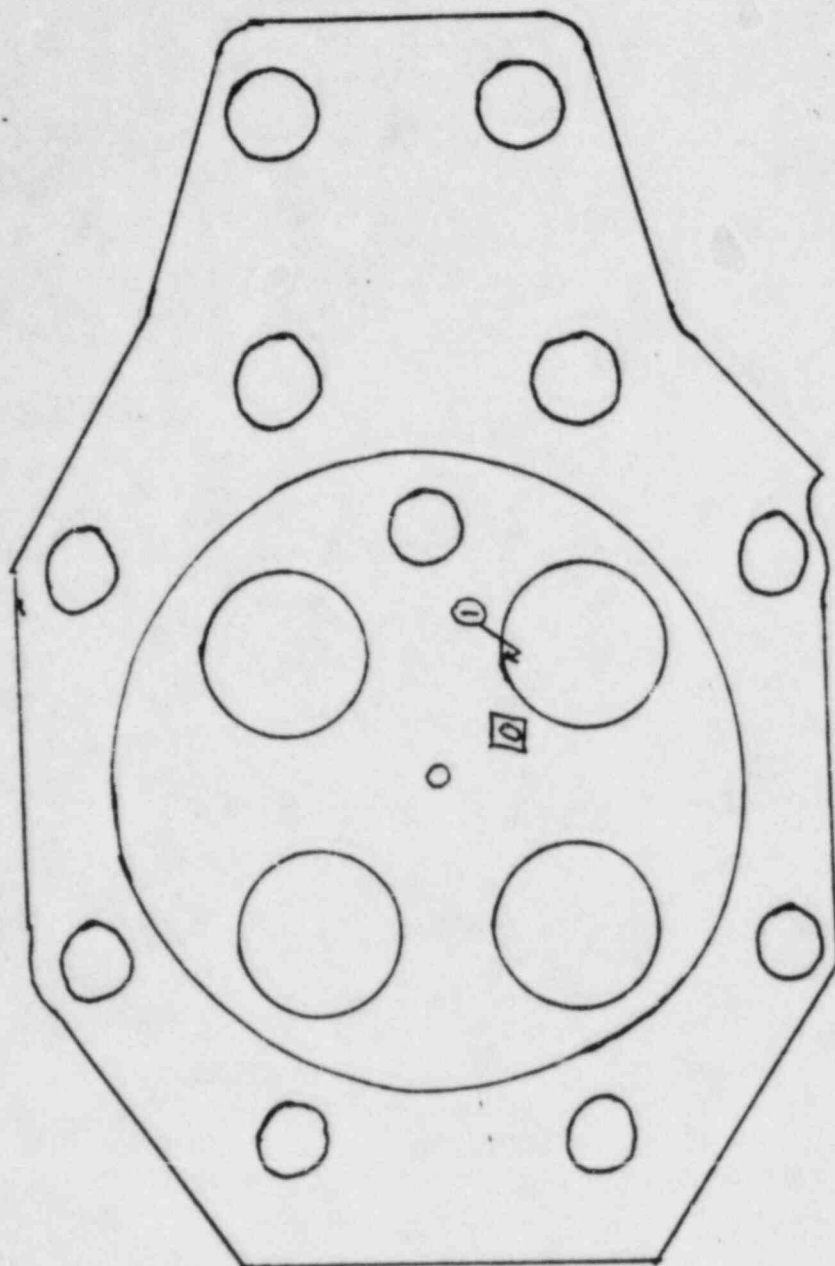
Victor Platanin  
RESPONSIBLE CERTIFIED PERSONNELII  
LEVEL11/13/81  
DATECOMPONENT I.D. #76.11/2/81  
1843 & ENG-103 BT CYL HEAD (642)  
SYSTEM 18-13PLANT/LOCATION  
EL 331 Turbine 3LD6

83 20f2  
G42

1. Porosity -  $\frac{1}{16}$ " ACCEPTABLE

Victor G. Holt 11/13/84

INTAKE



EXHAUST





## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 2

A. MATERIAL		TYPE	FABRICATED PROCESS	WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED <input type="checkbox"/>	
CROSS SECTION THICKNESS		MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
No. 6-2		N/A	N/A	TEMP. 74°F	M&TE. NO. 365 MWR/RR. No. R43-2055
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/2C-7B	84J012	
2. PENETRANT		"	SKL-HF/5	83G018	
3. EMULSIFIER AND/OR REMOVER		"	SKC-NF/2C-7B	84J012	
4. DEVELOPER		"	SKD-NF/2P-9B	82D111	
5. POST EXAMINATION CLEANER		"	SKC-NF/2C-7B	84J012	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY This L P report shows the results of Valve seat Lapping Further L P inspection revealed Pin hole Porosity over 3/64" Area in accordance with ASME section III NB5350 This is an acceptable condition. The above mentioned work was performed Per N.E.D. Engineer Direction.					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
① EXH. VALVE SEAT EE	3/64"	Pin hole Porosity	Acceptable as Per ASME		
2			section III NB5350		
3					
4					
D. ACCEPTANCE CRITERIA	ASME SECTION III NB5350		OPERATOR Victor Platania Level II Date 11/16/84		
E. ATTEST	[Signature]		RESPONSIBLE CERTIFIED PERSONNEL LEVEL II DATE 11/16/84		

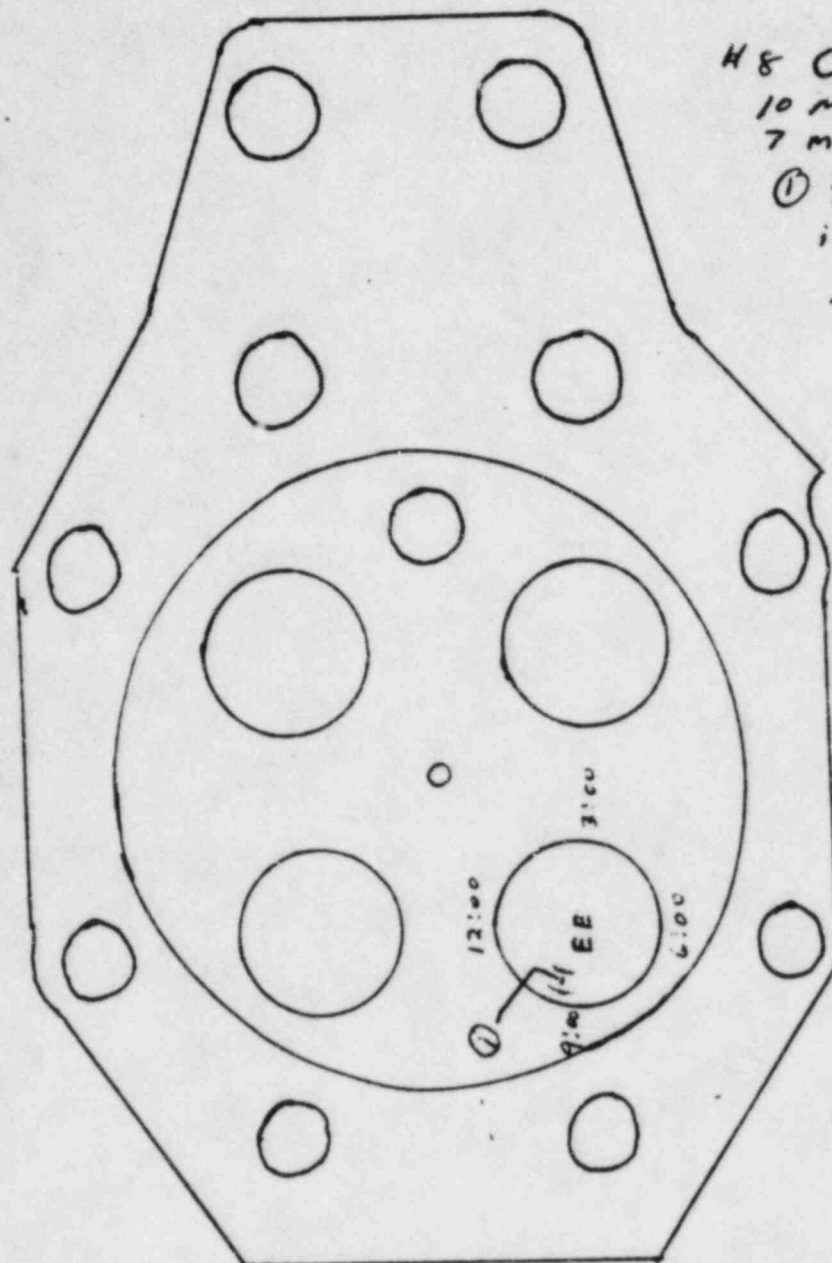
COMPONENT I.D.

SYSTEM

PLANT/LOCATION



INTAKE



#8 Cyl. Head S/N G52  
10 Minute Dwell - Penetrant  
7 Minute Dwell - Developer

①  $\frac{3}{16}$ " indication, Porosity  
in VALVE SEAT AREA

Richd. B. 11/16/78

EXHAUST



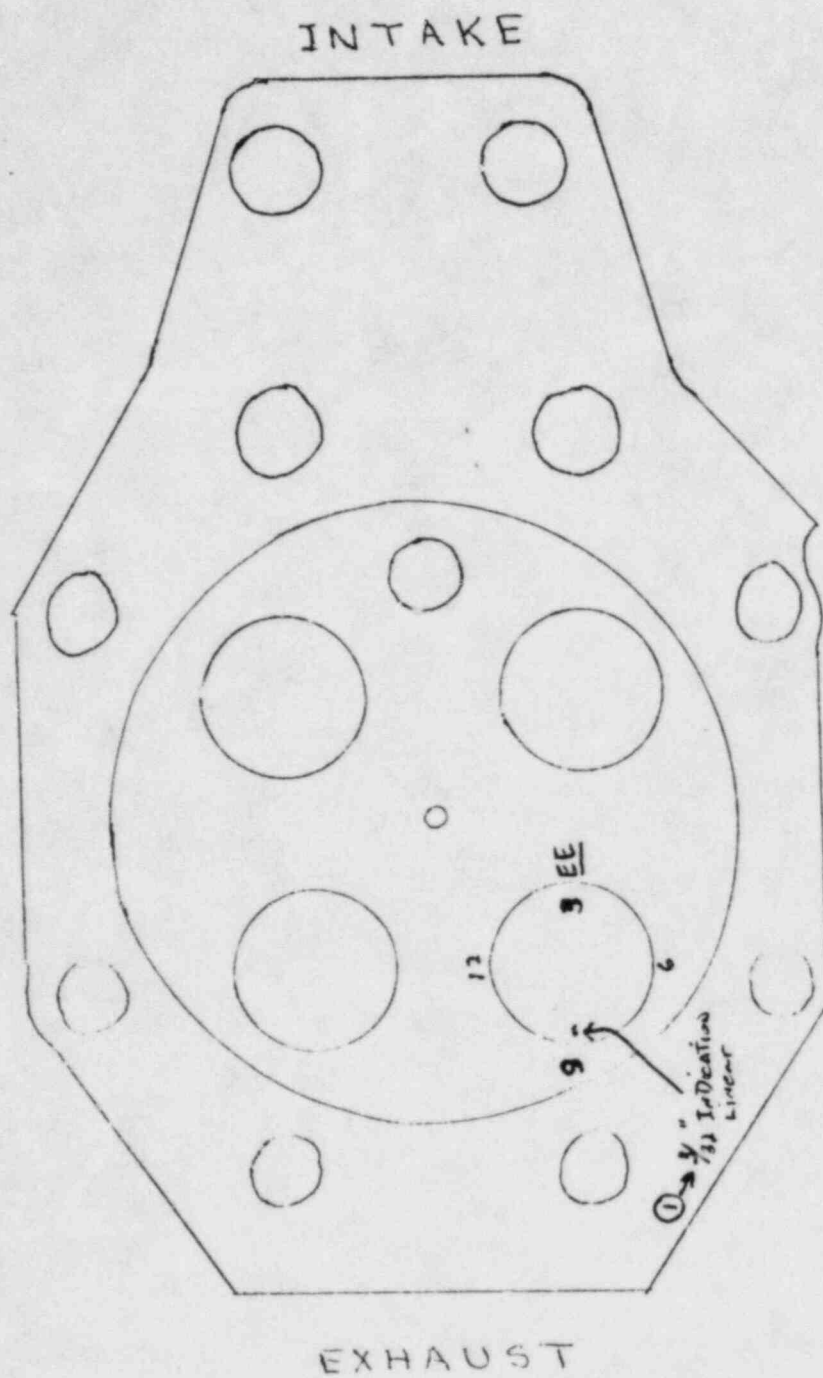
## LIQUID PENETRANT EXAMINATION REPORT

Pg 1 of 2

A. MATERIAL		TYPE	FABRICATED PROCESS	GEOMETRY	
		CS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED		
		<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:			
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED <input checked="" type="checkbox"/> AS FABRICATED	<input type="checkbox"/> GROUND <input type="checkbox"/> OTHER
	N/D	N/D			
B. NDE PROCEDURE No. 6.2		SURFACE/MAT'L. TEMP. 70°		METE. NO. 365	MWR/RR. No. R43-2053
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012	
2. PENETRANT		MAGNAFLUX	SKL-NF/S	83G018	
3. EMULSIFIER AND/OR REMOVER		MAGNAFLUX	SKC-NF/ZC-7B	84J012	
4. DEVELOPER		MAGNAFLUX	SKD-NF	82D111	
5. POST EXAMINATION CLEANER		MAGNAFLUX	SKC-NF/ZC-7B	84J012	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY					
+H60 #G52 - SEE ATTACHED SHEET (2 of 2) For Inspection Area A) EE Exhaust Port Valve Seat AREA has 3/32" Linear Indication in the 3:00 o'clock position.					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
①	3/32"	Linear	AS PER ASME III NB-5320 REJECT AS PER NDE 6.2 Para. 4.2.2		
2					
3					
4					
D. ACCEPTANCE CRITERIA	ASME SECTION III NB-5320 NDE 6.2 Para. 4.2.2		OPERATOR <u>VICTOR PLATANIA</u> Level <u>II</u> Date <u>11/7/84</u>		
E. ATTEST	<u>[Signature]</u> RESPONSIBLE CERTIFIED PERSONNEL		<u>II</u> LEVEL <u>11/7/84</u> DATE		

COMPONENT I.D.  
#8 Cyl. Head (G52) 1R43KENG-103  
SYSTEM  
1R43PLANT/LOCATION  
EL. C3 Turbine Deck

#8 CY4-G-52  
 Penetrant Dwell Time - 10 minutes  
 Developer Dwell Time - 5 minutes  
 Surface Temperature - 70°F.  
 Photo 6.12 Level II 11/7/84





ULTRASONIC THICKNESS  
MEASUREMENT REPORT

A. MATERIAL C/S		TYPE	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
CROSS SECTION THICKNESS		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>END HEAD</u>
MAX	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUNDED	
MIN <u>N/A</u>	<u>N/A</u>	<input type="checkbox"/> AS FABRICATED	<input type="checkbox"/> OTHER	
B. NDE Procedure No. <u>NDE 8-2</u>		<u>MWR/PR 2-P. 84</u> No. <u>03-360A</u>	Equipment ID S/N <u>D-METER</u> M&E No. <u>Block S/N 7K2025</u>	

INSTRUMENT SERIAL NO. <u>33120</u>	MECHANICAL GAUGE SERIAL NO. <u>2-012</u>
PRECISION <u>.001</u>	PRECISION <u>.001</u>

PREFERENCE SAMPLES - MECHANICAL MEASUREMENTS:				1. <u>.500</u>	2. <u>.750</u>	3. <u>1.00</u>
ULTRASONIC MEASUREMENTS:				TIME		
INITIAL:	1. <u>.495</u>	2. <u>.745</u>	3. <u>.995</u>	<u>9:20 PM</u>		
VERIFICATION	1. _____	2. _____	3. _____	MAXIMUM DIFFERENCE <u>.007</u> DRIFT <u>.000</u>		
VERIFICATION	1. _____	2. _____	3. _____			
VERIFICATION	1. _____	2. _____	3. _____			

MAXIMUM PROBABLE ERROR SUM OF INSTRUMENT AND MECHANICAL PRECISIONS, MAX. DIFFERENCE AND DRIFT: <u>.007</u>
---

C. EVALUATION	SKETCH OR DESCRIPTION OF MEASURED LOCATIONS <u>* SEE ATTACHED SKETCH</u>
READINGS TAKEN AREA - 5: <u>.750</u> 6: <u>.770</u> 4: <u>.555</u> 1: <u>.535</u> 2: <u>.535</u> 3: <u>.820</u>	

D. Acceptance CRITERIA	<u>N/A</u>	Operator <u>M.C. Lewis</u> Level <u>III</u>
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E. ATTEST	<u>Nelson C. Lewis</u> RESPONSIBLE CERTIFIED PERSONNEL	<u>III</u> TITLE	<u>3-11-84</u> DATE
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COMPONENT I.D. R43 8ENC-103-CY-1  
N32-422-J (HEAD)

SISTEM R43

PLANT/LOCATION TURBINE DECK

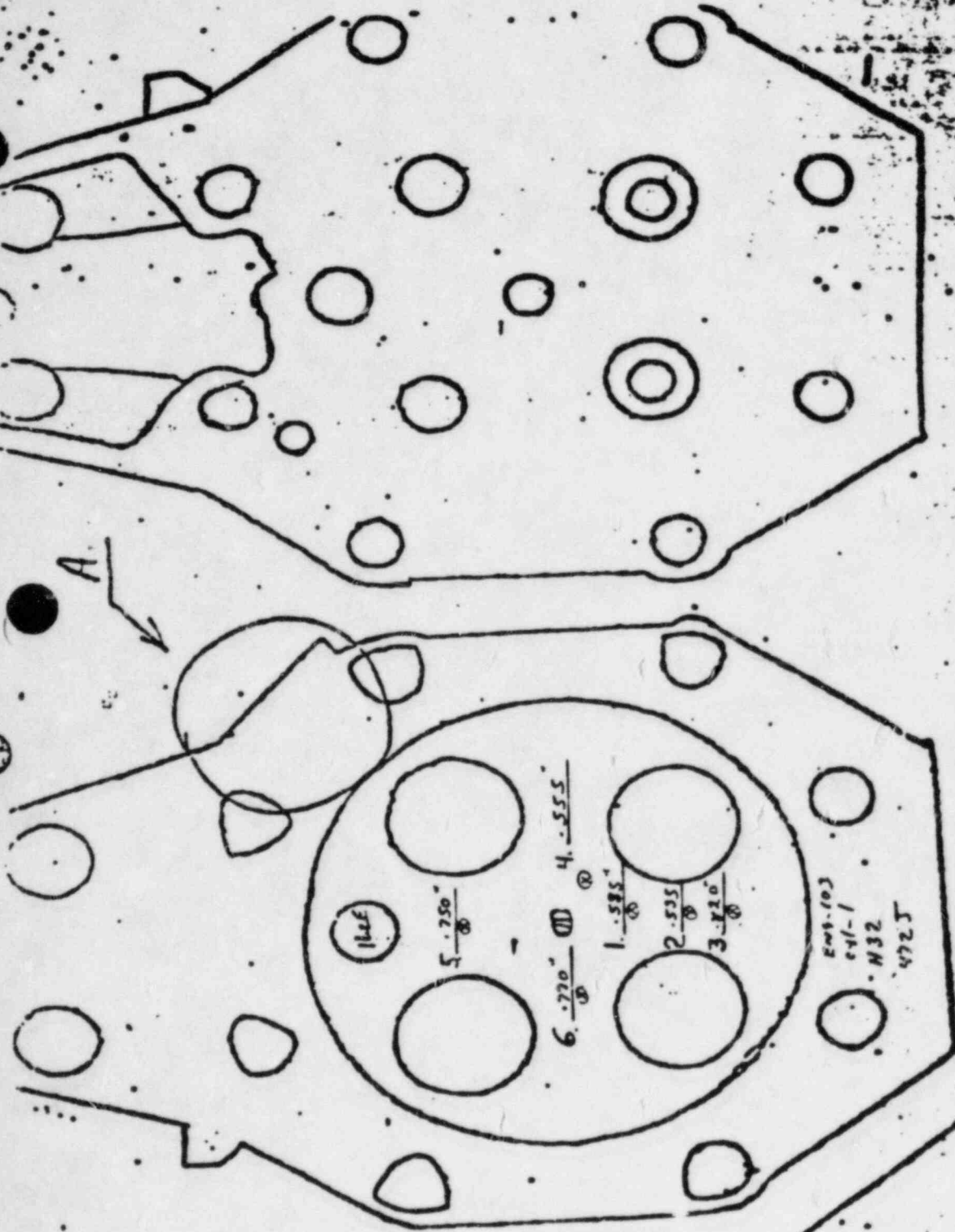


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DWG. 03-360-Q3-OF

SER. No. - 11134





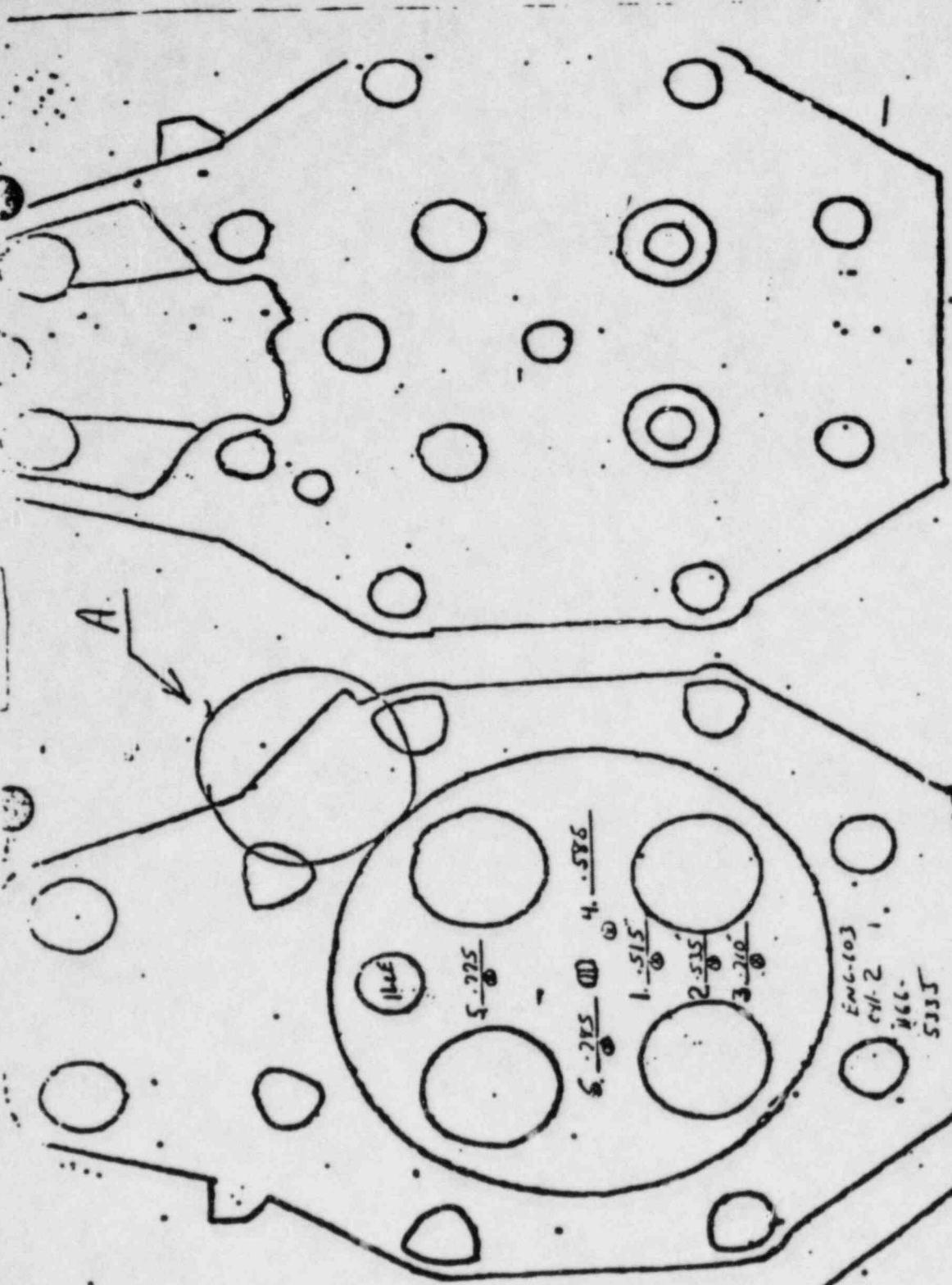
ULTRASONIC THICKNESS  
MEASUREMENT REPORT

<b>A. MATERIAL</b> C/S		<b>TYPE</b> GEOMETRY	<b>FABRICATED PROCESS</b> <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <u>ENG HEAD</u>	<b>COMPONENT I.D.</b> R43 & ENG-103-CH-2 <b>SYSTEM</b> R43 <b>PLANT/LOCATION</b> Turbine Deck																							
<b>CROSS SECTION THICKNESS</b>	<b>MAX</b> MIN <u>N/A</u>	<b>PIPE DIA.</b> <u>N/A</u>	<b>SURFACE CONDITION</b> <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER																								
<b>B. NDE Procedure</b> No. <u>NDE 8.2</u>		<b>MWR/RR</b> <u>I.R 24</u> No. <u>03-3604</u>	<b>Equipment ID S/N</b> <u>D-METER</u> <b>MATE No.</b> <u>Block 5/n 712025</u>																								
<b>INSTRUMENT SERIAL NO.</b> <u>33170</u> <b>PRECISION</b> <u>.001</u>		<b>MECHANICAL GAUGE SERIAL NO.</b> <u>2.012</u> <b>PRECISION</b> <u>.001</u>																									
<b>PREFERENCE SAMPLES - MECHANICAL MEASUREMENTS:</b> 1. <u>.500</u> 2. <u>.750</u> 3. <u>1.00</u>																											
<b>ULTRASONIC MEASUREMENTS:</b>																											
<table border="1"><thead><tr><th></th><th>1.</th><th>2.</th><th>3.</th><th>TIME</th></tr></thead><tbody><tr><td><b>INITIAL:</b></td><td>1. <u>.495</u></td><td>2. <u>.745</u></td><td>3. <u>.995</u></td><td><u>8:30 PM</u></td></tr><tr><td><b>VERIFICATION</b></td><td>1. _____</td><td>2. _____</td><td>3. _____</td><td rowspan="3"><b>MAXIMUM DIFFERENCE</b> <u>.007</u> <b>DRIFT</b> <u>.000</u></td></tr><tr><td><b>VERIFICATION</b></td><td>1. _____</td><td>2. _____</td><td>3. _____</td></tr><tr><td><b>VERIFICATION</b></td><td>1. _____</td><td>2. _____</td><td>3. _____</td></tr></tbody></table>						1.	2.	3.	TIME	<b>INITIAL:</b>	1. <u>.495</u>	2. <u>.745</u>	3. <u>.995</u>	<u>8:30 PM</u>	<b>VERIFICATION</b>	1. _____	2. _____	3. _____	<b>MAXIMUM DIFFERENCE</b> <u>.007</u> <b>DRIFT</b> <u>.000</u>	<b>VERIFICATION</b>	1. _____	2. _____	3. _____	<b>VERIFICATION</b>	1. _____	2. _____	3. _____
	1.	2.	3.	TIME																							
<b>INITIAL:</b>	1. <u>.495</u>	2. <u>.745</u>	3. <u>.995</u>	<u>8:30 PM</u>																							
<b>VERIFICATION</b>	1. _____	2. _____	3. _____	<b>MAXIMUM DIFFERENCE</b> <u>.007</u> <b>DRIFT</b> <u>.000</u>																							
<b>VERIFICATION</b>	1. _____	2. _____	3. _____																								
<b>VERIFICATION</b>	1. _____	2. _____	3. _____																								
<b>MAXIMUM PROBABLE ERROR</b> <b>SUM OF INSTRUMENT AND MECHANICAL PRECISIONS, MAX. DIFFERENCE AND DRIFT</b> <u>.007</u>																											
<b>C. EVALUATION</b>		<b>SKETCH OR DESCRIPTION OF MEASURED LOCATIONS</b> <u>* SEE ATTACHED SKETCH</u>																									
<b>Readings Taken</b> <b>AREA- 5.</b> <u>.775"</u> <b>6.</b> <u>.785"</u> <b>9.</b> <u>.585"</u> <b>1.</b> <u>.515"</u> <b>2.</b> <u>.535"</u> <b>3.</b> <u>.710"</u>																											
<b>D. Acceptance CRITERIA</b> <u>N/A</u>		<b>Operator</b> <u>M.C. Durie</u> <b>Level</b> <u>III</u>																									
<b>E. ATTEST</b> <u>Melton C. Durie</u> RESPONSIBLE CERTIFIED OPERATOR		<u>III</u> <u>3-11-84</u>																									

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3.210

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CH-2

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DWG. 03-360-Q3-0F

SER. No. - 11/31



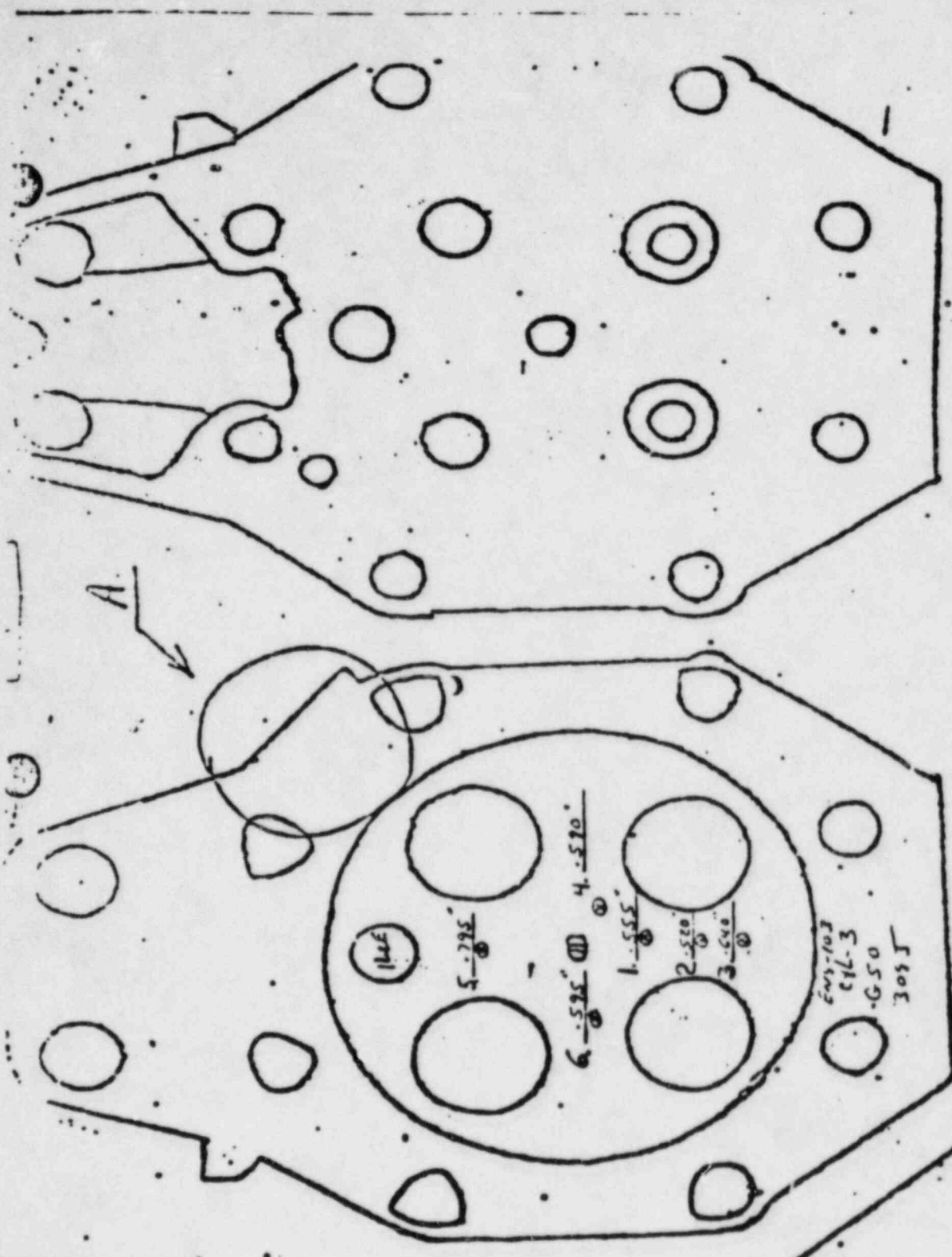
ULTRASONIC THICKNESS  
MEASUREMENT REPORT

A. MATERIAL c/s		TYPE	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>END HEAD</u>
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
B. NDE Procedure No. <u>NDE 8-2</u>		MMR/RR <u>I.A. 24</u> No. <u>03-3607</u>	Equipment ID S/N <u>D-METER</u> M&E No. <u>Block S/N 78025</u>			
INSTRUMENT SERIAL NO. <u>32170</u> PRECISION <u>.001</u>		MECHANICAL GAUGE SERIAL NO. <u>2-012</u> PRECISION <u>.001</u>				
PREFERENCE SAMPLES - MECHANICAL MEASUREMENTS: 1. <u>.500</u> 2. <u>.750</u> 3. <u>1.00</u>						
ULTRASONIC MEASUREMENTS:						
INITIAL:	1. <u>.495</u>	2. <u>.745</u>	3. <u>.965</u>	TIME <u>6:30 PM</u>		
VERIFICATION	1. _____	2. _____	3. _____	MAXIMUM DIFFERENCE <u>.007</u>		
VERIFICATION	1. _____	2. _____	3. _____	DRIFT <u>.000</u>		
VERIFICATION	1. _____	2. _____	3. _____			
MAXIMUM PROBABLE ERROR SUM OF INSTRUMENT AND MECHANICAL PRECISIONS, MAX. DIFFERENCE AND DRIFT = <u>.007</u>						
C. EVALUATION		SKETCH OR DESCRIPTION OF MEASURED LOCATIONS * SEE ATTACHED SKETCH				
READINGS TAKEN AREA 5: <u>.795</u> 6: <u>.595</u> 4: <u>.590</u> 1: <u>.555</u> 2: <u>.520</u> 3: <u>.640</u>						
D. Acceptance CRITERIA		N/A		Operator <u>H.C. Jones</u> Level <u>III</u>		
E. ATTEST		<u>William C. Jones</u> <u>III</u> <u>3-11-84</u>				

COMPONENT I.D. R4386NG-103-CV-3  
(Head)

SISTEM R43

PLANT/LOCATION TURBINE DEPT



DWG. 03-360-Q3-OF

SER. No. - 11734

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ULTRASONIC THICKNESS  
MEASUREMENT REPORT

A. MATERIAL <u>C/S</u>	TYPE	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
	GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <u>HEAD</u>	
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER

B. NDE Procedure No. <u>NDE 8.6</u>	MWR/RR <u>2.A 24</u> No. <u>03-360A</u>	Equipment ID S/N <u>D-METER</u> MLTE No. <u>Block 3/N 282025</u>
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INSTRUMENT SERIAL NO. <u>33120</u> PRECISION <u>.001</u>	MECHANICAL GAUGE SERIAL NO. <u>2.012</u> PRECISION <u>.001</u>
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PREFERENCE SAMPLES - MECHANICAL MEASUREMENTS:				1. <u>.500</u>	2. <u>.250</u>	3. <u>1.00"</u>
ULTRASONIC MEASUREMENTS:				TIME		
INITIAL:	1. <u>.495"</u>	2. <u>.745"</u>	3. <u>.995"</u>	<u>2:10 PM</u>		
VERIFICATION	1. _____	2. _____	3. _____	MAXIMUM DIFFERENCE <u>.007</u> DRIFT <u>.000</u>		
VERIFICATION	1. _____	2. _____	3. _____			
VERIFICATION	1. _____	2. _____	3. _____			

MAXIMUM PROBABLE ERROR SUM OF INSTRUMENT AND MECHANICAL PRECISIONS, MAX. DIFFERENCE AND DRIFT: <u>.007</u>
---

C. EVALUATION	SKETCH OR DESCRIPTION OF MEASURED LOCATIONS <u>* SEE ATTACHED SKETCH</u>
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READINGS TAKEN AREA - 5: <u>.790"</u> 6: <u>.560"</u> 4: <u>.550"</u> 1: <u>.520"</u> 2: <u>.510"</u> 3: <u>.545"</u>
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D. Acceptance CRITERIA	<u>N/A</u>	Operator <u>H.C. Irvine</u> Level <u>III</u>
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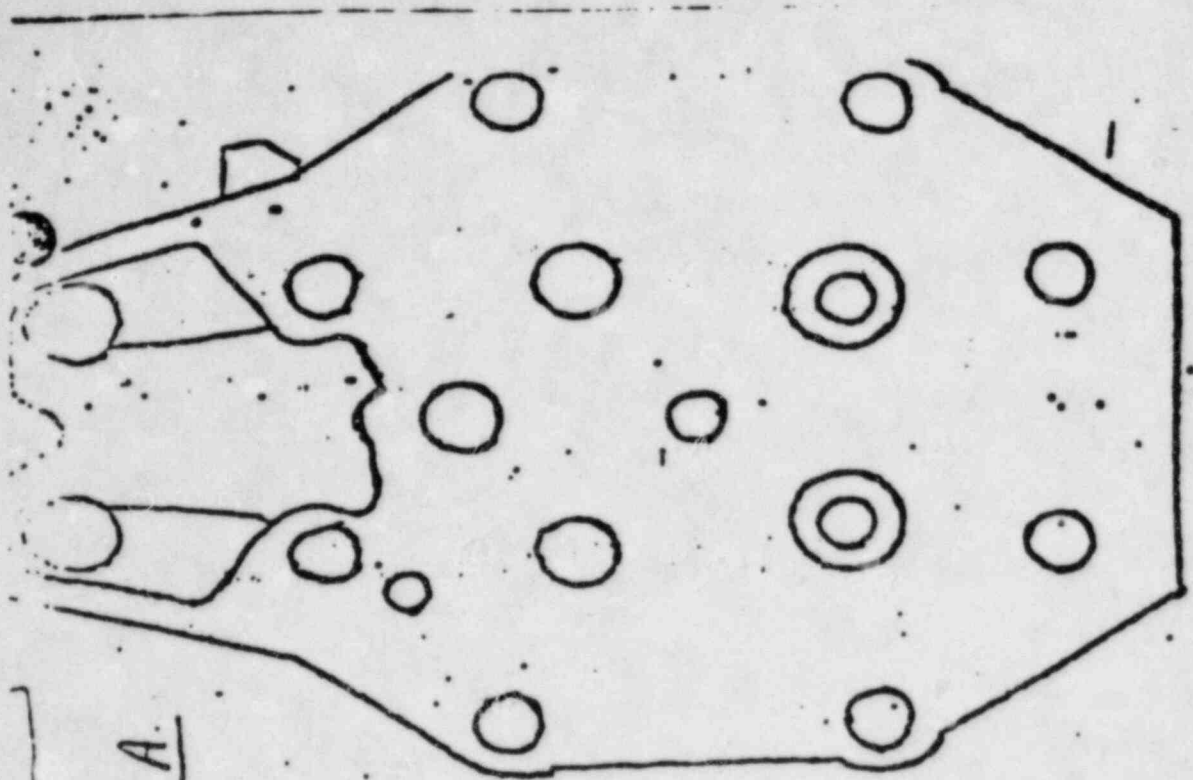
E. ATTEST	<u>Helen C. Irvine</u>	<u>III</u> <u>3-11-84</u>
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COMPONENT I.D. R43 #ENG-103-CW-4  
H60-5195 (HEAD)

SISTEM R43

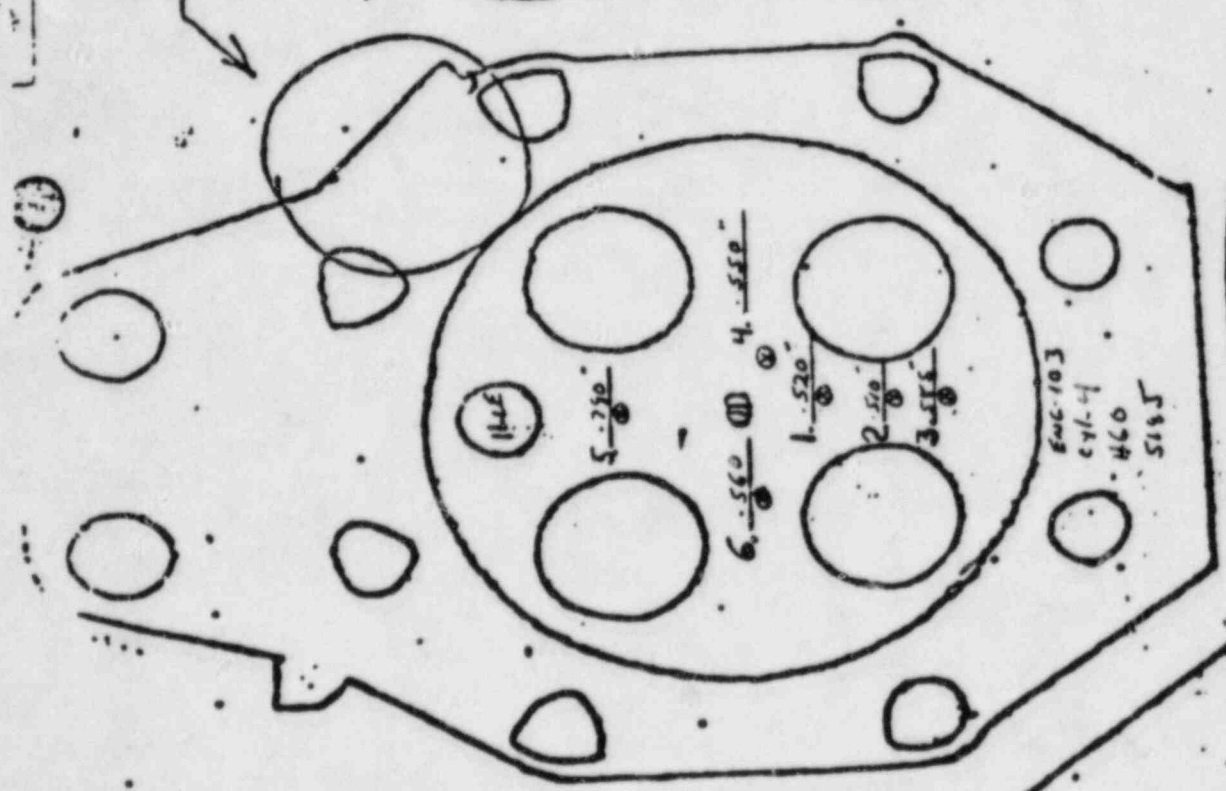
PLANT/LOCATION Turbine Deck





DWG. 03-360-Q3-OF

SER. No. 11234



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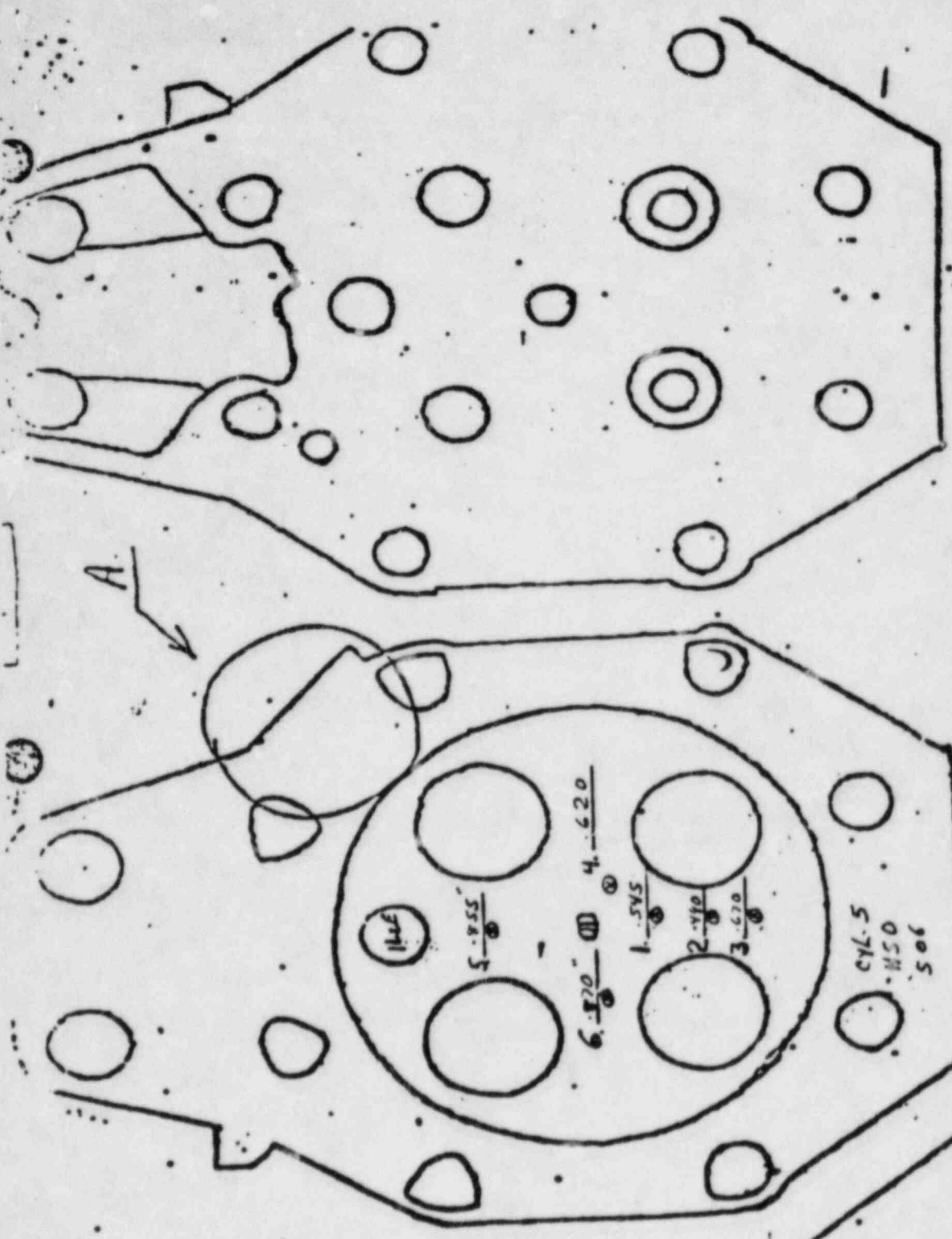
ULTRASONIC THICKNESS  
MEASUREMENT REPORT

<b>A. MATERIAL</b> C/S		<b>TYPE</b>	<b>FABRICATED PROCESS</b> <input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> FORGED
<b>CROSS SECTION THICKNESS</b> MAX MIN N/A		<b>GEOMETRY</b> <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <u>ENG HEAD</u>	<b>SURFACE CONDITION</b> <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
<b>B. NDE Procedure</b> No. <u>NDE 8-2</u>		<b>MWR/RR I.R. NO. 24</b> No. <u>03-260A</u>	<b>Equipment ID S/N D-METER</b> MATE No. <u>Block S/N 252025</u>
<b>INSTRUMENT SERIAL NO.</b> <u>33170</u> <b>PRECISION</b> <u>.001</u>		<b>MECHANICAL GAUGE SERIAL NO.</b> <u>2.012</u> <b>PRECISION</b> <u>.001</u>	
<b>PREFERENCE SAMPLES - MECHANICAL MEASUREMENTS:</b> 1. <u>.500</u> 2. <u>.750</u> 3. <u>1.0</u>			
<b>ULTRASONIC MEASUREMENTS:</b>			
<b>INITIAL:</b> 1. <u>.445</u> 2. <u>.745</u> 3. <u>.985</u> <u>840 PM</u>			
<b>VERIFICATION</b> 1. _____ 2. _____ 3. _____			
<b>VERIFICATION</b> 1. _____ 2. _____ 3. _____			
<b>VERIFICATION</b> 1. _____ 2. _____ 3. _____			
<b>MAXIMUM PROBABLE ERROR</b> <b>SUM OF INSTRUMENT AND MECHANICAL PRECISIONS, MAX. DIFFERENCE AND DRIFT</b> <u>.007</u>			
<b>C. EVALUATION</b>		<b>SKETCH OR DESCRIPTION OF MEASURED LOCATIONS</b> <u>* SEE ATTACHED SKETCH</u>	
<b>Reading taken</b> <b>Area - 5 .855"</b>  6 .870" 4 .620" 1 .545" 2 .490" 3 .670"			
<b>D. Acceptance CRITERIA</b> <u>N/A</u>		<b>Operator</b> <u>H.C. Lums</u> <b>Level</b> <u>III</u>	
<b>E. ATTEST</b> <u>Helson C. Lums</u>		<u>III</u> <u>3-11-84</u>	

COMPONENT I.D. R43 \* & NO. 103-CV-5  
H50-506 (HEAD)

SISTEM R43

PLANT/LOCATION Turbine Deck



DWG. 03-360-03-0F

SER. No. 11734

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1. 545  
2. 410  
3. 670  
5. 855  
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ULTRASONIC THICKNESS  
MEASUREMENT REPORT

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COMPONENT I.D. RVS #43-103-CV-6  
G-V 1145 HEAD

SISTON RVS

PLANT/LOCATION Turbine Drift

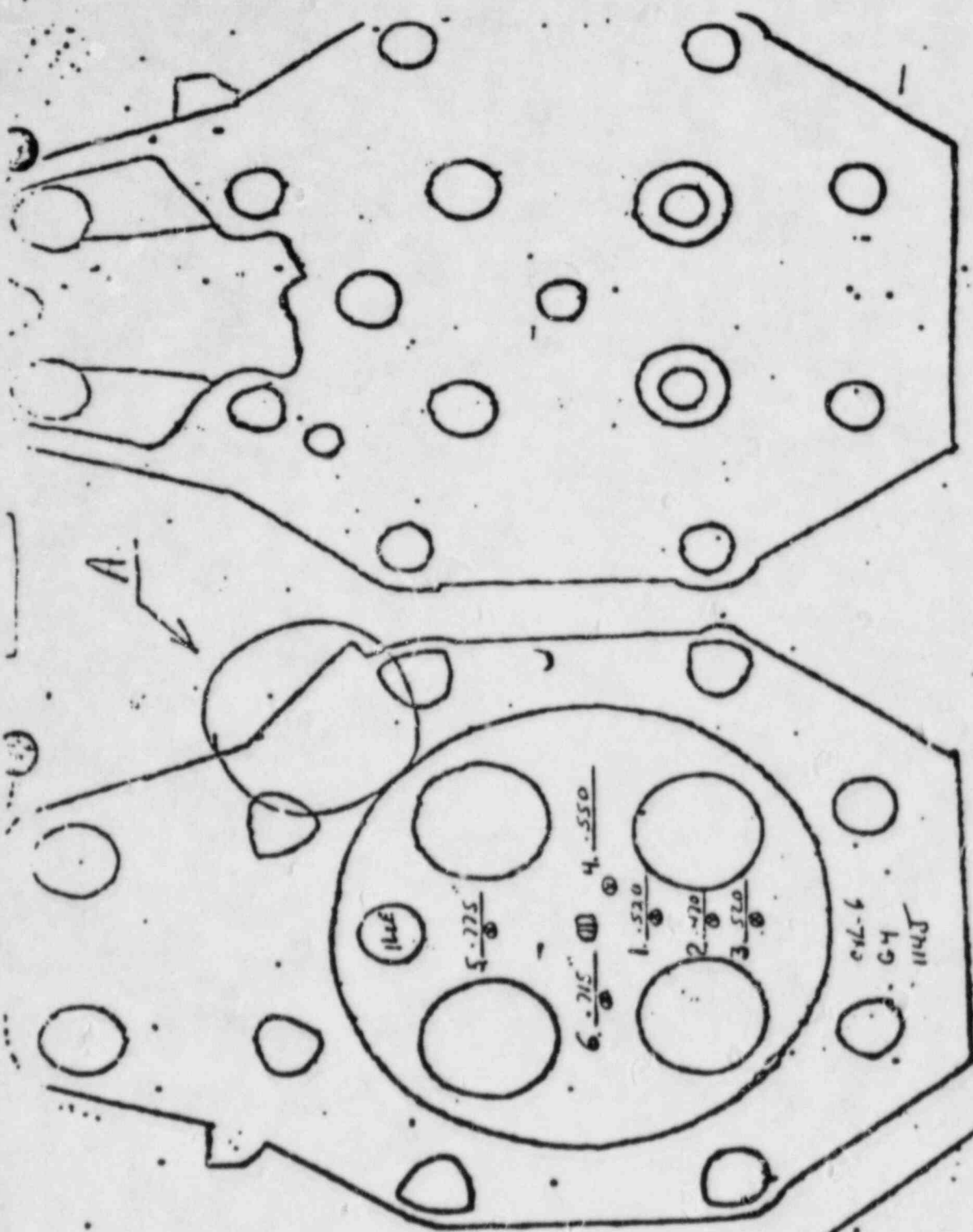
<b>A. MATERIAL</b>		<b>TYPE</b>	<b>FABRICATED PROCESS</b>
C/S		GEOMETRY	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
<b>CROSS SECTION THICKNESS</b>	<b>MAX</b>	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>END HEAD</u>
<b>MIN</b>	<u>N/A</u>	<b>PIPE DIA.</b>	<b>SURFACE CONDITION</b>
		<u>N/A</u>	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND
			<input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
<b>B. NDE Procedure</b>		<b>MNR/RR I.R. NO.</b>	<b>Equipment ID S/N</b>
No. <u>NDE 82</u>		<u>03-260A</u>	<u>D-METER</u>
			<b>NOTE No.</b> <u>Bochs/n 782025</u>
<b>INSTRUMENT SERIAL NO.</b>		<b>MECHANICAL GAUGE SERIAL NO.</b>	
<u>33170</u>		<u>2-012</u>	
<b>PRECISION</b>		<b>PRECISION</b>	
<u>.001</u>		<u>.001</u>	
<b>PREFERENCE SAMPLES - MECHANICAL MEASUREMENTS:</b>			
1. <u>.500</u> 2. <u>.250</u> 3. <u>1.00</u>			
<b>ULTRASONIC MEASUREMENTS:</b>			
<b>INITIAL:</b>	1. <u>.485</u>	2. <u>.745</u>	3. <u>.995</u>
			<u>6.10001</u>
<b>VERIFICATION</b>	1. _____	2. _____	3. _____
			<b>MAXIMUM DIFFERENCE</b>
<b>VERIFICATION</b>	1. _____	2. _____	3. _____
			<u>.007</u>
<b>VERIFICATION</b>	1. _____	2. _____	3. _____
			<b>DRIFT</b>
			<u>.000</u>
<b>MAXIMUM PROBABLE ERROR</b>			
SUM OF INSTRUMENT AND MECHANICAL PRECISIONS, MAX. DIFFERENCE AND DRIFT = <u>.007</u>			
<b>C. EVALUATION</b>		<b>SKETCH OR DESCRIPTION OF MEASURED LOCATIONS</b>	
		<u>* SEE ATTACHED SKETCH</u>	
<b>READING TAKEN</b>			
AREA 5. <u>.775</u>			
6. <u>.715</u>			
9. <u>.550</u>			
1. <u>.520</u>			
2. <u>.410</u>			
3. <u>.580</u>			
<b>D. Acceptance CRITERIA</b>		<b>Operator</b>	
<u>N/A</u>		<u>M.C. Davis</u>	
		<b>Level</b>	
		<u>III</u>	
<b>E. ATTEST</b>			
<u>Nelson C Davis</u>		<u>III</u>	
		<u>3-11-84</u>	



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26. 7/18.



