



GULF STATES UTILITIES COMPANY

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RBG- 19,210

File No. G9.5

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

Dear Mr. Denton:

River Bend Station - Unit 1
Docket No. 50-458

Enclosed for your review are Gulf States Utilities Company (GSU) revised program plan for evaluating and testing the Division I & II standby diesel generators and also data on the inspections and testing performed to date. This letter supplements docketed correspondence from J. E. Booker to H. R. Denton dated July 19, 1984 (RBG-18,244).

Sincerely,

J. E. Booker

J. E. Booker
Manager-Engineering
Nuclear Fuels & Licensing
River Bend Nuclear Group

JEB/JEP/je

Enclosure

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1.0 INTRODUCTION

This topical report has three purposes:

- (1) To present GSU's Program Plan to qualify the Transamerica Delaval, Inc. (TDI) manufactured standby diesel generators for River Bend Station.
- (2) To provide the Staff an opportunity to review, in advance, the plans for testing, post test inspection, and long term surveillance and monitoring.
- (3) To submit for NRC Staff review, the current results of design review and preservice inspection activities at River Bend Station.

GSU initiated the Diesel Qualification Program at River Bend Station in November, 1983 in response to TDI diesel component failures elsewhere and identified potential deficiencies in TDI's quality assurance program.

The objectives of the River Bend Diesel Qualifications Program are:

- (1) To evaluate the TDI diesels and;
- (2) To determine what is necessary to assure reliable standby power at River Bend Station. The Diesel Qualification Program includes activities to solve the known problems of the TDI diesels and;
- (3) To obtain NRC approval of the standby power supplies for River Bend Station.

The GSU approach to qualification of the TDI diesels is:

- (1) To correct the known problems before the diesels are operated at River Bend Station. This involves preservice engine disassembly for inspection, upgrading, and rebuilding.
- (2) To confirm engine reliability by testing and post test inspection, without engine disassembly.
- (3) To assure continued diesel reliability by a program of inservice surveillance, inspection, monitoring, and preventative maintenance.

The feasibility of this approach has been established through the design reviews provided by the TDI Diesel Generator Owners Group, the testing and inspections performed by the TDI diesel owners, and the product improvement recommendations provided by TDI. GSU and its contractors have devoted an intensive effort to accumulate this experience and to implement corrective action to improve diesel generator reliability prior to operation of the engines at River Bend Station. After rebuilding, the engines will be tested to confirm operational reliability. After testing, the engines will be inspected to identify latent defects not disclosed during rebuilding or testing. This inspection will involve minor disassembly, sufficient to detect latent problems, but not so extensive as to require retesting.

Figure 1 shows the logical relationship of program tasks, and Figure 2 shows the program schedule. The initial phase involves evaluation of industry experience, design review recommendations, and preservice inspection results. The second phase involves engine rework, rebuilding, confirmatory testing and post test inspection. This phase is expected to result in successful qualification of the TDI diesels.

The last phase is a program of continuing surveillance, inspection, monitoring, and preventative maintenance. The continuing surveillance and monitoring program will be finalized after the post test inspection is completed.

This report describes the plans for design reviews, inspections, testing, and long term preventative maintenance, surveillance and monitoring. The format of the report permits the results of ongoing activities to be added by revisions or supplements as the work proceeds. When complete, the report will describe, or incorporate by reference, the results of the design reviews, preservice inspections, rework activities, testing, and post test inspections.