DWG. 03-360-03-0F

SER. No. - 11/31





ULTRASONIC THICKNESS  
MEASUREMENT REPORT

COMPONENT I.D. R43 X ENC-103-CH-7  
G42-2925 (HEAD)

SISTEM R43

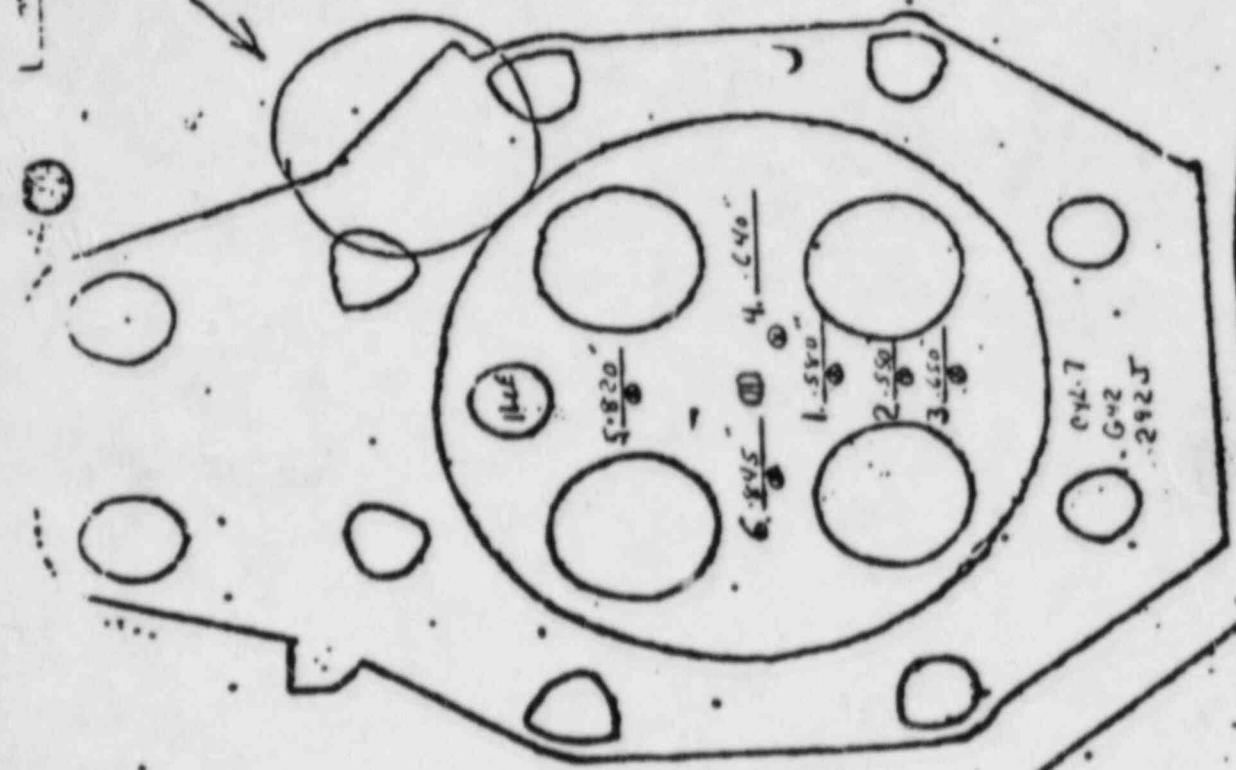
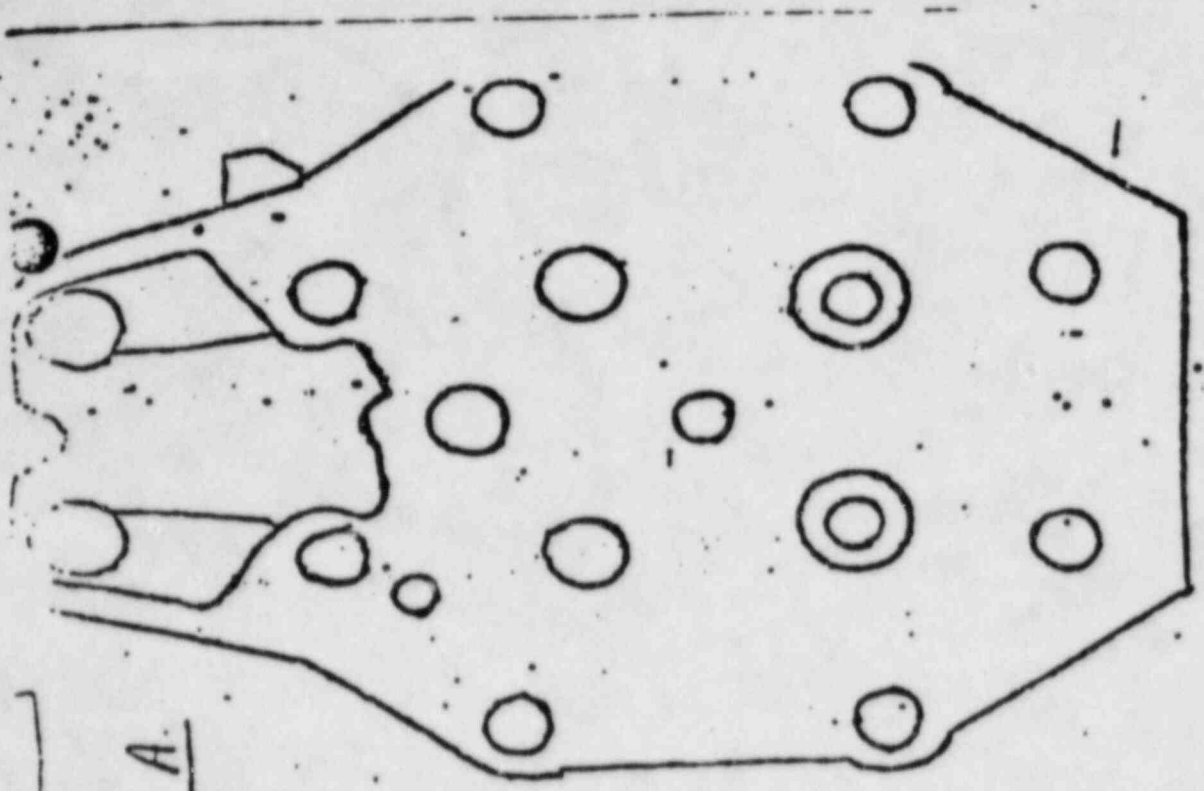
PLANT/LOCATION Turbine Deck

A. MATERIAL C/S		TYPE	FABRICATED PROCESS		<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>END HEAD</u>	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND	<input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
B. NDE Procedure No. <u>NDE 8-2</u>		MMR/RR I.P. No. <u>24</u> No. <u>03-360-A</u>		Equipment ID S/N <u>D-METER</u> M&E No. <u>N/A</u>	
INSTRUMENT SERIAL NO. <u>33170</u> PRECISION <u>.001</u>		MECHANICAL GAUGE SERIAL NO. <u>2.012</u> PRECISION <u>.001</u>			
PREFERENCE SAMPLES - MECHANICAL MEASUREMENTS: 1. <u>.500"</u> 2. <u>.750"</u> 3. <u>1.0"</u>					
ULTRASONIC MEASUREMENTS:					
INITIAL:	1. <u>.495</u>	2. <u>.745</u>	3. <u>9.95</u>	TIME <u>5:00 PM</u>	
VERIFICATION	1. _____	2. _____	3. _____	MAXIMUM DIFFERENCE <u>.007</u>	
VERIFICATION	1. _____	2. _____	3. _____	DRIFT <u>.000</u>	
VERIFICATION	1. _____	2. _____	3. _____		
MAXIMUM PROBABLE ERROR SUM OF INSTRUMENT AND MECHANICAL PRECISIONS, MAX. DIFFERENCE AND DRIFT = <u>.007</u>					
C. EVALUATION		SKETCH OR DESCRIPTION OF MEASURED LOCATIONS * SEE ATTACHED SKETCH			
Reading Taken AREA - 5 .820" 6 .845" 4 .640" 1 .580" 2 .550" 3 .650"					
D. Acceptance CRITERIA <u>N/A</u>		Operator <u>H. C. Lums</u> Level <u>III</u>			
E. ATTEST <u>Helson C. Lums</u> RESPONSIBLE CERTIFIED PERSONNEL		<u>III</u> <u>3-11-84</u>			

14-00000

A  
100

SECTION  
34-1/2 IN.



DWG. 03-360-Q3-OF

SER. No. 11134

## CYLINDER LINERS

Component Number 03-315C

### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, attachment CL-1, require visual inspection of the cylinder liners over the zone of piston travel for evidence of scuffing. Recording and acceptance criteria are in accordance with attachment CL-1.

### II. Inspection Results

Visual inspection of the eight cylinder liners revealed no scuffing. Cylinder liner number 6 contained a scratch from the bottom of the liner extending into the area of piston travel.

Copies of inspection reports are provided in attachment CL-2.

### III. Conclusion

All cylinder liner inspections required in accordance with SNRC-1094 and attachment CL-1 have been satisfactorily completed. Visual inspections of liners revealed no scuffing. The conditions observed on liners 1, 2, 3, 4, 5, 7 and 8 are as expected and acceptable. The scratch mark noted on liner number 6 was caused during disassembly and is not service induced. All eight liners have been honed to an acceptable finish prior to reassembly.

Based on the above, the cylinder liners have successfully completed the confirmatory testing and are acceptable for continued use in the engine.

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the cylinder liners are acceptable for nuclear service. Further, the cylinder liners have successfully completed confirmatory testing.

POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-315CCOMP. NAME Cylinder Block LinersTYPE OF INSPECTION:\_LP      \_MT      \_ET      \_UT      X VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

Visually inspect cylinder liners over zone of piston travel for evidence of excessive scuffing as defined by TDI Instruction Manual page 5-D-7. Inspections to be performed on all liners as the pistons are removed from the engine. Match mark the piston to cylinder orientation. If scuffing is reported, the piston skirts and piston rings should be inspected for wear patterns in the orientation of scuffing indications noted on the liners.

RECORDING CRITERIA:

Inspectors are to identify the location of all areas on the cylinder liners with scuffing. Photograph results. Assure that the engineer witnesses inspections.

ACCEPTANCE CRITERIA:

If scuffing is noted, measure the bore diameter at the point of the scuffing. The diameter must be  $\leq 17.060$  inches (TDI Instruction Manual, Appendix III, Pg 8-4).

REFERENCE DOCUMENTS:

- |                     |  |
|---------------------|--|
| 1. CODES, STANDARDS | <u>ANSI N 45 Sect 2.6</u>                |
| 2. TDI O.G.         | <u>Report for Cylinder Liner 03-315C</u> |
| 3. LILCO            | <u></u>                                  |
| 4. OTHER            | <u>TDI Instruction Manual</u>            |

COMMENTS:

ATTACHMENT CL-2



November 29, 1984

NPD-84-1072

A. Muller

NED Evaluation of Cylinder Liner Visual Inspections  
DG-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

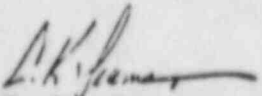
Conditions indicated on the attached visual inspection reports have been evaluated by Nuclear Engineering Department as noted below:

Conditions observed on liners 1, 2, 3, 4, 5, 7 and 8 are as expected and are acceptable. The scratch mark noted on liner number 6 was caused during disassembly and is not service induced. All eight cylinder liners are suitable for continued service in the engine. Liners should be honed prior to reassembly.

NPD-84-1012 is revised to add attached RMS readings taken 11/14/84.

The following consultant personnel examined the above conditions and concur with this evaluation:

. FAA Dr. L. Swanger  
. FEV Dr. F. C. Pischinger

  
C. K. Seaman  
Project Engineer

MS/tls

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger



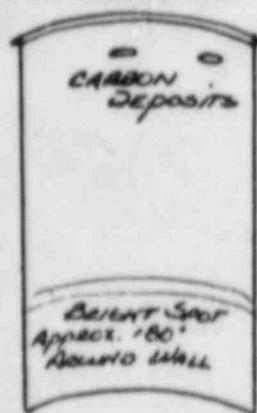
V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

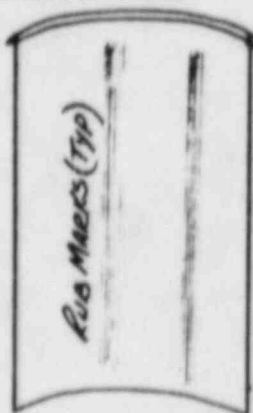
Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1243+E-03</b>		Organization Responsible: <b>LSH</b>		
Procedure/Rev.: <b>F-46548</b>	Spec./Rev.: <b>SWI-089</b>	Drawing/Rev.: <b>5-D-7</b> <b>TDI INST. MAN.</b>		Other: <b>CYL # 1</b>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR MATE
1 EXAMINATION AREA CLEANLINESS						<b>INSPECTED IN AS FOUND CONDITION</b>
2 SUFFICIENT LIGHTING						<b>DROP LIGHT</b>
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL						
a. No evidence of excessive scuffing		<input checked="" type="checkbox"/>			TDI O.G. No. 03-315C	
b. Piston & cylinder liners are match marked for piston inspection		<input checked="" type="checkbox"/>			TDI Inst. Manual pg. 5-D-7	Photograph results

## SKETCH OR DESCRIPTION OF EXAMINATION AREA



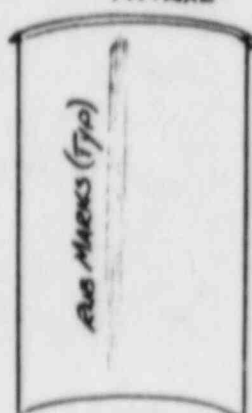
1

INT



2

EXN



3

INTAKE

INTAKE  
VIEWS

Prepared by: <b>William J. Franch</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Rows</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>L. L. L...</b>	Date: <b>11/8/84</b>	OQAE Approval: <b>[Signature]</b>	Date: <b>11/30/84</b>
Remarks: <b>NED TO EVALUATE * NED-84-1072</b>			



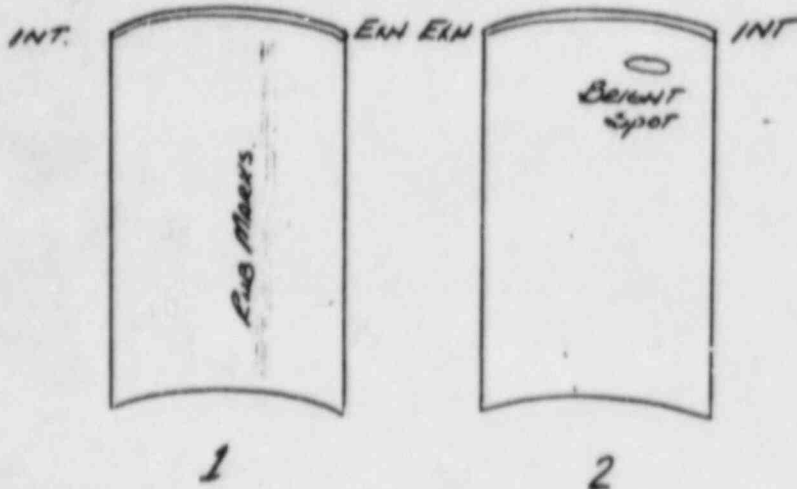
V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <i>POST ENDURANCE RUN INSPECTION</i>		System/Struct/Comp: <i>1R43+E-03</i>		Organization Responsible: <i>LSU</i>		
Procedure/Rev.: <i>F-46548</i>	Spec./Rev.: <i>SN1-089</i>	Drawing/Rev.: <i>5-D-7</i> <i>TDI INST MANUAL</i>		Other: <i>Cyl # 2</i>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS						<i>INSPECTED IN AS FOUND CONDITION</i>
2 SUFFICIENT LIGHTING						<i>DEEP LIGHT</i>
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL						
a. No evidence of excessive scuffing *					TDI O.G. No.03-315C	
b. Piston & cylinder liners are match marked for piston inspection *					TDI Inst.Manual pg. 5-D-7	Photograph results

## SKETCH OR DESCRIPTION OF EXAMINATION AREA



Prepared by: <i>William J. French</i>	Date: <i>11/2/84</i>	Approved for use: <i>C.D. Rows</i>	Date: <i>11/2/84</i>
OQA Inspector: <i>R. Lery</i>	Date: <i>11/8/84</i>	OQAE Approval: <i>[Signature]</i>	Date: <i>11/9/84</i>
Remarks: <i>NED TO EVALUATE * NRD-84-W72</i>			

## Operational Quality Assurance

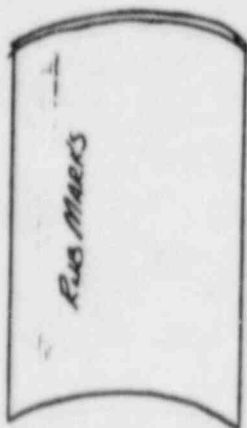
### Visual Inspection Report - CYLINDER BLOCK LINERS TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1243-E-03</b>		Organization Responsible: <b>LSU</b>	
Procedure/Rev.: <b>F-46548</b>	Spec./Rev.: <b>SMI-089</b>	Drawing/Rev.: <b>5-D-7</b> <b>TDI INST. MAN.</b>		Other: <b>Cyl # 3</b>	

VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR MATE
1 EXAMINATION AREA CLEANLINESS					<b>INSPECTED IN AS FOUND CONDITION</b> <b>Drop Light</b>
2 SUFFICIENT LIGHTING					
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL	<input checked="" type="checkbox"/>			TDI O.G. No. 03-315C	
a. No evidence of excessive scuffing	<input checked="" type="checkbox"/>			TDI Inst. Manual pg. 5-D-7	Photograph results:
b. Piston & cylinder liners are match marked for piston inspection	<input checked="" type="checkbox"/>				


SKETCH OR DESCRIPTION OF EXAMINATION AREA

INT



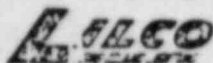
EXH

EXH



INTAKE VIEW

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Row</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>Poling</b>	Date: <b>11/8/84</b>	OQAE Approval: <b>Di Post</b>	Date: <b>11/30/84</b>
Remarks: <b>NED TO EVALUATE *NAD-24-1072</b>			



V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

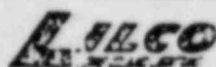
Inspection Activity: <i>POST ENDURANCE RUN INSPECTION</i>		System/Struct/Comp: <i>1R43* E-03</i>		Organization Responsible: <i>LSL</i>		
Procedure/Rev.: <i>F-46548</i>	Spec./Rev.: <i>SN1-089</i>	Drawing/Rev.: <i>5-D-7</i> <i>TDI INST MAN</i>		Other: <i>Cyl # 4</i>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS						<i>INSPECTED IN AS FOUND CONDITION</i>
2 SUFFICIENT LIGHTING						<i>Drop Light</i>
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL						
a. No evidence of excessive scuffing		<input checked="" type="checkbox"/>			TDI O.G. No.03-315C	
b. Piston & cylinder liners are match marked for piston inspection		<input checked="" type="checkbox"/>			TDI Inst. Manual pg. 5-7-7	Photograph results

SKETCH OR DESCRIPTION OF EXAMINATION AREA

*Cyl LINER MEETS VISUAL ACCEPTANCE CRITERIA*

Prepared by: <i>William J. French</i>	Date: <i>11/2/84</i>	Approved for use: <i>C.D. Row</i>	Date: <i>11/2/84</i>
OQA Inspector: <i>Robert</i>	Date: <i>11/8/84</i>	OQAE Approval: <i>C.D. Row</i>	Date: <i>11/3/84</i>
Remarks: <i>NED TO EVALUATE * NPD-84-1072</i>			





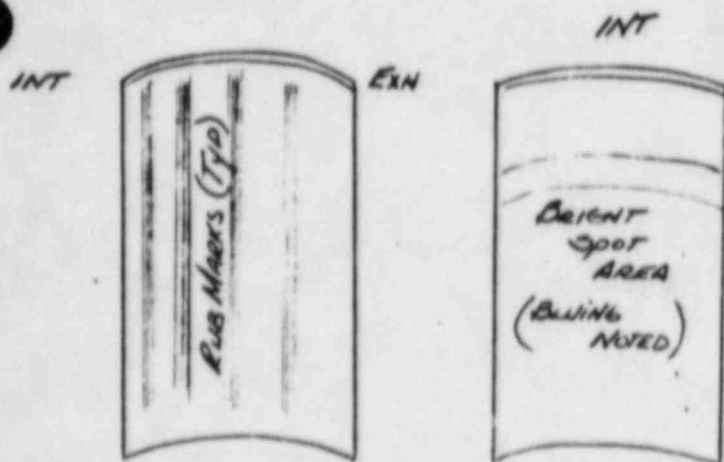
V-3.0

## Operational Quality Assurance

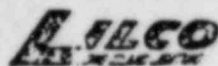
Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <i>POST ENDURANCE RUN INSPECTION</i>		System/Struct/Comp: <i>1R43*E-03</i>		Organization Responsible: <i>LSH</i>		
Procedure/Rev.: <i>F-46548</i>	Spec./Rev.: <i>SN1-089</i>	Drawing/Rev.: <i>5-D-7</i> <i>TDI INST. MAN.</i>		Other: <i>Cyl. # 5</i>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS						<i>INSPECTED IN AS FOUND CONDITION</i>
2 SUFFICIENT LIGHTING						<i>DEEP LIGHT</i>
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL						
a. No evidence of excessive scuffing		<i>*✓</i>			TDI O.G. No. 03-315C	
b. Piston & cylinder liners are match marked for piston inspection		<i>*✓</i>			TDI Inst. Manual pg. 5-D-7	Photograph results

## SKETCH OR DESCRIPTION OF EXAMINATION AREA



Prepared by: <i>William J. French</i>	Date: <i>11/2/84</i>	Approved for use: <i>C.D. Kowalski</i>	Date: <i>11/2/84</i>
OQA Inspector: <i>L. L. L...</i>	Date: <i>11/8/84</i>	OQAE Approval: <i>J.C. P...</i>	Date: <i>11/3/84</i>
Remarks: <i>NED TO EVALUATE * NFD-84-1072</i>			



V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:

System/Struct/Comp:

Organization  
Responsible:

Post Endurance Run Inspection

1R43\*E-03

LSU

Procedure/Rev.:

Spec./Rev.

Drawing/Rev.: 5-D-7

Other: Cyl #  
6

F-46548

SNI-089

TDI INST. MAN.

VISUAL INSPECTION DESCRIPTION  
(Check One)

SAT

UN-  
SAT

N/A

REFERENCES

REMARKS, VISUAL  
AIDS AND/OR X-RAYREMOTE ☐DIRECT ☒

1 EXAMINATION AREA CLEANLINESS

INSPECTED IN AS FOUND CONDITION

2 SUFFICIENT LIGHTING

DEEP LIGHT

3 CYLINDER LINERS OVER ZONE OF PISTON

\*✓

TDI O.G. No. 03-315C

TRAVEL

a. No evidence of excessive scuffing

\*✓

TDI Inst. Manual pg.

Photograph results

b. Piston &amp; cylinder liners are match

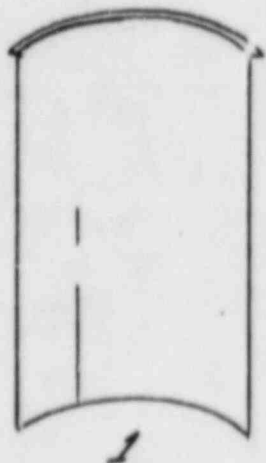
\*✓

5-D-7

marked for piston inspection

SKETCH OR DESCRIPTION OF EXAMINATION AREA

INT.



EXN.

EXN

INTAKE  
VIEWBROKEN SCRATCH RUNNING FROM BOTTOM OF LINER  
AND EXTENDING INTO PISTON TRAVEL AREA.

Prepared by:

Date:

Approved for use:

Date:

William J. French

11/2/84

C.D. French

11/2/84

OQA Inspector:

Date:

OQAE Approval:

Date:

L. Perry

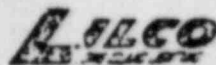
11/8/84

S. P. S.

11/8/84

Remarks:

NED TO EVALUATE. \* NPD-84-1072



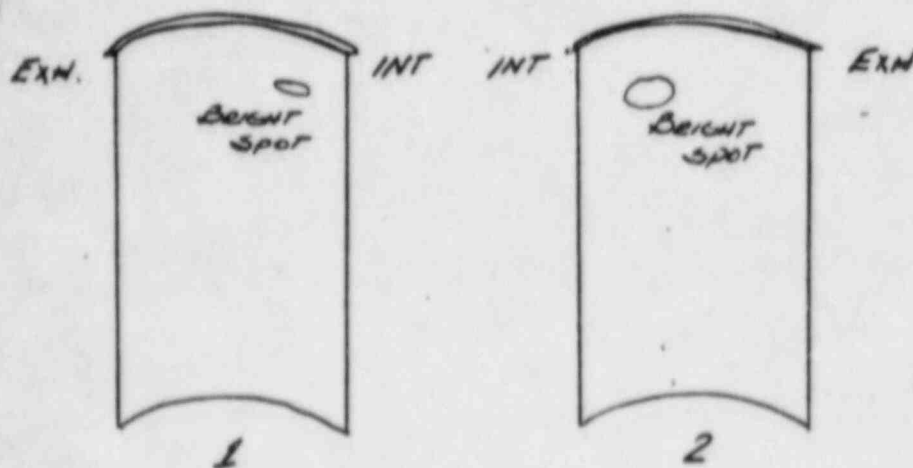
V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <i>POST ENDURANCE RUN INSPECTION</i>		System/Struct/Comp: <i>1R43*ENG-03</i>		Organization Responsible: <i>LSH</i>		
Procedure/Rev.: <i>F-46548</i>	Spec./Rev.: <i>SWI-089</i>	Drawing/Rev.: <i>5-D-7</i> <i>TDI INST. MAN.</i>		Other: <i>Cyl # 7</i>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR M&T
1 EXAMINATION AREA CLEANLINESS						<i>INSPECTED IN AS FOUND CONDITION</i>
2 SUFFICIENT LIGHTING						<i>DEEP LIGHT</i>
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL					TDI O.G. No.03-315C	
a. No evidence of excessive scuffing		<i>✓</i>			TDI Inst. Manual pg. 5-D-7	Photograph results
b. Piston & cylinder liners are match marked for piston inspection		<i>✓</i>				

SKETCH OR DESCRIPTION OF EXAMINATION AREA



Prepared by: <i>William J. French</i>	Date: <i>11/2/84</i>	Approved for use: <i>C.D. Kowalski</i>	Date: <i>11/2/84</i>
OQA Inspector: <i>[Signature]</i>	Date: <i>11/8/84</i>	OQAE Approval: <i>[Signature]</i>	Date: <i>11/15/84</i>
Remarks: <i>NED TO EVALUATE * NIP-84-1072</i>			



V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1R4B* ENG-03</b>		Organization Responsible: <b>LSU</b>		
Procedure/Rev.: <b>F-46548</b>	Spec./Rev.: <b>SAI-089</b>	Drawing/Rev.: <b>5-D-7</b>		Other: <b>Cyl # 8</b>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR MATE
1 EXAMINATION AREA CLEANLINESS						<b>INSPECTED IN AS FOUND CONDITION</b>
2 SUFFICIENT LIGHTING						<b>DEAD LIGHT</b>
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL		<input checked="" type="checkbox"/>			TDI O.G. No. 03-315C	
a. No evidence of excessive scuffing		<input checked="" type="checkbox"/>			TDI Inst. Manual pg. 5-D-7	Photograph results
b. Piston & cylinder liners are match marked for piston inspection		<input checked="" type="checkbox"/>				

SKETCH OR DESCRIPTION OF EXAMINATION AREA



1

EXH

INTAKE  
VIEW

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Rows</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>[Signature]</b>	Date: <b>11/8/84</b>	OQAE Approval: <b>[Signature]</b>	Date: <b>11/30/84</b>
Remarks: <b>NED TO EVALUATE *NPD-84-1072</b>			



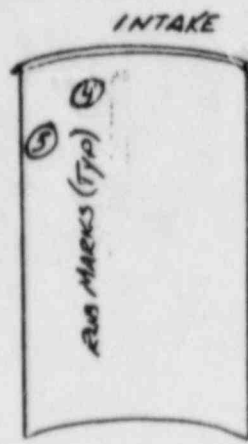
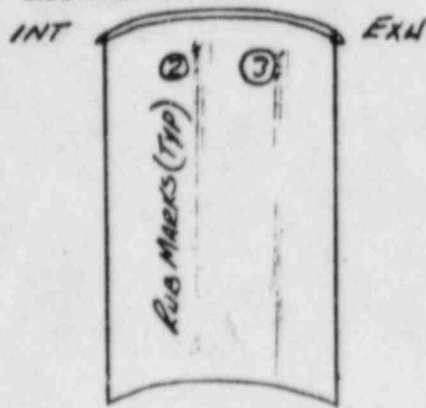
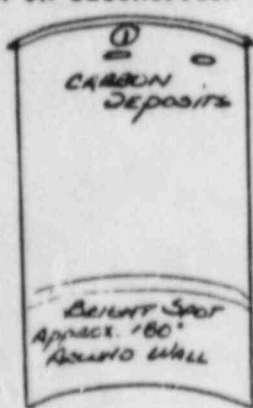
## Operational Quality Assurance

### Visual Inspection Report - CYLINDER BLOCK LINERS TDI EDG POST ENDURANCE RUN INSPECTION

Section Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1243-E-03</b>	Organization Responsible: <b>LSU</b>
Procedure/Rev.: <b>46548</b>	Spec./Rev.: <b>SWI-089</b>	Drawing/Rev.: <b>5-D-7</b> <b>TDI INST. MAN.</b>	Other: <b>CYL # 1</b>

VISUAL INSPECTION DESCRIPTION (Check One) NOTE <input type="checkbox"/> INDIRECT <input checked="" type="checkbox"/> DIRECT	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
EXAMINATION AREA CLEANLINESS					INSPECTED IN AS FOUND CONDITION
SUFFICIENT LIGHTING					DEEP LIGHT
CYLINDER LINERS OVER ZONE OF PISTON	*✓			TDI O.G. No.03-315C	
NO EVIDENCE OF EXCESSIVE SCUFFING	*✓			TDI Inst. Manual pg. 5-D-7	Photograph results
PISTON & CYLINDER LINERS ARE MATCH MARKED FOR PISTON INSPECTION	*✓				

#### Sketch or Description of Examination Area



**RMS READINGS**  
**CARBON Deposits**

① 4RMS VERTICAL  
① 4RMS HORIZONTAL

**RMS READINGS**  
**Approx. 15" from Liner Top**

② 11RMS VERTICAL  
② 10RMS HORIZONTAL  
③ 3RMS VERTICAL  
③ 7RMS HORIZONTAL

**RMS READINGS**  
**AREA 5**

④ 12RMS VERTICAL  
④ 5RMS HORIZONTAL

⑤ 4RMS HORIZONTAL  
⑤ 2RMS VERTICAL

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Rows</b>	Date: <b>11/2/84</b>
Inspector: <b>P. P. 11/14/84</b>	Date: <b>11/8/84</b>	OQAE Approval: <b>[Signature]</b>	Date: <b>11/30/84</b>

Remarks: **NEO TO EVALUATE NPO-24-W012**  
**RMS READINGS WERE TAKEN WITH A BENDIX PRO-FILOMETER**  
**TYPE QB AMPLIMETER**  
**M.H. Schuster 11/14/84**





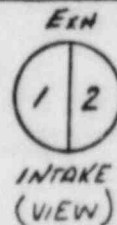
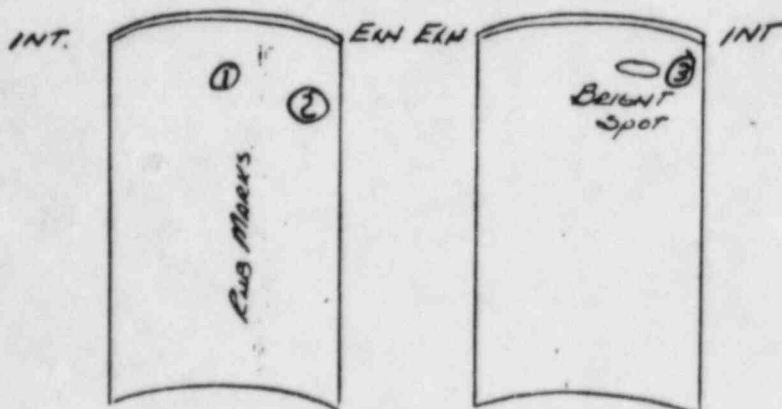
V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1R43*E-03</b>		Organization Responsible: <b>LSU</b>		
Procedure/Rev.: <b>F-46548</b>	Spec./Rev.: <b>3N1-089</b>	Drawing/Rev.: <b>5-D-7</b> <b>TDI INST MANUAL</b>		Other: <b>CYL # 2</b>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
EXAMINATION AREA CLEANLINESS		<b>INSPECTED IN AS FOUND CONDITION</b>				
EFFICIENT LIGHTING		<input checked="" type="checkbox"/>				<b>DRIP LIGHT</b>
CYLINDER LINERS OVER ZONE OF PISTON		<input checked="" type="checkbox"/>			TDI O.G. No. 03-315C	
LEVEL						
No evidence of excessive scuffing		<input checked="" type="checkbox"/>			TDI Inst. Manual pg. 5-D-7	Photograph results
Piston & cylinder liners are match marked for piston inspection		<input checked="" type="checkbox"/>				

## SKETCH OR DESCRIPTION OF EXAMINATION AREA



**1**  
**RMS READINGS**  
**APPROX. 15" FROM LINER TOP**  
① VERTICAL 4 RMS  
① HORIZONTAL 8 RMS  
② VERTICAL 3 RMS  
② HORIZONTAL 5 RMS

**2**  
**RMS READINGS**  
③ VERTICAL 8 RMS  
③ HORIZONTAL 3 RMS

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Kowalski</b>	Date: <b>11/2/84</b>
QA Inspector: <b>LaFerry</b>	Date: <b>11/8/84</b>	QA Approval: <b>St. Paul</b>	Date: <b>11/30/84</b>
Remarks: <b>NED TO EVALUATE - TPD-84-VT2</b> <b>RMS READINGS WERE TAKEN WITH A BENDIX PROSILOMETER</b> <b>TYPE QB AMPLIMETER</b> <b>M.A. Schuster</b> <b>11/14/84</b>			

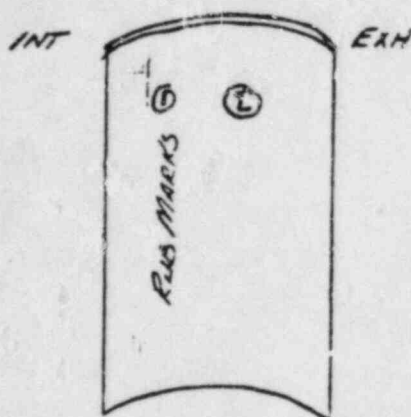
## Operational Quality Assurance

### Visual Inspection Report - CYLINDER BLOCK LINERS TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1243 * E-03</b>	Organization Responsible: <b>LSN</b>
Procedure/Rev.: <b>E-46548</b>	Spec./Rev.: <b>SWI-089</b>	Drawing/Rev.: <b>5-D-7</b> <b>TDI INST. MAN.</b>	Other: <b>Cyl. # 3</b>

VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
EXAMINATION AREA CLEANLINESS					<b>INSPECTED IN AS FOUND CONDITION</b>
EFFICIENT LIGHTING					<b>DROP LIGHT</b>
CYLINDER LINERS OVER ZONE OF PISTON RING	<input checked="" type="checkbox"/>			TDI O.G. No. 03-315C	
No evidence of excessive scuffing	<input checked="" type="checkbox"/>			TDI Inst. Manual pg. 5-D-7	Photograph results
Piston & cylinder liners are matched and marked for piston inspection	<input checked="" type="checkbox"/>				

SKETCH OR DESCRIPTION OF EXAMINATION AREA



**RMS READINGS**  
Approx. 15" from liner top

① VERTICAL	11 RMS
① HORIZONTAL	5 RMS
② VERTICAL	2 RMS
② HORIZONTAL	2 RMS

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Rows</b>	Date: <b>11/2/84</b>
Inspector: <b>P. L. R.</b>	Date: <b>11/8/84</b>	OQAE Approval: <b>A.P. R.</b>	Date: <b>11/3/84</b>
Remarks: <b>NED TO EVALUATE *NPD-84-WT2</b> <b>RMS READINGS WERE TAKEN WITH A BENDIX PROSILOMETER</b> <b>TYPE QB AMPLIMETER M.H. Schuster 11/14/84</b>			

## Operational Quality Assurance

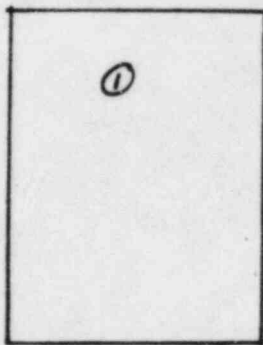
### Visual Inspection Report - CYLINDER BLOCK LINERS TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:		System/Struct/Comp:		Organization Responsible:	
POST ENDURANCE RUN INSPECTION		1R43* E-03		LSH	
Procedure/Rev.:	Spec./Rev.:	Drawing/Rev.:		Other:	
- 46548	SHI-089	5-D-7 TDI INST. MAN.		Cyl. # 4	
VISUAL INSPECTION DESCRIPTION (Check One)		SAT	UN-SAT	N/A	REMARKS, VISUAL AIDS AND/OR NOTE
REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>					
EXAMINATION AREA CLEANLINESS		INSPECTED IN AS FOUND CONDITION			
EFFICIENT LIGHTING		DROPT LIGHT			
CYLINDER LINERS OVER ZONE OF PISTON		TDI O.G. No. 03-315C			
LEVEL					
No evidence of excessive scuffing		TDI Inst. Manual pg. 5-D-7			
Piston & cylinder liners are match		Photograph results			
Marked for piston inspection					

ATCH OR DESCRIPTION OF EXAMINATION AREA

Cyl LINER MEETS VISUAL ACCEPTANCE CRITERIA

EXH



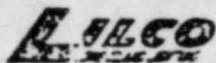
#### RMS READINGS

APPROX 15" FROM LINER TOP

- ① VERTICAL 15 RMS
- ① HORIZONTAL 22 RMS

Prepared by:	Date:	Approved for use:	Date:
William J. French	11/2/84	C.D. Rows	11/2/84
Inspector:	Date:	OQAE Approval:	Date:
R. Long	11/8/84	D.P. M	11/30/84
Remarks:			
<p style="text-align: center;">NED TO EVALUATE INFO-84-1072</p> <p style="text-align: center;">RMS READINGS WERE TAKEN WITH A BENDIX PROFILOMETER</p> <p style="text-align: center;">TYP QB AMPLIMETER MAX. Schuch 11/14/84</p>			





V-3.0

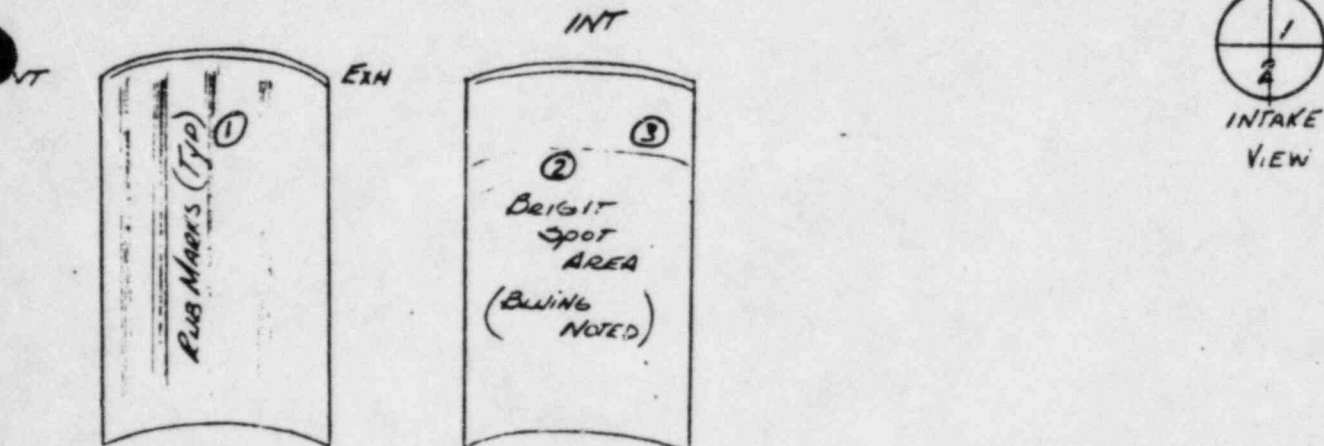
## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity:		System/Struct/Comp:	Organization Responsible:
1ST ENDURANCE RUN INSPECTION		1R43*E-03	LSH
Procedure/Rev.:	Spec./Rev.	Drawing/Rev.:	Other:
- 46548	5H1-089	5-D-7 TDI INST. MAN.	Cyl. # 5

VISUAL INSPECTION DESCRIPTION (Check One)	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
NOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>					
EXAMINATION AREA CLEANLINESS					INSPECTED IN AS FOUND CONDITION
SUFFICIENT LIGHTING					Drop Light
CYLINDER LINERS OVER ZONE OF PISTON				TDI O.G. No. 03-315C	
EL					
Evidence of excessive scuffing				TDI Inst. Manual pg. 5-D-7	Photograph results
Piston & cylinder liners are match					
Marked for piston inspection					

Sketch or Description of Examination Area



## RMS READINGS

Approx. 15" from liner top

- ① VERTICAL 4 RMS  
① Horizontal 5 RMS

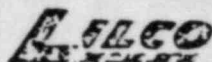
## RMS READINGS

- ② VERTICAL 2.5 RMS  
② HORIZONTAL 1 RMS  
③ VERTICAL 6 RMS  
③ HORIZONTAL 2 RMS

Prepared by:	Date:	Approved for use:	Date:
William J. French	11/2/84	C.D. Kraw	11/2/84
Inspector:	Date:	OQAE Approval:	Date:
P. Loney	11/8/84	J.P. K	11/30/84

NED TO EVALUATE \*NPD-84-1072  
RMS READINGS WERE TAKEN WITH A BENDIX PROFILOMETER TYPE QB AMPLIMETER

M.H. Shuster 11/14/84



V-3.0

## Operational Quality Assurance

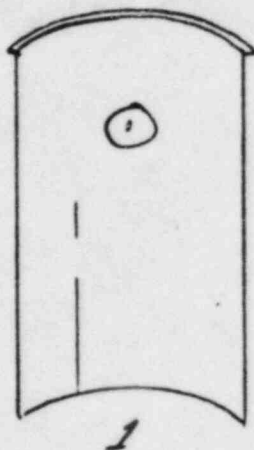
Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <i>Post Endurance Run Inspection</i>		System/Struct/Comp: <i>1R43*E-03</i>		Organization Responsible: <i>LSU</i>	
Procedure/Rev.: <i>F-46548</i>	Spec./Rev.: <i>SHI-089</i>	Drawing/Rev.: <i>5-D-7</i>		Other: <i>Cyl. # 6</i>	
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES
1 EXAMINATION AREA CLEANLINESS		<i>INSPECTED IN AS FOUND CONDITION</i>			
2 SUFFICIENT LIGHTING		<i>Deep Light</i>			
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL		TDI O.G. No. 03-315C			
a. No evidence of excessive scuffing		TDI Inst. Manual pg. 5-D-7			
b. Piston & cylinder liners are match marked for piston inspection		Photograph resu.			

Sketch or Description of Examination Area

INT.

EXH.

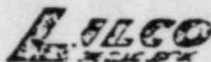
EXH  
1  
INTAKE  
VIEWBROKEN SCRATCH RUNNING FROM BOTTOM OF LINER  
AND EXTENDING INTO PISTON TRAVEL AREA.

RMS READINGS Approx. 15" from Liner Top

- ① VERTICAL 15 RMS
- ① HORIZONTAL 7 RMS

Prepared by: <i>William J. French</i>	Date: <i>11/2/84</i>	Approved for use: <i>C.D. Kraws</i>	Date: <i>11/2/84</i>
Inspector: <i>L. Perry</i>	Date: <i>11/14/84</i>	OQAE Approval: <i>D.C. Pao</i>	Date: <i>11/3/84</i>
Remarks: <i>NED TO EVALUATE - NPD-84-1072</i> <i>RMS READINGS WERE TAKEN WITH A BENOIX PROFILOMETER TYPE GB</i> <i>AMPLIMETER M.H. Schuster 11/14/84</i>			





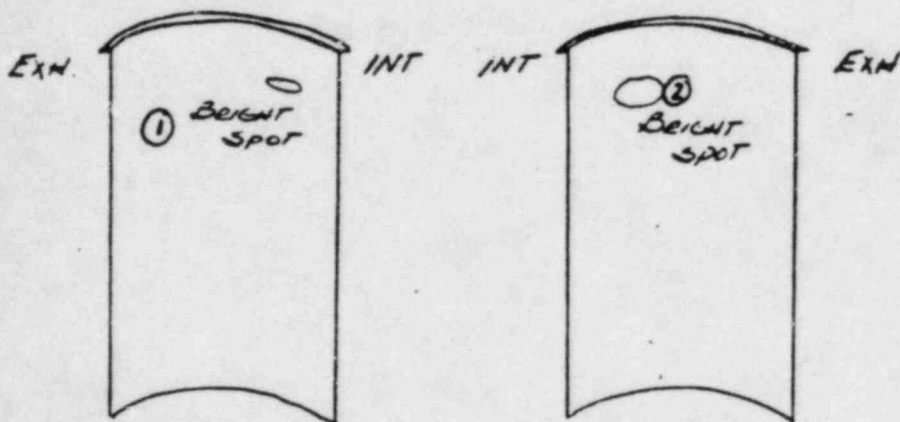
V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1R43+ENG-03</b>		Organization Responsible: <b>LSH</b>	
Procedure/Rev.: <b>F-46548</b>	Spec./Rev.: <b>SHI-089</b>	Drawing/Rev.: <b>5-D-7</b>		Other: <b>Cyl # 7</b>	
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES
1 EXAMINATION AREA CLEANLINESS		INSPECTED IN AS FOUND CONDITION			
2 SUFFICIENT LIGHTING		DEEP LIGHT.			
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL		TDI O.G. No. 03-315C			
a. No evidence of excessive scuffing		TDI Inst. Manual pg. 5-D-7			
b. Piston & cylinder liners are match marked for piston inspection		Photograph results			

Sketch or Description of Examination Area

1  
RMS READINGS

APPROX 15" FROM LINER TOP

① VERTICAL 6 RMS

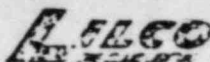
① HORIZONTAL 3 RMS

2  
RMS READINGS

② VERTICAL 2 RMS

② HORIZONTAL 2 RMS

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Kowalski</b>	Date: <b>11/2/84</b>
QA Inspector: <b>LSH</b>	Date: <b>11/8/84</b>	OQAE Approval: <b>J.P. [Signature]</b>	Date: <b>11/3/84</b>
Remarks: <b>NED TO EVALUATE *NED-84-1072</b> <b>RMS READINGS WERE TAKEN WITH A BENDIX PROFILOMETER TYPE QB</b> <b>AMPLIMETER. M.H. Schuster 11/14/84</b>			



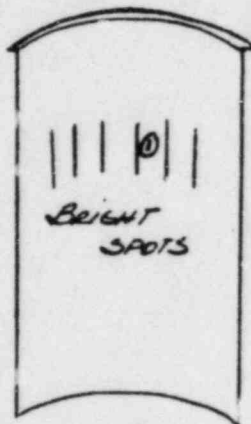
V-3.0

## Operational Quality Assurance

Visual Inspection Report - CYLINDER BLOCK LINERS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>POST ENDURANCE RUN INSPECTION</b>		System/Struct/Comp: <b>1243* ENG-03</b>		Organization Responsible: <b>LSU</b>	
Procedure/Rev.: <b>F-46548</b>	Spec./Rev.: <b>SAI-089</b>	Drawing/Rev.: <b>5-D-7</b>		Other: <b>Cyl # 8</b>	
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES
1 EXAMINATION AREA CLEANLINESS		INSPECTED IN AS FOUND CONDITION			
2 SUFFICIENT LIGHTING		DEEP LIGHT			
3 CYLINDER LINERS OVER ZONE OF PISTON TRAVEL		TDI O.G. No. 03-315C			
a. No evidence of excessive scuffing		TDI Inst. Manual pg. 5-D-7			
b. Piston & cylinder liners are match marked for piston inspection		Photograph result			

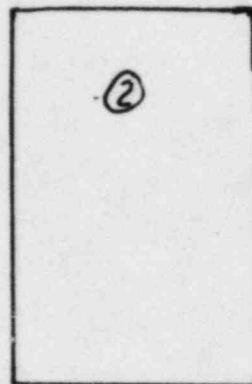
Sketch or Description of Examination Area



1

RMS READINGS

- ① VERTICAL 2RMS  
① HORIZONTAL 2RMS

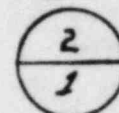
APPROX. 15" FROM  
LINER TOP

2

RMS READINGS

- ② VERTICAL 6RMS  
② HORIZONTAL 4RMS

EXH

INTAKE  
VIEW

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Kraws</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>Salvatore</b>	Date: <b>11/14/84</b>	OQA Approval: <b>D. P. [Signature]</b>	Date: <b>11/30/84</b>
Remarks: <b>NED TO EVALUATE - KPD-84-1072</b> <b>RMS READINGS WERE TAKEN WITH A BENDLY PROFILOMETER</b> <b>TYPE QB AMPLIMETER. M. Schuster 11/14/84</b>			

## CONNECTING ROD BEARINGS

Component Number 03-340B

### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, attachment CR-1, require liquid penetrant testing of the connecting rod bearing shells from all eight cylinders and eddy current examination or crack depth measurement by TSI surface resistance probe of all indications. Recording and acceptance criteria are as indicated in attachment CR-1.

### II. Inspection Results

Copies of the inspection reports are provided in attachment CR-2, and Failure Analysis Associates Report "Eddy Current Examination of Shoreham Nuclear Power Station Unit 1 Emergency Diesel Generator EDG 103 Post Endurance Run", November 29, 1984.

#### Inside Diameter (Babbitt Side)

Liquid penetrant inspection revealed linear indications at various locations on the bearings. All recordable linear indications found by liquid penetrant were found not recordable by eddy current inspection. Gouge marks caused by removal were found visually on connecting rod bearings No. 2 lower (SP-29) and No. 6 upper (SP-21).

#### Outside Diameter (Aluminum Side)

Liquid penetrant inspection revealed linear indications at various locations on the bearings outside diameter and edges. Rounded indications and porosity were also noted.

Recordable linear indications found by liquid penetrant inspection were found not recordable by eddy current inspection with the exception of the No. 6 upper bearing shell, SP-21. Eddy current inspection of bearing shell SP-21 revealed two cracks, the longest being 3/8 inch, approximately six inches from the pin end and one inch from the side of the bearing. Crack depths were measured with a TSI crack check model CC-800B and found to be 0.030 inches at the deepest point with an average depth of 0.020 inches.

### III. Conclusion

All connecting rod bearing inspections required in accordance with SNRC-1094 and attachment CR-1 have been satisfactorily completed. No relevant indications were found. Linear indications recorded by liquid penetrant inspection and evaluated by eddy current are cosmetic in nature (surface scratches) with the exception of bearing SP-21. The cracks found on bearing SP-21 do not exceed the .05 inch acceptance criteria and, based on the crack depth, bearing SP-21 is acceptable for use in the engine.



Engineering evaluation with a 30X microscope indicated that the crack was an inclusion.

Rounded indications and porosity, formed during casting, are not service induced indications and are acceptable.

Bearings SP-29 and SP-21 were replaced in the engine due to gouges in the babbitt side caused by handling during removal.

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the connecting rod bearings are acceptable for nuclear service. Further, the connecting rod bearings have successfully completed confirmatory testing.

POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-340BCOMP. NAME Connecting Rod Bearing Shells☒ LP      ☐ MT      ☒ ET      ☐ UT      ☐ VISUAL      ☒ OtherAREA TO BE EXAMINED/EXAMINATION DETAILS:

1 | Perform liquid penetrant examination of connecting rod bearing shells from all eight cylinders. Perform eddy current examination of all indications using either eddy current or TSI Crack Check.

RECORDING CRITERIA:

1 | Map and photograph indications in accordance with LILCO procedure NDE 6.2. Measure depth of any indications using FaAA Procedure NDE 11.7. or TSI Crack Check Model CC-800B.

ACCEPTANCE CRITERIA:

- 2 | 1) Babbitt side: Indications less than babbitt thickness (< 0.0022 inches) acceptable.
- 2) Aluminum side: Indications < 0.05 inches deep are acceptable.

REFERENCE DOCUMENTS:

- |                     |  |
|---------------------|--|
| 1. CODES, STANDARDS | <u>ASME Sect V</u>                               |
| 2. TDI O.G.         | <u>FaAA Procedure NDE 11.7; Phase I &amp; II</u> |
|                     | <u>Reports</u>                                   |
| 3. LILCO            | <u>LILCO Procedure NDE 6.2</u>                   |

COMMENTS:



ATTACHMENT CR-2

November 28, 1984

NPD-84-1057

A. Muller

NED Evaluation of Connecting Rod Bearing Inspections  
DG-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

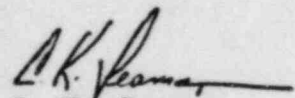
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the requirements of the confirmatory test as provided for in E&DCR F-46548 and appropriate revisions.

All inspection results are satisfactory. No LDR's are required. LDR # 2535 and LDR # 2546 were generated due to disassembly/handling damage to cylinder 2 and cylinder 6 bearing shells. These bearing shells should not be placed back into service.

The following consultant personnel concur with this evaluation:

. FAA Dr. L. Swanger



C. K. Seaman  
Nuclear Project Engineering Division

MS/tls

Attachment

cc: E. J. Youngling  
R. J. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger



## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 3

A. MATERIAL		TYPE <u>Aluminum</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>Bearing Shell</u>
CROSS SECTION THICKNESS	MAX <u>N/A</u> MIN	PIPE DIA. <u>N/A</u>	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
				<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>6.2</u>	SURFACE/MAT'L. TEMP. <u>69°F</u>	MATE. NO. <u>365</u>	MWR/RR. No. <u>RR R43 2055</u>
------------------------------------	-------------------------------------	----------------------	-----------------------------------

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012
2. PENETRANT	Magnaflux	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	Magnaflux	SKC-NF/ZC-7B	84J012
4. DEVELOPER	Magnaflux	SKD-NF	82D111
5. POST EXAMINATION CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

See attached sketches

C. EVALUATION	REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.
---------------	--

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 #1 Lower	N/A	N/A	N/A
2 #2 Lower	N/A	N/A	N/A
3 N/A	N/A	N/A	N/A
4 N/A	N/A	N/A	N/A
D. ACCEPTANCE CRITERIA	Indications: <u>2.0.05 are</u> <u>acceptable</u>		OPERATOR <u>Michael Sigel</u> Level <u>II</u> Date <u>11-7-84</u>

E. ATTEST	<u>Michael Sigel</u> RESPONSIBLE CERTIFIED PERSONNEL	<u>II</u> LEVEL	<u>11-7-84</u> DATE
-----------	---	--------------------	------------------------

COMPONENT I.D. Connecting Rod  
1 R43\*EDG-103 Bearing Shells

SYSTEM

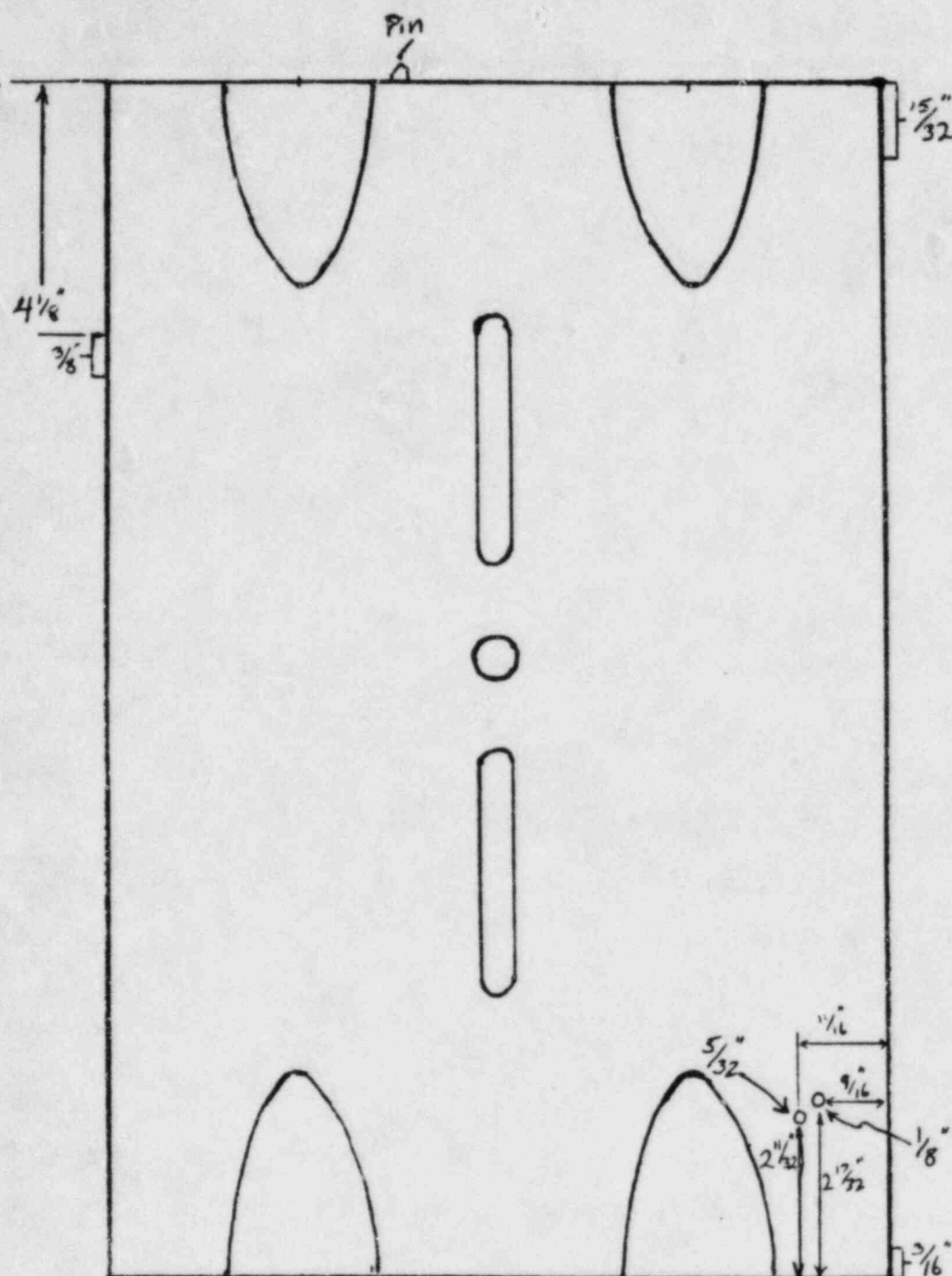
1 R43

PLANT/LOCATION EDG room - 103

#2 Lower Con Rod

Bearing Shell  
Aluminum Side

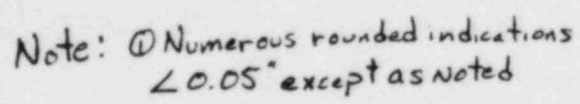
Page 2 of 3



Note : ① Numerous rounded indications  
     $\angle 0.05"$  except as noted

② Linears on edges are  $1/8"$   
    From aluminum surface

Michael Stappal 4/II 11-7-84



② Linears on edges are  $\frac{1}{8}$ " from aluminum surface

Michael Stypel <sup>2</sup>/<sub>II</sub> 11-7-84





## LIQUID PENETRANT EXAMINATION REPORT

PAGE 1 OF 6

A. MATERIAL		TYPE <u>Aluminum</u>	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <u>BEARING SHELL</u>
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
	<u>N/A</u>	<u>N/A</u>		<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>6.1 &amp; 6.2</u>	SURFACE/MAT'L. TEMP. <u>69°F</u>	M&TE. NO. <u>365</u>	MWR/RR. No. <u>RR R43-2055</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/ZC-78	845012
2. PENETRANT	MAGNAFLUX	SKL-HF/S	836018
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/ZC-78	845012
4. DEVELOPER	MAGNAFLUX	SKD-NF	82D111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/ZC-78	845012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

SEE ATTACHED SKETCHES

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
#4 LOWER	N/A	N/A	N/A
#5 LOWER	N/A	N/A	N/A
#6 LOWER	N/A	N/A	N/A
#7 LOWER	N/A	N/A	N/A
#8 LOWER	N/A	N/A	N/A
3 N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

D. ACCEPTANCE  
CRITERIAINDICATIONS:  
≤ 0.05 INCHES ARE  
ACCEPTABLEOPERATOR Art P...  
Level II Date 11-7-84

## E. ATTEST

Art P...  
RESPONSIBLE CERTIFIED PERSONNELII  
LEVEL11/7/84  
DATECOMPONENT I.D. Con Rod Bearings  
1 R43 \* EDG-103  
SHELLS

SYSTEM

1 R43

PLANT/LOCATION

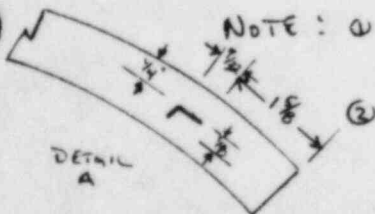
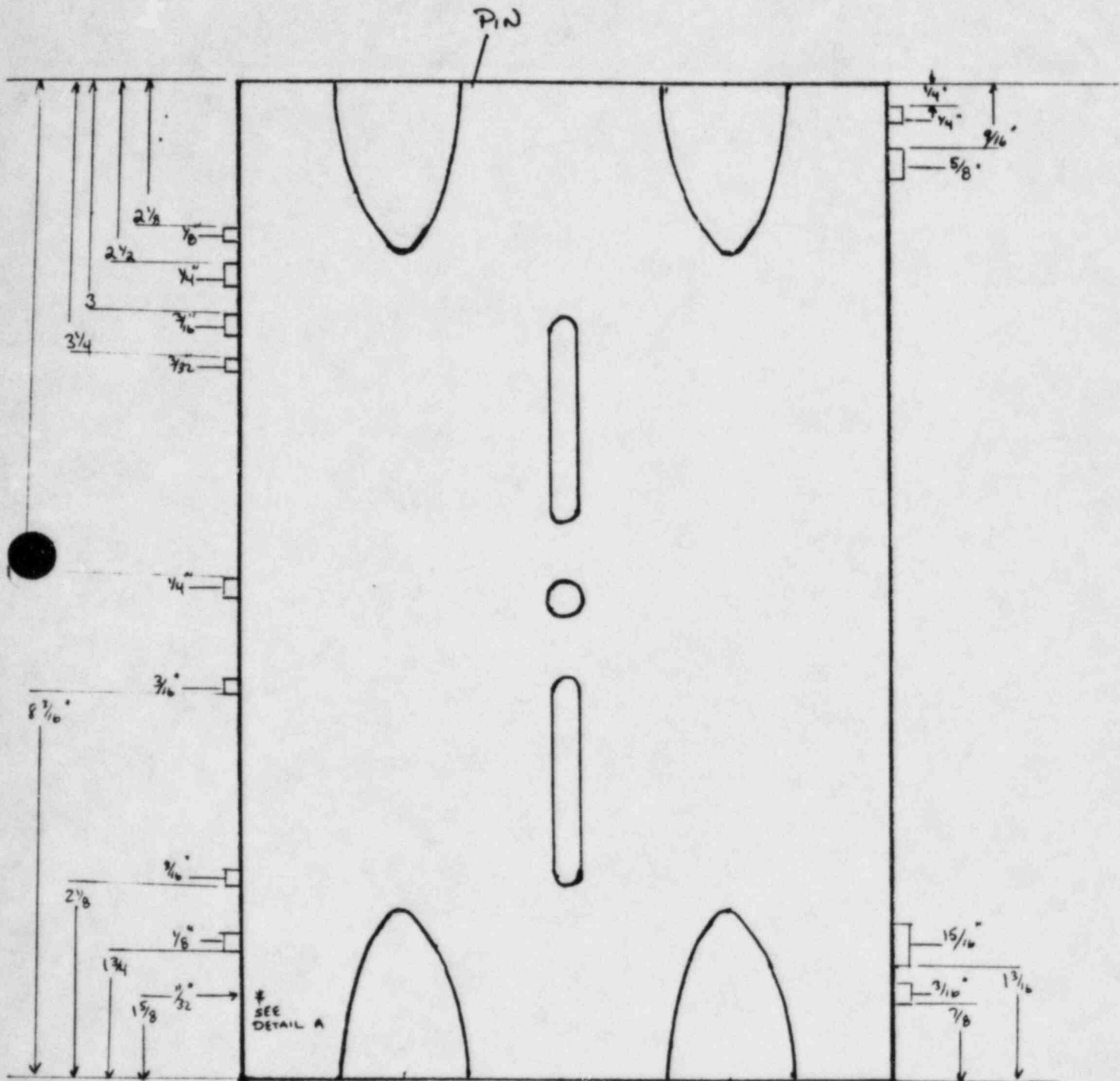
EDG Room - 103

\*5 LOWER CON ROD

PAGE 2 of 6

BEARING SHELL

ALUMINUM SIDE



NOTE: ① NUMEROUS POROSITY INDICATIONS  
L.05"

② LINEARS ON EDGES ARE 1/8" FROM  
ALUMINUM SURFACE, EXCEPT  
AS SHOWN ON DETAIL A

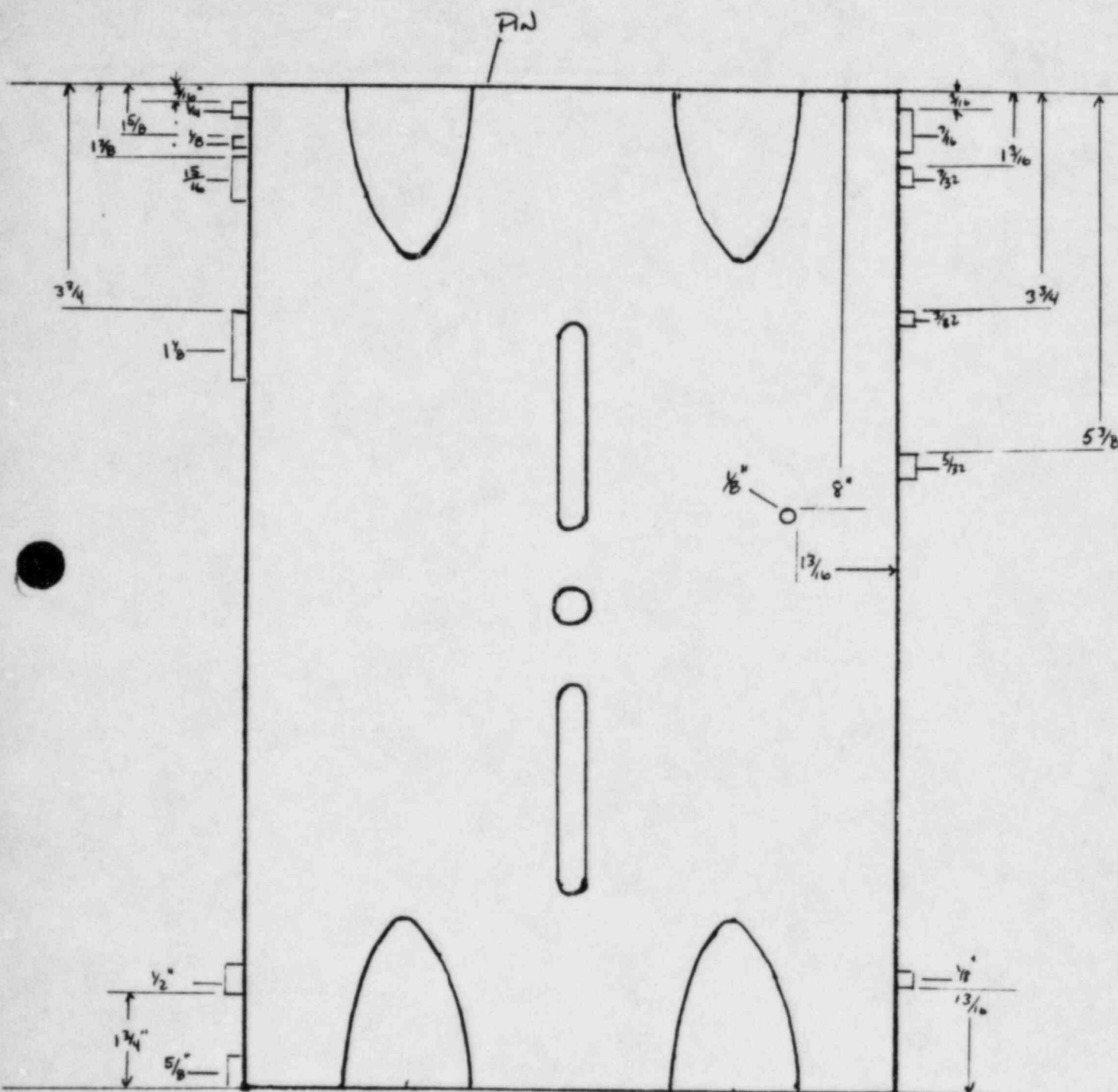
Art Puma PT II  
11-7-84

#4 LOWER CON ROD

BEARING SHELL

ALUMINUM SIDE

PAGE 3 OF 6



NOTE: ① NUMEROUS POROSITY INDICATIONS  
L .05" EXCEPT AS NOTED

② LINEARS ON EDGES ARE 1/8" FROM  
ALUMINUM SURFACE.

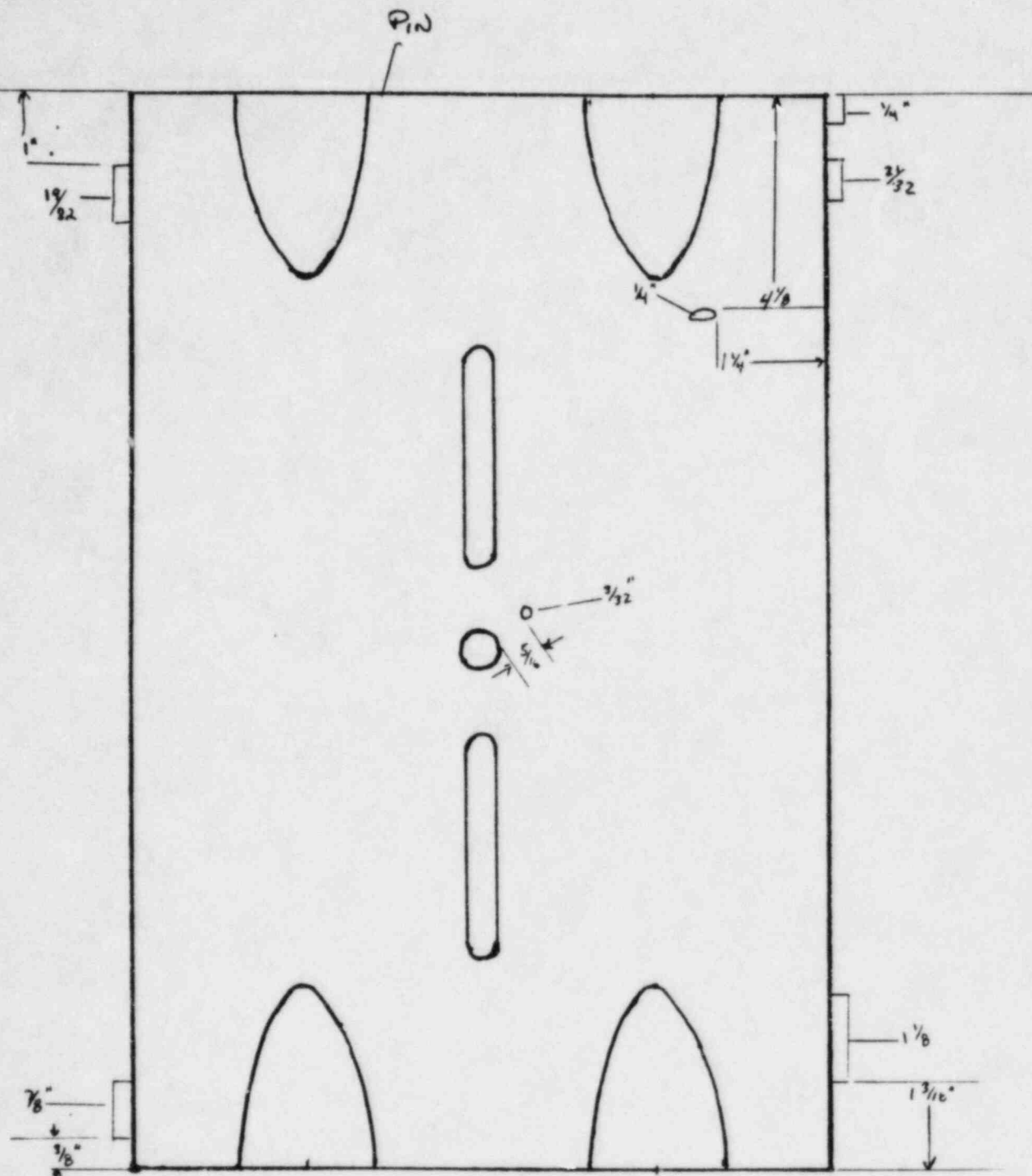
Art Pomeroy PT II  
11-7-84

#6 LOWER CON ROD

PAGE 4 OF 6

BEARING SHELL

ALUMINUM SIDE



NOTE: ① NUMEROUS POROSITY INDICATIONS  
LESS THAN .05" EXCEPT AS NOTED

② LINEARS ON EDGES ARE  $\frac{1}{8}$ " FROM  
ALUMINUM SURFACE.

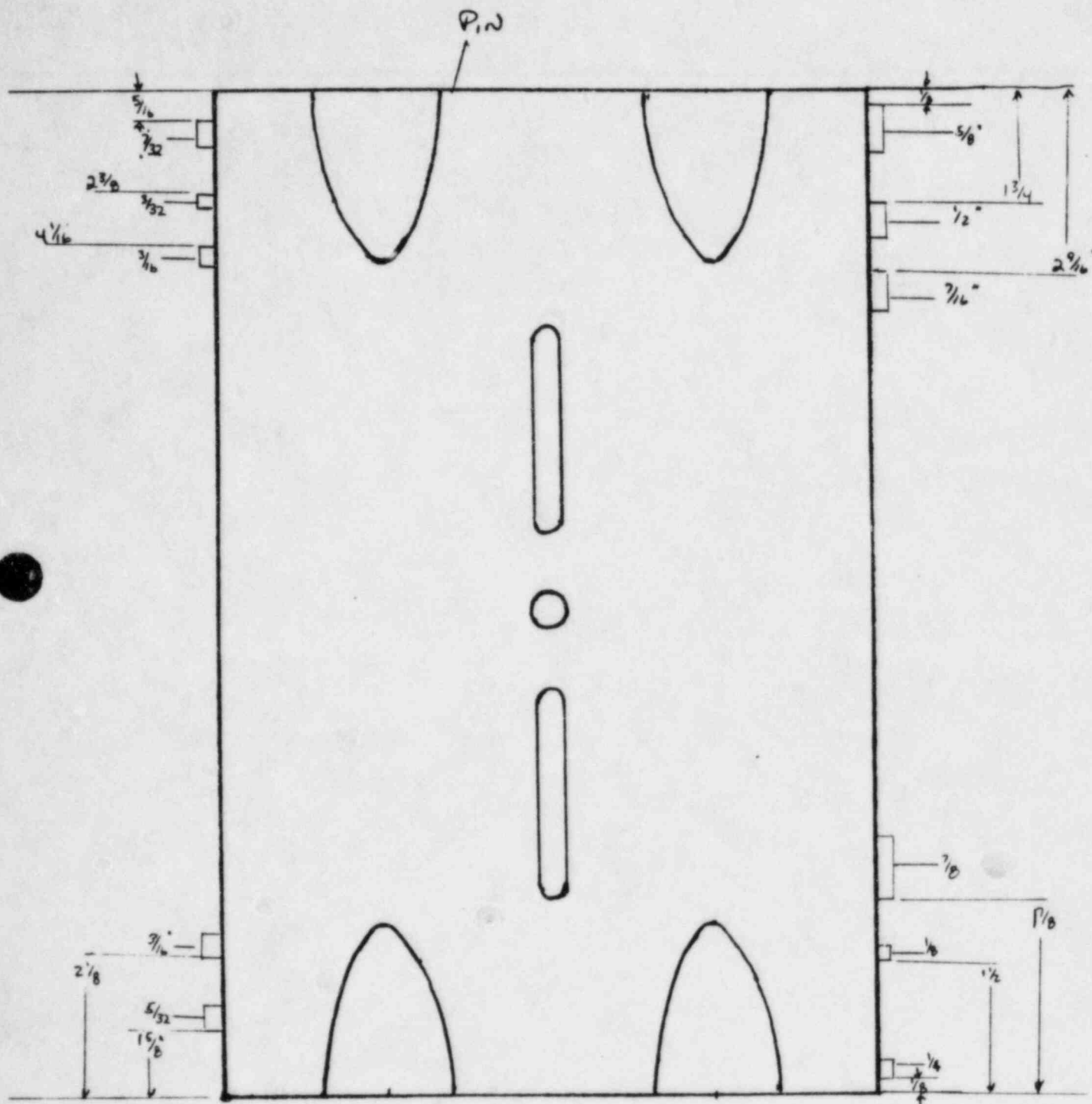
Art Pinner PT II  
11-7-84

# 7 LOWER CON ROD

BEARING SHELL

ALUMINUM SIDE

PAGE 5 OF 6



NOTE: ① NUMEROUS POROSITY INDICATIONS  
L .05"

② LINEARS ON EDGES ARE 1/8" FROM  
ALUMINUM SURFACE.

Art. P. M. PT II  
11-7-54

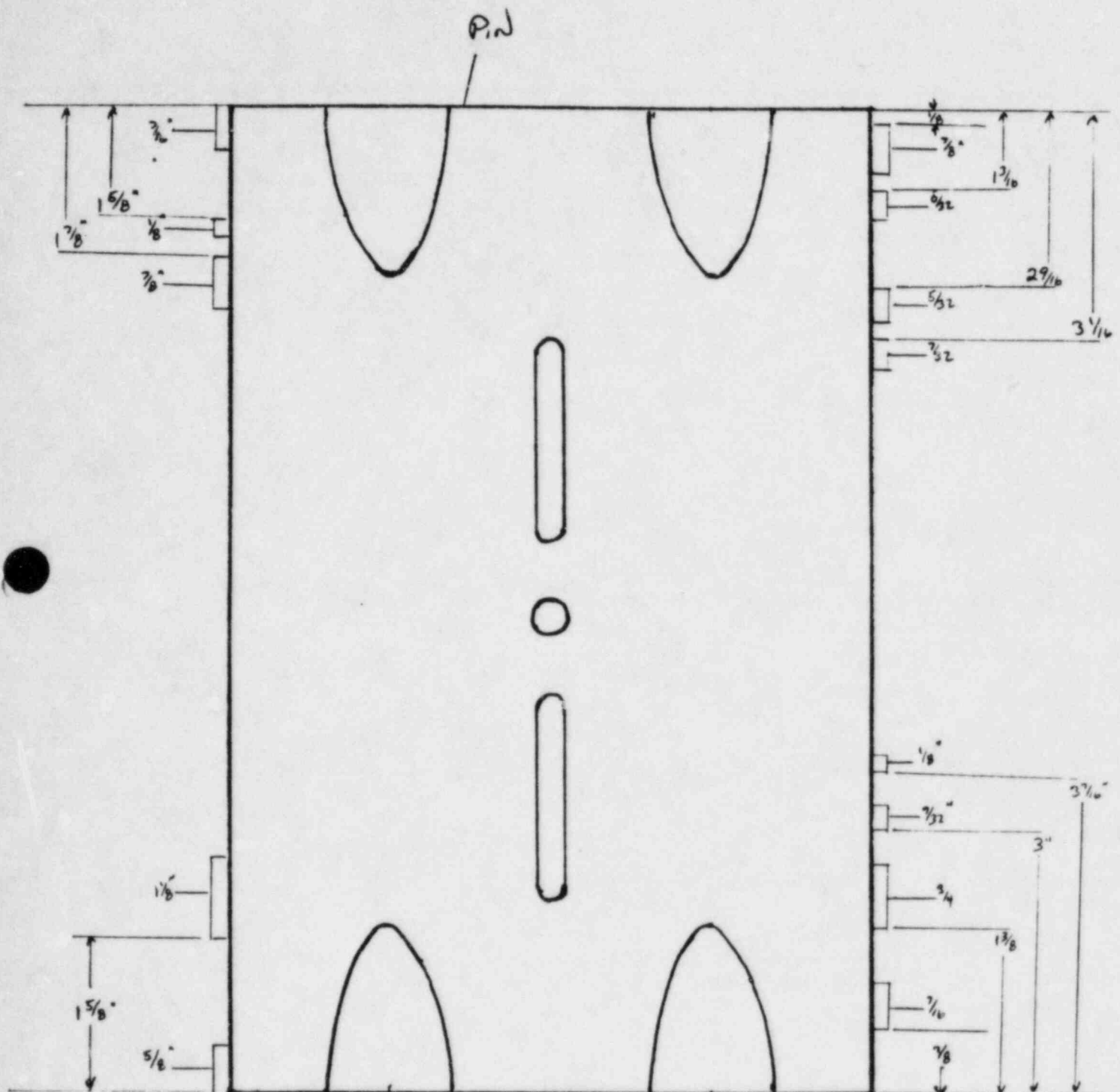


\* 8 LOWER CON ROD

BEARING SHELL

ALUMINUM SIDE

PAGE 6 OF 6



NOTE: ① NUMEROUS POROSITY INDICATIONS  
L.O.F.

② LINEARS ON EDGES ARE 1/8" FROM  
ALUMINUM SURFACE.

Art R... PT II  
11-7-84



## LIQUID PENETRANT EXAMINATION REPORT

Page (of) 1

A. MATERIAL		TYPE Aluminum	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <i>Bearing Shell</i>
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
	N/A	N/A		<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>6.2</u>	SURFACE/MAT'L. TEMP. <u>67°F</u>	MATE. NO. <u>365</u>	MWR/KR. No. <u>RR1R43 2055</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012
2. PENETRANT	Magnaflux	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	Magnaflux	SKC-NF/ZC-7B	84J012
4. DEVELOPER	Magnaflux	SKD-NF/	82D111
5. POST EXAMINATION CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

N  
A

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
#4 conrod 1 Bearing Shell Babbit Side	N/A	N/A	Acceptable
2 N/A	N/A	N/A	N/A
3 N/A	N/A	N/A	N/A
4 N/A	N/A	N/A	N/A
D. ACCEPTANCE CRITERIA	NDE 6.2 para 4.2.2		OPERATOR <u>Michael Spaul</u> Level <u>II</u> Date <u>11-14-84</u>
E. ATTEST	<u>Michael Spaul</u> RESPONSIBLE CERTIFIED PERSONNEL		<u>II</u> LEVEL <u>11-14-84</u> DATE

COMPONENT I.D. Con Rod Bearing Shell  
(Babbit Side)  
1R43 X EDG-103 LOWER HALF  
SYSTEM

1R43

PLANT/LOCATION EDG Room 103



## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 10

A. MATERIAL		TYPE Aluminum	FABRICATED PROCESS	<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER: <i>Boat Hull</i>
CROSS SECTION THICKNESS	MAX MIN N/A	PIPE DIA. N/A	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER
				<input type="checkbox"/> AS FABRICATED		

B. NDE PROCEDURE No. <u>6.1 + 6.2</u>	SURFACE/MAT'L TEMP. <u>65° F</u>	MATE. NO. <u>365</u>	MWR/RR. No. <u>RR43-2053</u>
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/2C-7B	84 J012
2. PENETRANT	MAGNAFLUX	SKL-NF/15	83 G018
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/2C-7B	84 J012
4. DEVELOPER	MAGNAFLUX	SKD-NF	82 D111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/2C-7B	84 J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

SEE ATTACHED SKETCHES

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
3 Lower	N/A	N/A	N/A
1 Upper	N/A	N/A	N/A
2 Upper	N/A	N/A	N/A
3 Upper	N/A	N/A	N/A
4 Upper	N/A	N/A	N/A
5 Upper	N/A	N/A	N/A
6 Upper	N/A	N/A	N/A
7 Upper	N/A	N/A	N/A
8 Upper	N/A	N/A	N/A
4 & 7 up			

D. ACCEPTANCE  
CRITERIAINDICATIONS:  
≤ 0.05 inches and  
acceptable

OPERATOR

Level

Rodney J. Borne  
11-8-84

## E. ATTEST

RESPONSIBLE CERTIFIED PERSONNEL

II

FE

11-8-84

11-8-84

E

COMPONENT I.D.

CONV. ROD REMAIN  
SHELLS

SYSTEM

PLANT/LOCATION

Shoreham, FL 63 TUGBOAT PORT

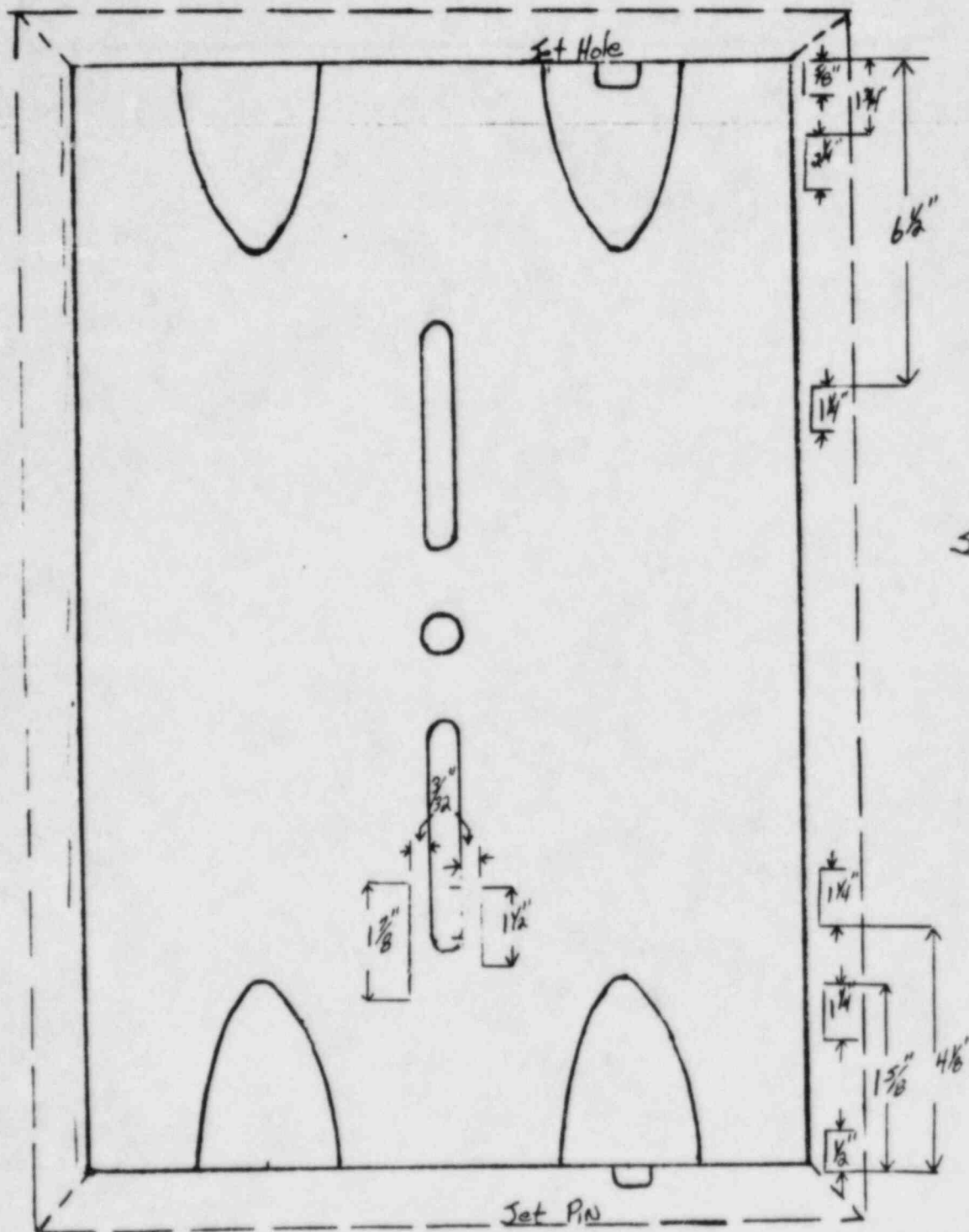
IR43

E06-103

IR43

Upper Bearing #1  
Aluminum Side

Page 2 of 10

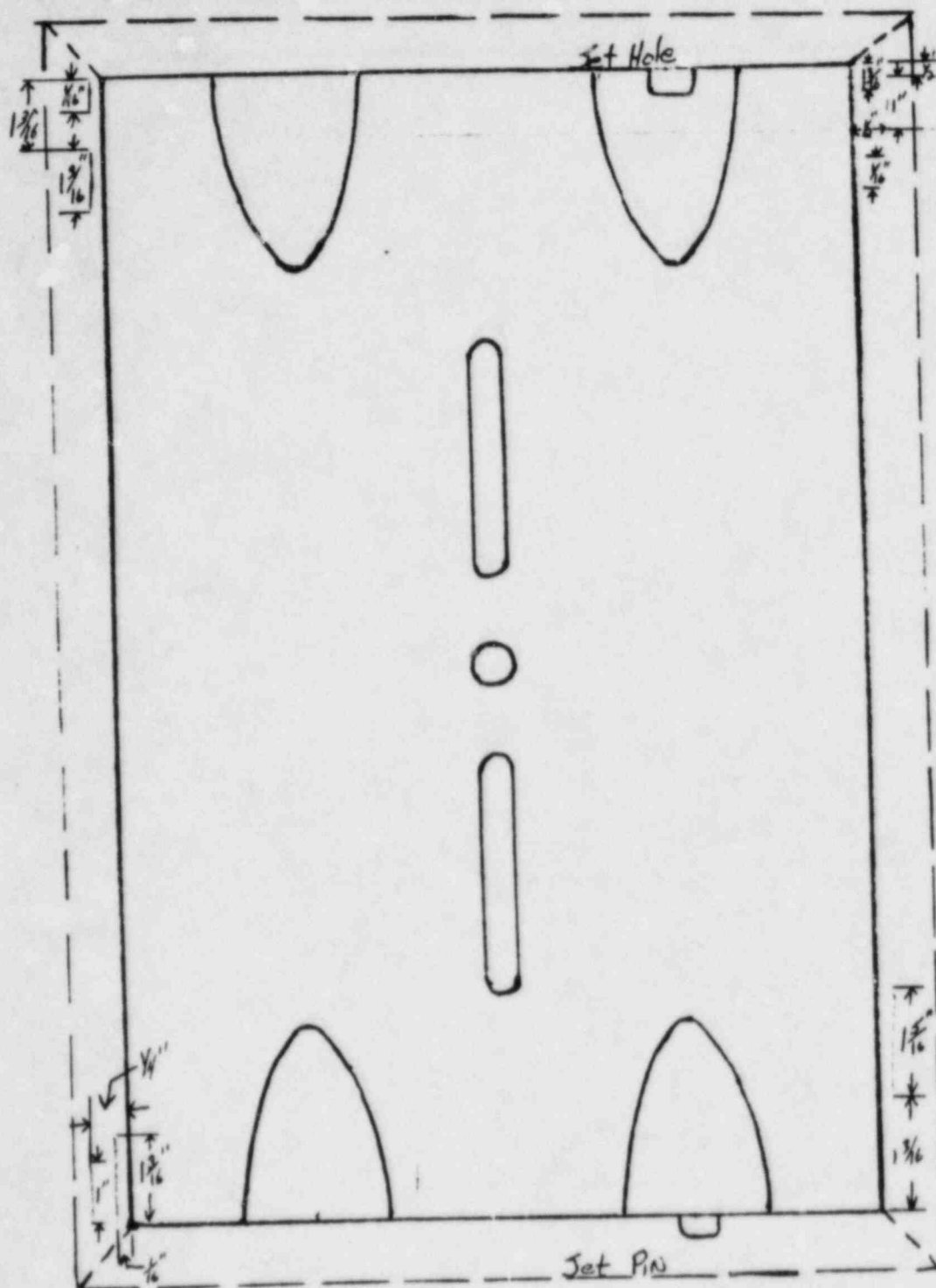


\* All Linear Indications on Sides A + B are  $\frac{1}{16}$ " From O.D. Aluminum Side

\* Linear Indications on Side A are Intermittent From Set Hole to Set Pin Edges

\* Porosity located on entire surface No larger than  $\frac{1}{16}$ "

Robert J. Smith Jr.  
Date 11-28-84

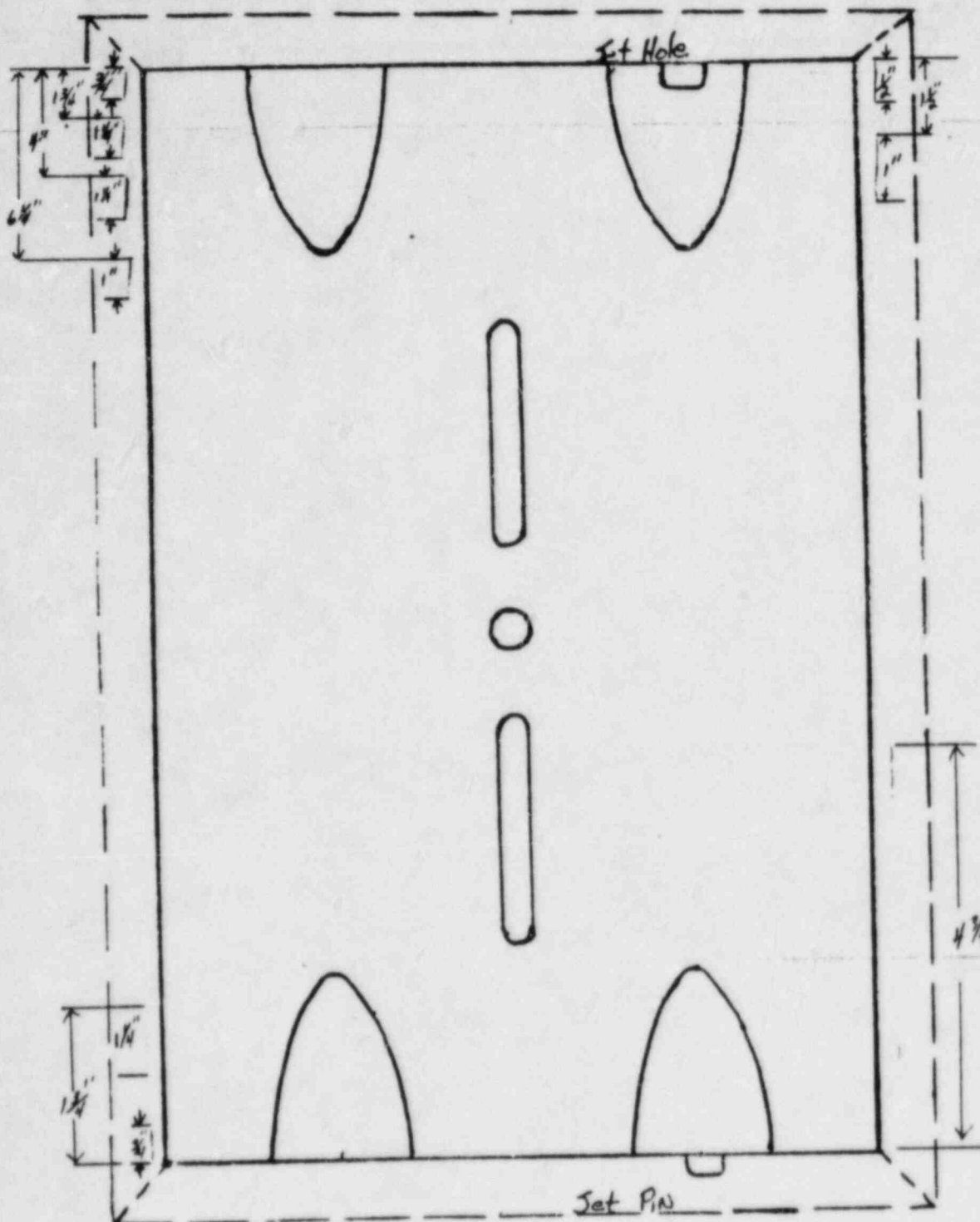


\* Linear Indications on Sides A+B are  $\frac{1}{16}$ " From O.D. Aluminum Side unless otherwise shown.