FIGURE 1
RIVER BEND DIESEL ACTIVITIES

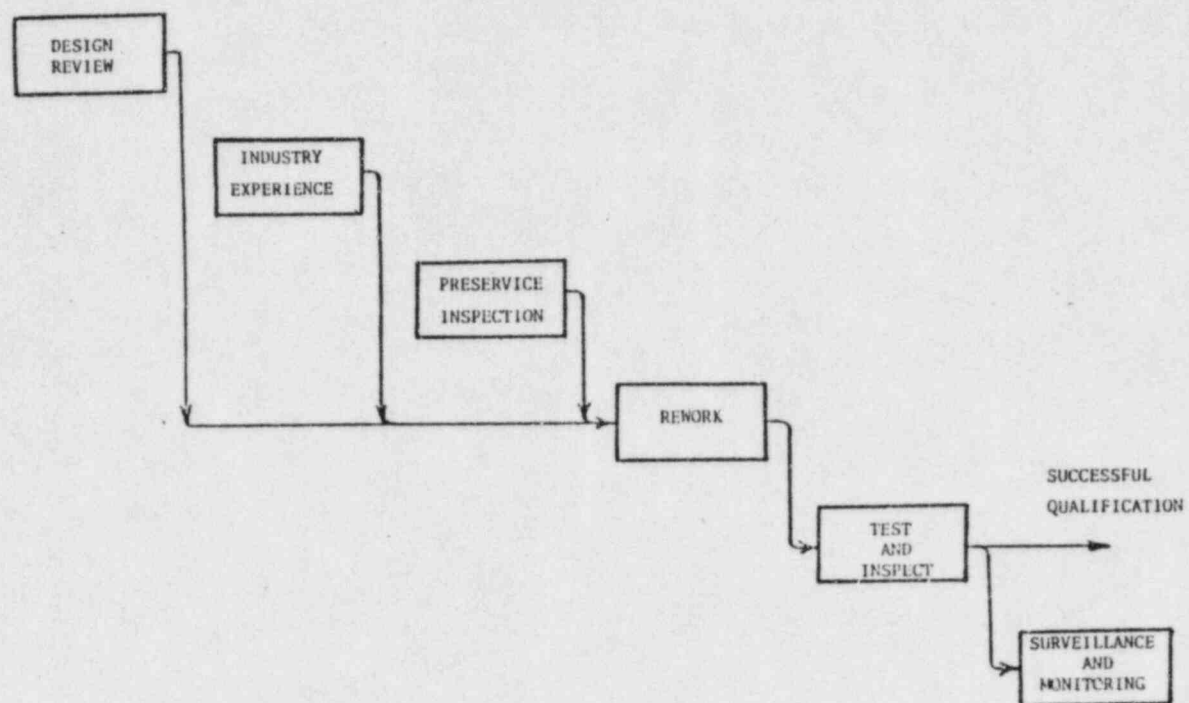
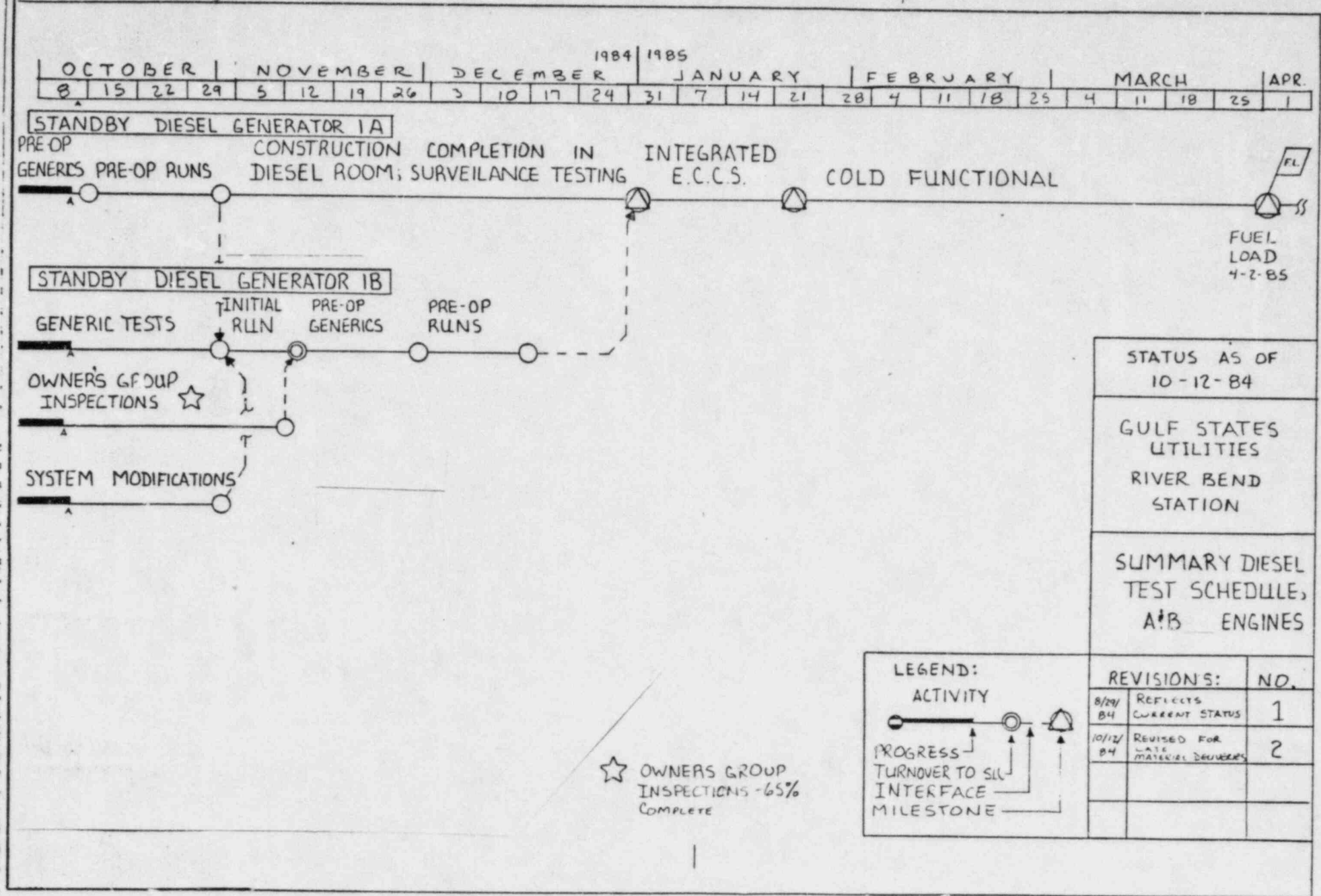


FIGURE 2



2.0 PROGRAM ACTIVITIES

The following subsections provide information relating to current activities with respect to GSU's approach to the qualification of the TDI diesels. GSU is a member and an active participant in the TDI Diesel Generator Owners' Group. GSU has assembled and utilized the experience of other TDI diesel generator owners in the River Bend Station Program. All the recommendations of the Phase I design review received to date and all the recommendations of the manufacturer will be incorporated into this program. The River Bend Station Phase II design review will begin in October, 1984, and be completed by December 7, 1984.