\* Porosity located on entire surface and edges no larger than  $\frac{1}{32}$ "

Robert J. Smith  
Date 11-8-84





Side B

Set PIN

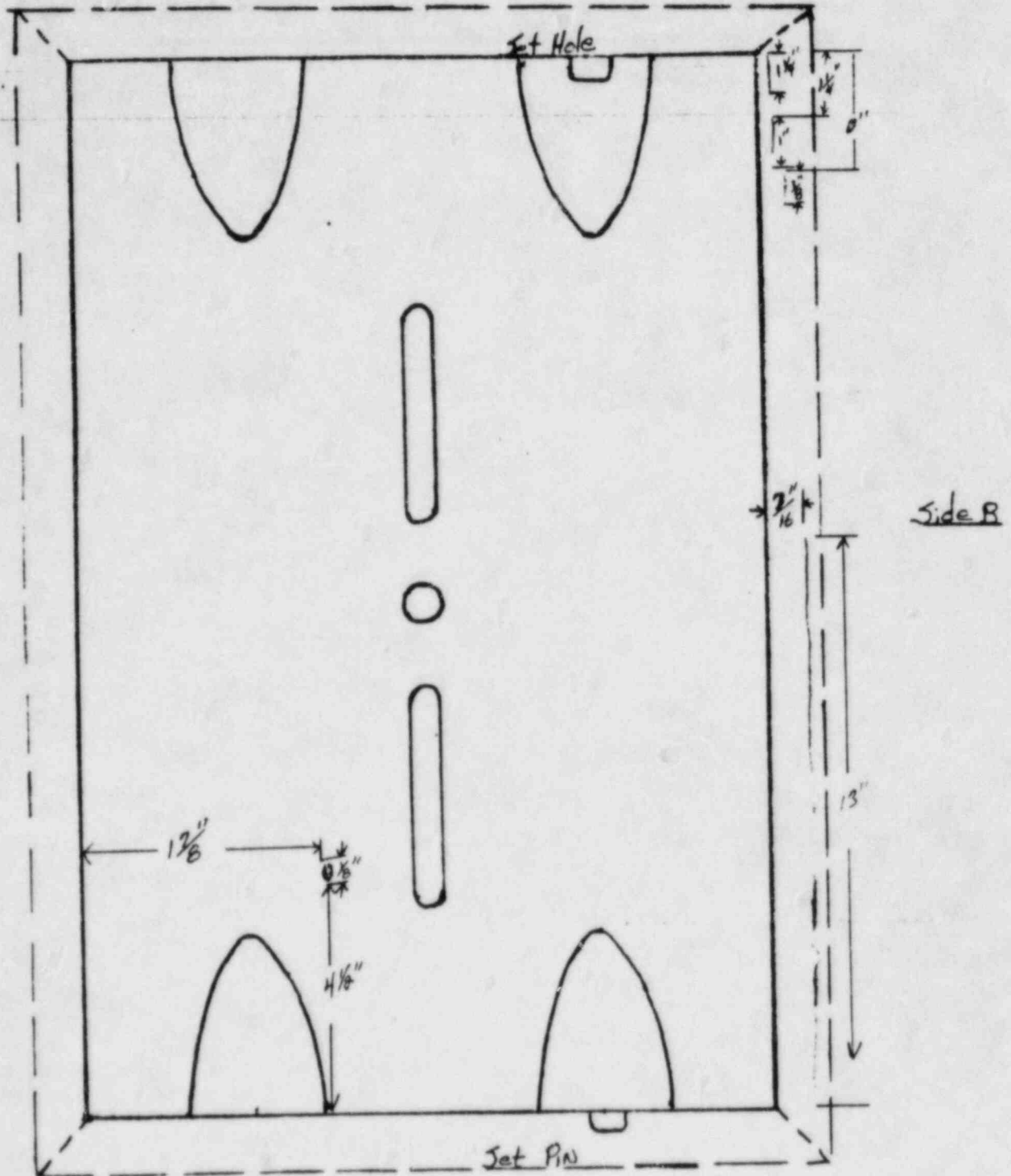
Richard J. Smith, Jr.  
Date 11-25-84

Date 11-2-04

- \* All Linear Indications  $\leq 16''$  From Q.D. Aluminum Side
- \* Light porosity on Q.D. surface

\* Light porosity on a.p. surface

Upper Bearing #4  
Mercurian side



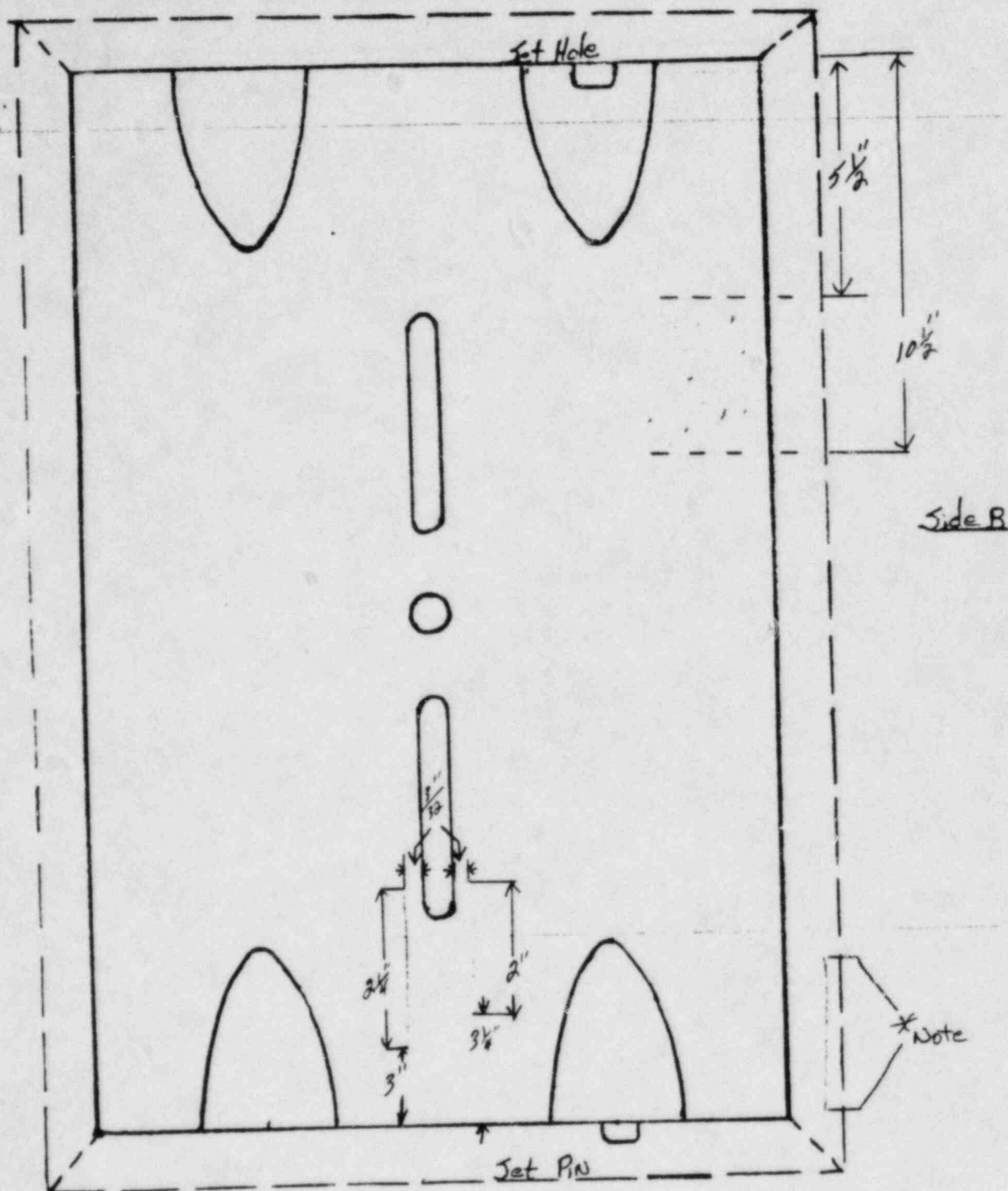
\* Linear Indications  $\frac{1}{16}$ " From A.D. Aluminium Side unless other wise noted, on side B.

\* Light frosty located on entire surface no larger than  $\frac{3}{32}$ "

Richard J. Smith 4/11  
Date 11-8-81

Upper Bearing #5  
Aluminum Side

Side A



Richard J. Smith  
Date 11-1-84

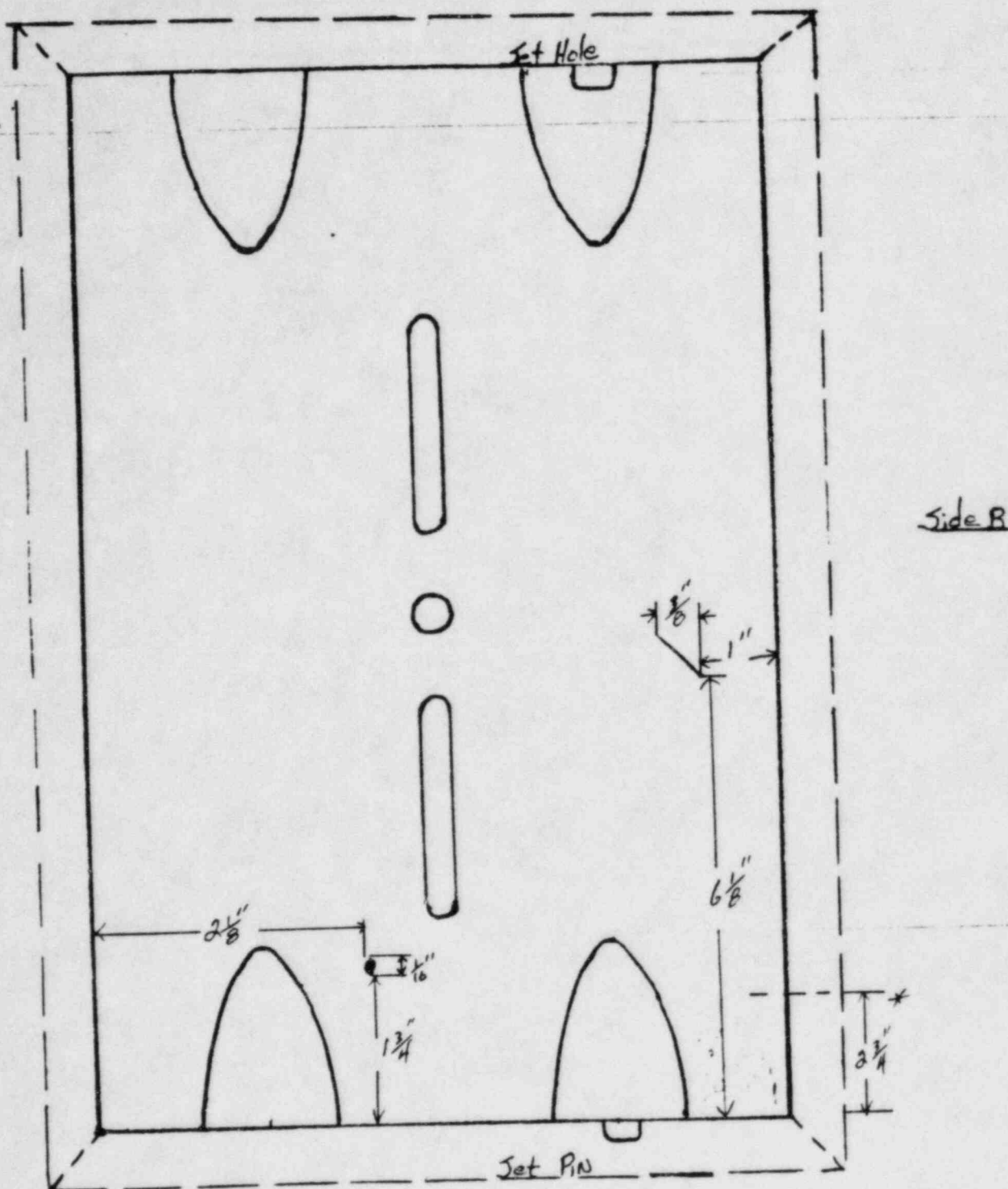
\* Linear Indication is Full Radius. stays between a  $\frac{1}{32}"$  to  $\frac{1}{16}"$  from the I.D. surface.

\* Porosity Located Between  $5\frac{1}{2}"$  to  $10\frac{1}{2}"$  no larger than  $\frac{1}{16}"$  on Side B

\* Not To Scale

Under Bearing #6  
Minimum Side

Page 7 of 10

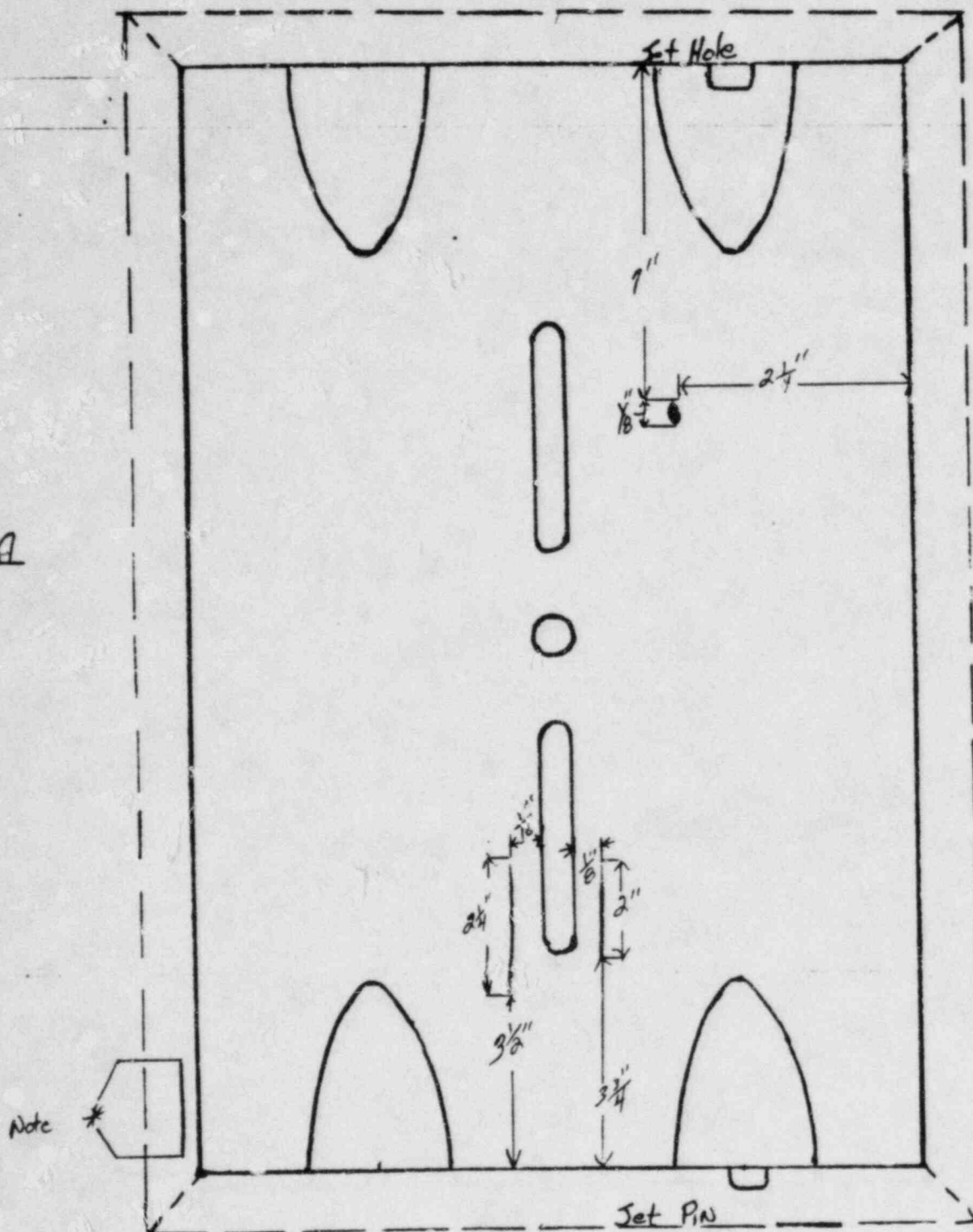


- \* Moderate Porosity Condition within the  $3\frac{3}{4}"$  area no larger  $\frac{1}{32}"$
- \* Light Pore over surface no larger than  $\frac{1}{16}"$

Richard J. Smith for  
Inte. M.E. EN

Side A

Side R



Richard J. Smith  
11-8-84

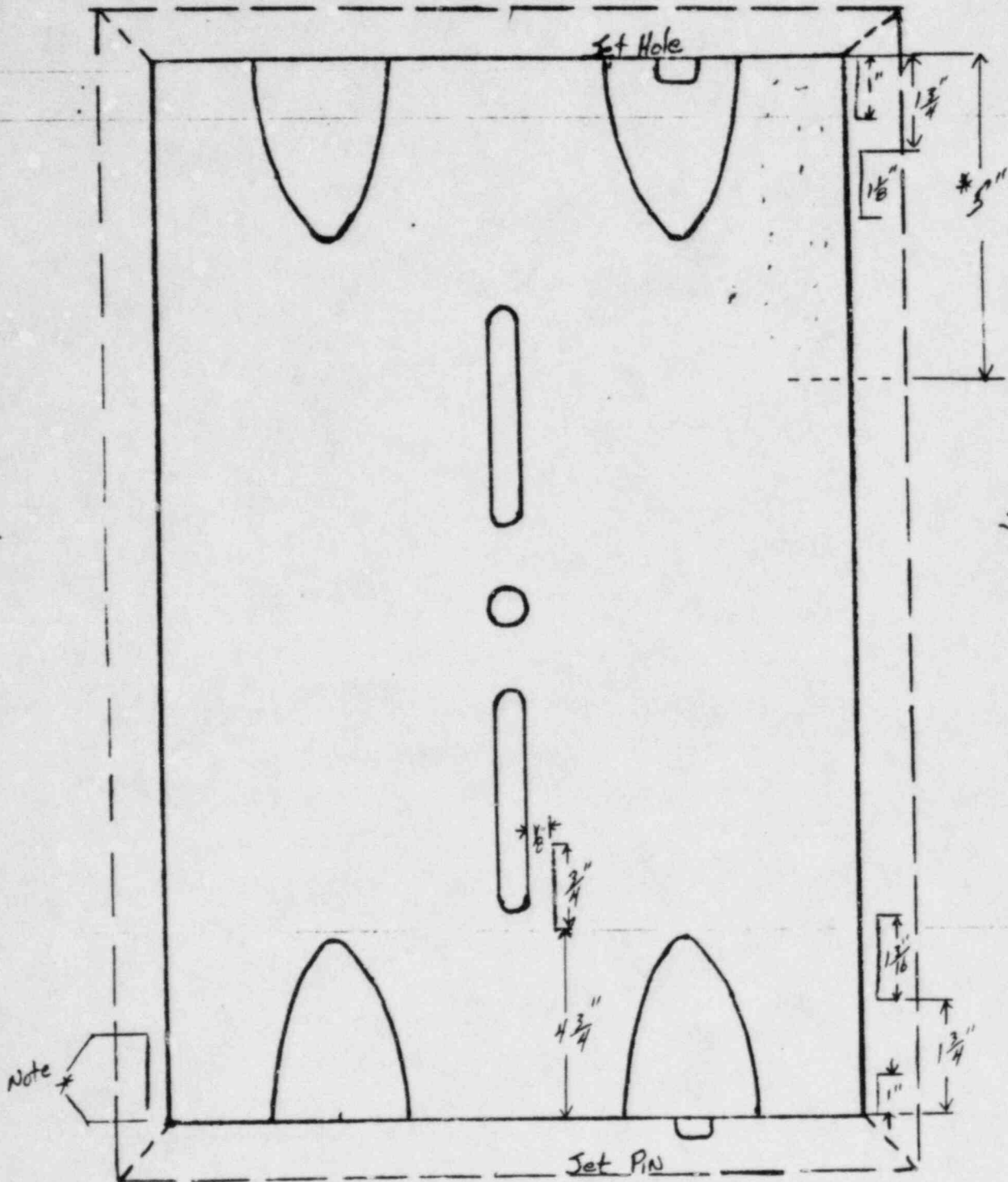
- \* Linear Indication runs entire Radius (Side A)  
1/8" from all Radii.
- \* Porosity located over entire Side A and QR Surface



Upper Porting #8  
Aluminum Side

Side A

Side B

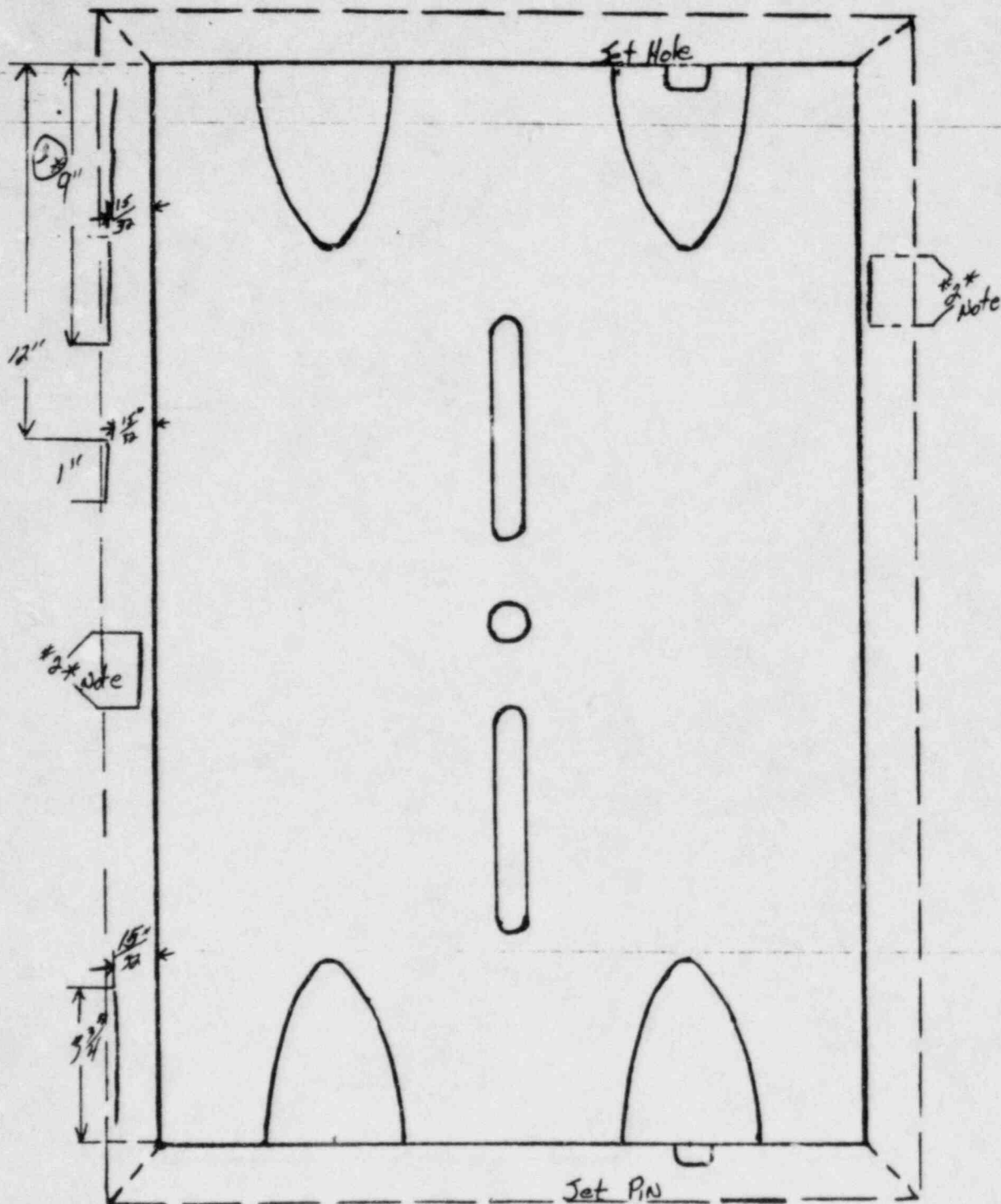


Richard J. Smith  
Date 11-2-84

- \* Linear Indication entire Radius (Intermittent)
- \* All Linear Indications on Side A+B are  $\frac{1}{16}$ " from the D.D. (Aluminum Side)
- \* Moderate Porosity Condition Between 5" Area
- \* Light Porosity on entire D.D. surface

Lower Bearing #3  
Aluminum Side

Page 16 of 10



- \* 1\* Intermittent Linear from Set Hole Edge to 9"
- \* 2\* Intermittent Linear Full radius 1/16" from QD, Aluminum Side
- \* Moderate Porosity Condition on entire QD Surface.

*Robert J. Smith*  
Date 11-6-84



## LIQUID PENETRANT EXAMINATION REPORT

PAGE 1 OF 16

A. MATERIAL		TYPE	FABRICATED PROCESS		<input type="checkbox"/> WELDED	<input checked="" type="checkbox"/> CAST	<input type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE	<input type="checkbox"/> PLATE	<input type="checkbox"/> ROD	<input checked="" type="checkbox"/> OTHER:	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED	<input type="checkbox"/> GROUND	<input type="checkbox"/> OTHER	
	N/A	N/A		<input checked="" type="checkbox"/> AS FABRICATED			

B. NDE PROCEDURE No. NDE-6.2	SURFACE/MAT'L TEMP. 73°F	M&T. NO. 366	MWR/RR. No. R43-2055
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INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	82J083
2. PENETRANT	MAGNAFLUX	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/ZC-7B	82J083
4. DEVELOPER	MAGNAFLUX	SKD-NF	82D111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/ZC-7B	82J083

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

EXAMINED INSIDE RADIUS AND ENDS OF UPPER BEARINGS  
DUE TO ~~HOLES~~ <sup>W/6/84</sup> POLISHED SURFACES: POOLING OF THE PENETRANT WAS OBSERVED DURING DWELL TIME

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 CYL 1,2,3,4 5,6,7,8		SEE ATTACHED SKETCHES	
2			
3			
4			

## D. ACCEPTANCE CRITERIA

OPERATOR Richard B. Boney  
Level II Date 11-6-84

## E. ATTEST

Robert J. Smith  
Richard B. Boney  
RESPONSIBLE CERTIFIED PERSONNEL

II  
II  
LEVEL

11-6-84  
11-6-84  
DATE

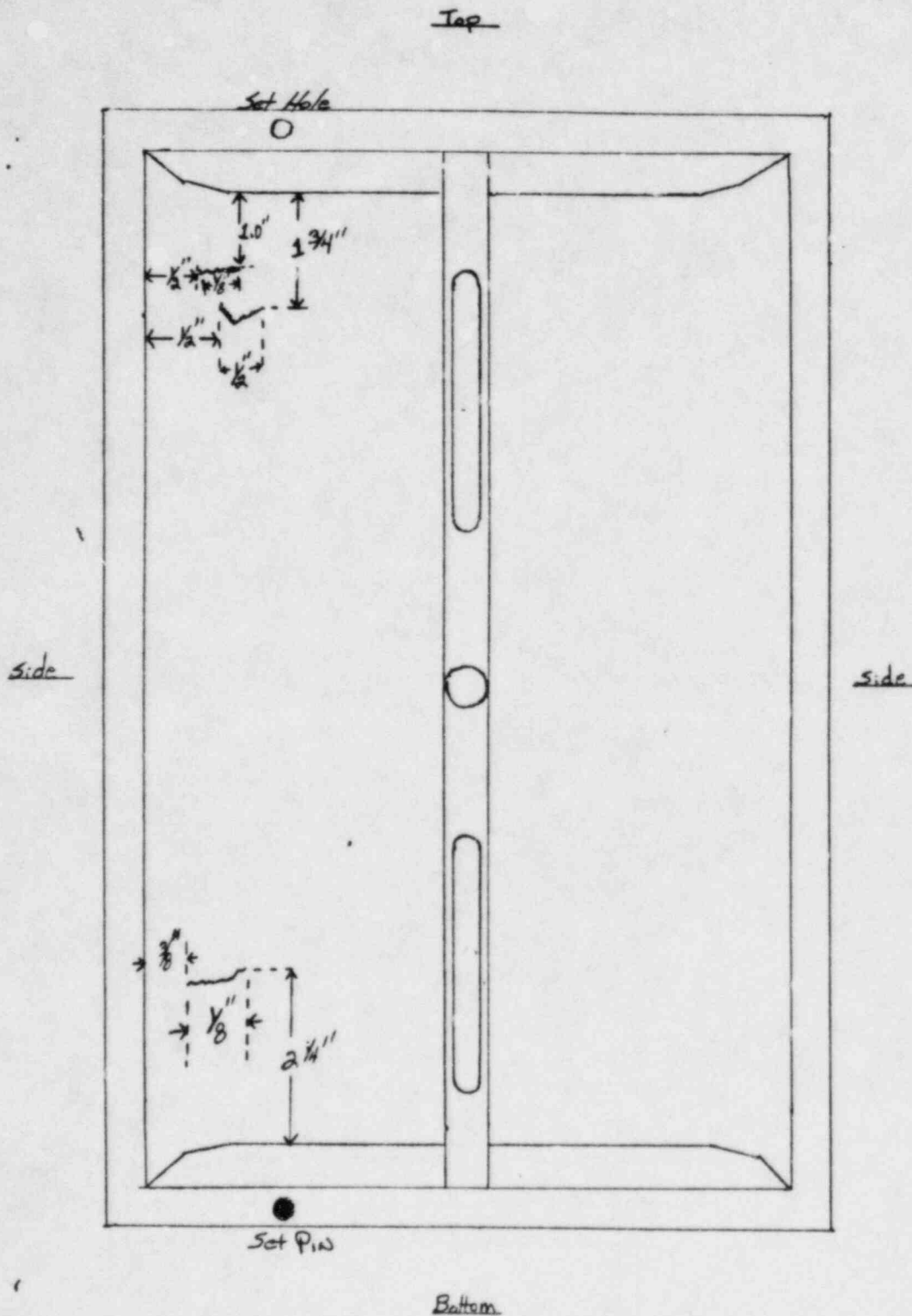
COMPONENT I.D.  
1R43 \* EDG-103 upper & lower BEARING SHAFT, CONNECTING ROD SYSTEM

1R43

PLANT/LOCATION  
EL-63' Turbine Deck SHOREHAM

Inside Radius and Top & Bottom (Hole & Pin) edges w/g. Examined  
Lower Bearing #1

PAGE 2 OF 16

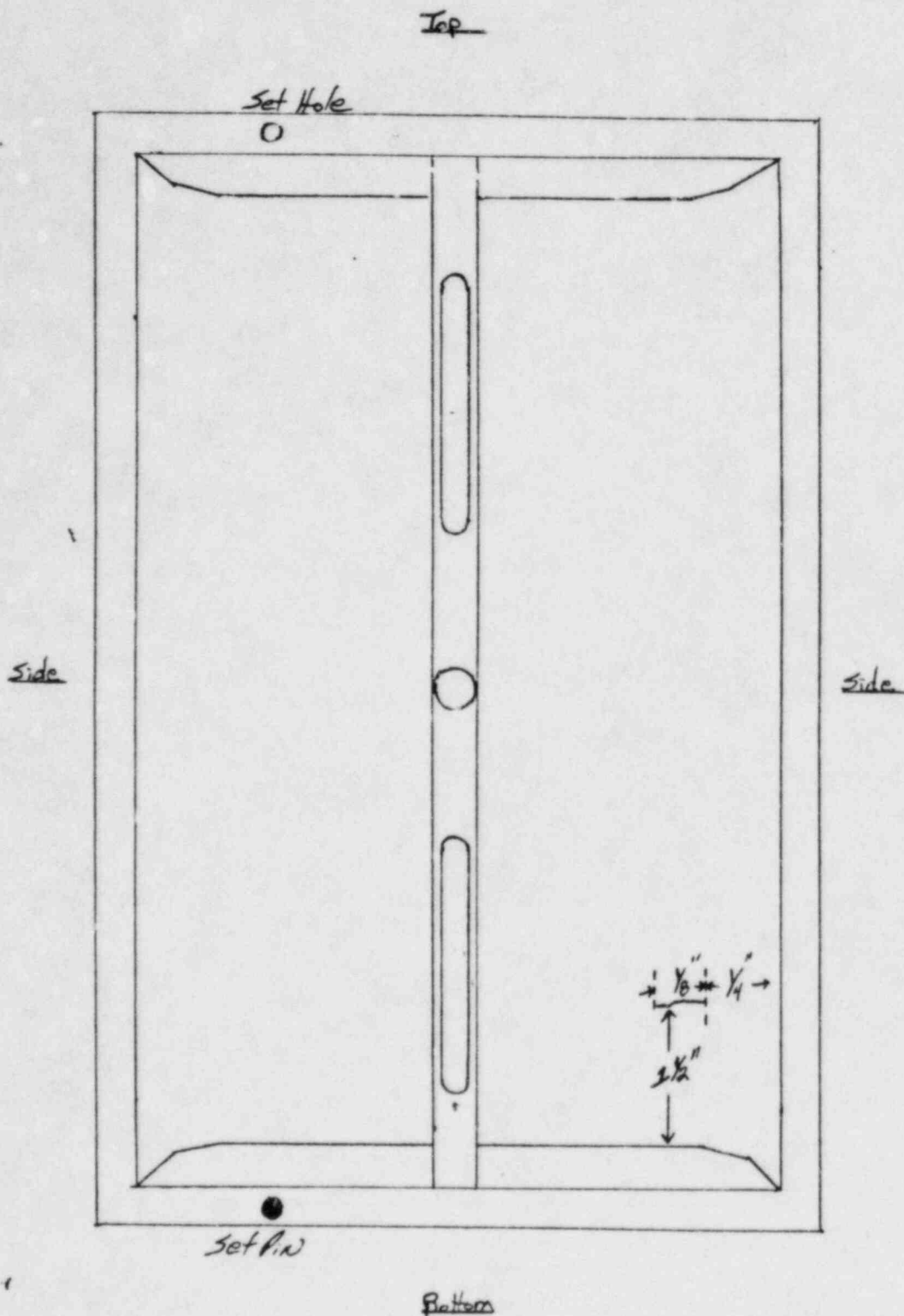


Not to Scale

Richard J. Smith, II  
Date 11-5-04

Examined inner Radius and set Hole & Pin Edges only  
Lower Bearing #2

PAGE 3 OF 16



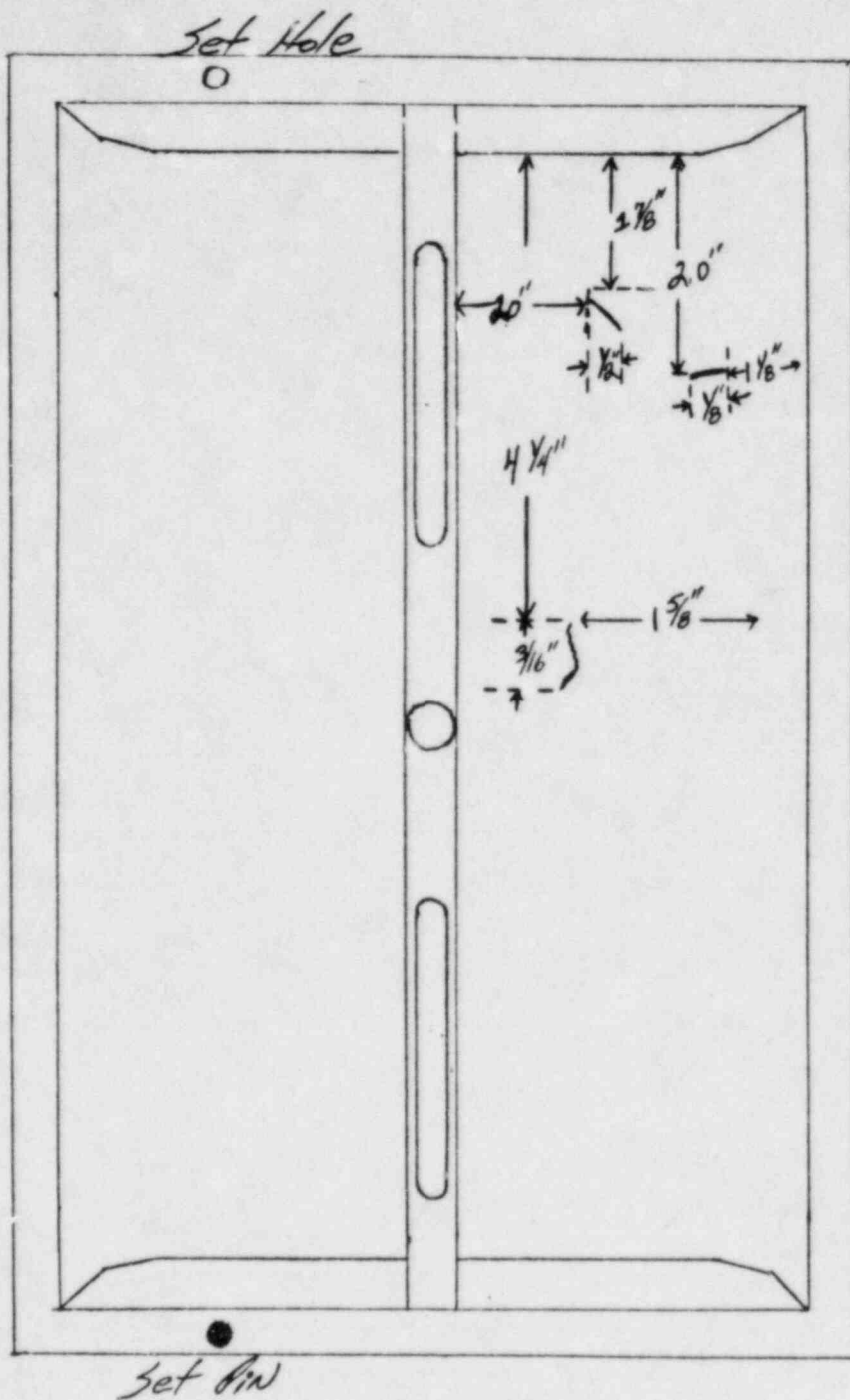
Not To Scale

Richard J. Smith, Jr.  
Date 11-5-84



Examined inner Radius and Set Hole & Pin Edges only  
Lower Bearing #3

PAGE 4 OF 16

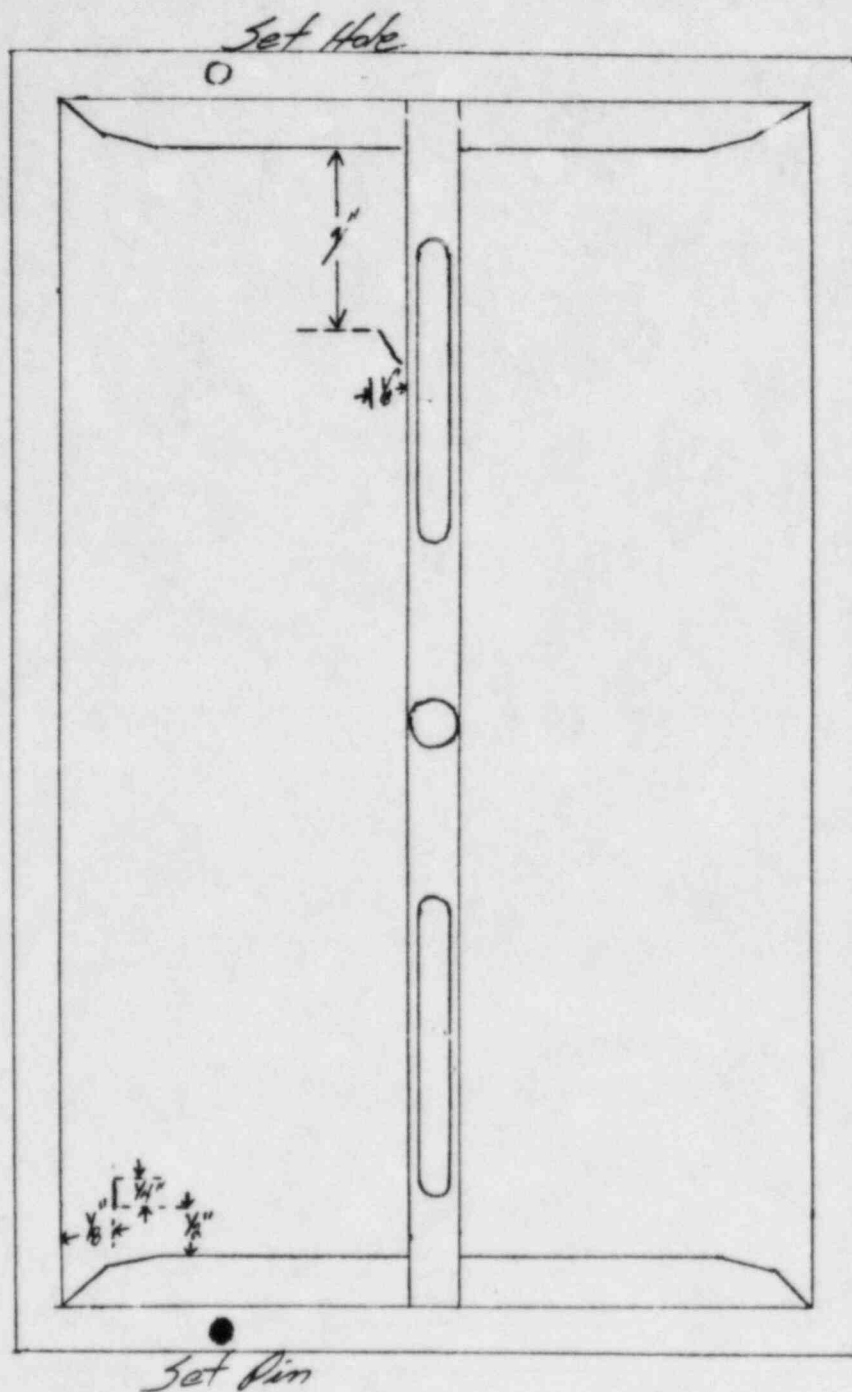


Not to Scale

Richard J. Smith HII  
Date 1/15/84

Examined Inner Radius area also Set Hole & Pin Edges only  
Lower Bearing #5

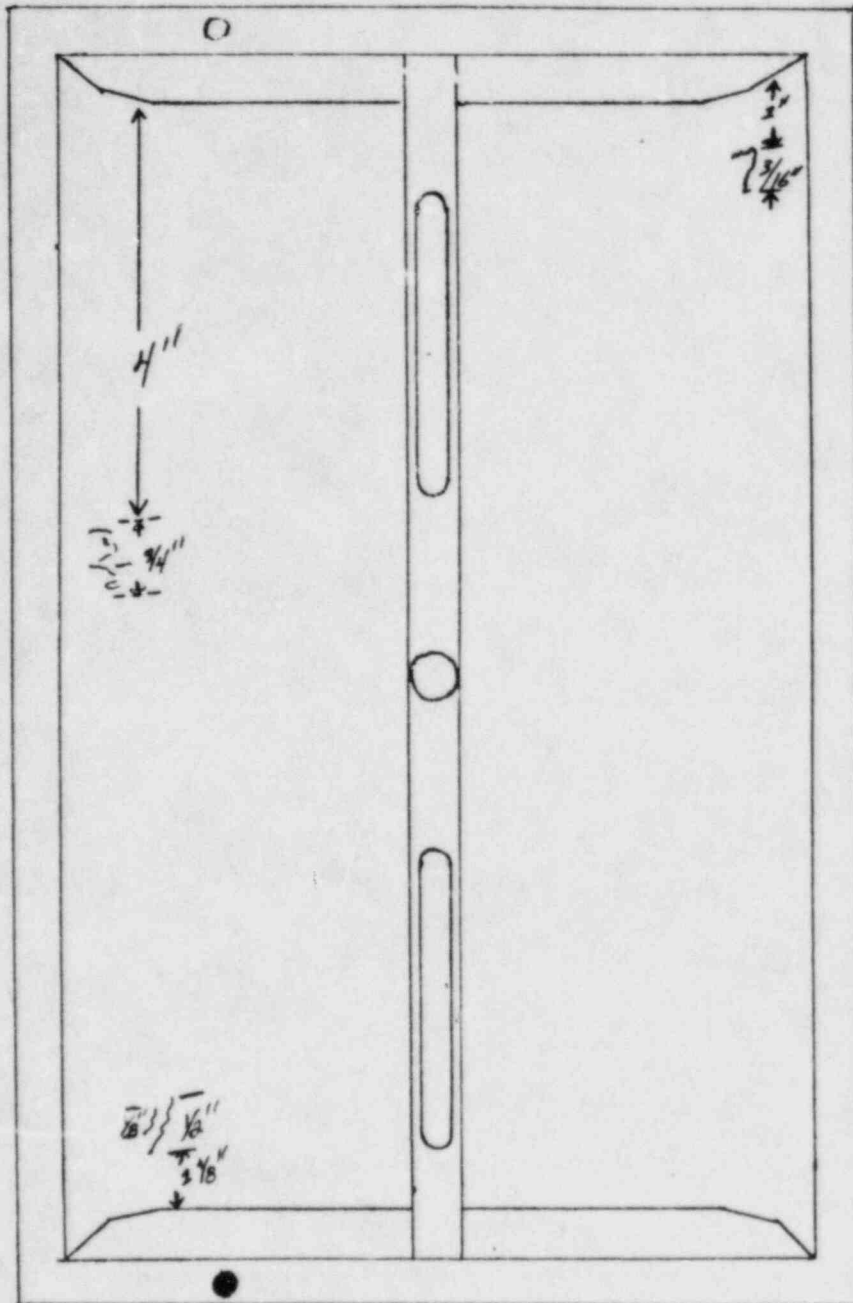
PAGE 5 OF 16



Richard J. Smith 4/II  
Date 11-3-84

Examined inner Radius area also set Hole & Pen Edge Only  
Lower Bearing #6

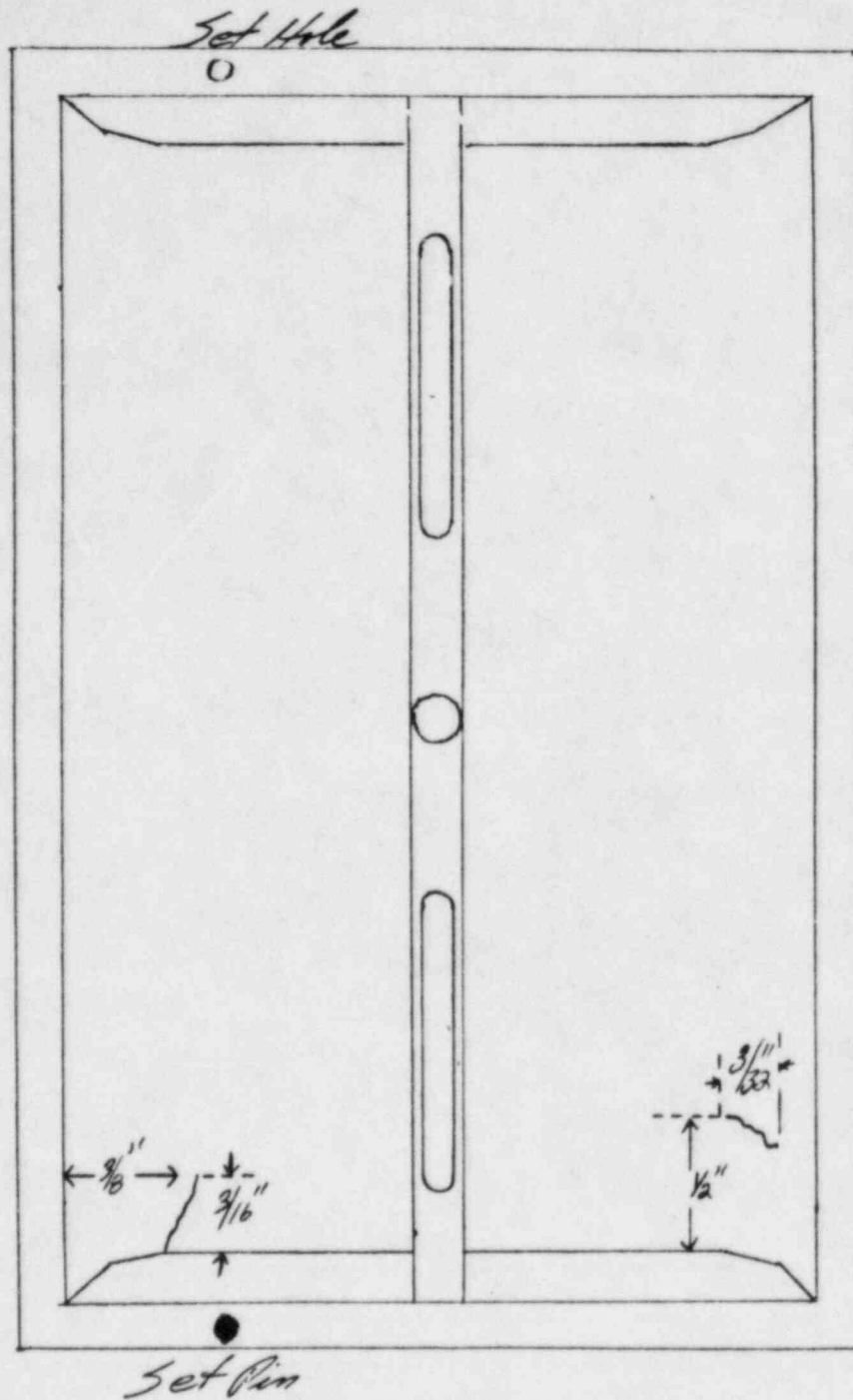
PAGE 6 OF 16



Richard J. Smith 4II  
Date 11-5-84

Examined inner Radius also Set Hole & Pin Edges  
Lower Bearing #7

PAGE 7 OF 16

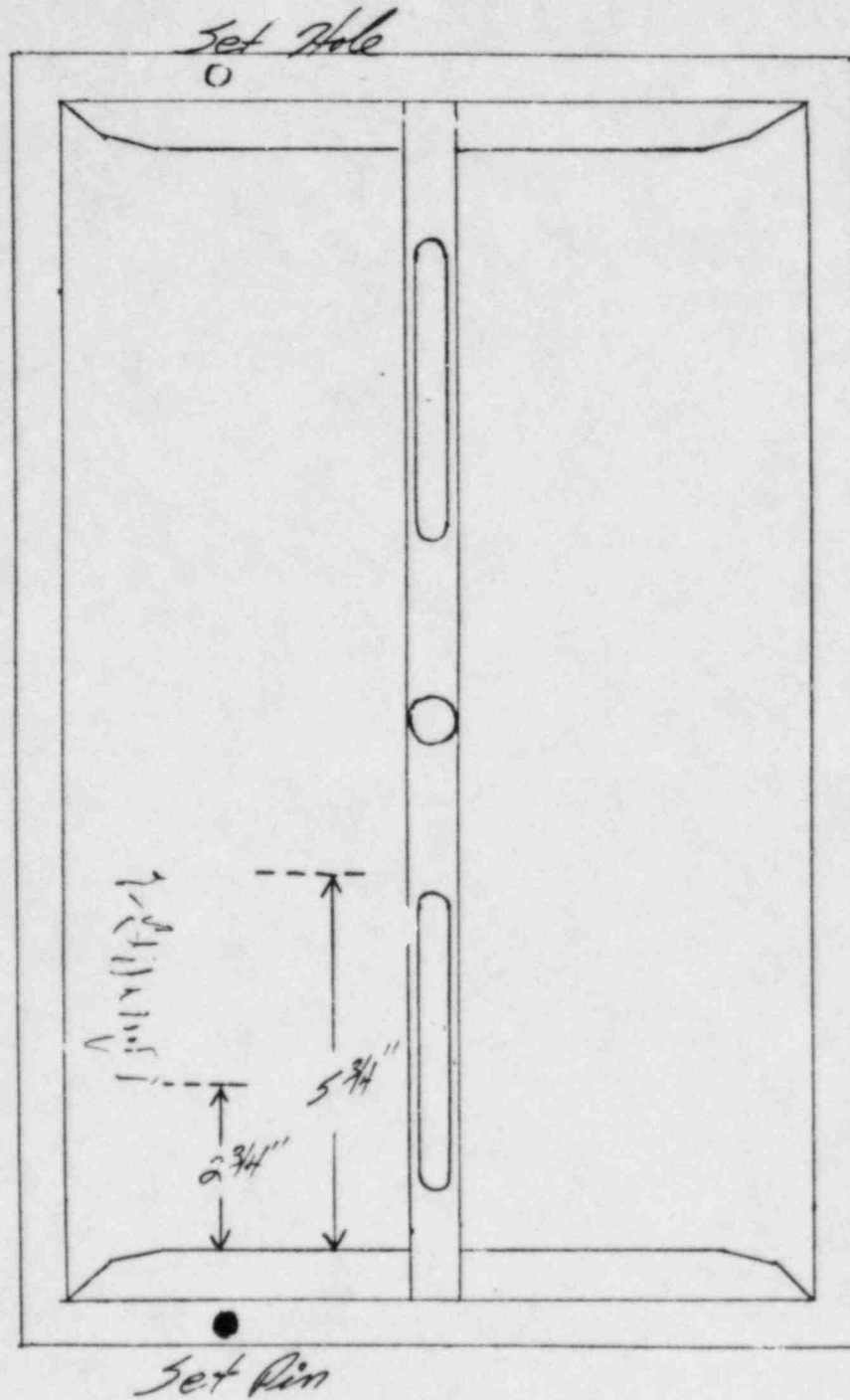


Not to Scale

Richard J. Smith  $\frac{1}{11}$   
Date 11-5-84

Examined inner Radius also Set Hole and Pin only  
Lower Bearing #8

PAGE 8 OF 16

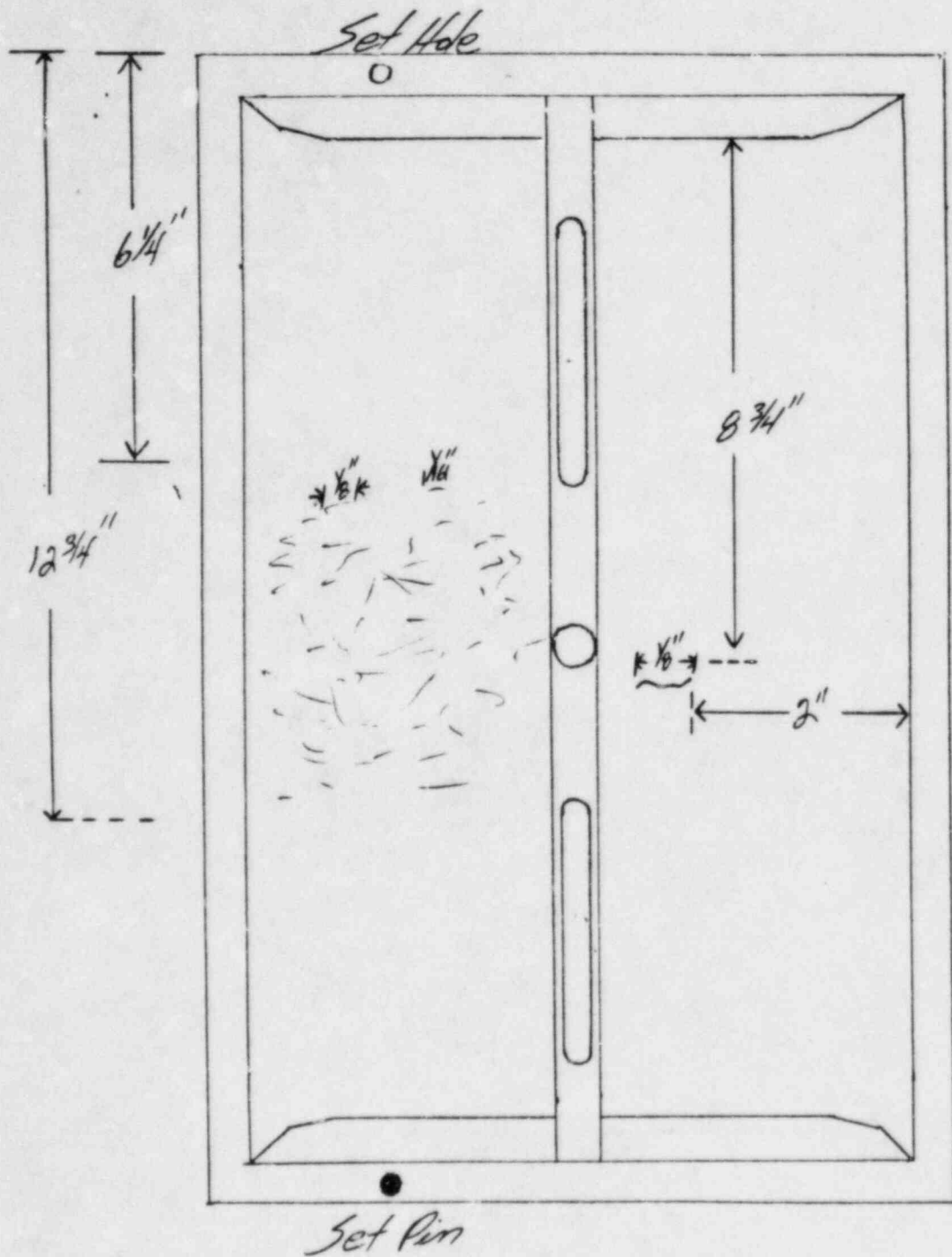


Richard J. Smith Jr  
Date 11-5-84



Examined inner Radius also Set Hole and Pin Edges only .  
upper bearing #1

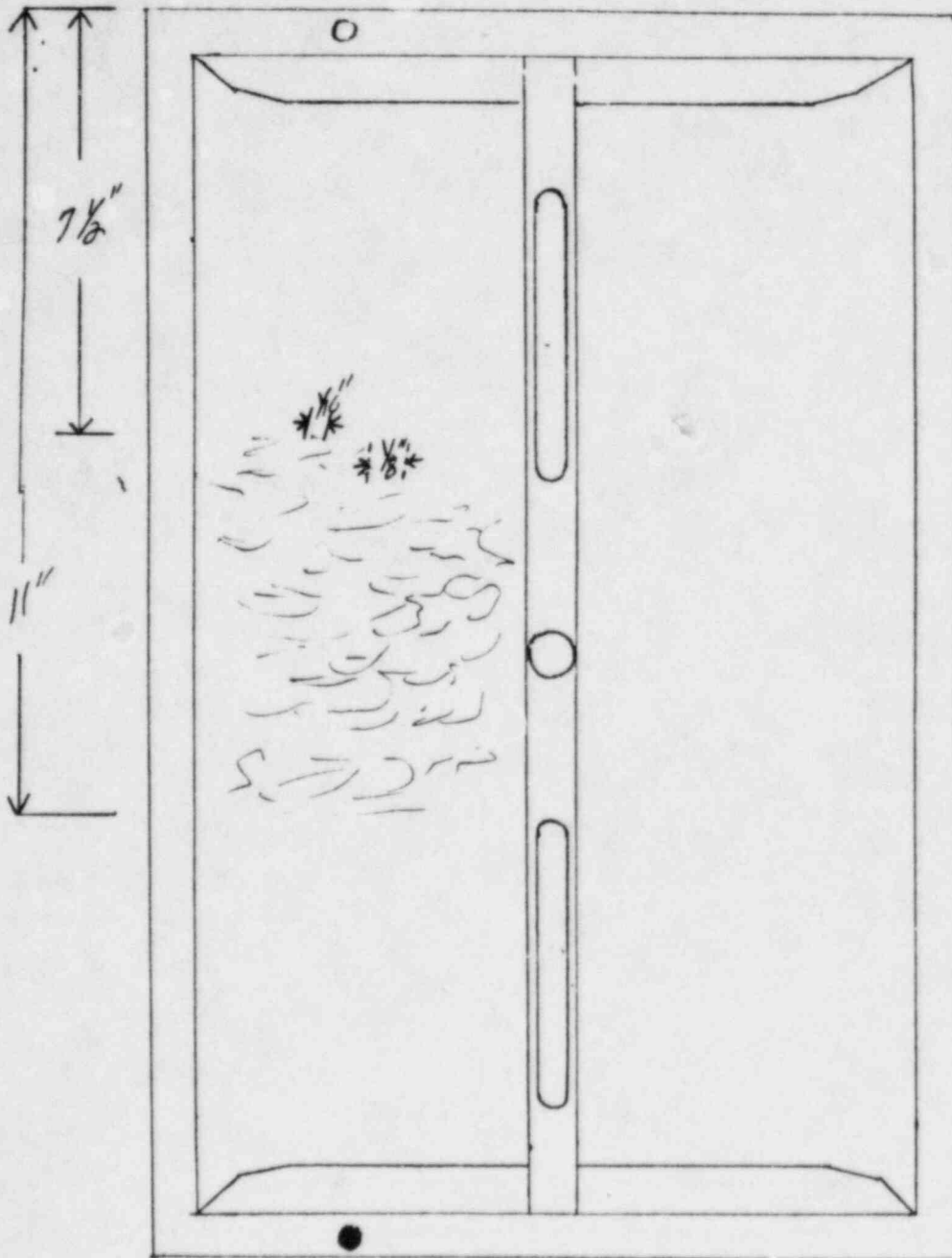
PAGE 9 OF 16



Richard J. Smith III  
Date 11-5-84

Examined inner Radius also Set Hole & for Edges only  
Upper Bearing #2

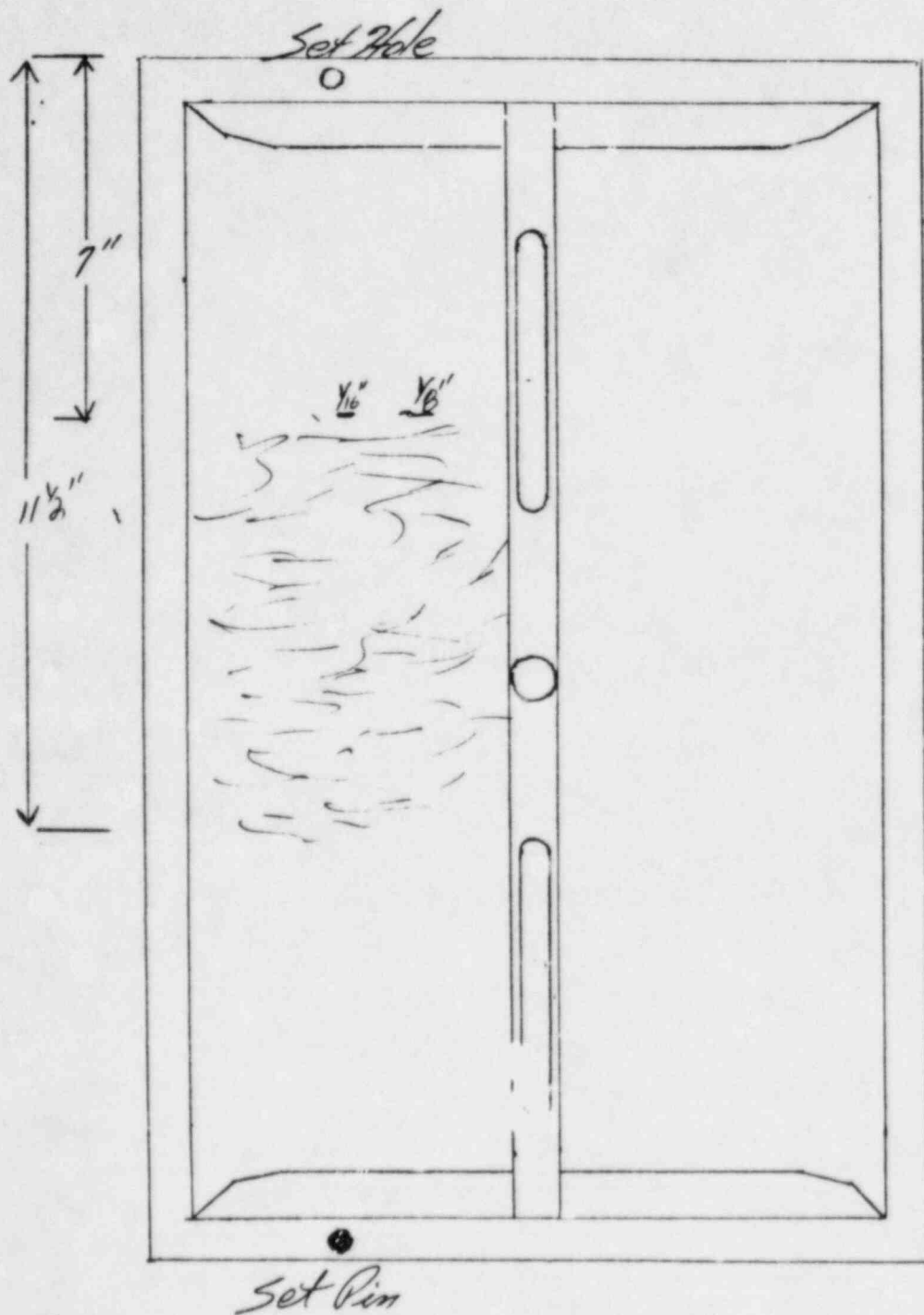
PAGE 10 OF 16



Richard J. Smith  $\frac{1}{2}$   
Date 11-5-84

Examine Inner Radius also Set Hole & pin edges only  
upper Bearing #3

PAGE 11 OF 16

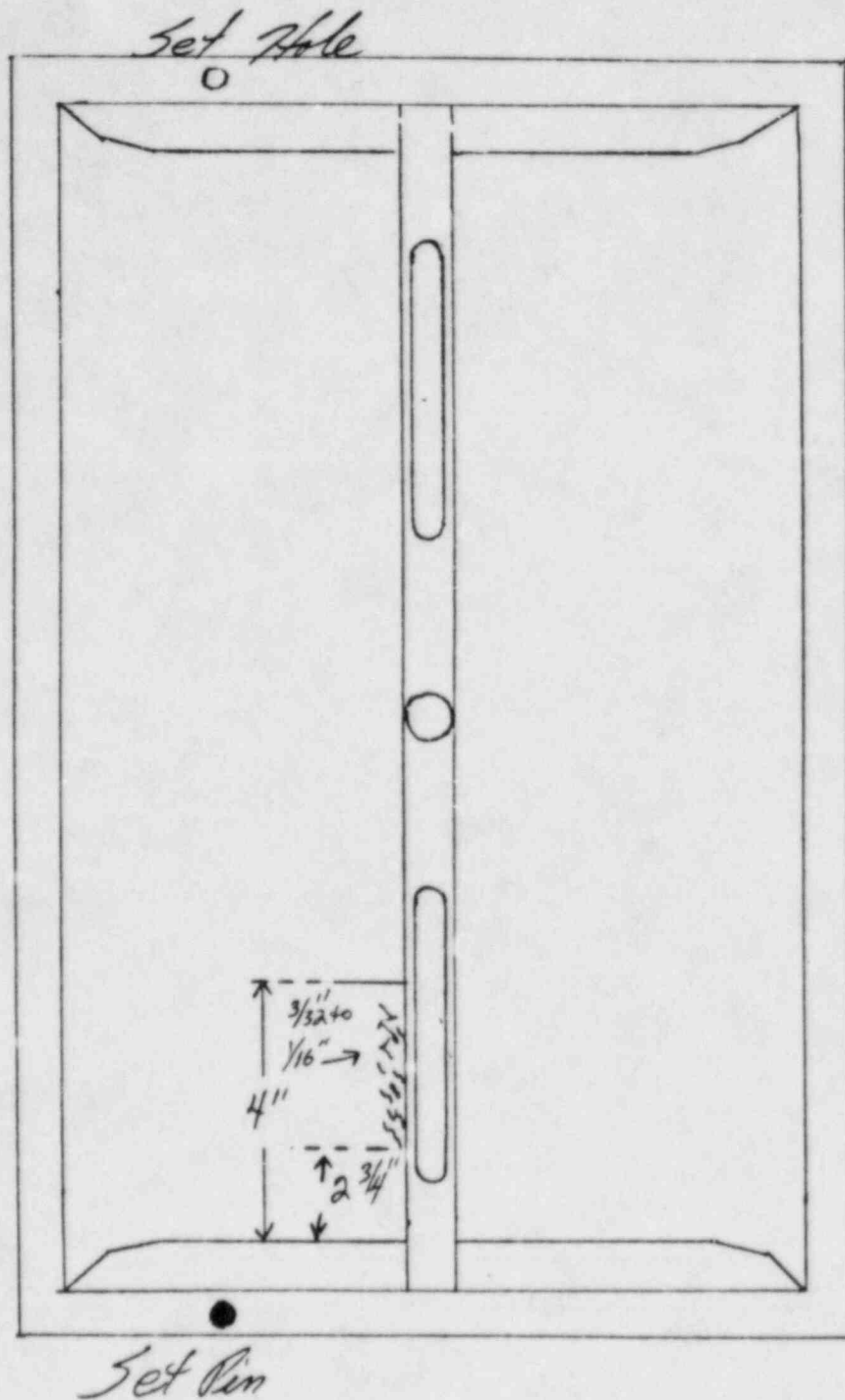


Not to Scale

Richard J. Smith  
Date 11-5-84

Examined inner Radius also Set Hole & Rim Edges only  
upper Bearing #4

PAGE 12 OF 16

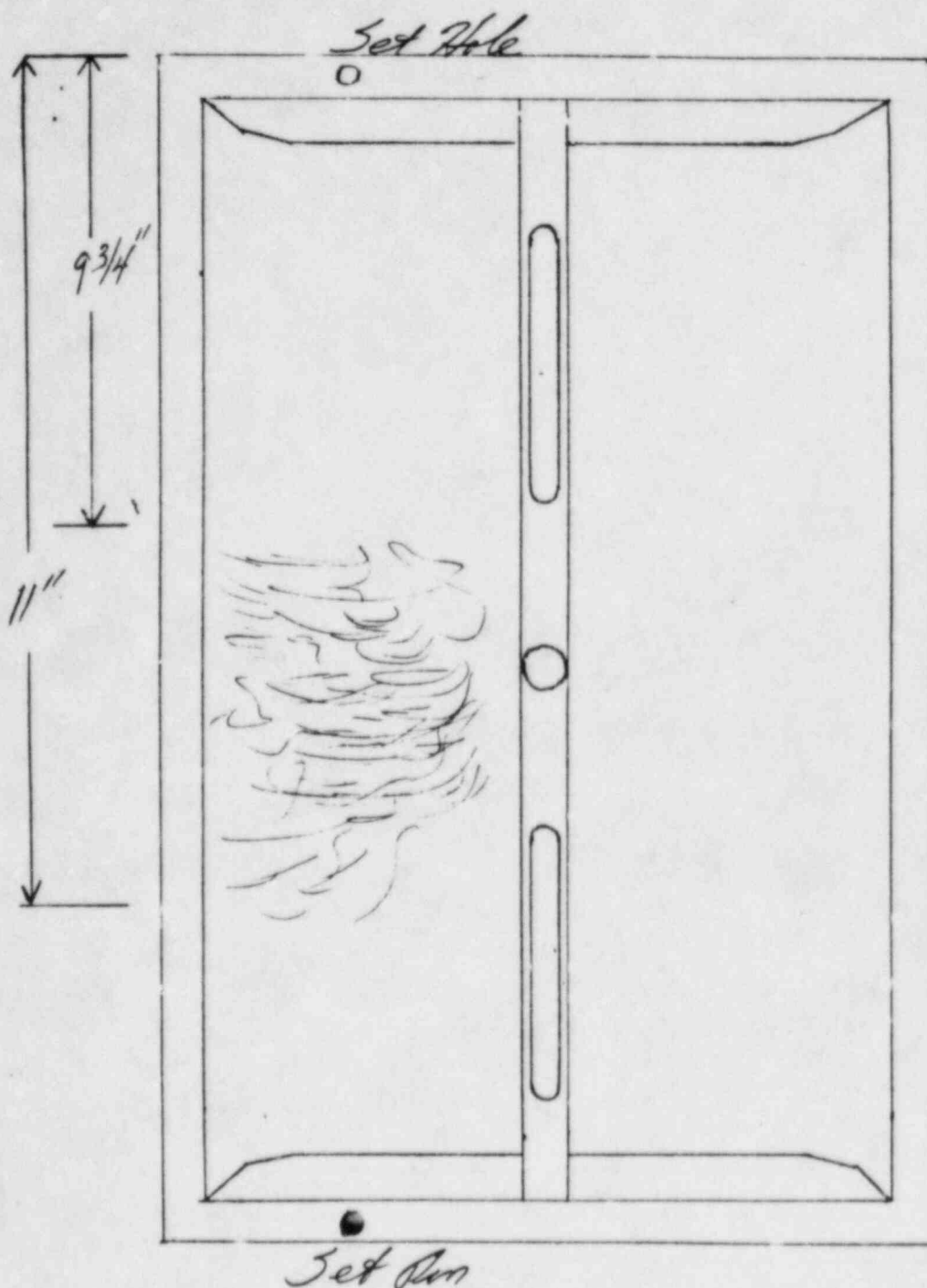


Not to scale

Richard J. Smith 4/II  
Date 11-5-84

Examined inner Radius also Set Hole and Pin Edges only  
upper Bearing #5

PAGE 13 OF 16



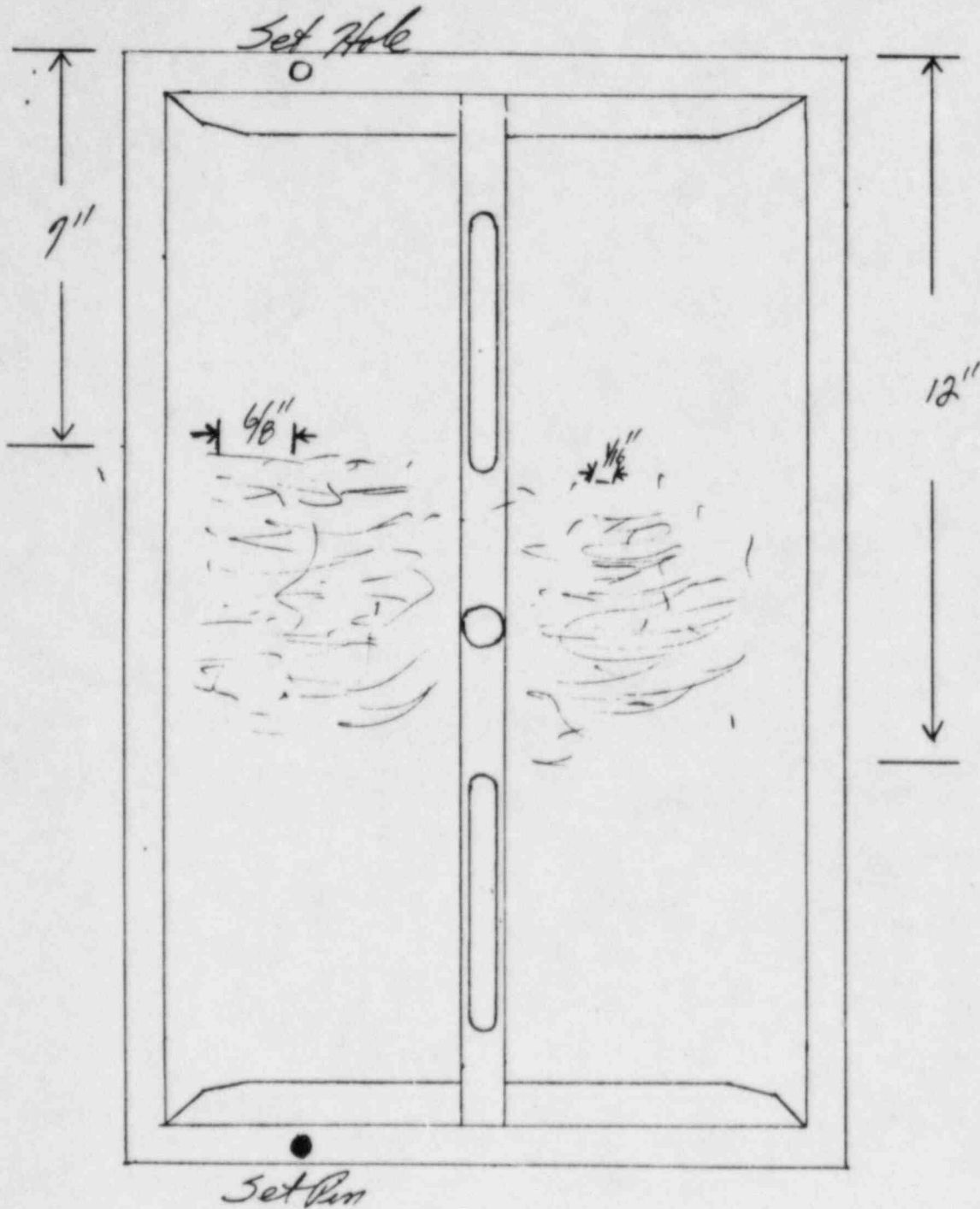
Not to Scale

Richard J. Smith H  
Date 11-5-84



Examined inner Radius also Set Hole & Pin Edges only  
upper Bearing #6

PAGE 14 OF 16

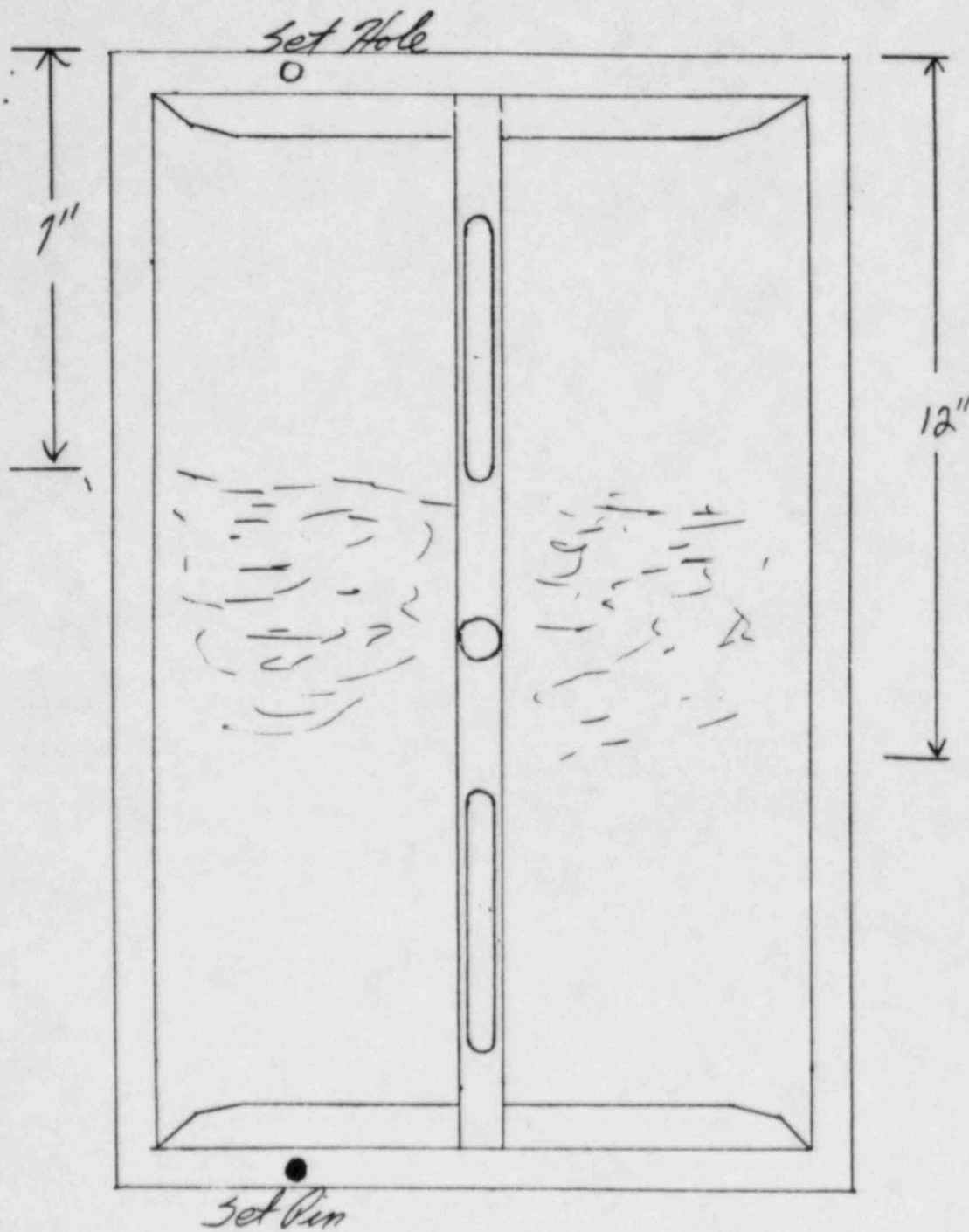


Not to Scale

Richard J. Smith H/E  
Date 11-5-84

Examined inner Radius also Set Hole & Pin Edges only  
upper Bearing #7

PAGE 15 OF 16

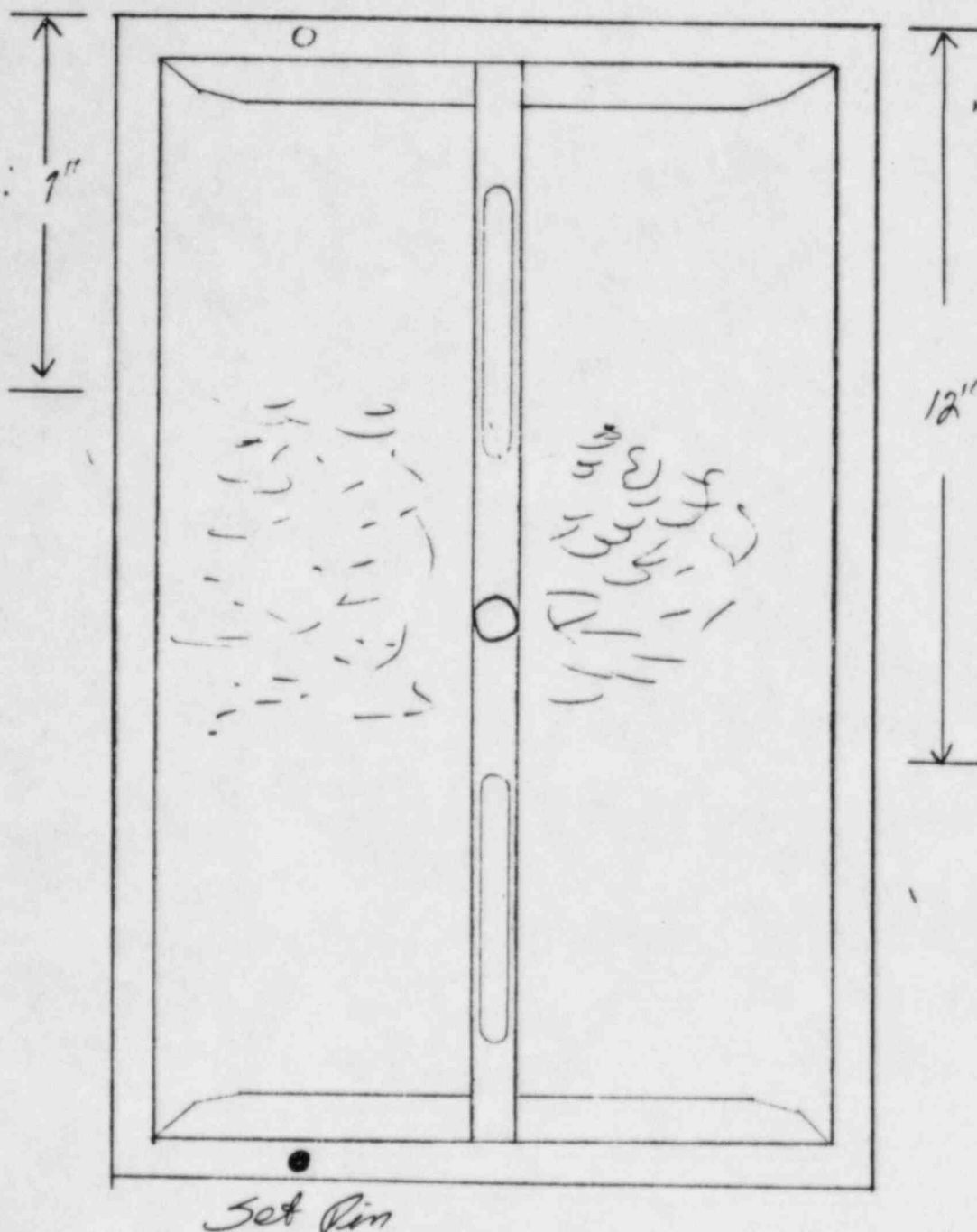


Not to Scale

Richard J. Smith  
Date 11-5-84 +/12

Examined inner Radius also Set Hole & Pin only  
upper bearing # 8

PAGE 16 OF 16



Not to Scale

Richard J. Smith III  
Date 11-5-84

TO: Mel Shuster, NED

FROM: R.A. Kinney, QAD

## THIS FORM IS DESIGNED FOR HAND-WRITTEN MESSAGES

MESSAGE: Subject: Crack Depth Measurement: R43\* Bear Shell AESP #21

On November 15, 1984 crack depth measurements were made on the TDI bearing Shell 03-340-05-AESP #21 using the TSI Crack Check model CC-800 B. The measurements followed a localized liquid penetrant examination to verify the crack location. The greatest depth noted for either of the two cracks was 0.030 inches with an average depth of 0.020 inches. The below listed calibration was used.

STD	
Actual	Measured
0.50	+0.47
0.40	+0.39
0.30	+0.30
0.20	+0.20
0.10	+0.10
surface	+0.00

Crack Check Data:

Probe SP1-B

Calibration Block - AL 6061-T6 S/N 263

Non-Fc setting; zero 3.39; cal. 5.88

CC: QAD File 390.11

SIGNED

R. Arthur Kinney

DATE 11/15/84

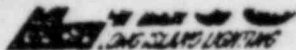
REPLY:

Received 11/15/84  
Mel Shuster

SIGNED

DATE

INSTRUCTIONS-AFTER REPLY IS WRITTEN, SNAP OUT CARBONS. RETAIN THE WHITE COPY AND RETURN THE YELLOW COPY TO POINT OF ORIGIN.



## LIQUID PENETRANT EXAMINATION REPORT

A. MATERIAL		TYPE	FABRICATED PROCESS	GEOMETRY	
		Al babbitt	<input type="checkbox"/> WELDED <input checked="" type="checkbox"/> CAST <input type="checkbox"/> WORKED	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <i>bearing shell</i>	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION		
		12 in.	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER		
B. NDE PROCEDURE No. 6.2		SURFACE/MAT'L. TEMP. ~65°F		M&TE. NO. - MWR/RR. No. -	
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.	
1. PRE-CLEANER		Magnaflux	SKC-NF/ZC-7B	84A028	
2. PENETRANT		Magnaflux	SKL-HF/SKL-S	81E180	
3. EMULSIFIER AND/OR REMOVER		Magnaflux	SKC-NF/ZC-7B	84A028	
4. DEVELOPER		Magnaflux	SKD-NF/ZP-9B	82J067	
5. POST EXAMINATION CLEANER		Magnaflux	SKC-NF/ZC-7B	84A028	
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY					
<div style="text-align: center;"><p>I.D. EDGE</p><p>Cracks</p><p>N.T.S.</p><p>Bearing Shell</p></div>					
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.			
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)		
1 see sketch	$\frac{11}{32}$ inch	crack	crack depth		
2 " "	$\frac{1}{8}$ inch	crack	measurement I.O.C.		
3					
4					
D. ACCEPTANCE CRITERIA		information only	OPERATOR <u>R.A. Kinney</u> Level <u>P.T. II</u> Date <u>11/15/84</u>		
E. ATTEST		R Andrew Kinney P.T. II 11/15/84			

COMPONENT I.D. Bearing Shell  
03-340-05-AESP #21  
SYSTEM R43\*PLANT/LOCATION  
SNPS



## WRIST PINS

Component Number 03-341C

### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, attachment WP-1, require a visual inspection of the wrist pin chrome finish for evidence of chipping or cracking, and a liquid penetrant examination of the wrist pin oil holes. Recording and acceptance criteria are as indicated in attachment WP-1.

### II. Inspection Results

Copies of all inspection reports are provided in attachment WP-2.

#### Visual Inspections

Visual inspection of the wrist pins revealed no cracking, chipping, blistering or any other indications of damage. This was a direct inspection performed in a clear well lighted work area.

#### Liquid Penetrant Inspections

Liquid penetrant examination of all oil holes revealed no recordable indications.

### III. Conclusion

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the wrist pins are acceptable for nuclear service. Further, the wrist pins have successfully completed confirmatory testing.

POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-341CCOMP. NAME Wrist PinsTYPE OF INSPECTION:☒ LP      ☐ MT      ☐ ET      ☐ UT      ☒ VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

Perform the following inspections of all eight wrist pins:

- 1) Visually inspect wrist pins for evidence of chipping or cracking of the chrome finish
- 2) Perform liquid penetrant examination of the oil holes in accordance with LILCO procedures NDE 6.1, 6.2.

RECORDING CRITERIA:

- 1) Record evidence of cracking, chipping or blistering of the chrome finish. Photograph results
- 2) Map all indications. Photograph results.

ACCEPTANCE CRITERIA:

- 1) Damage to chrome finish is to be reported on an LDR
- 2) Linear indications are to be reported on an LDR

REFERENCE DOCUMENTS:

- |                     |                                     |
|---------------------|-------------------------------------|
| 1. CODES, STANDARDS | <u>ASME Sections III, V, IX, XI</u> |
| 2. TDI O.G.         | <u>Phase II Report</u>              |
| 3. LILCO            | <u>Procedures NDE 6.1, 6.2.</u>     |

COMMENTS:

ATTACHMENT WP-2

November 28, 1984

NPD-84-1059

A. Muller

NED Evaluation of Wrist Pin Inspections  
DG-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

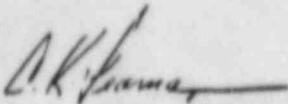
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the requirements of the confirmatory test as provided for in E&DCR F-46548 and appropriate revisions.

All inspection results are satisfactory. No LDR's are required or were generated as a result of these inspections.

The following consultant personnel concur with this evaluation:

. FAA Dr. L. Swanger

  
C. K. Seaman  
Project Engineer

MS/tls

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger



## LIQUID PENETRANT EXAMINATION REPORT

Page 1 of 1

A. MATERIAL	TYPE	Steel	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED
	GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <i>Wrist Pin</i>		
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
	N/A	N/A		

B. NDE PROCEDURE No. <u>6.2</u>	SURFACE/MAT'L. TEMP. <u>69°F</u>	MATE. NO. <u>365</u>	MWR/RR. No. <u>RR R43 255</u>
---------------------------------	----------------------------------	----------------------	-------------------------------

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012
2. PENETRANT	Magnaflux	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	Magnaflux	SKC-NF/ZC-7B	84J012
4. DEVELOPER	Magnaflux	SKD-NF	82D111
5. POST EXAMINATION CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

N  
A

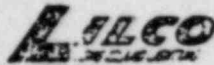
C. EVALUATION	REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.
---------------	--

LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
Oil Holes of Wrist Pin #1, 2, 3, 4, 5	N/A	N/A	Acceptable (No indication)
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
D. ACCEPTANCE CRITERIA	N/A	OPERATOR <u>Robert [Signature]</u> Level <u>II</u> Date <u>11-7-84</u>	
E. ATTEST	<u>116 [Signature]</u> RESPONSIBLE CERTIFIED PERSONNEL	<u>II</u> LEVEL	<u>11-7-84</u> DATE

FT  
1R43\*EDG-103  
COMPONENT I.D.  
Wrist Pin #1, 2, 3, 4, 5, 6, 7, 8SYSTEM  
1R43

PLANT/LOCATION EDG room-103





V-1.0

Operational Quality AssuranceVisual Inspection Report - WRIST PINS  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <i>R43-2055</i>		System/Struct/Comp: <i>1R43#ENG-103</i>		Organization Responsible: <i>LSL</i>		
Procedure/Rev.: <i>EIDCRF-46548</i>	Spec./Rev.: <i>SHI-089</i>	Drawing/Rev.:		Other: <i>TDI DG #03-341C</i>		
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>		SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS		✓				
2 SUFFICIENT LIGHTING		✓				
3 CHROME FINISH		✓			TDI O.G. No.03-341C	
a. No cracking		✓			Map all indications	
b. No chipping		✓			and photograph	
c. No blistering		✓			results.	
d. No other indications of damage		✓				

SKETCH OR DESCRIPTION OF EXAMINATION AREA *Visual Inspection of WRIST PINS TO ALL 8 PISTONS were found to be satisfactory.*

Prepared by: <i>William J. French</i>	Date: <i>11/2/84</i>	Approved for use: <i>C.D. Rows</i>	Date: <i>11/2/84</i>
OQA Inspector: <i>[Signature]</i>	Date: <i>11/2/84</i>	OQAE Approval: <i>C.D. Rows</i>	Date: <i>11/29/84</i>
Remarks: <i>NPJ-84-1059</i>			

## WRIST PIN BUSHINGS

Component Number 03-340A

### I. Introduction

Confirmatory test requirements in accordance with SNRC-1094 and the inspection plan WB-1 require a liquid penetrant examination to be performed on all eight wrist pin bushings. Recording and acceptance criteria is as indicated in attachment WB-1.

### II. Inspection Results

Liquid penetrant examination of all connecting rod wrist pin bushings revealed no recordable indications.

Copies of inspection reports are provided in attachment WB-2.

### III. Conclusions

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the wrist pin bushings are acceptable for nuclear service. Further, the wrist pin bushings have successfully completed confirmatory testing.

POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. 03-340ACOMP. NAME Wrist Pin BushingsTYPE OF INSPECTION:☒ LP☐ MT☐ ET☐ UT☐ VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

Perform liquid penetrant examination of connecting rod wrist pin bushings in accordance with LILCO Procedure NDE 6.2.

RECORDING CRITERIA:

Map all linear indications, photograph results.

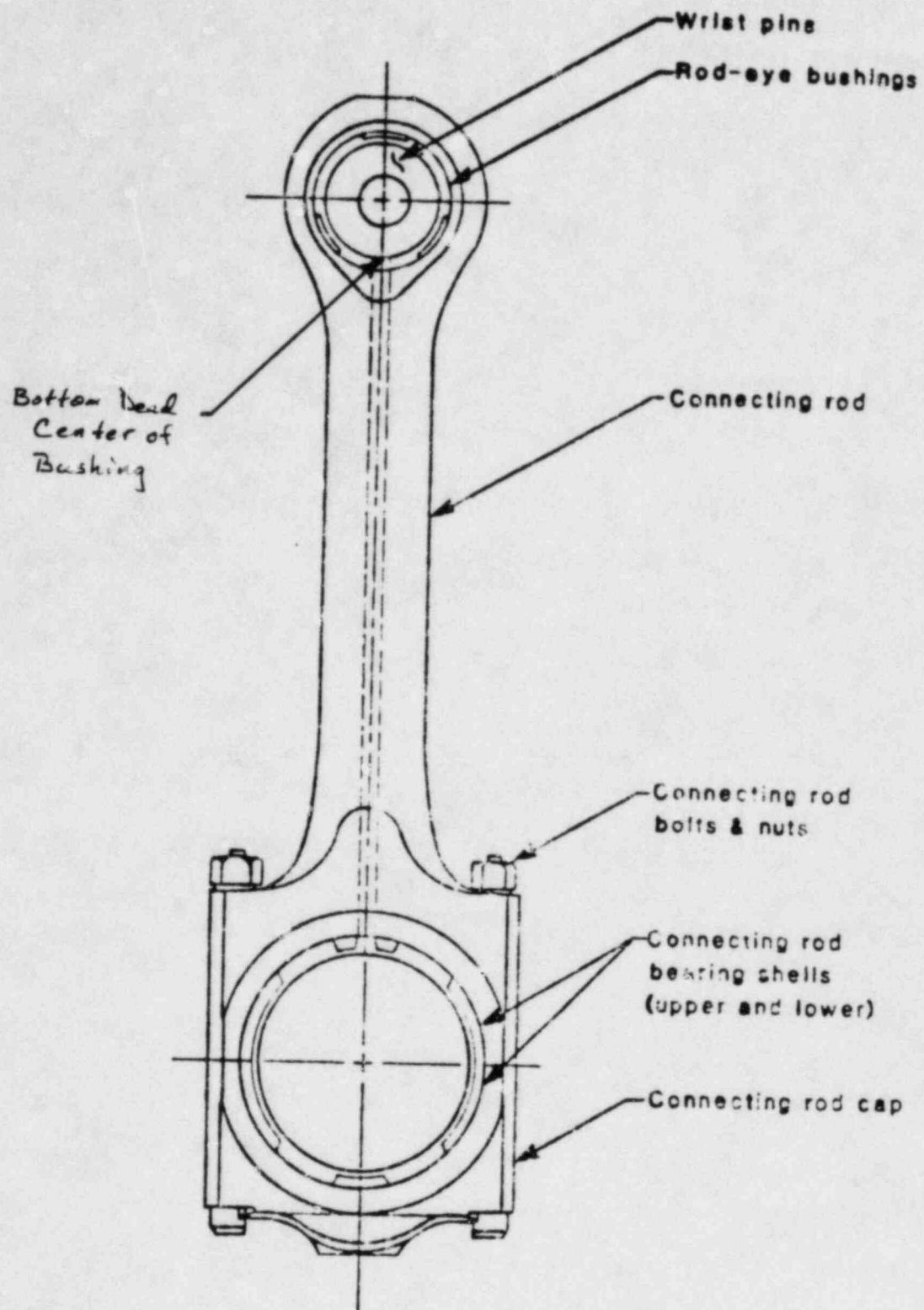
ACCEPTANCE CRITERIA:

Linear indications in accordance with LILCO Procedure NDE 6.2, within  $\pm 15^\circ$  of bottom dead center (see attached figure) are unacceptable.

REFERENCE DOCUMENTS:

- |                     |  |
|---------------------|--|
| 1. CODES, STANDARDS | <u>ASME Sections V, IX, XI; ASME NB 5000</u> |
| 2. TDI O.G.         | <u>Phase I &amp; II Reports</u>              |
| 3. LILCO            | <u>Procedure NDE 6.1, 6.2</u>                |

COMMENTS:



Inline connecting rod, model R-4 engine.

ATTACHMENT WB-2



November 28, 1984

NPD-84-1060

A. Muller

NED Evaluation of Wrist Pin Bushing Inspections  
DG-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

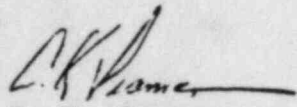
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the requirements of the confirmatory test as provided for in E&DCR F-46548 and appropriate revisions.

All inspection results are satisfactory. No LDR's are required or were generated as a result of these inspections.

The following consultant personnel concur with this evaluation:

. FAA Dr. L. Swanger



C. K. Seaman  
Project Engineer

MS/tls

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Pischinger



## LIQUID PENETRANT EXAMINATION REPORT

<b>A. MATERIAL</b> BRONZE		<b>TYPE</b>	<b>FABRICATED PROCESS</b> <input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED
<b>CROSS SECTION THICKNESS</b> MAX MIN N/A		<b>GEOMETRY</b> <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:	<b>SURFACE CONDITION</b> <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
<b>B. NDE PROCEDURE</b> No. NDE-62		<b>SURFACE/MAT'L. TEMP.</b> 73°F	<b>MATE. NO.</b> 366 <b>MWR/RR. No.</b> R43-2055
<b>INSPECTION MATERIALS</b>	<b>BRAND</b>	<b>DESIGNATION</b>	<b>BATCH NO.</b>
1. PRE-CLEANER	MAGNAFLUX	SKC-NF/2C-78	82J083
2. PENETRANT	MAGNAFLUX	SKL-HF/S	83G018
3. EMULSIFIER AND/OR REMOVER	MAGNAFLUX	SKC-NF/2C-78	82J083
4. DEVELOPER	MAGNAFLUX	SKD-NF	82D111
5. POST EXAMINATION CLEANER	MAGNAFLUX	SKC-NF/2C-78	82J083
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY			
<b>C. EVALUATION</b>		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.	
<b>LOCATION</b>	<b>SIZE (INCHES)</b>	<b>DESCRIPTION</b>	<b>ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)</b>
WRIST P.N. 1 Bushings 1, 2, 3 4, 5, 6, 7, 8			ACCEPTED
2			
3			
4			
<b>D. ACCEPTANCE CRITERIA</b>	N/A		<b>OPERATOR</b> Rodney S. Boney <b>Level</b> II <b>Date</b> 11-6-84
<b>E. ATTEST</b>	Rodney S. Boney		II 11-6-84
<b>RESPONSIBLE CERTIFIED PERSONNEL</b>		<b>LEVEL</b>	<b>DATE</b>

COMPONENT I.D.  
1R43 \* EDG-103  
WRIST P.N.  
Bushings  
SYSTEM  
1R43  
PLANT/LOCATION  
Shoreham  
EL-63 Turbine Bell

## GEARS

### Component Number Various

#### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, attachment G-1, require visual examination of all accessible areas of the gears through the inspection doors for evidence of fretting and damage to the gear teeth. Recording and acceptance criteria are as indicated in attachment G-1.

#### II. Inspection Results

Seven gears were accessible through the inspection doors:

- 1) camshaft gear
- 2) idler gear
- 3) lube oil pump gear carrier gear
- 4) crankshaft gear
- 5) crank to pump gear
- 6) governor drive gear
- 7) governor driven gear

Evidence of pitting was reported on two of the seven gears: the camshaft gear and the idler gear. The pitting was noted during the DR/QR baseline inspection and did not progress as a result of the endurance run. Inspection of the remaining five gears revealed no recordable indications.

Copies of all inspection reports are provided in attachment G-2.

#### III. Conclusion

All gear inspections required in accordance with SNRC-1094 and attachment G-1 have been satisfactorily completed.

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owners Group remains unchanged. It is confirmed that the gears are acceptable for nuclear service. Further, the gears have successfully completed confirmatory testing.

POST ENDURANCE RUN INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. VariousCOMP. NAME GearsTYPE OF INSPECTION:\_LP      \_MT      \_ET      \_UT      X VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

1 | Perform a visual inspection of accessible areas of gears through inspection doors. Engine should be barred over as required for maximum inspection coverage. Inspect for fretting and damaged teeth. See TDI Inst. manual page 8-4A for gear descriptions (Attached).

RECORDING CRITERIA:

Inspector will document conditions found on applicable inspection report.

ACCEPTANCE CRITERIA:

1 | If evaluation of fretting/signs of distress is required for acceptance, FaAA representative will provide evaluation on the inspection report. Excessive fretting/signs of distress are unacceptable. Photograph unacceptable areas.

REFERENCE DOCUMENTS:

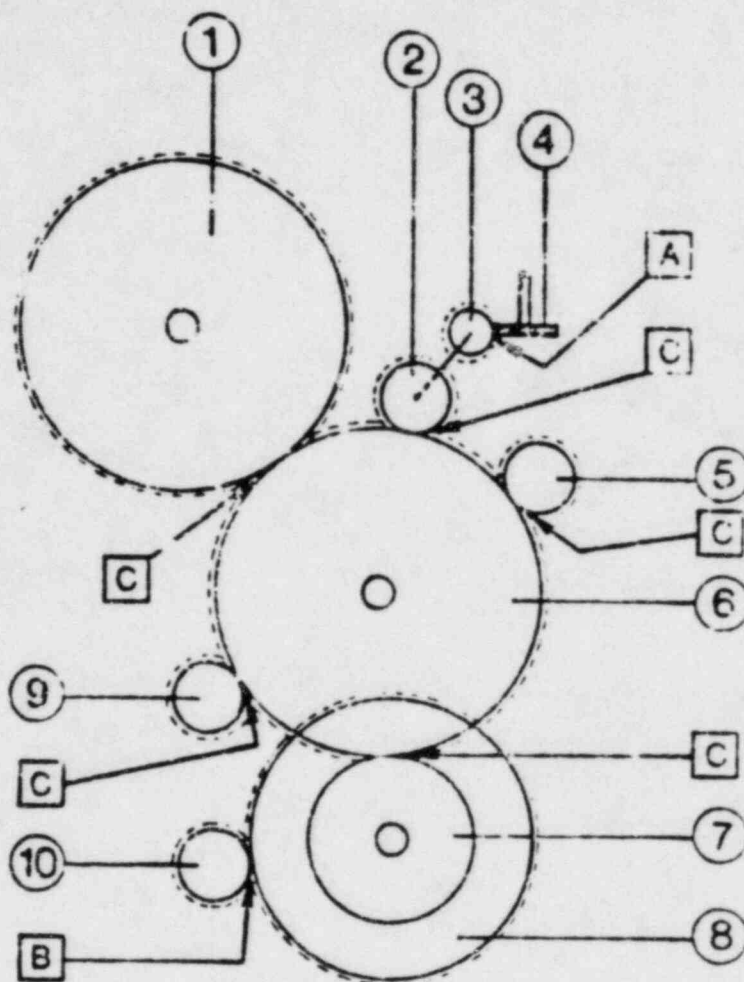
1. CODES, STANDARDS
2. TDI O.G.
3. LILCO

TDI Inst. Manual Section 8, Appendix III-1COMMENTS:



## APPENDIX III-1

### GEAR SET AND BACKLASH CLEARANCES MODEL R-4 ENGINE



ITEM	DESCRIPTION	Q <sup>PL</sup>
1	CAMSHAFT GEAR	350
2	TACHOMETER DRIVE GEAR	402
3	GOVERNOR DRIVE GEAR	402
4	GOVERNOR DRIVEN GEAR	402
5	ACCESSORY DRIVE GEAR	41Q
6	IDLER GEAR	355
7	CRANKSHAFT GEAR	310
8	CRANK TO PUMP GEAR	355
9	L. O. PUMP GEAR CARRIER GEAR	420
10	WATER PUMP GEAR	425

POS	BACKLASH	
	INCHES	CENTIMETERS
A	0.008/0.010	0.015/0.025
B	0.004/0.006	0.010/0.015
C	0.008/0.012	0.020/0.031



ATTACHMENT G-2

November 26, 1984

NPD-84-1036

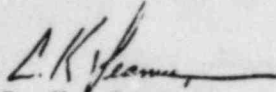
A. Muller

NED Evaluation of GEAR Visual Inspections  
DG-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

Conditions indicated on the attached visual inspection reports have been evaluated by Nuclear Engineering Department as noted below:

Pitting noted by OQA on the crankshaft gear and idler gear is the same as was reported during base line inspections. The endurance run did not cause a progression of the pitting on these gears. This evaluation was provided by Dr. L. Swanger, FaAA.

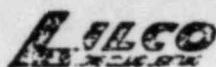
Based on the above it is NED's conclusion that the conditions observed on the DG-103 gears are acceptable. All referenced gears are suitable for continued service in the engine.

  
C. K. Seaman

GML/tls

Attachment

cc: E. J. Youngling  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger



V-2.0

## Operational Quality Assurance

## Visual Inspection Report - GEARS

## TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>R43-2055 Supplement #1</b>		System/Struct/Comp: <b>1R43AENG-103</b>	Organization Responsible: <b>LSU</b>
Procedure/Rev.: <b>NPD-84-866</b> <b>ETDCRF-46548A</b>	Spec./Rev.	Drawing/Rev.: <b>TDI Manual Page 8-4A</b>	Other:

VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS	✓				
2 SUFFICIENT LIGHTING	✓				
3 GEARS-ACCESSIBLE THROUGH INSPECTION DOORS	✓			TDI Inst. Manual Section 8, App. III-1	
* a. No excessive fretting	✓			Indications require	
* b. No signs of distress	✓			FaAA engineering evaluation-note	
				indications with	
				evaluation, FaAA	

## SKETCH OR DESCRIPTION OF EXAMINATION AREA

signature required.

GEARS accessible for inspection were the following; and had shown evidence of pitting:

- \* 1. CAMSHAFT Gear - (Pitting)
- \* 2. IDLER Gear - (Pitting)
- 3. L.O. Pump Carrier Gear
- 4. Crankshaft Gear
- 5. Crank To Pump Gear
- 6. Governor Drive Gear
- 7. Governor Driven Gear

\* Referred To N.E.D. For evaluation of Acceptability *Photo 6* OQA  
11/3/84

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Kous</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>Photo 6</b>	Date: <b>11/3/84</b>	OQAE Approval: <b>C.D. Kous</b>	Date: <b>11/29/84</b>

Remarks: Items 3A & 3B were acceptable to NED as per NPD-84-1036 11/12/84

## TURBOCHARGER

Component Number MP-017

### I. Introduction

Confirmatory testing requirements in accordance with SNRC-1094 and the inspection plan, attachment TC-1, require the following:

- 1) breakaway torques of the turbocharger mounting flange bolts;
- 2) visual inspection of mounting flange bolts and inlet flange bolts;
- 3) Visual inspection of nozzle ring capscrews as installed;
- 4) visual inspection of nozzle ring vanes;
- 5) turbocharger float check measurements.

Recording and acceptance criteria are as indicated in attachment TC-1.

### II. Inspection Results

Of eight mounting flange bolts, four were loose, two had breakaway torques of 60 ft. lbs., and two were inaccessible with a torque wrench. The mounting bolts showed no evidence of thread distortion, necking, or cracking.

The inlet flange bolts were inspected with eleven bolts showing no signs of thread distortion, necking or cracking. One inlet flange bolt had stripped threads.

Nozzle ring capscrews were inspected with satisfactory results. The nozzle ring vanes showed no signs of distortion or warping. The gap between the nozzle ring and nose piece was reported between 0.002 and 0.003 inches.

The float check measurement was recorded at 0.0055 inches. This was a "wet" measurement.

Copies of all inspection reports are provided in attachment TC-2.

### III. Conclusion

All turbocharger inspections required in accordance with SNRC-1094 and attachment TC-1 have been satisfactorily completed.

Loose mounting flange bolts was determined to be the result of thermal expansion and contraction of the turbocharger casing. To avoid this situation in the future, E&DCR F-46537A has been issued to require hot torque of these bolts on all three engines.

The damaged inlet flange bolt showed thread distortion on 50% of the length. The damage was uniform circumferentially on the bolt. Visual examination indicates that the damage was inflicted upon installation or removal and was not service induced. The bolt was replaced on the turbocharger. LDR 2570 was generated.



The float check measurement was taken with a film of oil on the rotor. The measurement was recorded 0.0055 inches. LDR 2208 (dated 3-13-84) shows the installation float check measurement as 0.006 inches "wet". Ellicot accepted this measurement since the acceptance criteria is for dry measurements. The wear patterns on the bearing surface were reviewed and were determined to be acceptable. Therefore this measurement is acceptable.

Based on the above inspections and testing, LILCO and its consultants conclude that the final evaluation of the TDI Owner's Group remains unchanged. It is confirmed that the turbocharger is acceptable for nuclear service. Further, the turbocharger has successfully completed the confirmatory testing.



POST RUN ENDURANCE INSPECTIONCOMPONENT DESCRIPTION:TDI O.G. NO. MP-017COMP. NAME TurbochargerTYPE OF INSPECTION:\_LP\_MT\_ET\_UTX VISUALAREA TO BE EXAMINED/EXAMINATION DETAILS:

- 1 | Perform the following tests 1) Record breakaway torques of turbocharger mounting flange bolts 2) Visually inspect Turbocharger mounting flange bolts and turbine inlet flange bolts for signs of distress 3) Visually inspect nozzle ring capscrews as installed - do not remove capscrews for inspection - 4) Inspect nozzle ring vanes for integrity and distortion or warping 5) Record turbocharger float check measurements.

RECORDING CRITERIA:

- 1) Record values
- 2) Thread distortion, necking, cracked or broken bolts
- 3) Cracked or broken capscrews
- 4) Inspect for chipped, bent, nicked or missing vanes. Check warpage with 0.005" shim between nozzle ring and nose piece
- 5) Record Values

ACCEPTANCE CRITERIA:

- 1 | 1) For information only. No acceptance criteria required.
- 2) Thread Distortion, necking, cracked or broken bolts unacceptable
  - 3) Cracked or broken cap screws unacceptable
  - 4) Acceptable if 0.005" shim does not fit between nozzle ring and nose piece. Chipped, bent, nicked or missing vanes are unacceptable.
  - 5) Acceptable wear limitations 0.008 to 0.020 inches

REFERENCE DOCUMENTS:

1. CODES, STANDARDS
2. TDI O.G.
3. LILCO
4. OTHER

Elliot Instruction Manual TC-70-A, pg 7,12,21COMMENTS:

ATTACHMENT TC-2

November 29, 1984

NPD-84-1063

A. Muller

NED Evaluation of Turbocharger Inspections  
DG-103 Confirmatory Test  
Shoreham Nuclear Power Station - Unit 1  
W.O. 44430

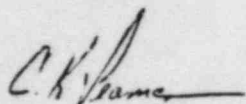
The attached inspection reports have been evaluated by NED as noted below:

All inspections have been completed in accordance with the Requirements of the confirmatory test as provided for in E&DCR F-46548 and appropriate revisions.

Inspection results are satisfactory. No LDR's are required. LDR #2570 was generated for a Inlet Flange Capscrew for threads which were damaged during installation or removal. This capscrew will be replaced. E&DCR F-46537A provides additional torque requirements for the turbocharger mounting bolts.

The following consultant personnel concur with this evaluation:

. FAA Dr. L. Swanger

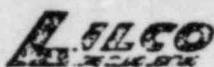


C. K. Seaman  
Project Engineer

MS/tls

Attachment

cc: E. J. Vounding  
R. M. Kascsak  
M. Schuster  
G. M. Laurie  
R. VanGalder  
D. Pietrowski  
Dr. L. Swanger  
Dr. F. Dischinger



A-5.0

## Operational Quality Assurance

Visual Inspection Report - TURBOCHARGER  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>RRR R43-2056</b>		System/Struct/Comp: <b>1R43K ENG-103</b>	Organization Responsible: <b>LSU</b>
Procedure/Rev.: <b>ELLIOTT TYPE "G"</b> <b>INST/MANUAL TC-70-A</b>	Spec./Rev.: <b>SH1089 REV.2</b>	Drawing/Rev.:	Other: <b>EEDR F46548A</b>

VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS	✓				
2 SUFFICIENT LIGHTING	✓				FLASH LIGHT
3 TURBOCHARGER	✓			TDI O.G. No. MP-017	
a. No broken or cracked capscrews	✓			Elliot Inst. Manual	
b. Warpage <.005" between nozzle ring and nose piece	✓			TC-70-A Pg.12, 21	
c. No chipped, bent, nicked or missing vanes.			✓		
d. Thrust bearing float check			✓		
e. No thread distortion, necking, cracked or broken mounting & inlet flange bolts.	✓				

SKETCH OR DESCRIPTION OF EXAMINATION AREA

E. NOTED: ONE (1) CAPSCREW HAD STRIPPED THREADS AT 150 FT LBS BREAKAWAY VALUE OF INLET FLANGE. THREE (3) THREADS WERE STRIPPED INSIDE OF SAME HOLE AND 1 INCH OF GOOD THREADS REMAIN IN SAME HOLE. ELEVEN (11) CAPSCREWS OF INLET FLANGE BOLTS -

E. NO EVIDENCE OF THREAD DISTORTION, NECKING, CRACKING OR BROKEN MOUNTING NOTED.

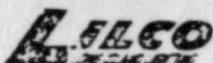
B. CHECKED WARPAGE WITH FELLER GAGE BETWEEN NOZZLE RING AND NOSE PIECE. RESULTS OBTAINED WERE LESS THAN .005" (ACTUAL READING .002" ± .003")

A. VISUALLY INSPECTED NOZZLE RING CAPSCREWS DID NOT FIND ANY BROKEN OR CRACKED CAPSCREWS. LOCKWIRE IN GOOD CONDITION.

INSPECTION PERFORMED ON 11-10-84

Prepared by: <b>William J. Fruch</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Young</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>James A. Krosky</b>	Date: <b>11/20/84</b>	OQAE Approval: <b>Alto</b>	Date: <b>11/30/84</b>
Remarks: <b>* NFI-84-1063</b>			





A-5.0

## Operational Quality Assurance

Visual Inspection Report - TURBOCHARGER  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: RRR R43-2056		System/Struct/Comp: R43 ENG-103	Organization Responsible: LSU
Procedure/Rev.: ELLIOTT TYPE "G" INST. BOOK TC-70-A	Spec./Rev.: SH-089 Rev 2	Drawing/Rev.:	Other: EIDCRF96548A

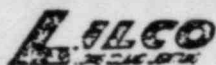
VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR M&TE
1 EXAMINATION AREA CLEANLINESS	✓				
2 SUFFICIENT LIGHTING	✓				Flashlight
3 TURBOCHARGER	✓			TDI O.G. No. MP-017	
a. No broken or cracked capscrews			✓	Elliot Inst. Manual	
b. Warpage <.005" between nozzle ring and nose piece			✓	TC-70-A Pg.12, 21	
c. No chipped, bent, nicked or missing vanes.	✓				
d. Thrust bearing float check	✓		✓		
e. No thread distortion, necking, cracked or broken mounting & inlet flange bolts.					

## SKETCH OR DESCRIPTION OF EXAMINATION AREA

- 1) EVIDENCE OF OIL LEAK THROUGH SEAL ON TURBINE END AROUND TURBINE DISK (SEE FRAMES 11-13, ROLL No 4)
- 2) EXAMINATION/MEASUREMENT OF ROTOR FLOAT SHOWED A PLAY OF 0.0055 IN. PER ELLIOTT INST. MANUAL; MIN. DESIGN CLEARANCE AND MIN. ACCEPTABLE WARE LIMITATIONS ARE BOTH 0.008 IN (DIAL INDICATOR M&TE 2-44-86-CAL. DUE DATE: 3-13-85)
- 3) LOOSE PARTICLES IN TURBINE VANE AREA OF QUESTIONABLE ORIGIN (I.E.: VANE COATING PEELING, LOOSE CARBON PARTICLES) PIECES NUMBER AS SEVERAL DOZEN

Prepared by: William J. French	Date: 11/2/84	Approved for use: C.D. Young	Date: 11/2/84
OQA Inspector: Robert M. Dargatzis	Date: 11/9/84	OQAE Approval: [Signature]	Date: 11/3/84
Remarks: A DFD-84-1063			





A-5.0

## Operational Quality Assurance

Visual Inspection Report - TURBOCHARGER  
TDI EDG POST ENDURANCE RUN INSPECTION

Inspection Activity: <b>RRR R43-2056</b>		System/Struct/Comp: <b>1R43*EDG-103</b>	Organization Responsible: <b>LSU</b>
Procedure/Rev.: <b>ELLIOTT Type "B"</b> <b>INST. MANUAL TC-70-A</b>	Spec./Rev.: <b>SMI-089 REV. 2</b>	Drawing/Rev.:	Other: <b>EEDCRF 46548A</b>

VISUAL INSPECTION DESCRIPTION (Check One) REMOTE <input type="checkbox"/> DIRECT <input checked="" type="checkbox"/>	SAT	UN-SAT	N/A	REFERENCES	REMARKS, VISUAL AIDS AND/OR NOTE
1 EXAMINATION AREA CLEANLINESS	✓				
2 SUFFICIENT LIGHTING	✓				FLASHLIGHT
3 TURBOCHARGER	✓			TDI O.G. No. MP-017	
a. No broken or cracked capscrews			✓	Elliot Inst. Manual	
b. Warpage <.005" between nozzle ring and nose piece			✓	TC-70-A Pg.12, 21	
c. No chipped, bent, nicked or missing vanes.	✓				
d. Thrust bearing float check			✓		
e. No thread distortion, necking, cracked or broken mounting & inlet flange bolts.			✓		

## SKETCH OR DESCRIPTION OF EXAMINATION AREA

VISUALLY INSPECTED NOZZLE RING VANES FOR INTEGRITY AND DISTORTION AND WARPING. NOTED SOME CARBON DEPOSIT ON THE VANES.  
NO VISIBLE SIGNS OF DISTORTION OR WARPING NOTED.

Prepared by: <b>William J. French</b>	Date: <b>11/2/84</b>	Approved for use: <b>C.D. Young</b>	Date: <b>11/2/84</b>
OQA Inspector: <b>James A. Masley</b>	Date: <b>11/9/84</b>	OQAE Approval: <b>SC Lee</b>	Date: <b>11/30/84</b>
Remarks: <b>*NPD-84-1063</b>			

SHOREHAM I

NUCLEAR POWER STATION

September 4, 1979

REVISION 10

TARTUP FORM 7.6

PAGE 2

R43-2056

REWORK SUPERVISOR WORK SUMMARY

BRIEF DESCRIPTION OF WORK:

STEP # 10.

SIDE  $5/8''$ -11 (FOUR TOTAL) MOUNTING BOLTS WERE LOOSE.  
BOTTOM  $5/8''$ -11 (TWO) EAST MOUNTING BOLTS @ 60 FT. LBS - AND FOR  
BOTTOM  $5/8''$ -11 (TWO) WEST MOUNTING BOLTS COULD NOT USE TORQUE  
COMPONENTS REPLACED (IF APPLICABLE): WRENCH DUE TO SPACE LIMITATION.

OQA

A.O. 11-7-84

NOTE, CALIBRATED TOOLS UTILIZED:

MTE # 761 (1-18-85)

ADDITIONAL COMMENTS:

Philip Ke 11/7/84  
Rework Supervisor Signature/Date

**EDDY-CURRENT EXAMINATION OF  
SHOREHAM NUCLEAR POWER STATION UNIT 1  
EMERGENCY DIESEL GENERATOR  
EDG 103  
-POST ENDURANCE RUN-**

Prepared by:

Duane P. Johnson  
Brian A. Holcombe  
Donald O. Johnson

Failure Analysis Associates  
2225 East Bayshore Road  
Palo Alto, California 94303

Final Report

Prepared for:

Diesel Generator Owners' Group

November 29, 1984

Job Number: QRSNPS

**EDDY-CURRENT EXAMINATION OF  
SHOREHAM NUCLEAR POWER STATION UNIT 1  
EMERGENCY DIESEL GENERATOR  
EDG 103  
-POST ENDURANCE RUN-**

**1.0 INTRODUCTION**

The eddy-current examinations detailed in this report were conducted on EDG 103 as directed in Shoreham Nuclear Power Station - Unit 1 E & DCR-F46548 series inspection plans. The examinations were conducted at the Shoreham Nuclear Power Station (SNPS) in the time period 11-5-84 to 11-13-84 by Failure Analysis Associates (FaAA) (level II) inspectors Donald O. Johnson, Brian A. Holcombe and Kimball J. Brunty. They were assisted by FaAA employees Sam X. McFadden and Laney H. Bisbee. The Long Island Lighting Company (LILCO) representative directing the nondestructive examinations was Milford H. Schuster, LILCO-Shoreham Nuclear Power Plant, P.O. Box 618, Wading River, NY 11792. (516) 929-8300 x3696.

**2.0 CONNECTING ROD BEARING SHELLS EDDY-CURRENT EXAMINATION**

**2.1 Inspection**

Eddy-current examinations were performed on all linear liquid penetrant indications on the bearing shells removed from EDG 103 after the endurance run to determine if the penetrant indications corresponded to imperfections with significant depth. FaAA NDE 11.7, Revision 0 eddy-current test procedure was used (see Appendix A). Figure 1 shows the eddy-current crack signal obtained from the bearing shell crack standard. All eddy-current crack signals greater than 10% of this standard signal were recorded.

Eddy-current tests of the concave (babbitt side) of the bearing shells were performed on 11-6-84 and a record of the tests is FaAA Eddy-Current Report #84110610 (see Appendix B).



05631-28

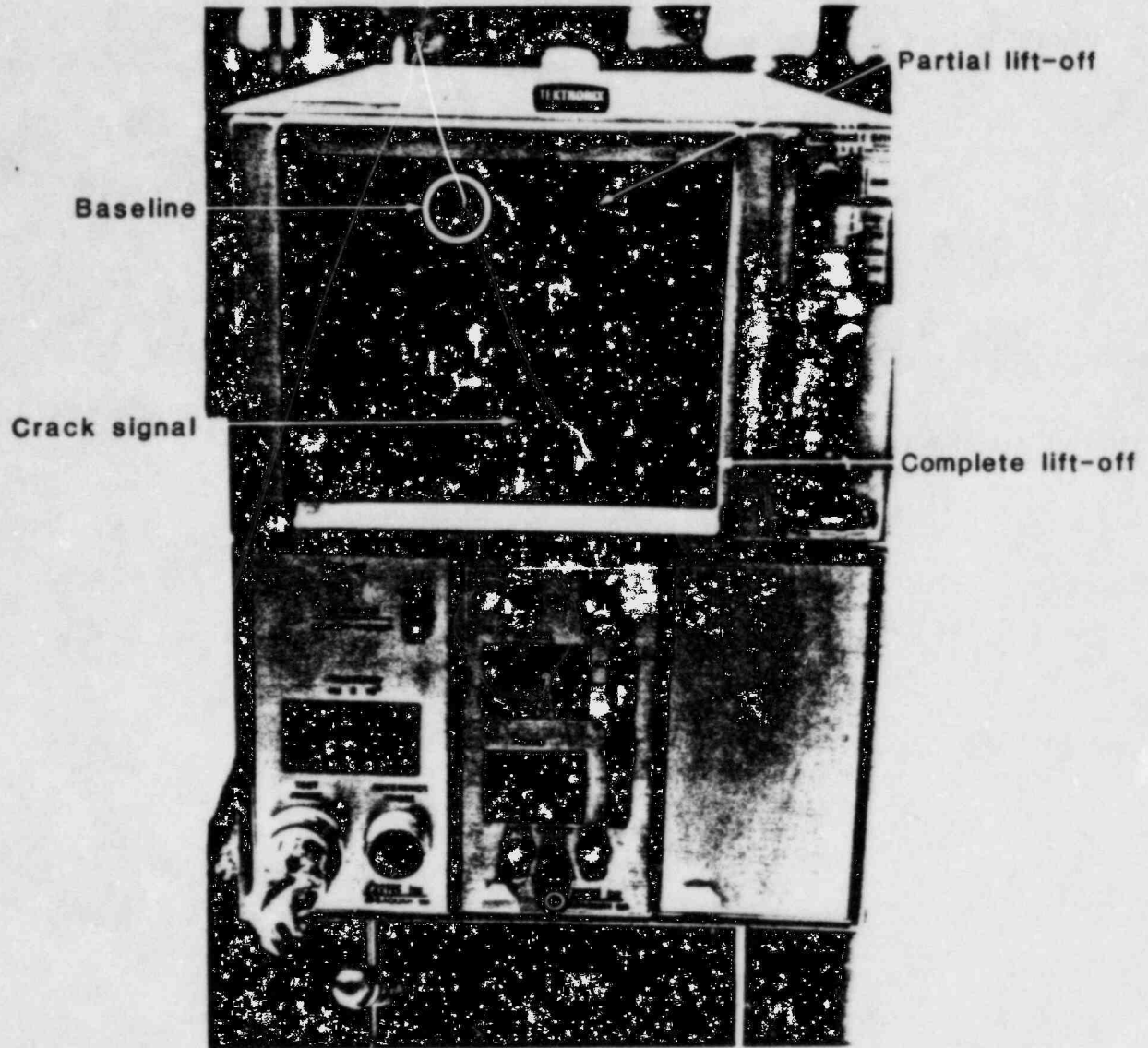


Figure 1 - Crack Signal from Bearing Shell Standard



Eddy-current tests of the convex side (aluminum side) and edges of the bearing shells were performed on 11-8-84 and a record of the tests is FaAA Eddy-Current Report #84110810 (see Appendix C).

## 2.2 Examination Results

No recordable eddy-current indications were found on the concave side or edges of the bearing shells. One recordable eddy-current indications with magnitude 66% of the reference level was found on the convex side (aluminum side) of the #6 upper bearing shell, approximately 6 +/- inch from the pin end of the shell and approximately 1 +/- inch from the right side of the shell with the pin end down. The eddy-current indication was approximately 3/8 inch long running at approximately 30° to the side of shell. Figure 2 is a photograph of the penetrant indication in the #6 upper bearing shell. Figure 3 is a close-up photograph of the penetrant indication.

05632-28

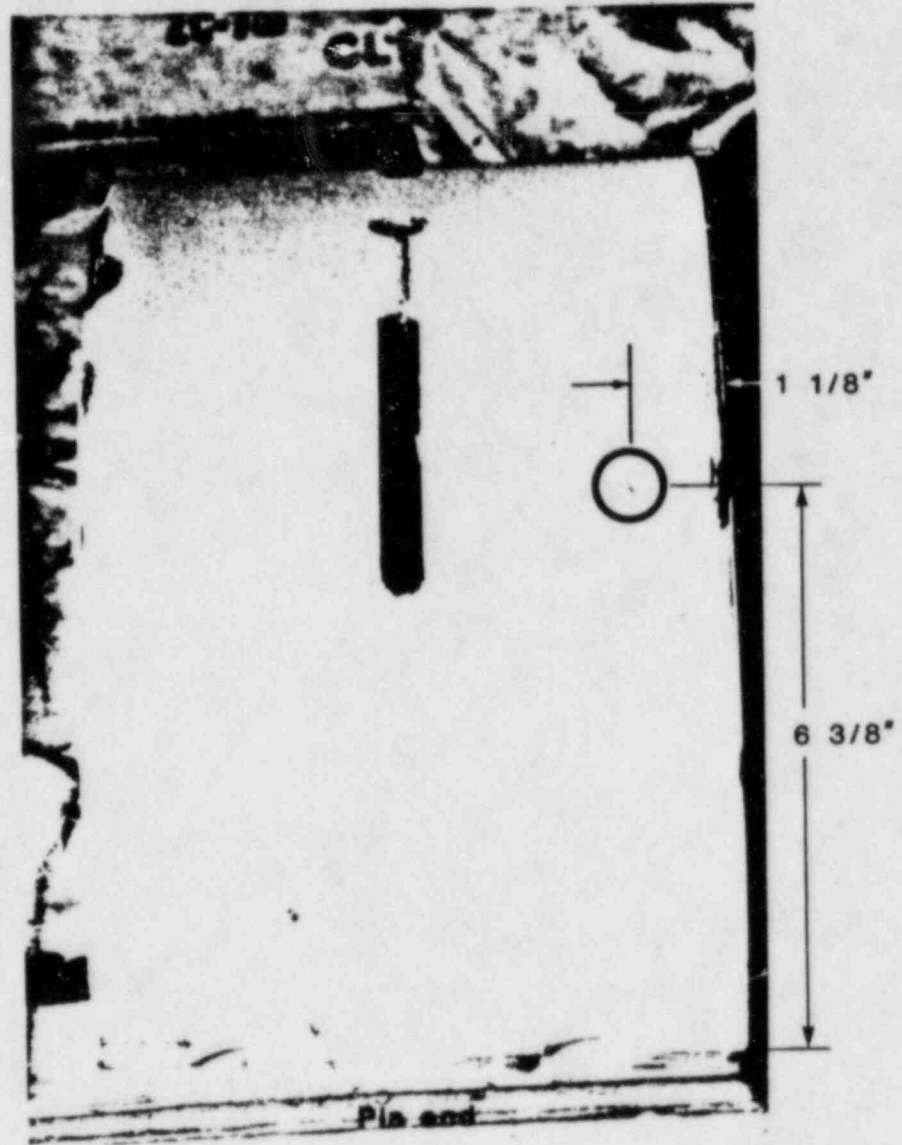
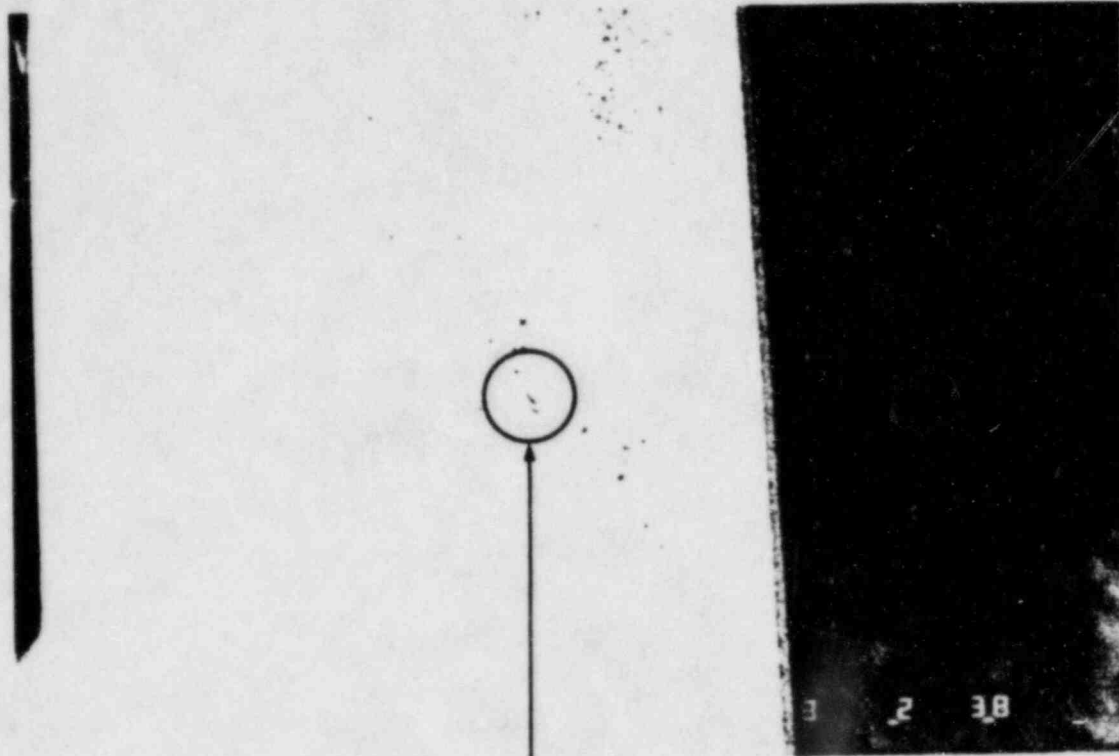


Figure 2 - Photograph of Liquid Penetrant Indication  
#6 Upper Bearing Shell

05632-35



Linear penetrant indication

Figure 3 - Close-up Photograph of Linear  
Liquid Penetrant Indication in  
#6 Upper Bearing Shell

### **3.0 CRANKSHAFT OIL HOLE EDDY-CURRENT EXAMINATION**

#### **3.1 Inspection**

Eddy-current examinations were performed of all crankpin journal and main journal oil holes except the oil holes in main bearing journals 1, 2, 10 and 11. The inspections were performed with the crankshaft in place. The crankshaft oil holes were inspected in all cases from the lower extent of the oil hole radius to a depth of 3.0 inches. FaAA NDE 11.3, Revision 2 eddy-current test procedure was used (see Appendix D). The acceptance criteria are given on page 6 of SNPS-Unit 1 E & DCR-F46548A Inspection Plan.

Eddy-current tests of the crankpin oil holes were performed on 11-6-84 and a record of these tests is FaAA Eddy-Current Report #84110601 (see Appendix E). Eddy-current tests of the main journal oil holes were performed on 11-9-84 and a record of these tests is FaAA Eddy-Current Report #84110910 (see Appendix F).

#### **3.2 Examination Results**

All oil holes passed the most sensitive (level 1) examination.

### **4.0 CRANKSHAFT FILLET JOURNAL AND THRUST FACE EDDY-CURRENT EXAMINATION**

#### **4.1 Inspection**

Eddy-current examinations were performed on all linear liquid penetrant indications identified to FaAA inspectors by LILCO OQA personnel except those penetrant indications at the intersection of the fillet and thrust face. It was not possible to adequately examine these edges with eddy-current because of the lack of an adequate standard for this geometry.

The inspection was performed with the crankshaft in place. FaAA NDE 11.1, Revision 0 eddy-current test procedure was used (see Appendix G). The eddy-current recording criterion was any crack-like indications exceeding 50% of the signal obtained from the  $1/16$  inch long by  $1/32$  inch deep simulated crack in FaAA crack standard PA07396-83121.

Eddy-current examination of the linear penetrant indication on the generator end in the fillet area of crankpin #7 was performed on 11-7-84 and is recorded on FaAA Eddy-Current Report #84110702 (see Appendix H). The indication and an area 3 inches circumferentially on each side of the indication were examined.

Eddy-current examination of the linear penetrant indications on the thrust faces of the crankpins reported on LILCO Liquid Penetrant Report dated 11-9-84 was performed on 11-12-84 and is recorded on FaAA Eddy-Current Report #84111210 (see Appendix I). One penetrant indication on the generator end of crankpin #6, one penetrant indication on the governor end of crankpin #7, seven penetrant indications on the generator end of crankpin #7, and two penetrant indications on the generator end of crankpin #8 were evaluated with eddy-current.

Eddy-current examination of the linear penetrant indications on the main bearing fillets, journals and thrust faces reported on LILCO liquid penetrant report dated 11-12-84 was performed on 11-12-84 and recorded on FaAA Eddy-Current Report #84111210 (see Appendix I). Three penetrant indications on the generator end of main bearing #7, four penetrant indications on the generator end of main bearing #8, seven penetrant indications on the governor end of main bearing #8, one penetrant indication on the governor end of main bearing #9, and five penetrant indications on generator end of main bearing #9 were evaluated with eddy-current.

#### **4.2 Examination Results**

No recordable indications were observed.

### **5.0 CYLINDER BLOCK STUD HOLE EDDY-CURRENT EXAMINATION**

#### **5.1 Inspection**

Eddy-current examinations were performed of stud holes #6 and #7 of cylinder #4 and stud holes #2 and #3 of cylinder #5. Stud holes are numbered sequentially in the clockwise direction around the cylinder with hole #1 at



approximately one o'clock near the exhaust side of the block. The examination was performed with the cylinder head and the four studs removed but with the liner in place.

The examination extended from the top of the block down to the bottom of the threaded portion of the stud holes. FaAA NDE 11.8, Revision 1 eddy-current test procedure was used (see Appendix J). The recording level was 100% of 0.020 inch deep simulated crack. The eddy-current tests were performed on 11-7-84 and are recorded on FaAA Eddy-Current Report #84110703 (see Appendix K).

## **5.2 Examination Results**

No recordable indications were observed.

APPENDIX A

FaAA NDE 11.7, REVISION 0

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION OF  
DIESEL ENGINE BEARING SHELLS

NDE: 11.7

Page 1 of 3

Revision: 0

Date: 02-07-84

Approved by NDE Manager: Duane B. Johnson

Date: 2/7/84

Reviewed - NDE Level III: Duane B. Johnson

Date: 2/7/84

### 1.0 PURPOSE AND SCOPE

- 1.1 To establish calibration, scanning and evaluation techniques for eddy-current examination of bearing shells.

### 2.0 REFERENCES

- 2.1 NDE 2.1 - Certification of NDE (Nondestructive Examination) Personnel.
- 2.2 NDE 9.2 - Radiographic Examination of Diesel Engine Upper and Lower Bearing Shells.

### 3.0 PERSONNEL CERTIFICATION

- 3.1 Personnel performing eddy-current examination shall be at least NDT Level I. Data interpretation shall be performed by at least a Level II eddy-current inspector. All inspectors shall be certified according to FaAA practice for certification and qualification of NDT Personnel.

### 4.0 EQUIPMENT

- 4.1 Eddy-Current Instrument (ECI) used with this instruction shall be an impedance-plane display instrument such as the M1Z-17.
- 4.2 The eddy-current test probe shall be a FaAA-ECP-200-P with tape over the sensing end.
- 4.3 The eddy-current reference probe shall be a FaAA-ECP-200-B or ECP-200-P.

### 5.0 REFERENCE STANDARD

- 5.1 Reference standard PA0-7396-840120 is a diesel engine bearing shell containing a service induced crack.

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION OF  
DIESEL ENGINE BEARING SHELLS

NDE: 11.7  
Page 2 of 3  
Revision: 0  
Date: 02-07-84

### 6.0 CALIBRATION PROCEDURE

- 6.1 Set ECI frequency to 500 kHz  $\pm$  50 kHz.
- 6.2 Set ECI volts per division to 0.5.
- 6.3 Set ECI gain to 07.
- 6.4 Adjust horizontal and vertical position control such that balance point is at (0.0 V, 1.0 V).
- 6.5 Adjust horizontal attenuator such that horizontal saturation is greater than 1.5 V and less than - 1.5 V.
- 6.6 Adjust ECI phase until initial left-off signal is horizontal and to the right.
- 6.7 Adjust ECI gain to achieve a crack indication from reference standard, PA0-7396-840120 with vertical magnitude equal to  $2.5 \pm 0.5$  V.
- 6.8 Repeat steps 6.2 to 6.7 until no further adjustment is necessary.
- 6.9 Calibration check shall be completed.
  - a. before examination of bearing shell.
  - b. after examination of bearing shell.
  - c. at least once an hour.
- 6.10 Should recalibration be needed, the last test prior to calibration check shall be retested.
- 6.11 ECI should be on at least 10 minutes before calibration or testing.

### 7.0 EXAMINATION

- 7.1 The bearing shell shall be examined in areas only where Radiographic Linear indications are present.

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION OF  
DIESEL ENGINE BEARING SHELLS

NDE: 11.7

Page 3 of 3

Revision: 0

Date: 02-07-84

7.2 The scanning pattern shall be perpendicular to the linear indication.

### 8.0 ACCEPTANCE CRITERIA

8.1 No eddy-current crack indications exceeding 10% of the crack signal obtained from reference standard PA0-7396-840120 is acceptable.

### 9.0 RECORDS

9.1 Set-up and calibration shall be recorded on "Eddy-Current Calibration Report," Form 11.1.10.

9.2 All indications exceeding 10% of the reference standard shall be recorded.

9.3 All records shall be filed according to job number.



APPENDIX B

RECORD OF CONNECTING ROD BEARING SHELL  
EDDY-CURRENT EXAMINATION  
CONCAVE SIDE

FaAA EDDY-CURRENT REPORT #84110610

11.1.10

1 of 4

Failure  
Analysis  
Associates

# PRELIMINARY REPORT

FINALIZED

D. Johnson  
11-24-84

Job no. PA07396

Report no. P4110610

Material description

AL/SN ALLOY

Code or specification

FAAA NDE 11.7

Full on NA

Full off NA

Reference standard

PA07396  
840120

Instrument

MIZ-17

S/N B010881

## Instrument

Freq. 500 KHz Gain 09

Volts/div 0.5

Phase 147

Test probe

FAAA ECP 200P

S/N

2

Cable length

16'

Reference probe

FAAA ECP 200P

S/N

1

Cable length

16'

## Calibration

5.4 units + 0.6 L/O

NA units NA L/O

NA units NA L/O

NA units NA L/O

## Strip Chart Recorder

Type

NA

S/N

NA

## Channel 1

Sen

NA

Position null point

NA

Chart speed

NA

mm/sec

## Channel 2

Sen

NA

Position null point

NA

## Calibration Check

Time 10:14

Phase 147

Gain 09

Time 10:15

Phase 147

Gain 09

Time 10:19

Phase 147

Gain 09

Time 10:30

Phase 147

Gain 09

Time 10:31

Phase 147

Gain 09

Time 10:37

Phase 147

Gain 09

Time 10:40

Phase 147

Gain 09

Time 10:41

Phase 147

Gain 09

Time 10:45

Phase 147

Gain 09

Time 10:47

Phase 147

Gain 09

B-1

Examiner

B. G. Johnson II

Examiner

11.1.10

2 of 4

Failure  
Analysis  
Associates

# PRELIMINARY REPORT

FINALIZED  
S.P. Johnson

Job no. PA07396 11-6-84 Report no. 84110610  
 Material description AL/SN ALLOY  
 Code or specification FAA AND 11.7 REV D Full on NA Full off NA  
 Reference standard PA07396 Instrument M12-17 S/N 840120  
840120

## Instrument

Freq. 500 KHz Gain 09 Volts/div 0.5 Phase 147  
 Test probe FAA ECP 200P S/N 2  
 Cable length 16'  
 Reference probe FAA ECP 200P S/N 1  
 Cable length 16'

## Calibration

<u>5.4</u> units	<u>+0.6</u>	L/O	<u>NA</u> units	<u>NA</u>	L/O
<u>NA</u> units	<u>NA</u>	L/O	<u>NA</u> units	<u>NA</u>	L/O

## Strip Chart Recorder

Type NA S/N NA

## Channel 1

Sen NA  
 Position null point NA  
 Chart speed 1A mm/sec

## Channel 2

Sen NA  
 Position null point NA

## Calibration Check

Time <u>10:49</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>10:51</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>10:55</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>11:00</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>11:01</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>11:02</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>11:04 EDT.</u>	Phase <u>147</u>	Gain <u>09</u>
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

B-2

Examiner B.A. Johnson Level II Examiner \_\_\_\_\_ Level \_\_\_\_\_

# EDDY CURRENT EXAMINATION REPORT

3 of 4

Analysis Associates

Item Inspected: SHOREHAM TDI BEARING SHELLS CON NO. DB 103		PRELIMINARY REPORT		FINALIZED D.P. Johnson 11-26-84	
Material: AL/SN Pb BABBIT	<input type="checkbox"/> Welded <input type="checkbox"/> Worked	<input checked="" type="checkbox"/> Cast	Surface condition: <input checked="" type="checkbox"/> Machined <input type="checkbox"/> As fabricated	<input type="checkbox"/> Ground <input type="checkbox"/>	
NDE Procedure no. <u>11.7</u> <u>REV. 0</u>		Job no. <u>PA07396</u>		Report no. <u>84110610</u>	
Recording criteria: <u>SEE FAA NDE 11.7 REV. 0</u>					
Sketch or other detail (use other side if more space is needed):					
Specific examination area					
<u>AREAS OF BEARING SHELLS WITH RECORDABLE PT INDICATIONS (BABBIT AREA)</u>					
Brg. Shell Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks	
1L	—	—	—	NO RECORDABLE INDICATION (NRI)	
2L	—	—	—	NRI	
3L	—	—	—	NRI	
4L	—	—	—	NRI	
5L	—	—	—	NRI	
6L	—	—	—	NRI	
7L	—	—	—	NRI	
8L	—	—	—	NRI	
14	—	—	—	NRI	
Examiner <u>Bruce A. Johnson</u>		Level <u>II</u>		Date <u>11-6-84</u>	
Examiner _____		Level _____		Date _____	

# EDDY CURRENT EXAMINATION REPORT

4 of 4 Analysis Associates

Item Inspected: <b>PRELIMINARY</b> <span style="float: right;">Finalized</span>				
SHOREHAM 7 DI BEARING SHELLS CON ROD DG 103 <b>REPORT</b> <span style="float: right;">D.P. Johnson 11-26-84</span>				
Material: AL/SN Pb Babbitt	<input type="checkbox"/> Welded <input type="checkbox"/> Worked <input checked="" type="checkbox"/> Cast Surface condition: <input checked="" type="checkbox"/> Machined <input type="checkbox"/> As fabricated <input type="checkbox"/> Ground			
NDE Procedure no. <u>11.7 Rev. 0</u>	Job no. <u>PA07396</u> Report no. <u>84110610</u>			
Recording criteria: <u>SEE RAA NDE 11.7 REV. 0</u>				
Sketch or other detail (use other side if more space is needed):				
Specific examination area				
AREAS OF BEARING SHELLS WITH RECORDABLE PT INDICATIONS (BABBIT AREA)				
Brg. Shell Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks
2 u	—	—	—	NO RECORDABLE INDICATIONS (NRI)
3 u	—	—	—	NRI
4 u	—	—	—	NRI
5 u	—	—	—	NRI
6 u	—	—	—	NRI
7 u	—	—	—	NRI
8 u	—	—	—	NRI
Examiner <u>Don A. Heller</u> Level <u>II</u> Date <u>11-6-84</u> Examiner _____ Level _____ Date _____				



APPENDIX C

RECORD OF CONNECTING ROD BEARING SHELL  
EDDY-CURRENT EXAMINATION  
CONVEX SIDE AND EDGES

FaAA EDDY-CURRENT REPORT #84110810

11.1.10

FINALIZED

# PRELIMINARY

Failure Analysis Associates

## REPORT

EDDY-CURRENT CALIBRATION REPORT

Job no. PA07396Date 11-8-84Report no. 84110810Material description AL/SW ALLOYCode or specification FAAA NDE 11.7 Rev. 0 Full on NA Full off NAReference standard PA07396 Instrument MIZ-17 S/N 840120 8010881

## Instrument

Freq. 500KHz Gain 09 Volts/div 0.5 Phase 147Test probe FAAA ECP 200P S/N 2Cable length 16'Reference probe FAAA ECP 200P S/N 1Cable length 16'

## Calibration

5.8 units @ +1.2 L/ONA units @ NA L/ONA units @ NA L/ONA units @ NA L/O

## Strip Chart Recorder

Type NA S/N NA

## Channel 1

Sen NAPosition @ null point NAChart speed NA mm/sec

## Channel 2

Sen NAPosition @ null point NA

## Calibration Check

Time <u>01:41</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>01:45</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>01:49</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>01:55</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:00</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:04</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:10</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:13</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:17</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:22</u>	Phase <u>147</u>	Gain <u>09</u>

Examiner B. A. Felt Level II Examiner                      Level

11.1.10

PRELIMINARY <sup>245</sup>Failure  
Analysis  
Associates

EDDY-CURRENT VIBRATION REPORT

## REPORT

Job no. PA07396Date 11-8-84Report no. 84110810Material description AL/SW ALLOYCode or specification FAA NDE 11.7 Rev. 0 Full on NA Full off NAReference standard PA01396 Instrument M12-17 S/N 840120 840120 8010881

## Instrument

Freq. 500 kHz Gain 09 Volts/div 0.5 Phase 147Test probe FAA ECP 200P S/N 2Cable length 16'Reference probe FAA ECP 200P S/N 1Cable length 16'

## Calibration

5.8 units @ 2+1.2 L/ONA units @ NA L/ONA units @ NA L/ONA units @ NA L/O

## Strip Chart Recorder

Type NA S/N NA

## Channel 1

Sen NAPosition @ null point NAChart speed NA mm/sec

## Channel 2

Sen NAPosition @ null point NA

## Calibration Check

Time <u>02:25</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:28</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:30</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:33</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:37</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:41</u>	Phase <u>147</u>	Gain <u>09</u>
Time <u>02:45 E.O.T.</u>	Phase <u>147</u>	Gain <u>09</u>
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

Examiner B.A. Helt Level II Examiner \_\_\_\_\_ Level \_\_\_\_\_

11.1.11

FINALIZED  
D.G. Johnson  
11-26-84

## EDDY CURRENT EXAMINATION REPORT

Analysis  
Associates

295

Item Inspected:  
SHOREHAM  
TDI CON AOD  
BEARING SHELLSPRELIMINARY  
REPORT

DG 103

Material:

AL/SN ALLOY

☐ Welded  
☐ Worked☒ Cast

Condition:

☒ Machined  
☐ As fabricated☐ Ground  
☐NDE Procedure  
no. 11.7 REV. 0

Job no.

PAD7396

Report no.

84110810

Recording criteria: SEE FAA NDE 11.7 REV. 0

Sketch or other detail (use other side if more space is needed):

## Specific examination area

AREAS OF BEARING SHELLS WITH RECORDABLE P.T.  
INDICATIONS ON O.D. OF SHELLS, ALSO EDGES.

PA

Brg. Shell Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks
1L				NO RECORDABLE INDICATIONS
2L				NO RECORDABLE INDICATIONS
3L				NO RECORDABLE INDICATIONS
4L				NO RECORDABLE INDICATIONS
5L				NO RECORDABLE INDICATIONS
6L				NO RECORDABLE INDICATIONS
7L				NO RECORDABLE INDICATIONS
8L				NO RECORDABLE INDICATIONS

Examiner

D.G. Johnson

Level

II

Date

11-8-84

Examiner

Level

Date

11.1.11

FINALIST  
D.P. Johnson  
11-26-84

## EDDY CURRENT EXAMINATION REPORT

4 of 5

Analysis  
Associates

Item Inspected:

SHOREHAM  
TDI CON ROD  
BEARING SHELLSPRELIMINARY  
REPORT

DG 103

Material:

AL/Si ALLOY

☐ Welded  
☐ Worked

Defect

condition:

☒ Machined  
☐ As fabricated☐ Ground  
☐

NDE Procedure

no. 11.7 Rev. 0

Job no.

PAD7396

Report no.

84110810

Recording criteria:

SEE FAA NDE 11.7 Rev. 0

Sketch or other detail (use other side if more space is needed):

SEE ATTACHED DRAWING

## Specific examination area

AREAS OF BEARING SHELLS WITH RECORDABLE P.T.  
INDICATIONS ON O.D. OF SHELLS, ALSO EDGES.

Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks
1 U				NO RECORDABLE INDICATIONS
2 U				NO RECORDABLE INDICATIONS
3 U				NO RECORDABLE INDICATIONS
4 U				NO RECORDABLE INDICATIONS
5 U				NO RECORDABLE INDICATIONS
6 U	66% OF REF.	SEE DRAWING	SEE DRAWING	CRACK INDICATION
7 U				NO RECORDABLE INDICATIONS
8 U				NO RECORDABLE INDICATIONS

Examiner

D. A. Johnson

Level

II

Date

11-8-84

Examiner

Level

Date

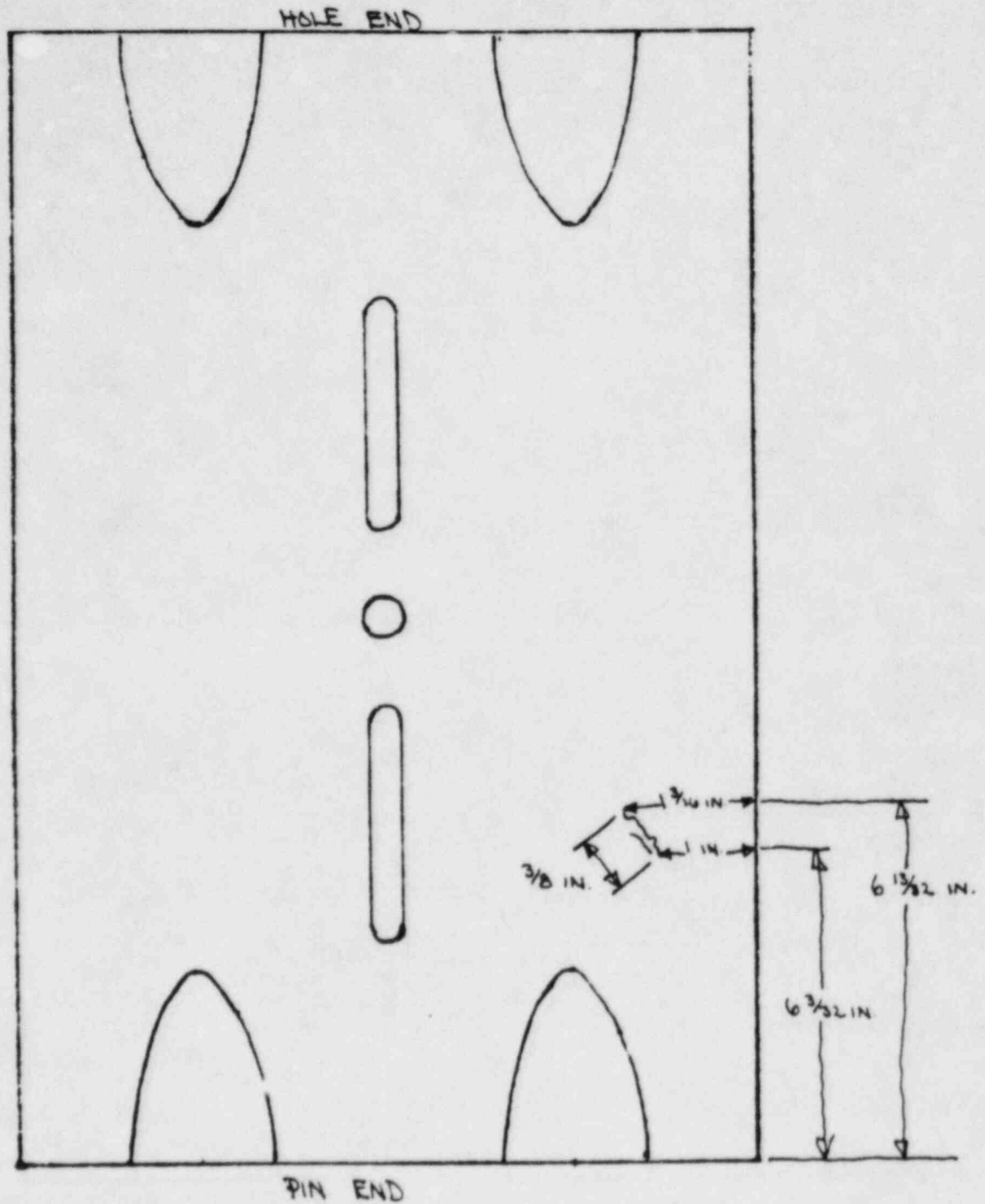


PRELIMINARY

5 of 5

CONNECTING ROD BEARING SHELL # 6 UPPER

Finalized  
D.P. Johnson  
11-26-89



APPENDIX D

FaAA NDE 11.3, REVISION 2

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE  
MAIN-JOURNAL AND CRANK-PIN OIL HOLE

NDE: 11.3  
Page 1 of 5  
Revision: 2  
Date: 08/20/84

Approved by NDE Manager: Duane B. Johnson  
Reviewed - NDE Level III: Duane B. Johnson

Date: 8-16-84  
Date: 8-16-84

### 1.0 PURPOSE AND SCOPE

- 1.1 To establish calibration, scanning, and evaluation techniques for eddy current examination of the main-journal and crank-pin oil holes of TDI diesels for crack detection.

### 2.0 REFERENCES

- 2.1 ASME Section V - Nondestructive Examination  
2.2 NDE 2 - Certification and Qualification of NDE Personnel  
2.3 NDE 5 - Calibration of NDE Equipment  
2.4 NDE 11.1 - Eddy-Current Inspection Procedure - General

### 3.0 PERSONNEL CERTIFICATION

- 3.1 Personnel performing eddy current examinations shall be at least Level I ET inspectors. Personnel interpreting data shall be at least Level II ET inspectors. All inspectors shall be certified in accordance with Reference 2.2.

### 4.2 EQUIPMENT

- 4.1 The eddy current instruments (ECI) used with this procedure shall be an impedance-plane display instrument such as the MIZ-17 and an impedance-component/time base instrument designed for use with rotating probes such as the FORSTER-DEFECTOSCOP D 2.831. The ECI shall be certified in accordance with Reference 2.3.
- 4.2 The eddy current probes (ECP) used shall be a FaAA ECP-100R for the oil hole fillet and FaAA ECP SP90-C for the remains of the hole. The inductance of the reference probe used with the MIZ-17 shall be similar to that of the FaAA ECP-100R.
- 4.3 The ECP fixture for the oil hole fillet will be of a hand held indexing type holding the ECP perpendicular to a tangent to the radius.

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE  
MAIN JOURNAL AND CRANK PIN OIL HOLE

NDE: 11.3

Page 2 of 5

Revision: 2

Date: 08/20/84

### 5.0 REFERENCE STANDARD

- 5.1 The reference standard shall be of similar material and geometry to the item being tested. The standard shall contain two (2) Electrical Discharge Machining (EDM) notches 0.020 inches deep, and 0.040 inches long. One notch shall be located on the oil hole fillet and one in the oil hole.

### 6.0 PROCEDURE QUALIFICATION

- 6.1 This procedure shall be qualified by its demonstrated ability to detect the reference notch and the calibration curve shown in Exhibit 11.3.1.

### 7.0 CALIBRATION PROCEDURE OIL HOLE FILLET

- 7.1 Set impedance plane display ECI frequency to  $2.0 \pm 0.2$  MHz.
- 7.2 Set the ECI vertical volts per division to 0.5.
- 7.3 Adjust the horizontal and vertical positioning controls so that the balance point is at (0.0V, 1.0V).
- 7.4 Balance with test probe on a sound area in the radius of the reference standard.
- 7.5 Adjust ECI phase until initial lift-off signal is horizontal and to the right.
- 7.6 Adjust horizontal attenuator so that horizontal saturation is greater than 2.0V and less than -2.0V.
- 7.7 Adjust ECI gain so that the reference notch gives a negative signal of  $2.0V \pm 0.2V$  at the horizontal center of the CRT. Rebalancing will be necessary with each gain adjustment.
- 7.8 Calibration shall be completed prior to beginning the inspection, following a 10 minute warm-up of the ECI. Calibration checks shall be performed at least once per hour and at the conclusion of the inspection.
- 7.9 Should the reference notch or crack signal drop to below 80% of the previous calibration level, the system shall be recalibrated and all scans since the previous calibration shall be repeated.

**NONDESTRUCTIVE EXAMINATION PROCEDURE**

Title: EDDY-CURRENT INSPECTION PROCEDURE

MAIN JOURNAL AND CRANK PIN OIL HOLE

NDE: 11.3

Page 3 of 5

Revision: 2

Date: 08/20/84

**8.0 CALIBRATION PROCEDURE OIL HOLE**

- 8.1 With the rotating probe inserted in a sound area of the reference standard and the impedance-component/time base ECI in the impedance-plane display mode, adjust the phase so that lift-off is in the horizontal direction.
- 8.2 Switch the ECI to the time-base mode and adjust the Yo control so that the base line is at 0.0. Insert the rotating probe in the area of the reference standard containing the EDM notch and adjust the sensitivity and filter so that the notch signal-to-noise ratio is at least five (5) to one (1) and the peak of the reference notch signal on the cathode ray tube (CRT) is at 100% for level 1,2 or 3 inspections and 50% for level 4 or 5 inspections.
- 8.3 For level 1 inspections, set alarm threshold at 20%  
For level 2 inspections, set alarm threshold at 60%  
For level 3 inspections, set alarm threshold at 80%  
For level 4 inspections, set alarm threshold at 60%  
For level 5 inspections, set alarm threshold at 80%
- 8.4 Turn on audio and visual alarms.
- 8.5 Calibrate prior to beginning the inspection, following a 10 minute warm-up of the ECI. Calibration checks shall be performed at least once per hour and at the conclusion of the inspection.
- 8.6 Should the reference notch signal drop to below 80% of the previous calibration level, the system shall be recalibrated and all scans since the previous calibration shall be repeated.

**9.0 EXAMINATION PROCEDURE**

- 9.1 The full extent of the oil hole fillet shall be inspected using an impedance-plane display instrument. One 360 degree circumferential scan shall be made every 6 degrees.
- 9.2 The oil hole is inspected using the impedance-component/time ECI. There are five (5) possible inspection levels depending upon the engine, oil hole and distance down the oil hole from the journal surface. The level of inspection is specified by the Crankshaft Design Review Task Leader.

Level 1 Inspection - 0.010 x 0.020 inch notch  
Level 2 Inspection - 0.015 x 0.020 inch notch  
Level 3 Inspection - 0.020 x 0.040 inch notch



# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE  
MAIN JOURNAL AND CRANK PIN OIL HOLE

NDE: 11.3  
Page 4 of 5  
Revision: 2  
Date: 08/20/84

Level 4 Inspection - 0.030 x 0.060 inch notch  
Level 5 Inspection - 0.040 x 0.080 inch notch

- 9.3 The forward motion of the rotating oil hole probe and the scan speed of the fillet probe shall not exceed  $1/2$  inch per second.
- 9.4 All eddy current indications which exceed the alarm threshold shall be re-examined. The nature of the indication and its maximum amplitude shall be determined.

### 10.0 RECORDING CRITERIA

- 10.1 All eddy current crack indications with magnitude greater than the designated percent of full screen height shall be recorded.

Level 1 -	35%
Level 2 -	70%
Level 3 -	100%
Level 4 -	70%
Level 5 -	90%

- 10.2 In the oil hole fillet region, all crack indications exceeding level 1 shall be recorded unless otherwise specified by the Crankshaft Design Review Task Engineer.
- 10.3 The length of all recordable indications shall be traced to where the crack indication becomes indistinguishable from the noise. This information shall be noted on Form 11.1.11.

### 11.0 RECORDS

- 11.1 Set-up and calibration shall be recorded on Eddy Current Calibration Report (Form 11.1.10).
- 11.2 All relevant indications shall be recorded on Form 11.1.11.
- 11.3 All records shall be filed according to job number.

### 12.0 EXHIBITS

- 12.1 Magnitude of ET signal from different size EDM notches.

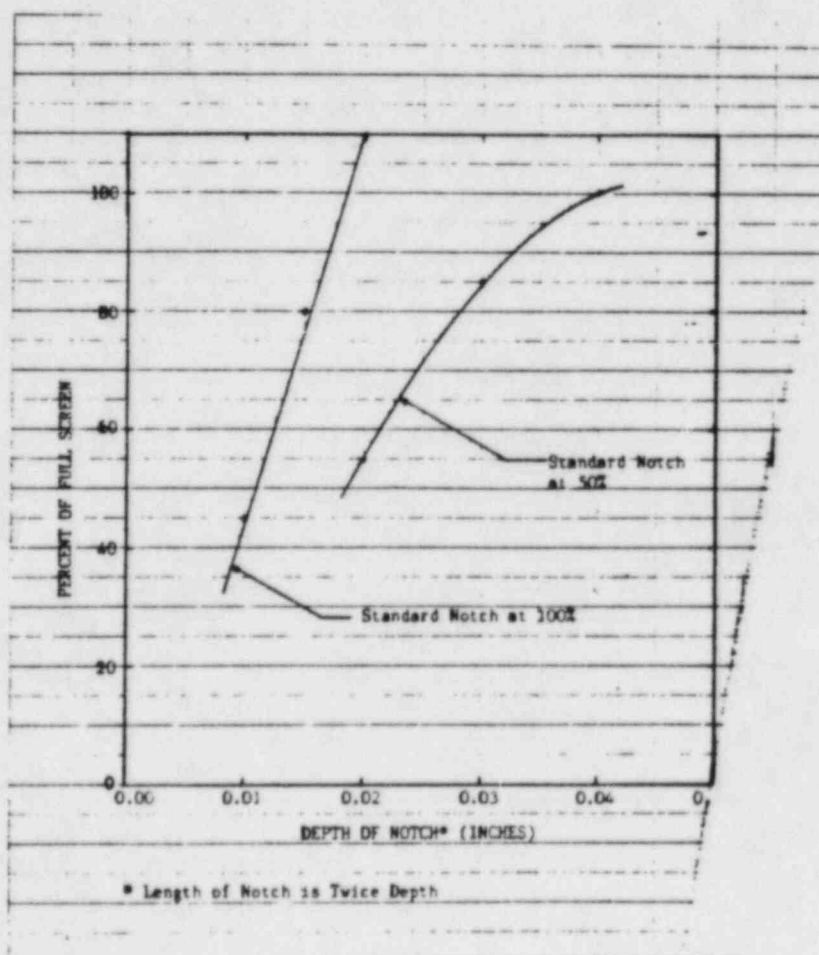
# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE  
MAIN JOURNAL AND CRANK PIN OIL HOLE

NDE: 11.3  
Page 5 of 5  
Revision: 2  
Date: 08/20/84

EXHIBIT 11.3.1  
Magnitude of ET signal from different size EDM notches



APPENDIX E

RECORD OF CRANKPIN OIL HOLE  
EDDY-CURRENT EXAMINATION

FaAA EDDY-CURRENT REPORT #84110601

## EDDY-CURRENT CALIBRATION REPORT

1 of 2 Failure  
Analysis  
Associates

Job no. PA07396 Date 11-6-84 Report no. 841106-01  
 Material description CARBON STEEL  
 Code or specification FAA NDE 11.3 REV. 2 Full on NA Full off NA  
 Reference standard SA0904 Instrument FORESTER S/N 37  
DETECTOSCOPE  
 Instrument FINALIZED  
D.P. Johnson  
11/27-89  
 Freq. 500 KHz Gain 19.0 Instrument FILTER Phase 144  
Volts/div 7  
 Test probe FAA ECP 3P-90C S/N RIA 7.5  
 Cable length 16'  
 Reference probe NA S/N NA  
 Cable length NA

## Calibration

NA units @ NA L/O  
NA units @ NA L/O

NA units @ NA L/O  
NA units @ NA L/O

## Strip Chart Recorder

Type NA S/N NA

## Channel 1

Sen NA  
 Position @ null point NA  
 Chart speed NA mm/sec

## Channel 2

Sen NA  
 Position @ null point NA

## Calibration Check

Time <u>16:47</u>	Phase <u>144</u>	Gain <u>19</u>
Time <u>16:55</u>	Phase <u>144</u>	Gain <u>19</u>
Time <u>17:08</u>	Phase <u>144</u>	Gain <u>19</u>
Time <u>17:26</u>	Phase <u>144</u>	Gain <u>19</u>
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

Examiner [Signature] Level II Examiner [Signature] Level II

## EDDY CURRENT EXAMINATION REPORT

2 of 3

Analysis  
Associates

Item Inspected:

ROD Journal OIL HOLES  
ON D6103 AT  
SHOREHAMPRELIMINARY  
REPORTCRANK PIN OIL  
HOLES ON D6103  
AT SHOREHAM

Material:

Carbon  
STEEL☐ Welded  
☒ Worked☐ Cast

Surface

condition:

☒ Machined  
☐ As fabricated☐ Ground  
☐

NDE Procedure

no. 11.3 REV 2

Job no. PA07396

Report no. 840106-01

Recording criteria: SEE LILCO MEMO OCT 23, 1989 LILCO EDCR F-9658A

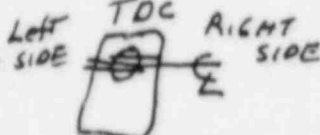
Sketch or other detail (use other side if more space is needed):

Page 2

#1 Cou END



FLYWHEEL RIGHT SIDE



\* OIL LOCATION, Looking FROM Generator END TOWARDS GOVERNOR END  
The oil holes are RIGHT AND LEFT when the CRANK PIN IS AT TOP DEAD CENTER

## Specific examination area

OIL HOLE FROM EDGE OF Radius TO 3"

CON Rod Indication no.	Magnitude of Indication	Length of Indication	* Location	Remarks
				NRI = NO RECORDABLE INDICATION
#1 R	NRI (Level 3)		RIGHTSIDE	RIGHT SIDE
#2 L	NRI (Level 3)		LEFTSIDE	LEFT SIDE
#3 R	NRI		RIGHTSIDE	RIGHTSIDE
#3 L	NRI		LEFTSIDE	LEFT SIDE
#4 R	NRI		RIGHTSIDE	RIGHT SIDE
#4 L	NRI		LEFTSIDE	LEFT SIDE
#5 R	NRI		RIGHTSIDE	RIGHTSIDE
#5 L	NRI		LEFTSIDE	LEFT SIDE
#6 L	NRI		LEFTSIDE	LEFTSIDE

Examiner *[Signature]*Level IIDate 11-6-84Examiner *[Signature]*Level IIDate 11-6-84



11.1.11

## EDDY CURRENT EXAMINATION REPORT

3 of 3  
Analysis  
Associates

Item Inspected:

CRANK PIN OIL HOLE  
ON D6103  
ShorehamPRELIMINARY  
REPORT

FINALIZED

D.O. Johnson  
11-27-84

Material:

Carbon  
STEEL☐ Welded  
☒ Worked☐ Cast

condition:

☒ Machined  
☐ As fabricated☐ Ground  
☐

NDE Procedure

no. 11.3 REV 2

Job no. PA07396

Report no. 841106-01

Recording criteria:

LILCO memo OCT. 23/1984 LILCO E-DCR F-41548A

Sketch or other detail (use other side if more space is needed):

PAGE 3

SEE PAGE 2 OF REPORT 841106-01

## Specific examination area

CON Rod Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks
6R	NRI		RIGHTSIDE	RIGHT SIDE
7R	NRI		RIGHTSIDE	RIGHT SIDE
7L	NRI		LEFTSIDE	LEFT SIDE
8R	NRI		RIGHTSIDE	RIGHT SIDE
8L	NRI		LEFTSIDE	LEFT SIDE
1L	NRI (Level 2)	Off	LEFTSIDE	LEFT SIDE
2R	NRI (Level 2)	Off	RIGHTSIDE	RIGHT SIDE

Examiner

D. Johnson

Level

II

Date

11-6-84

Examiner

Lilly J. B. Jr.

Level

II

Date

11-6-84

APPENDIX F

RECORD OF MAIN JOURNAL OIL HOLE  
EDDY-CURRENT EXAMINATION

FaAA EDDY-CURRENT REPORT #84110910

## EDDY CURRENT EXAMINATION REPORT

Analysis  
Associates

Item Inspected: <b>MAIN JOURNAL OIL HOLES DG 103</b>		PRELIMINARY REPORT		FINALIZED <i>DD Johnson</i> 11-27-84	
Material: <b>CARBON STEEL</b>	<input type="checkbox"/> Welded <input checked="" type="checkbox"/> Worked	<input type="checkbox"/> Cast <input type="checkbox"/> Condition:	<input checked="" type="checkbox"/> Machined <input type="checkbox"/> As fabricated	<input type="checkbox"/> Ground	
NDE Procedure no. <u>11.3 REV. 2</u>		Job no. <u>PA07396</u>		Report no. <u>84110910</u>	
Recording criteria: <u>LILCO E+DCR F-46598A</u>					
Sketch or other detail (use other side if more space is needed): OIL HOLES DESIGNATED RIGHT AND LEFT AS FOLLOWS: STANDING AT GOVERNOR END FACING FLYWHEEL, #3 MAIN WITH #2 CRANKPIN AT T.D.C. #8 & 9 MAINS WITH #7 CRANKPIN AT T.D.C. #4, 5, 6, & 7 MAINS WITH #4 CRANKPIN AT T.D.C.					
Specific examination area					
<u>MAIN JOURNAL OIL HOLES - MAIN JOURNALS # 3, 4, 5, 6, 7, 8, 9.</u>					
<u>FROM EDGE OF RADIUS TO 3"</u>					
<u>PA</u>					
Journal Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks	
4L & R				NO RECORDABLE INDICATIONS (NRI)	
5L & R				NRI	
6L & R				NRI	
7L & R				NRI	
8L & R				NRI	
9L & R				NRI	
3L & R				NRI	
Examiner <u><i>Br. A. Johnson</i></u> Level <u>II</u> Date <u>11-9-84</u> Examiner _____ Level _____ Date _____					

# PRELIMINARY REPORT

2012  
Failure  
Analysis  
Associates

11.1.10

FINAL-00

D.D. Johnson

11-27-84

EDDY-CURRENT CALIBRATION REPORT

Job no. PA07396 Date 11-9-84 Report no. 84110910

Material description CARBON STEEL

Code or specification FAA NDE 11.3 REV 2 Full on NA Full off NA

Reference standard 840904 Instrument FORESTER S/N 37  
DEFECTOSCOPE-D

## Instrument

Freq. 500 KHZ Gain 36.0 Filter VOLTS/DIV 7 Phase 144

Test probe FAA ECP 5P 90C S/N 20

Cable length 16'

Reference probe NA S/N NA

Cable length NA

## Calibration

NA units @ NA L/O  
NA units @ NA L/O

NA units @ NA L/O  
NA units @ NA L/O

## Strip Chart Recorder

Type NA S/N NA

### Channel 1

Sen NA  
Position @ null point NA  
Chart speed NA mm/sec

### Channel 2

Sen NA  
Position @ null point NA

## Calibration Check

Time <u>2:06</u>	Phase <u>144</u>	Gain <u>36</u>
Time <u>2:48</u>	Phase <u>144</u>	Gain <u>36</u>
Time <u>3:01</u>	Phase <u>144</u>	Gain <u>36</u>
Time <u>3:54</u>	Phase <u>144</u>	Gain <u>36</u>
Time <u>3:59</u>	Phase <u>144</u>	Gain <u>36</u>
Time <u>4:24</u>	Phase <u>144</u>	Gain <u>36</u>
Time <u>4:44 E.O.T.</u>	Phase <u>144</u>	Gain <u>36</u>
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

Examiner D.D. Johnson Level II Examiner \_\_\_\_\_ Level \_\_\_\_\_

APPENDIX G

FaAA NDE 11.1, REVISION 0



# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE

GENERAL PROCEDURE - CRACK DETECTION

NDE: 11.1

Page 1 of 5

Revision: 0

Date: 04/20/84

Approved by NDE Manager: Duane B. Johnson

Date: 5-17-84

Reviewed - NDE Level III: Duane B. Johnson

Date: 5-17-84

### 1.0 PURPOSE AND SCOPE

- 1.1 To establish calibration, scanning, and evaluation techniques for eddy current examination of conductive materials for crack detection. A specific procedure may be used in conjunction with this general procedure, and shall take precedence.

### 2.0 REFERENCES

- 2.1 ASME Section V - Nondestructive Examination
- 2.2 NDE 2 - Certification and Qualification of NDE Personnel
- 2.3 NDE 5 - Calibration of NDE Equipment

### 3.0 PERSONNEL CERTIFICATION

- 3.1 Personnel performing eddy-current examinations shall be at least Level I ET inspectors. Personnel interpreting data shall be at least Level II ET inspectors. All inspectors shall be certified in accordance with Reference 2.2.

### 4.0 EQUIPMENT

- 4.1 The eddy- current instrument (ECI) used with this procedure shall be an impedance-plane display instrument such as the MIZ-17. The ECI shall be calibrated in accordance with Reference 2.3.
- 4.2 A two-channel strip chart recorder (SCR) may be used. Channel 1 on the SCR should be connected to the vertical output of the ECI and channel 2 on the SCR should be connected to the horizontal output of the ECI.
- 4.3 The eddy- current test probe used is dependent upon the parameters of the specific inspection to be performed.
- 4.4 The inductance of the reference probe shall be similar to that of the test probe.
- 4.5 Fixtures for holding the test probe during scanning are permissible.

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION OPERATING PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE

GENERAL PROCEDURE - CRACK DETECTION

NDE: 11.1

Page 2 of 5

Revision: 0

Date: 04/20/84

### 5.0 REFERENCE STANDARD

- 5.1 The reference standard shall be electrically and magnetically similar to the object to be inspected. In some cases the object itself may be used as the reference standard. The reference standard shall contain a reference notch or crack. The surface of the reference standard shall be representative of that of the object being inspected.

### 6.0 PROCEDURE QUALIFICATION

This procedure shall be qualified by its demonstrated ability to detect the reference notch or crack.

### 7.0 CALIBRATION PROCEDURE

- 7.1 Set ECI frequency as required by specific inspection parameters. Inspection parameters include, but are not limited to, test probe characteristics and desired depth of penetration.
- 7.2 Set ECI volts per division.
- 7.3 Adjust horizontal and vertical positioning controls so that the balance point is at (0.0 ~~V~~, 1.0 ~~V~~).
- 7.4 Balance with test probe on object to be tested.
- 7.5 Adjust ECI phase until initial lift-off signal is horizontal and to the right.
- 7.6 Adjust horizontal attenuator so that horizontal saturation is greater than +4 major units and less than -4 major units.
- 7.7 Adjust ECI gain so that a minimum recordable indication gives a negative signal of at least 0.4 major units at the horizontal center of the CRT. Rebalancing will be necessary with each gain adjustment.
- 7.8 In circumstances where lift-off varies significantly during examination, the reference notch or crack signal magnitude shall be recorded for at least 3 different lift-offs.
- 7.9 Before starting the inspection, allow a 10-minute warm-up of the ECI, then complete the calibration. Calibration checks shall be performed at least once per hour and at the end of the inspection.

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION OPERATING PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE

GENERAL PROCEDURE - CRACK DETECTION

NDE: 11.1

Page 3 of 5

Revision: 0

Date: 04/20/84

- 7.10 Should the reference notch or crack signal drop to below 80% of the previous calibration level, the system shall be recalibrated and all scans since the previous calibration shall be repeated.

### 8.0 EXAMINATION PROCEDURE

- 8.1 The area(s) specified shall be inspected and noted on the Failure Analysis Associates Eddy-Current Examination Report (Form 11.1.11).
- 8.2 The scanning speed shall not exceed 4 inches per second.

### 9.0 RECORDING CRITERIA

All eddy current crack indications with magnitude greater than a specified level, relative to the signal obtained from the reference notch or crack, shall be recorded. This recorded level shall be noted on Report Form 11.1.11.

### 10.0 RECORDS

- 10.1 Set-up and calibration shall be recorded on Eddy Current Calibration Report (Form 11.1.10).
- 10.2 All relevant indications shall be recorded on Form 11.1.11.
- 10.3 All records shall be filed according to job number.

### 11.0 EXHIBITS

- 11.1 Exhibit 11.1.1 - Eddy Current Calibration Report (Form 11.1.10).
- 11.2 Exhibit 11.1.2 - Eddy Current Examination Report (Form 11.1.11).

# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION OPERATING PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE

GENERAL PROCEDURE - CRACK DETECTION

NDE: 11.1

Page 4 of 5

Revision: 0

Date: 04/20/84

### EXHIBIT 11.1.1 EDDY CURRENT CALIBRATION REPORT

11.1.10

#### EDDY-CURRENT CALIBRATION REPORT

Failure  
Analysis  
Associates

Job no. \_\_\_\_\_ Date \_\_\_\_\_ Report no. \_\_\_\_\_  
Material description \_\_\_\_\_  
Code or specification \_\_\_\_\_ Full on \_\_\_\_\_ Full off \_\_\_\_\_  
Reference standard \_\_\_\_\_ Instrument \_\_\_\_\_ S/N \_\_\_\_\_

Instrument \_\_\_\_\_  
Freq. \_\_\_\_\_ Gain \_\_\_\_\_ Volts/div \_\_\_\_\_ Phase \_\_\_\_\_  
Test probe \_\_\_\_\_ S/N \_\_\_\_\_  
Cable length \_\_\_\_\_  
Reference probe \_\_\_\_\_ S/N \_\_\_\_\_  
Cable length \_\_\_\_\_

Calibration  
\_\_\_\_\_ units @ \_\_\_\_\_ L/O  
\_\_\_\_\_ units @ \_\_\_\_\_ L/O  
\_\_\_\_\_ units @ \_\_\_\_\_ L/O

Strip Chart Recorder  
Type \_\_\_\_\_ S/N \_\_\_\_\_

Channel 1 Channel 2  
Sen \_\_\_\_\_ Sen \_\_\_\_\_  
Position @ null point \_\_\_\_\_ Position @ null point \_\_\_\_\_  
Chart speed \_\_\_\_\_ mm/sec

Calibration Check

Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

Examiner \_\_\_\_\_ Level \_\_\_\_\_ Examiner \_\_\_\_\_ Level \_\_\_\_\_







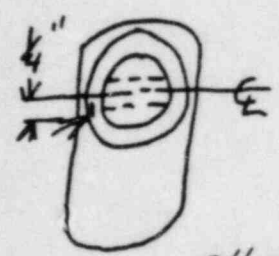
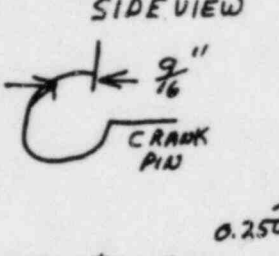
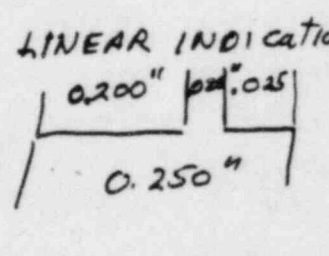
APPENDIX H

RECORD OF CRANKPIN #7 FILLET  
EDDY-CURRENT EXAMINATION

FaAA LIQUID PENETRANT REPORT #84110701  
FaAA EDDY-CURRENT REPORT #84110702

LIQUID PENETRANT EXAMINATION REPORT

1 of 1  
FINALIZED  
D.O. Johnson  
11-28-84

<b>A. Material</b> CARBON STEEL	Type: <u>CRANKSHAFT</u> <u>DG103</u>	Fabricated Process:	<input type="checkbox"/> Welded <input type="checkbox"/> Cast <input checked="" type="checkbox"/> Worked	PT Component I.D. SHOREHAM DG103 CRANKSHAFT
Cross Section Thickness:	Geometry: <input type="checkbox"/> Pipe <input type="checkbox"/> Plate <input type="checkbox"/> Rod <input type="checkbox"/> Other: <u>FILLET RADIUS</u>	Surface Condition: <input type="checkbox"/> As Fabricated	<input type="checkbox"/> Ground <input checked="" type="checkbox"/> Other: <u>SHOT PEENED</u>	
<b>B. NDE Procedure</b> No. <u>FAPA 6.3</u>	Surface Mat'l. Temp. <u>78°F</u>	M & TE. No.	MR/RR. REPORT No. <u>841107-01</u>	
Inspection Materials	Brand	Designation	Batch No.	
1. Pre-Cleaner	<u>MAGNAFLUX</u>	<u>SKC-NF/ZC-70</u>	<u>34-52-0203</u>	
2. Penetrant	<u>"</u>	<u>ZL-22A</u>	<u>83 F003</u>	
3. Emulsifier and/or Remover		<u>SKC-NF/ZC-70</u>	<u>34-52-0203</u>	
4. Developer		<u>SKD-NF</u>	<u>34-52-0201</u>	
Post Examination Cleaner		<u>SKC-NF/ZC-70</u>	<u>34-52-0203</u>	
Sketch or other detail (use other side if necessary): <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>END VIEW TDC</p> </div> <div style="text-align: center;">  <p>SIDE VIEW</p> </div> <div style="text-align: center;">  <p>LINEAR INDICATION</p> </div> </div> <p>ALL MEASUREMENTS APPROXIMATE</p>				
<b>C. Evaluation</b>	Report below those indications observed and the pertinent information required. Where additional space is required, use other side.			
Location	Size (Inches)	Description	Action (Accept/Reject, and comment as necessary)	Plant/Location SHOREHAM / Lico.
1. <u>1/4" from center of oil hole (BELOW)</u>	<u>0.250</u>	<u>LINEAR</u>	<u>CHECKED WITH EDDY CURRENT REPORT NO 841107-02</u>	
2.			<u>INDICATION SHOWN BY</u>	
3.			<u>QRA AS per THEIR DRAWING</u>	
<b>D. Acceptance Criteria</b>	Operator: <u>Don Johnson</u> Level: <u>II</u> Date: <u>11-7-84</u>			
<b>E. Attest</b>	<u>Will B. Johnson</u> Responsible (Certified Person)	<u>II</u> Level	<u>11-7-84</u> Date	

11.1.11

## EDDY CURRENT EXAMINATION REPORT

PAGE 1052  
Analysis  
Associates

Item Inspected: SHOREHAM CRANKSHAFT DG103		<b>PRELIMINARY REPORT</b>		FINALIZED D.O. Johnson 11-28-84	
Material: CARBON STEEL	<input type="checkbox"/> Welded <input checked="" type="checkbox"/> Worked			<input type="checkbox"/> Cast condition:	<input type="checkbox"/> Machined <input type="checkbox"/> As fabricated
NDE Procedure no. 11.1 REV 0		Job no. PA07396		Report no. 841107-02	
Recording criteria: USING REFSTANDARD PA07396-83121 NOTCH $\frac{1}{16} \times \frac{1}{2}$ 50% OF STANDARD					
Sketch or other detail (use other side if more space is needed): SEE REPORT NO 841107-01 FOR DRAWING AND LOCATION EXAMINED.					
Specific examination area					
THE LINEAR IN THE FILLET OF CRANK PIN #7 GENERATOR END FROM THE FLOUR SCENT PENETRANT INSPECTION REPORT NO. 841107-01					
Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks	
1				NO RECORDABLE INDICATION	
Examiner	D. Johnson		Level	II	
Examiner	K. J. B. B. B.		Level	II	
			Date	11-07-84	
			Date	11-07-84	

11.1.10

Failure Analysis  
Associates

PAGE 2 of 2

# PRELIMINARY REPORT

Job no. PA07396 Report no. 841107-02  
 Material description CARBON CARBON STEEL  
 Code or specification FAA AND 11.1 RW Full on NA Full off NA  
 Reference standard PA07396 Instrument Miz-17 S/N B010001  
83121

## Instrument

Freq. 500 KHz Gain 5 Volts/div 0.5 Phase 219  
 Test probe FAA ECP GK90 S/N 3  
 Cable length 16'  
 Reference probe FAA ECP GK90 S/N 2  
 Cable length 16'

## Calibration

2.8 units +0.4 L/O NA units NA L/O  
NA units NA L/O NA units NA L/O

## Strip Chart Recorder

Type NA S/N NA

### Channel 1

Sen NA  
 Position null point NA  
 Chart speed NA mm/sec

### Channel 2

Sen NA  
 Position null point NA

## Calibration Check

Time	Phase	Gain
<u>10:05</u>	<u>219</u>	<u>5</u>
<u>10:13 EOT</u>	<u>219</u>	<u>5</u>
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain
Time	Phase	Gain



APPENDIX I

RECORD OF CRANKPIN THRUST FACES  
AND MAIN BEARING FILLETS, JOURNALS, AND THRUST FACES  
EDDY-CURRENT EXAMINATION

FaAA EDDY-CURRENT REPORT #84111210  
LILCO LIQUID PENETRANT REPORT DATED 11-09-84  
LILCO LIQUID PENETRANT REPORT DATED 11-12-84



11.1.11

## EDDY CURRENT EXAMINATION REPORT 1/12/84

Analysis  
Associates

Item Inspected: DG 103 CRANKSHAFT		<b>PRELIMINARY REPORT</b>		FINALIZED D.O. Johnson 11-28-84	
Material: CARBON STEEL	<input type="checkbox"/> Welded <input checked="" type="checkbox"/> Worked	<input type="checkbox"/> Cast	Surface condition:	<input checked="" type="checkbox"/> Machined <input type="checkbox"/> As fabricated	<input type="checkbox"/> Ground <input type="checkbox"/>
NDE Procedure no. 11.1 REV. 0	Job no. PAO 7396		Report no. 84111210		
Recording criteria: 50% OF REFERENCE					
Sketch or other detail (use other side if more space is needed):					
Specific examination area					
THOSE AREAS SPECIFIED BY ULCO WHICH CONTAINED P.T. INDICATIONS (SEE COPIES OF PT REPORTS ATTACHED) ONLY THOSE INDICATIONS NUMBERED AND EXAMINED WITH EDDY CURRENT (DOT)					
Indication no.	Magnitude of Indication	Length of Indication	Location	Remarks	
ALL AREAS NOTED ON P.T. REPORT				NO RECORDABLE INDICATIONS	
Examiner <u>Bruce A. Nelson</u>	Level <u>II</u>		Date <u>11-12-84</u>		
Examiner _____	Level _____		Date _____		

# PRELIMINARY REPORT

20/124  
Failure  
Analysis  
Associates

11.1.10

Finalized  
D.O. Johnson  
11-28-84

EDDY CURRENT CALIBRATION REPORT

Job no. PA07396 Date 11-12-84 Report no. 84111210

Material description CARBON STEEL

Code or specification FAA NDE 11.1 REV. 0 Full on NA Full off NA

Reference standard PA07396 Instrument MIZ-17 S/N B010881  
83121

## Instrument

Freq. 500 KHz Gain 8 Volts/div 0.5 Phase 205

Test probe FAA GK 90 S/N 3

Cable length 16'

Reference probe FAA GK 90 S/N 2

Cable length 16'

## Calibration

4.0 units @ -0.6 L/O

NA units @ NA L/O

NA units @ NA L/O

NA units @ NA L/O

## Strip Chart Recorder

Type NA S/N NA

### Channel 1

Sen NA

Position @ null point NA

Chart speed NA mm/sec

### Channel 2

Sen NA

Position @ null point NA

## Calibration Check

Time <u>17:02</u>	Phase <u>205</u>	Gain <u>8</u>
Time <u>17:52</u>	Phase <u>205</u>	Gain <u>8</u>
Time <u>18:22</u>	Phase <u>205</u>	Gain <u>8</u>
Time <u>18:43</u>	Phase <u>205</u>	Gain <u>8</u>
Time <u>19:40</u>	Phase <u>205</u>	Gain <u>8</u>
Time <u>20:07</u> E.O.T.	Phase <u>205</u>	Gain <u>8</u>
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

Examiner [Signature] Level II Examiner \_\_\_\_\_ Level \_\_\_\_\_



## LIQUID PENETRANT EXAMINATION REPORT

3 of 14

page 1 of 6

A. MATERIAL		TYPE <u>Steel</u>	FABRICATED PROCESS <input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED	
		GEOMETRY <input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER: <u>Crank-Shaft</u>		
CROSS SECTION THICKNESS	MAX MIN <u>N/A</u>	PIPE DIA. <u>N/A</u>	SURFACE CONDITION <input checked="" type="checkbox"/> MACHINED <input type="checkbox"/> AS FABRICATED	<input type="checkbox"/> GROUND <input checked="" type="checkbox"/> Shot peened <input checked="" type="checkbox"/> OTHER

B. NDE PROCEDURE No. <u>6.3</u>	SURFACE/MAT'L. TEMP. <u>69°F</u>	MATE. NO. <u>365</u>	MWR/RR. No. <u>RR R43 2035</u>
---------------------------------	----------------------------------	----------------------	--------------------------------

INSPECTION MATERIALS	BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012
2. PENETRANT	Magnaflux	ZL-22A	83F003
3. EMULSIFIER AND/OR REMOVER	Magnaflux	SKC-NF/ZC-7B	84J012
4. DEVELOPER	Magnaflux	SKD-NF	82D111
5. POST EXAMINATION CLEANER	Magnaflux	SKC-NF/ZC-7B	84J012

SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY

See attached sketches  
Note: Con rod journals #7 & #8 thrust face examined only

## C. EVALUATION

REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.

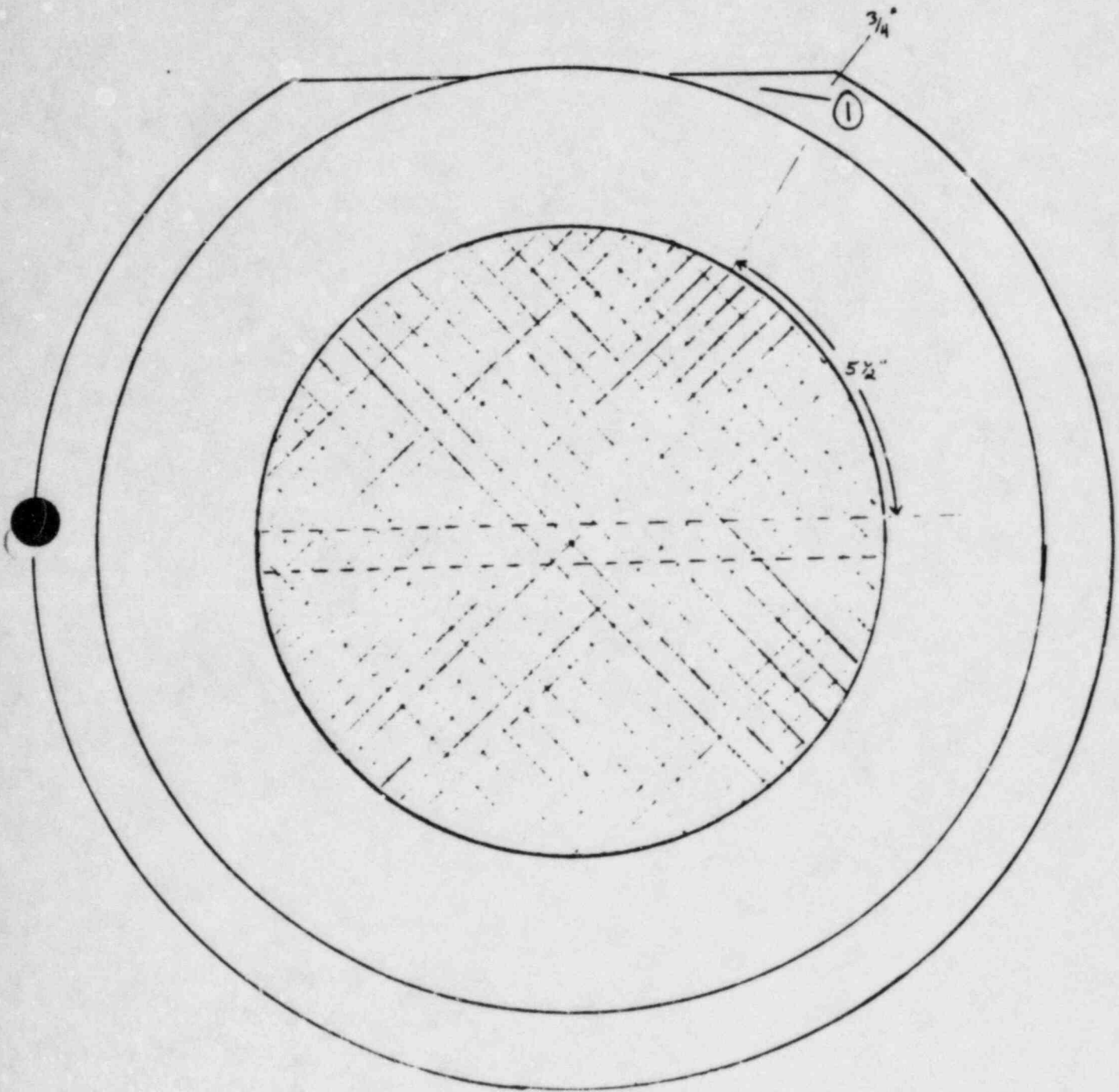
LOCATION	SIZE (INCHES) <sup>APPROX</sup> SEE ATTACHED	DESCRIPTION <sup>LINEAR</sup> <sub>APPROX</sub>	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)
1 #6 con rod journal	<u>N/A</u>	<u>N/A</u>	subject to eddy current exam
2 #7 con rod journal (thrust face)	<u>N/A</u>	<u>N/A</u>	subject to eddy current exam
3 #8 con rod journal (thrust face)	<u>N/A</u>	<u>N/A</u>	subject to eddy current exam
4 N/A	<u>N/A</u>	<u>N/A</u>	N/A
D. ACCEPTANCE CRITERIA	NDE 6.3 para 4.2-1		OPERATOR <u>Art Purnan</u> <u>M. L. [signature]</u> Level <u>PT II</u> Date <u>11-9-84</u>
E. ATTEST	<u>Art Purnan</u> <u>M. L. [signature]</u> RESPONSIBLE CERTIFIED PERSONNEL		PT II <u>11-9-84</u> LEVEL DATE

COMPONENT I.D. Crankshaft  
R43\*EDC 103

SYSTEM IR43

PLANT/LOCATION EDC room-103

# 6 CRANK PIN JOURNAL  
GENERATOR END FILLET &  
THRUST FACE



EXPLODED VIEW OF FILLET RADIUS AREA

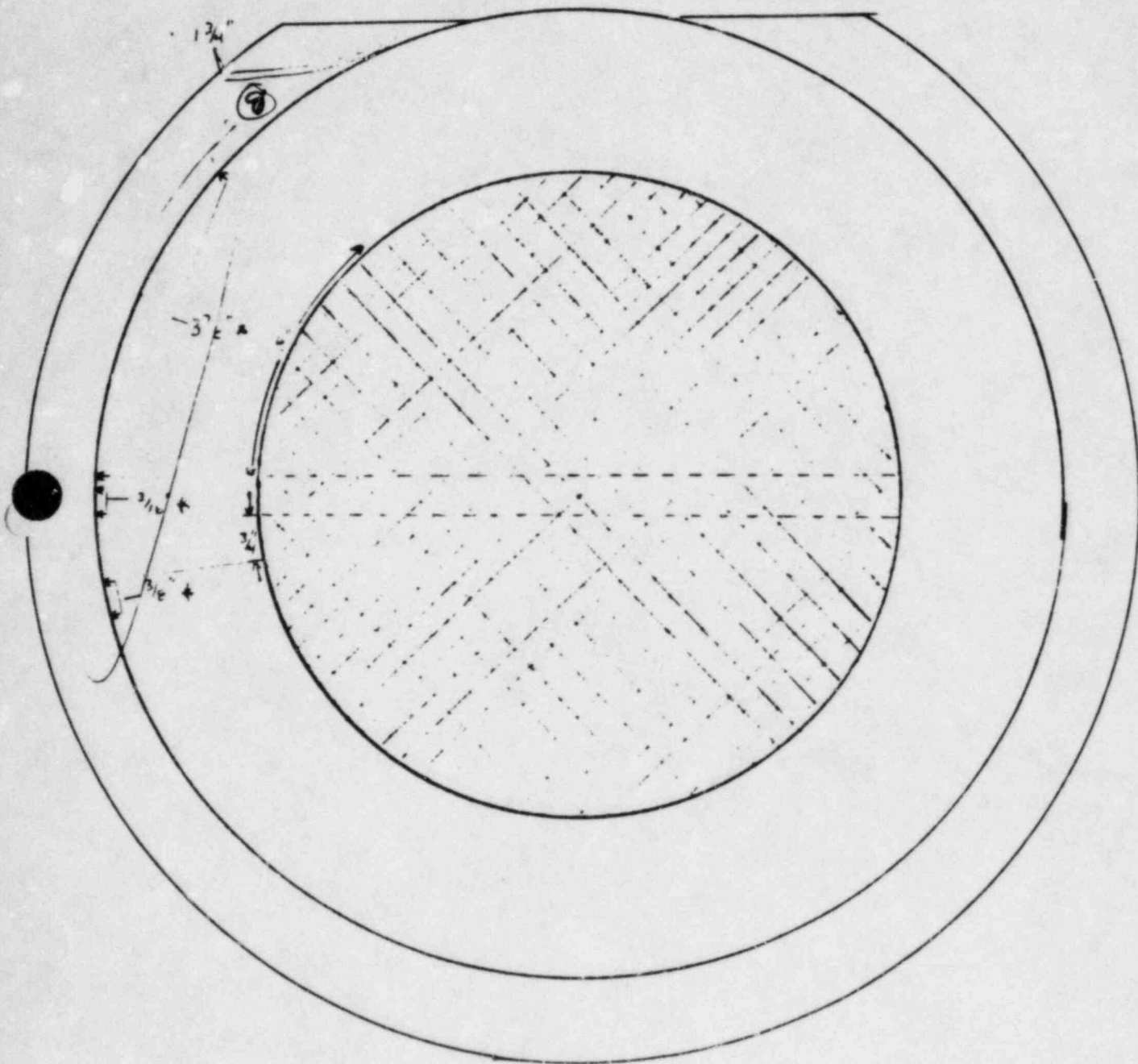


\* 7 CRANK PIN JOURNAL

TURBO END THRUST

FACE ONLY

5 of 14  
PAGE 3 of 6



ENLARGED VIEW OF FILLET RADIUS AREA

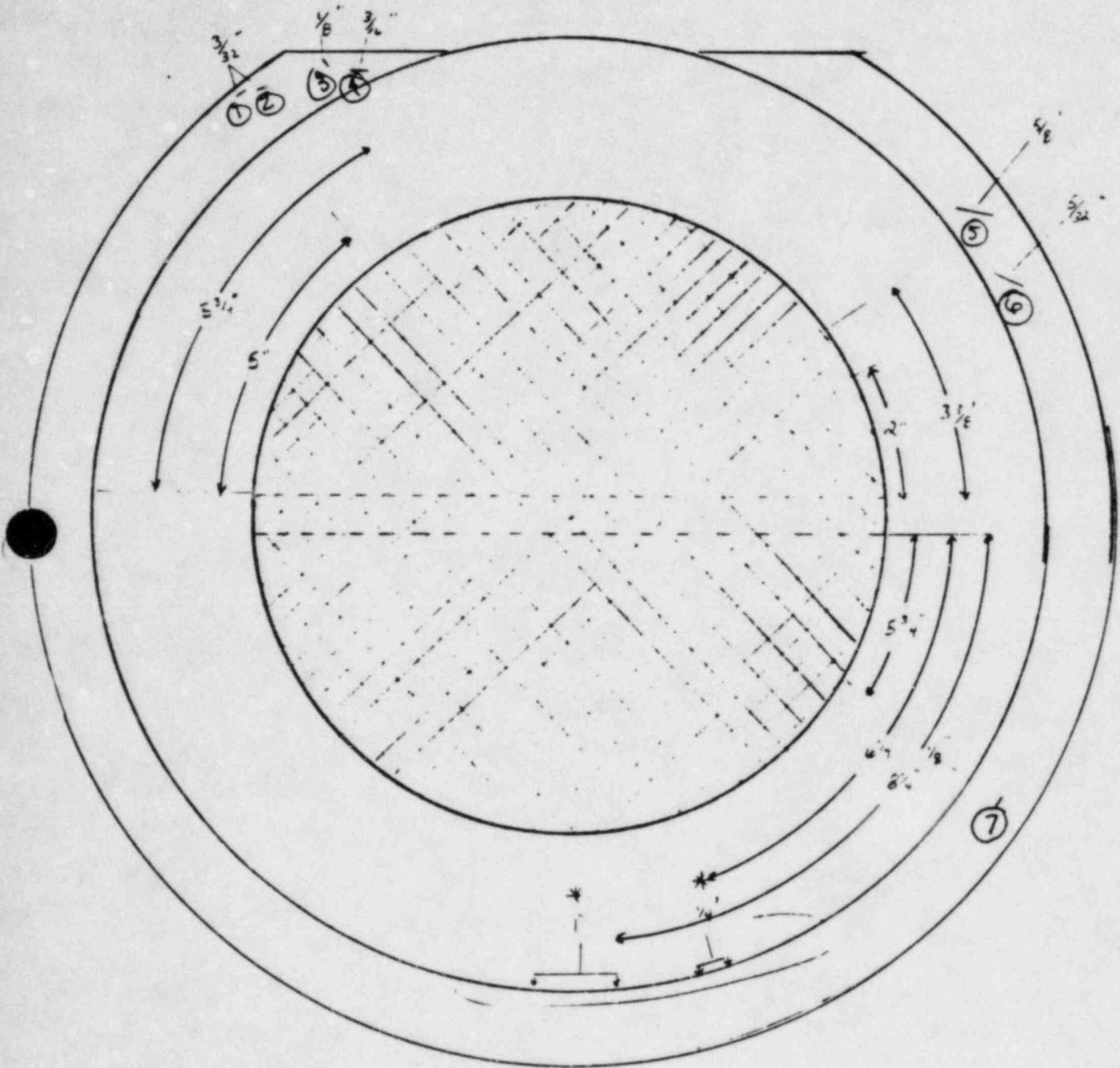
\* SEE DETAIL "A"

Art. Pinner PT. II  
H.S. 34  
Michael Lippert PT. II  
11-2-84



7 CRANK P.W. JOURNAL  
GENERATOR END THRUST  
FACE ONLY

PAGE 6 of 14  
 4 of 6



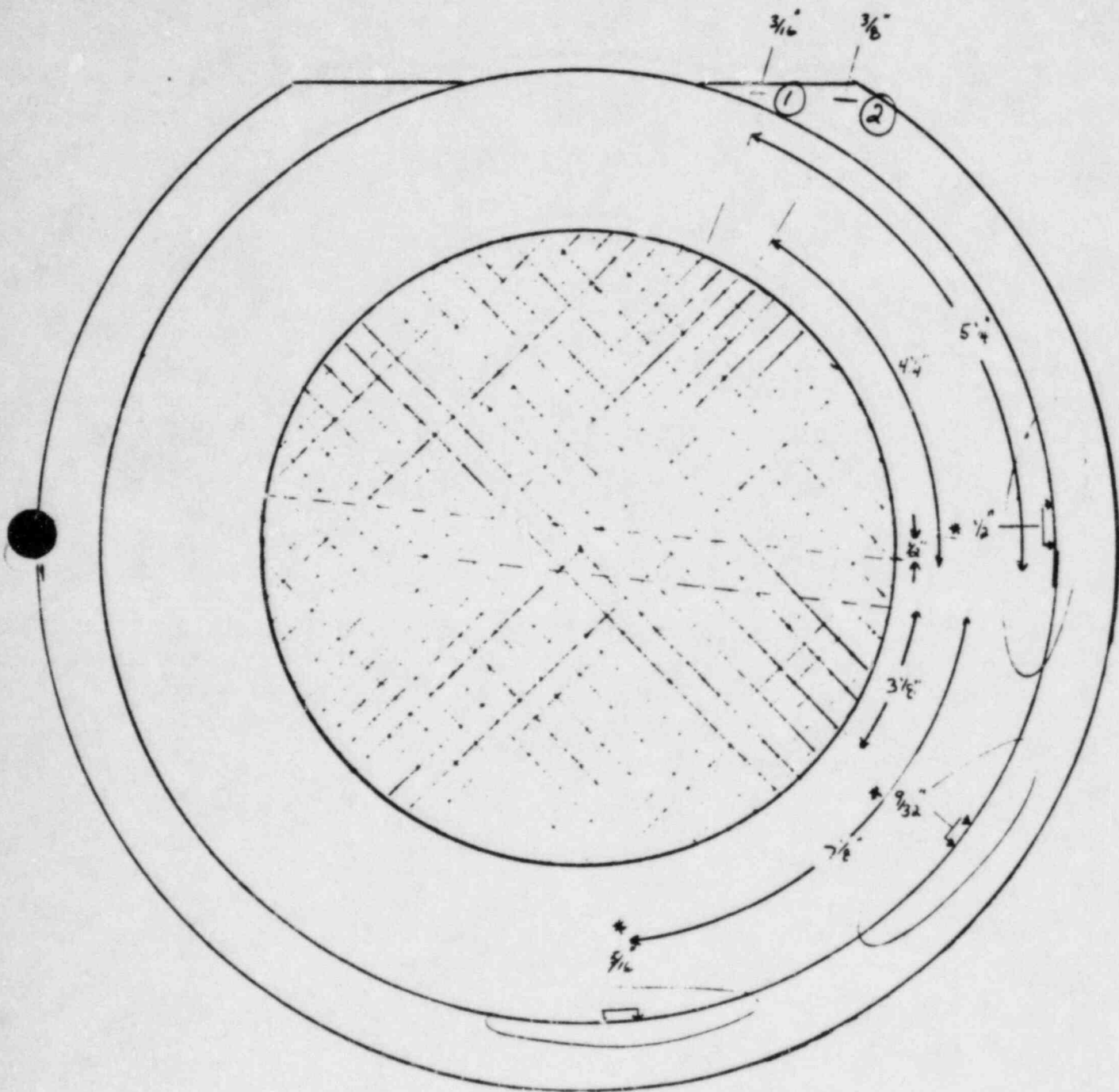
EXPLODED VIEW OF FILLET RADIUS AREA

\* SEE DETAIL "A"

Out Run PT II  
 11-9-84  
 Michael Sybil PT II 11-9-84

\*8 CRANK PIN JOURNAL  
GENERATOR END THRUST  
FACE ONLY

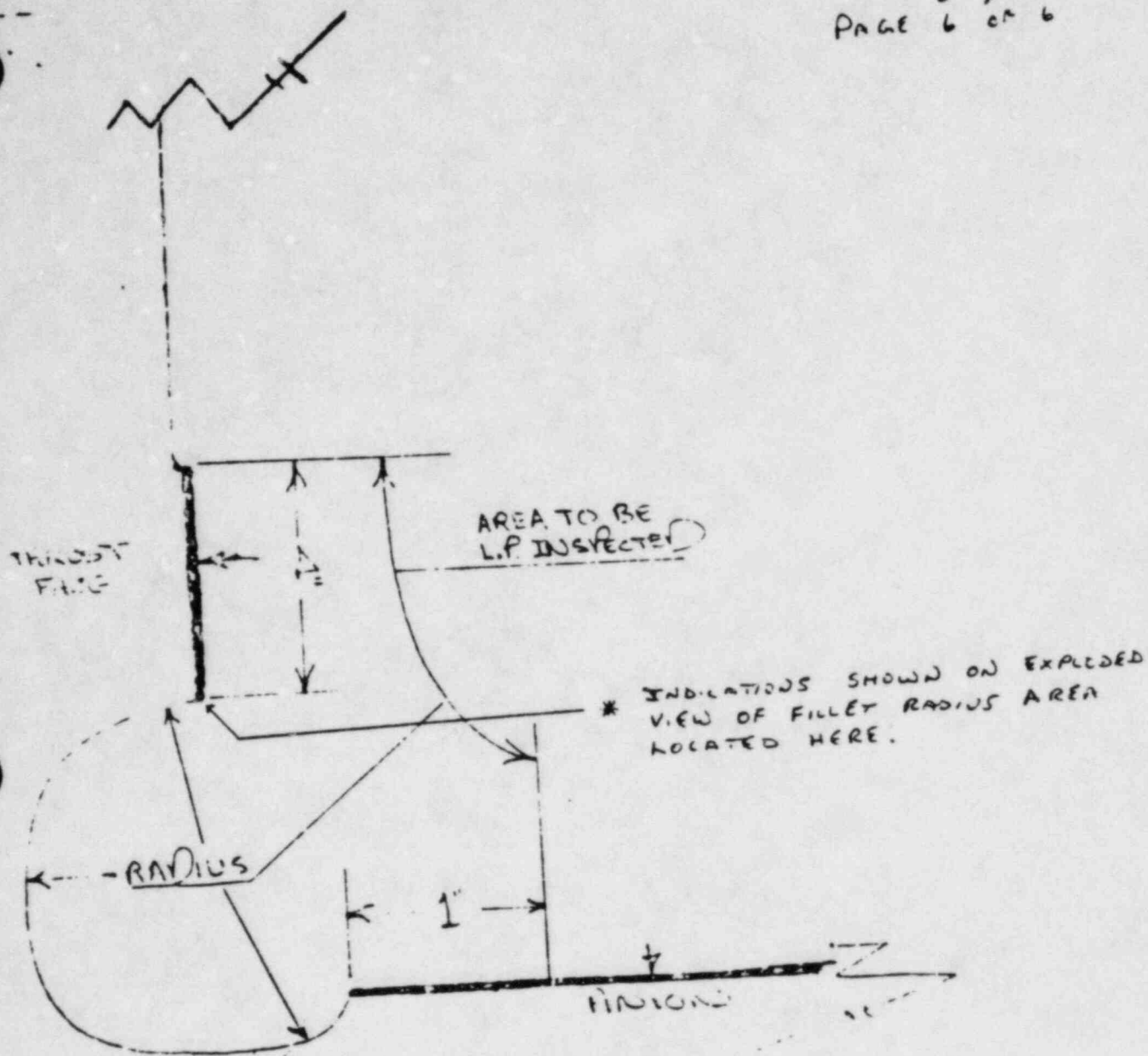
7 of 14  
 PAGE 5 OF 6



EXPLODED VIEW OF FILLET RADIUS AREA

SEE DETAIL "A"

Art. Rev. PT II  
 11-9-84  
 Mutual Supply PT II 11-9-84



DETAIL "A"

Art Pinner — PT II 11-9-84  
 Michael Lloyd PT II 11-9-84



## LIQUID PENETRANT EXAMINATION REPORT

9 of 14

A. MATERIAL		TYPE <i>Steel</i>	FABRICATED PROCESS	<input type="checkbox"/> WELDED <input type="checkbox"/> CAST <input checked="" type="checkbox"/> WORKED
		GEOMETRY	<input type="checkbox"/> PIPE <input type="checkbox"/> PLATE <input type="checkbox"/> ROD <input checked="" type="checkbox"/> OTHER:	
CROSS SECTION THICKNESS	MAX MIN	PIPE DIA.	SURFACE CONDITION	<input type="checkbox"/> MACHINED <input type="checkbox"/> GROUND <input checked="" type="checkbox"/> AS FABRICATED <input type="checkbox"/> OTHER
B. NDE PROCEDURE No. <u>6.3</u>		SURFACE/MAT'L. TEMP. <u>73°F</u>		MATE. NO. <u>365</u> MWR/RR. No. <u>43-2055</u>
INSPECTION MATERIALS		BRAND	DESIGNATION	BATCH NO.
1. PRE-CLEANER		<i>magnaflux</i>	<i>SKC-DE/2C-7B</i>	<i>B4TD13</i>
2. PENETRANT		<i>magnaflux</i>	<i>2L-22A</i>	<i>B3FD03</i>
3. EMULSIFIER AND/OR REMOVER		<i>magnaflux</i>	<i>SKC-DE/2C-7B</i>	<i>B4TD12</i>
4. DEVELOPER		<i>magnaflux</i>	<i>SKD-DE</i>	<i>B3D111</i>
5. POST EXAMINATION CLEANER		<i>magnaflux</i>	<i>SKC-DE/2C-7B</i>	<i>B4TD12</i>
SKETCH OR OTHER DETAIL: USE OTHER SIDE IF NECESSARY <i>Area Examined all oil holes and fillet areas AND THROST FACE</i>				
C. EVALUATION		REPORT BELOW THOSE INDICATIONS OBSERVED AND THE PERTINENT INFORMATION REQUIRED. WHERE ADDITIONAL SPACE IS REQUIRED USE OTHER SIDE.		
LOCATION	SIZE (INCHES)	DESCRIPTION	ACTION (ACCEPT/REJECT, AND COMMENT AS NECESSARY)	
<i>Main Bearing #7</i>	<i>See attached Sketch</i>	<i>Linear</i>	<i>Subject to Eddy Current For Acceptance</i>	
<i>Main Bearing #8</i>	<i>See attached Sketch</i>	<i>Linear</i>	<i>Subject to Eddy Current For Acceptance</i>	
<i>Main Bearing #9</i>	<i>See attached Sketch</i>	<i>Linear</i>	<i>Subject to Eddy Current For Acceptance</i>	
<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i> <i>At Runway</i>	
D. ACCEPTANCE CRITERIA		OPERATOR <i>Robert J. Brown</i> Level <u>PT II</u> Date <u>11-12-84</u>		
E. ATTEST		DATE <u>11-12-84</u>		

COMPONENT I.D. 1843 \* END 103

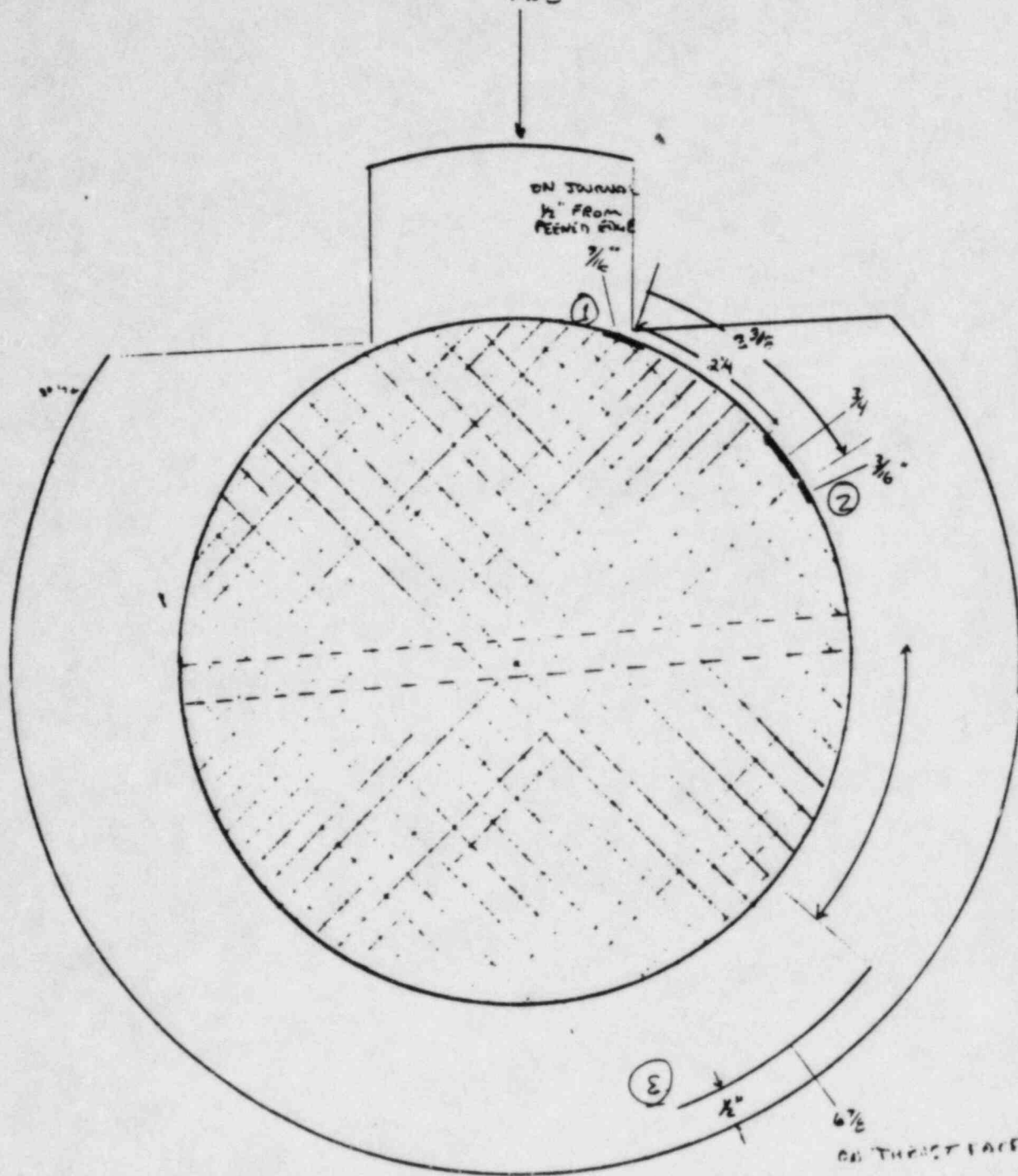
SYSTEM

PLANT/LOCATION

EDG Room 103



\* 7 MAIN BEARING FILET, JOURNAL, OIL HOLES  
\* THRUST FACE GENERATOR SIDE \* 124L  
TDC



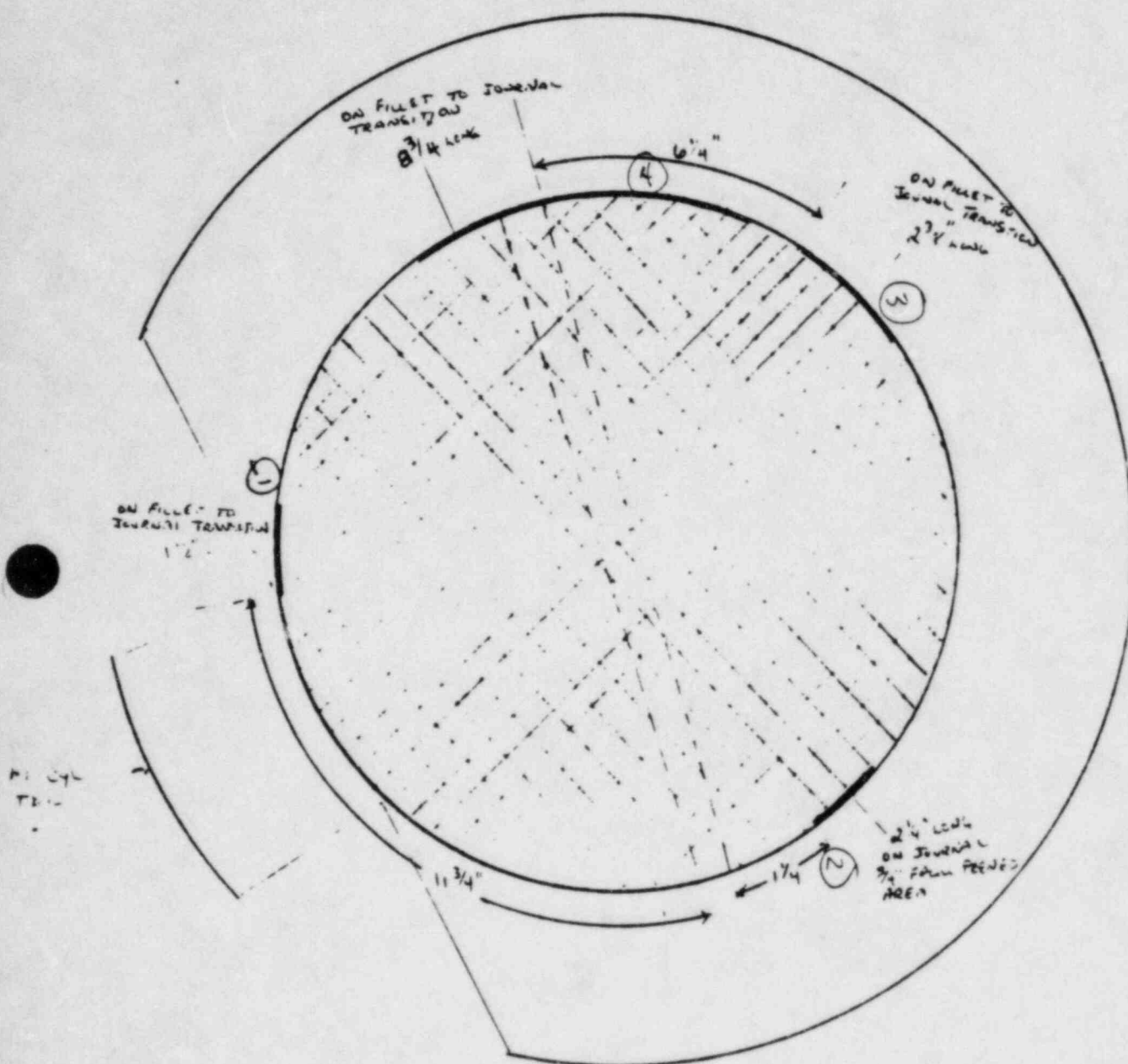
Art Penna p. II  
11-12-84



# 8 MAIN BEARING FILLET, OIL HOLES

JOURNAL & THRUST FACE

GENERATOR SIDE

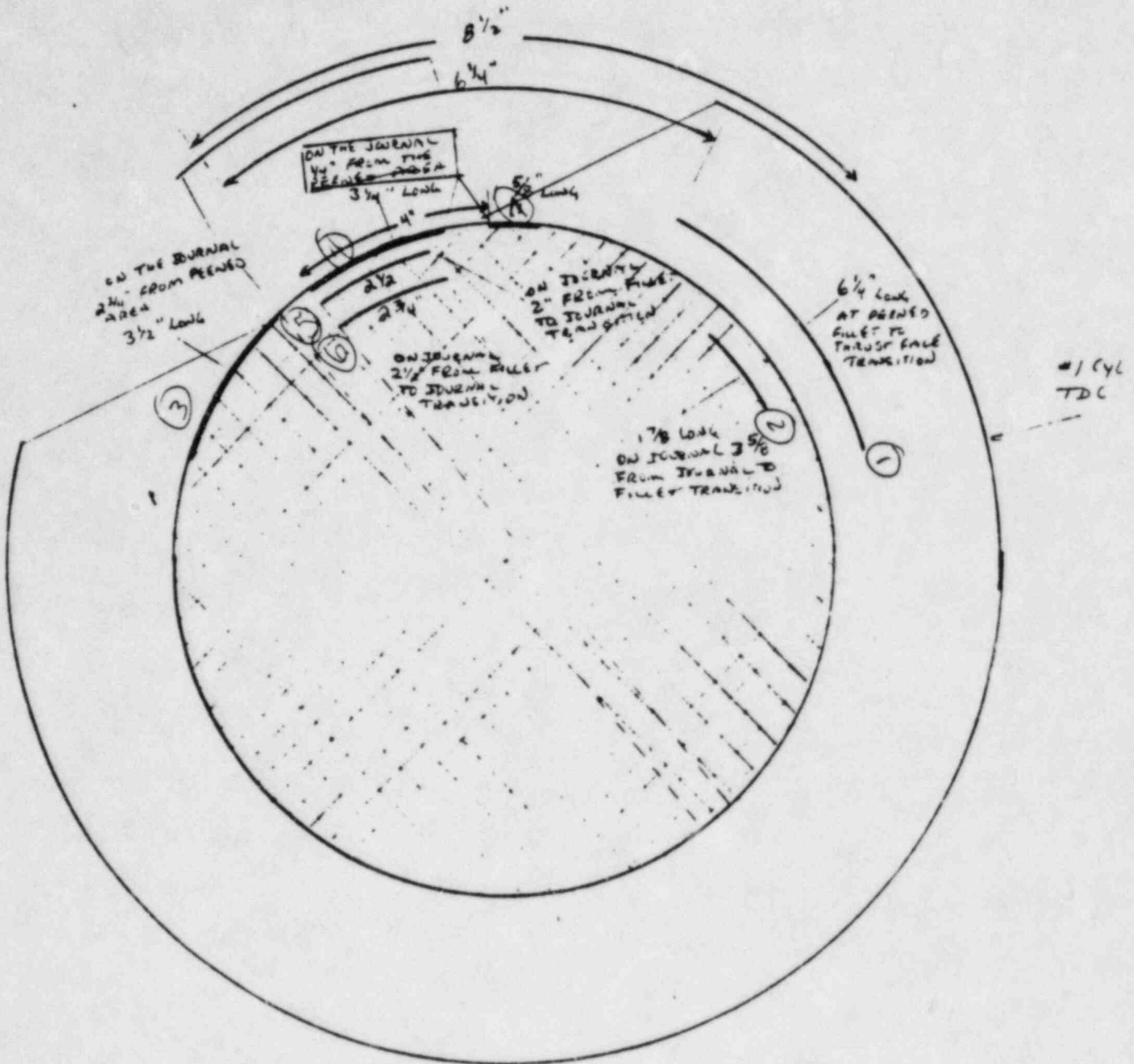


LODED VIEW OF FILLET RADIUS AREA

Art Reman  
P. II  
11-12-84

" 8 MAIN BEARING FILLET, OIL HOLES,  
JOURNAL AND THRUST FACE  
TURBOCHARGER SIDE

12/14 OK



EXPLODED VIEW OF FILLET RADIUS AREA

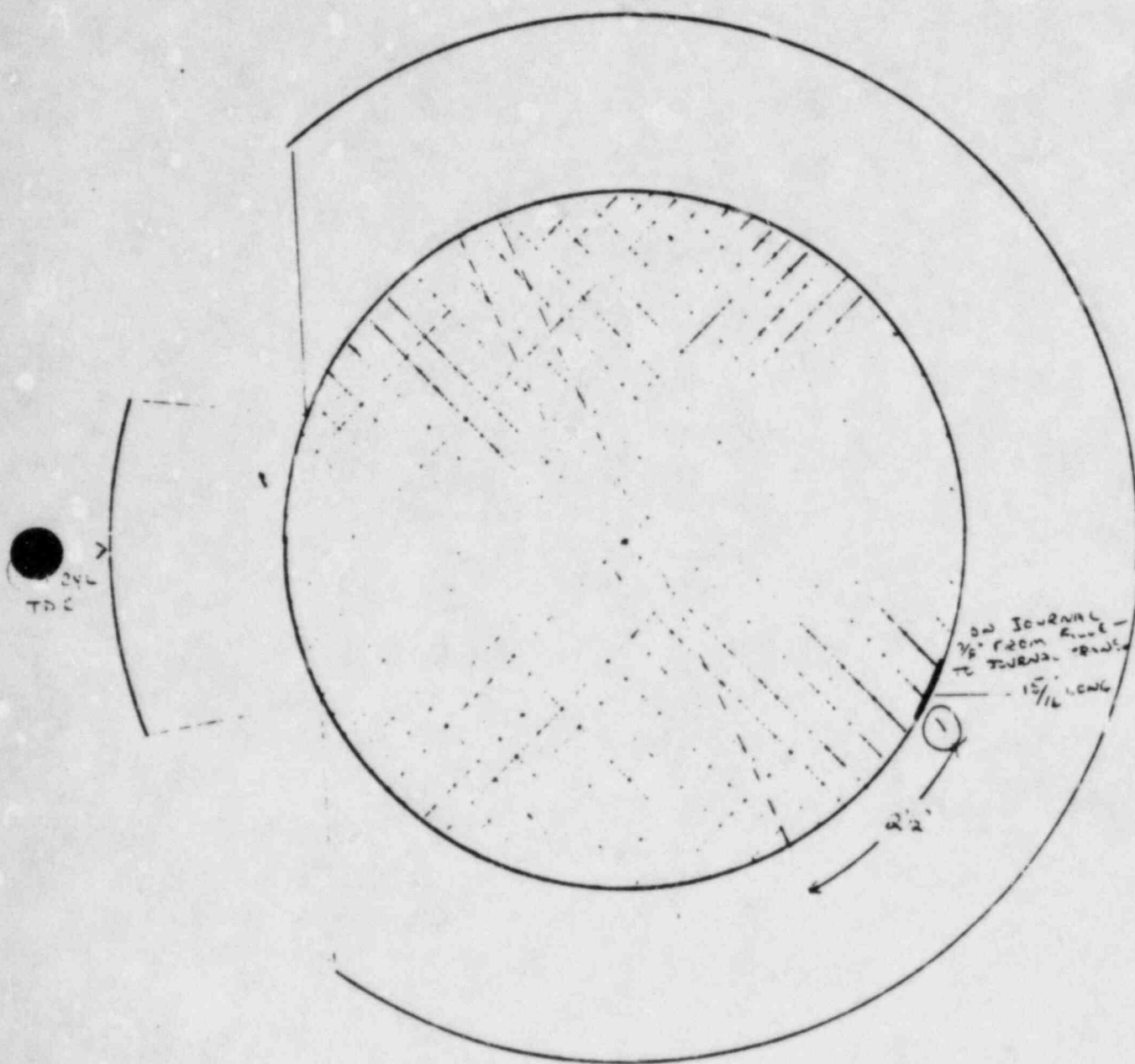
Art P...  
 PT II  
 11-12-54

\* 9 MAIN BEARING FILLET, OIL HOLES

JOURNAL AND THRUST FACE

TURBO CHARGER SIDE

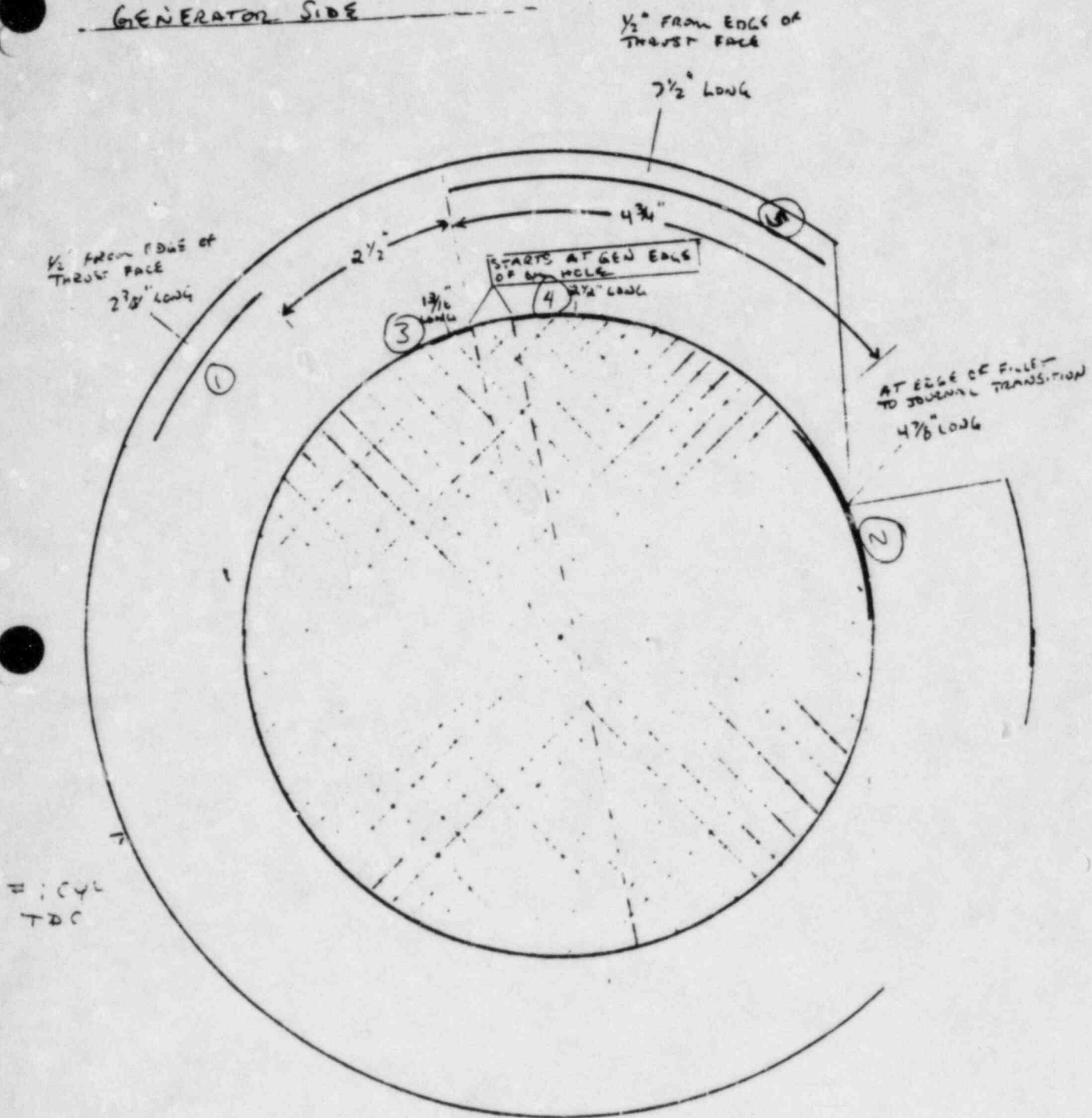
13 of 14 OK



EXPLODED VIEW OF FILLET RADIUS AREA

\* 9 MINOR BEARING FILLET, OIL HOLES  
JOURNAL AND THRUST FACE  
GENERATOR SIDE

14 of 14 OK



EXPLODED VIEW OF FILLET RADIUS AREA

Art Ruman PT II  
 11-12-84

APPENDIX J

FaAA NDE 11.8, REVISION 1



# Failure Analysis Associates

## NONDESTRUCTIVE EXAMINATION PROCEDURE

Title: EDDY-CURRENT INSPECTION PROCEDURE  
FOR GRAY CAST IRON

Approved by NDE Manager: Duane B. Johnson

Reviewed - NDE Level III: Duane B. Johnson

NDE: 11.8

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Revision: 1

Date: 9/21/84

Date: 9/21/84

Date: 9/21/84

### 1.0 PURPOSE AND SCOPE

- 1.1 To establish calibration, test and evaluation procedure for eddy-current examination of gray cast iron.

### 2.0 REFERENCE

- 2.1 Certification and qualification of NDE personnel, NDE-2.  
2.2 Preparation and control of Nondestructive Examination Procedures, NDE-3.

### 3.0 PERSONNEL CERTIFICATION

- 3.1 Personnel performing examination shall be at least level I eddy-current inspector. Data interpretation shall be performed by at least a level II eddy-current inspector. All inspectors shall be certified according to "FaAA Practice for Certification and Qualification of NDT Personnel."

### 4.0 EQUIPMENT

- 4.1 Eddy-current instrument (ECI) used with this instruction shall be an impedance-plane display instrument such as the M1Z 17.  
4.2 The eddy-current test probe shall operate at a test frequency between 0.4 and 2.0 MHZ.  
4.3 The reference standard shall be fabricated from a gray cast iron material (ASTM 64-68 class 30 to 45). The standard shall contain a  $0.020 \pm 0.005$  inch deep slot.

### 5.0 EXAMINATION SURFACE

- 5.1 The surface may be threaded or smooth.

### 6.0 CALIBRATION PROCEDURE

- 6.1 Set ECI test frequency between 0.4 and 2.0 MHZ.  
6.2 Set ECI volts per division to 0.5  
6.3 Set ECI gain to OE.

# Failure Analysis Associates

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- 6.4 Adjust horizontal and vertical position controls such that balance point is at 0.0V, 1.0V.
- 5.5 Adjust horizontal attenuator such that horizontal saturation is greater than 1.5V and less than -1.5V.
- 6.6 Place probe in fixture on reference standard and balance ECI.
- 6.7 Adjust ECI phase until initial lift-off signal is horizontal and to the right.
- 6.8 Adjust ECI gain such that the  $0.020 \pm 0.005$  inch deep slot gives a  $-2.0 \pm 0.2V$  vertical signal on the Cathod Ray Tube (CRT).
- 6.9 Repeat steps 6.6 - 6.8 until no further adjustment is necessary.
- 6.10 Immediately prior to any calibration, the calibration shall be checked by scanning the reference standard. If the slot on the reference standard gives a signal on the CRT less than 1.6V at  $0.0 \pm 0.2V$  horizontal, then the ECI shall be recalibrated and the area tested since the previous calibration shall be retested.
- 6.11 Recalibration shall be completed:
- Before beginning of examination
  - After examination has been completed
  - At least once an hour
- 6.12 ECI should be on at least 10 minutes before calibration or testing.
- 7.0 EXAMINATION
- 7.1 The surface examined and probe used shall be recorded on Eddy-Current Examination Report form 11.1.11.
- 8.0 RECORDING CRITERIA
- 8.1 All crack-like signals on the CRT that exceed 100% of the signal obtained from the 0.020 inch deep slot shall be recorded.

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### 9.0 EVALUATION OF RECORDABLE INDICATIONS

- 9.1 The length of all recordable indications shall be traced to where the eddy-current indication is indistinguishable from the noise.

### 10.0 RECORDS

- 10.1 Set-up and calibration shall be recorded on Eddy-Current Calibration Report form 11.1.10
- 10.2 All areas scanned and all recordable indication shall be recorded on Eddy-Current Examination Report form 11.1.11
- 10.3 All records shall be filed according to job number

APPENDIX K

RECORD OF CYLINDER BLOCK STUD HOLE  
EDDY-CURRENT EXAMINATION

FaAA EDDY-CURRENT REPORT #84110703



11.1.11

# PRELIMINARY REPORT

## EDDY CURRENT EXAMINATION REPORT

Failure Analysis Associates  
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Item Inspected: SHOREHAM, DG 103, BLOCK TOP STD HOLES				
FINALIZED D. J. Johnson 11-29-84				
Material: CAST IRON	<input type="checkbox"/> Welded <input type="checkbox"/> Worked	<input checked="" type="checkbox"/> Cast	Surface condition: <input checked="" type="checkbox"/> Machined <input type="checkbox"/> As fabricated	<input type="checkbox"/> Ground <input type="checkbox"/>
NDE Procedure no. 11.8 REV. 1	Job no. PAD7396		Report no. 841107-03	
Recording criteria: SEE PROCEDURE				
Sketch or other detail (use other side if more space is needed):  SEE ATTACHED DRAWING				
Specific examination area				
HOLES #6 AND #7 of CYLINDER #4, HOLES #2 AND #3 of CYLINDER #5. SCAN AROUND AND DOWN IN THE HOLES TO THE THREADS WITH A BLADE PROBE AND DOWN TO THE BOTTOM of the STD HOLES WITH A THREAD PROBE.				
STD HOLE Indication no.	Magnitude of indication	Length of indication	Location	Remarks
#2 of cyl. 5	—	—	—	NO RECORDABLE INDICATION (NRI)
#3 of cyl. 5	—	—	—	NRI
#6 of cyl. 4	—	—	—	NRI
#7 of cyl. 4	—	—	—	NRI
Examiner <u>K. M. G. Barty</u>	Level <u>II</u>	Date <u>11-7-84</u>		
Examiner <u>D. J. Johnson</u>	Level <u>II</u>	Date <u>11-7-84</u>		



## PRELIMINARY REPORT

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11.1.10

## EDDY-CURRENT CALIBRATION REPORT

Failure  
Analysis  
Associates

Job no. PA07396 Date 11-7-84 Report no. 841107-03  
Material description CAST IRON  
Code or specification FAAA NDE 11.8 REV. 1 Full on NA Full off NA  
Reference standard PA03315A Instrument M17-17 S/N 3010881  
840227

Finalized  
D.P. Johnson  
11-29-84

## Instrument

Freq. 500 KHz Gain 15 Volts/div 0.5 Phase 270  
Test probe FAAA ECP 200 B S/N 3  
Cable length 16'  
Reference probe FAAA ECP 200 B S/N 31  
Cable length 16'

## Calibration

<u>4.9</u> units @ <u>+1.0</u> L/O	<u>4.0</u> units @ <u>+3.4</u> L/O
<u>4.0</u> units @ <u>+3.0</u> L/O	units @ L/O

## Strip Chart Recorder

Type NA S/N NA

## Channel 1

## Channel 2

Sen NA Sen NA  
Position @ null point NA Position @ null point NA  
Chart speed NA mm/sec

## Calibration Check

Time <u>11:15</u>	Phase <u>270</u>	Gain <u>15</u>
Time <u>11:45</u>	Phase <u>270</u>	Gain <u>15</u>
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

Examiner K.M. J. B. Jr. Level II Examiner D. Johnson Level II

## PRELIMINARY REPORT

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11.1.10

## EDDY-CURRENT CALIBRATION REPORT

Failure  
Analysis  
Associates

Job no. PA07396 Date 11-7-84 Report no. B41107-03  
Material description CAST IRON  
Code or specification FAAA NDE 11.8 REV.1 Full on NA Full off NA  
Reference standard PA03315A-840227 Instrument M12-17 S/N 3010881

Finalized  
D.D. Johnson  
11-29-84

## Instrument

Freq. 2.0 MHz Gain 07 Volts/div 0.5 Phase 158  
Test probe FAAA ECP 100T S/N 4  
Cable length 16'  
Reference probe FAAA ECP 100T S/N 5  
Cable length 16'

## Calibration

<u>4.2</u> units @ <u>+0.2</u> L/O	<u>NA</u> units @ <u>NA</u> L/O
<u>NA</u> units @ <u>NA</u> L/O	<u>NA</u> units @ <u>NA</u> L/O

## Strip Chart Recorder

Type NA S/N NA

## Channel 1

## Channel 2

Sen NA Sen NA  
Position @ null point NA Position @ null point NA  
Chart speed NA mm/sec

## Calibration Check

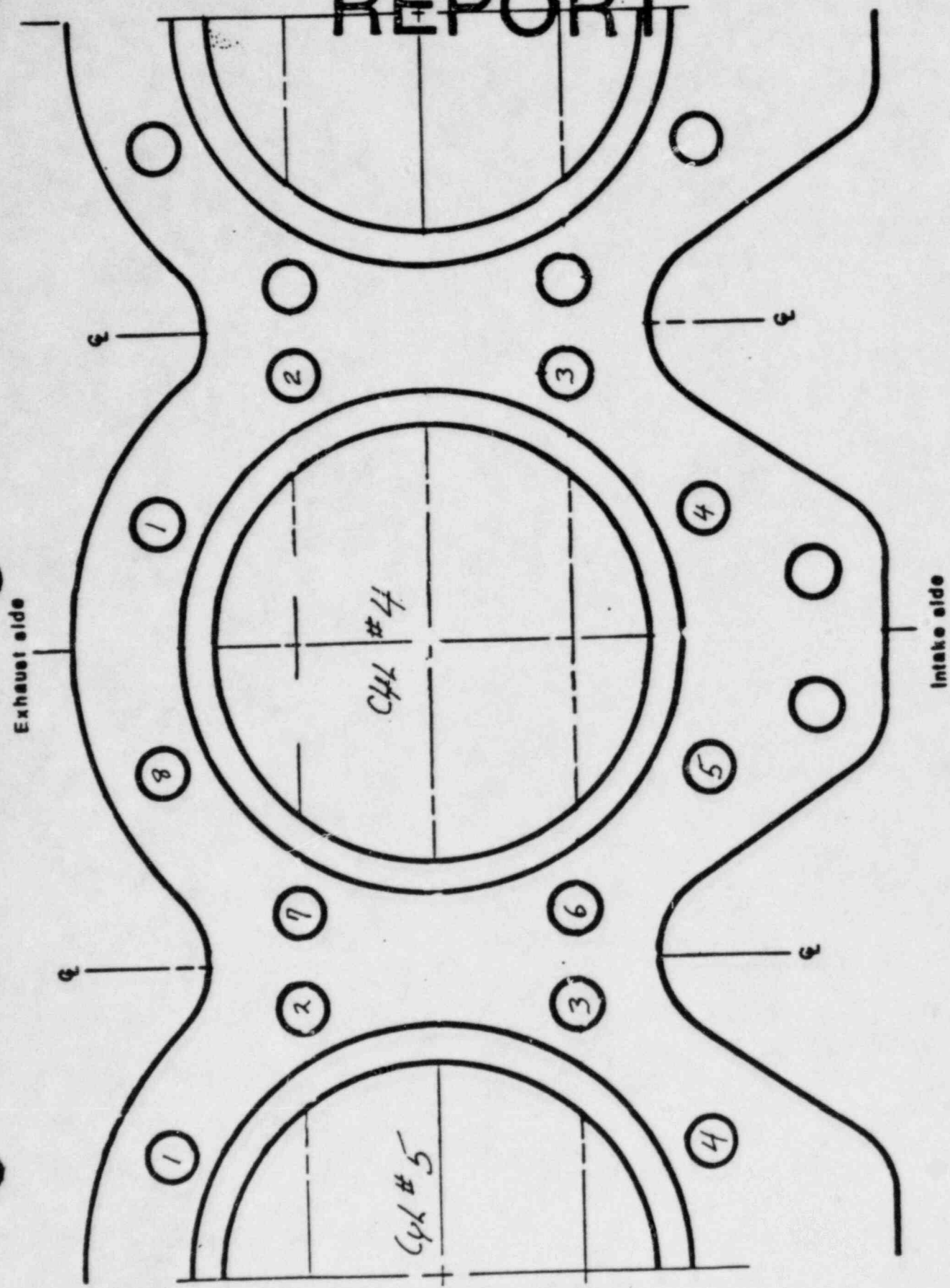
Time <u>13:41</u>	Phase <u>158</u>	Gain <u>07</u>
Time <u>13:49 E.O.T.</u>	Phase <u>158</u>	Gain <u>07</u>
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____
Time _____	Phase _____	Gain _____

Examiner Kellie B. Burt Level II Examiner D.D. Johnson Level II

# PRELIMINARY REPORT

*Finalized*  
*D.O. Johnson*  
*11-28-84*

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**Failure  
Analysis  
Associates**

ENGINEERING AND METALLURGICAL CONSULTANTS  
2225 EAST BAYSHORE ROAD  
PO BOX 61470, P.O. ALTO, CALIFORNIA 94701 (415) 656-9400

November 30, 1984

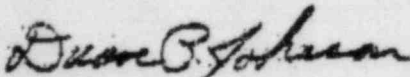
Mr. Milford Schuster  
LILCO - Shoreham Nuclear Power Station  
P.O. Box 618  
Wading River, NY 11792

Dear Mel:

The enclosed erratum needs to be added to your copies of the Failure Analysis Associates Report #FAA-84-11-17 entitled "Eddy-Current Examination of Shoreham Nuclear Power Station Unit 1, Emergency Diesel Generator EDG103 -Post Endurance Run-"

If you have any question please give me a call.

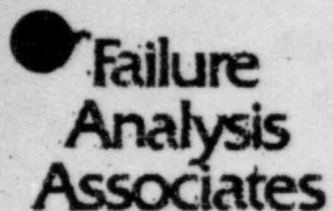
Sincerely,



Duane P. Johnson  
NDE Manager

cc: John Kammeyer, TDI Owner's Group





ENGINEERING AND METALLURGICAL CONSULTANTS  
2228 EAST BAYSHORE ROAD  
P.O. BOX 51470, PALO ALTO, CALIFORNIA 94303 (415) 936-8400

#### ERRATUM (11-30-84)

#### Failure Analysis Associates Report #FARR-84-11-17

- Table of Contents - Comma between "Fillet" and "Journal"
- Page 6 Line 17 - Comma between "Fillet" and "Journal"
- Page 7 Line 10 - Change "one" to "two"
- Page 7 Line 17 - Change "three" to "four"