GSU does not anticipate a request for a full power operating license prior to completing implementation or final Staff evaluation of the TDI Owners' Group program. However, because the only Staff positions issued to date have been for interim licensing, GSU is pursuing compliance to these positions pending receipt of the final Staff evaluation. The following sections document GSU's compliance to the Staff position for interim licensing as outlined in Section 4 of the NRC Staff Safety Evaluation Report on Transamerica Delaval, Inc. Diesel Generator Owners' Group Program Plan:

Phase I - Resolution of Known Problems

The River Bend Diesel Qualification Program meets the recommendations of the TDI Owners' Group with respect to resolution of known problems.

Phase II - Design Review and Quality Revalidation

The River Bend Phase II Design Review Program will begin in October, 1984, and is scheduled to be complete by December 7, 1984.

Engine Testing and Inspection

GSU recognizes the Staff's plans to evaluate the need for additional testing and inspection as part of the Staff's generic review of the results of the Phase I program. Pending completion of the Staff's evaluation, this report addresses the interim test and inspection considerations stated in Section 4.6 of the SER.

- 1) The qualified load for the River Bend Station diesel generators will be provided in Table 8.3-2 of the Final Safety Analysis Report. Applicable experience from testing of the DSR-48 engine at the Shoreham Nuclear Power Station and at other facilities will be factored into the River Bend Station Program.
- 2) Item 2 of Section 4.6 of the SER is not applicable since the piston skirts in the River Bend Station engines are the AE design.
- 3) GSU will prepare appropriate operating procedures to ensure that the River Bend Station diesel generators are not loaded above qualified load.

- 4) GSU will revise the River Bend Station Technical Specifications to limit testing of the diesel generators to the qualified load.
- 5) With regard to the requirements of Item 5 of Section 4.6 "Interim Basis for Licensing," both diesel generators have been disassembled for inspection and rebuilding prior to preoperational testing. The inspections defined in Section 2.3 of this program plan include all components considered part of the TDI Owners' Group Phase I program, plus inspection of engine gears and wrist pin bushings. Other components are included in the inspection based on operating experience at other plants, and the recommendations of the TDI Owners' Group.

A summary of the inspections performed and the results are included in Section 2.3 of this program plan. Where the type of inspection or acceptance criteria deviate from that of the TDI Owners' Group, the deviation will be specifically identified and justification provided.

- 6) Following engine reassembly, hot and cold crankshaft deflection measurements will be taken to verify that the crankshaft alignment is within manufacturer's recommendations. The hot deflection measurements will begin within 15 to 20 minutes of engine shutdown, when practicable, consistent with personnel safety. A torsigraph test has been performed for diesel generator 1A. Engine tests consistent with Item 6 and defined in Section 2.5 of this program plan will be performed.
- 7) A program for maintenance and surveillance will be submitted by December 15, 1984 for NRC Staff review and approval.

2.1 Industry Experience Review

The purpose of this activity is to define the known problems of the TDI engines and to determine if these problems might be applicable to River Bend Station.

- Review of industry experience data accumulated by the TDI Diesel Generator Owners Group.
- Visits by River Bend Project Personnel to observe diesel inspections at other nuclear stations.
- Participation in TDI Diesel Owners Group meetings and activities.
- Informal exchange of information with other TDI diesel owners.

The accumulated experience is evaluated for applicability to the River Bend Station diesels. Those items considered applicable are further investigated. This either is done as part of the TDI Diesel Generator Owners Group Review Quality Revalidation effort, or they are added to the work list of inspections, tests, or investigations conducted by GSU and its contractors at River Bend Station. Results of industry experience reviews conducted to date are reflected in the plans for design review, preservice inspection, rework, testing, post test inspection, and surveillance and monitoring which are described in later sections of this report.

2.2 Design Review

The purpose of this activity is to verify the design adequacy of the diesel generator components and systems. The TDI Diesel Generator Owners Group will perform design reviews of TDI supplied components whose failure might affect the safety functions of the diesel generators.

Table 1 lists the TDI supplied components to the parts group level as listed in the TDI parts manual. For each component, the table lists the design review report reference, and summarizes the conclusions of the design review. Those reports listed are thereby incorporated by reference in this report. Product improvements or upgrades are also identified in the table.

TABLE 1
DESIGN REVIEWS

NOTE: DATA CURRENT TO 07/05/84

NUMBER	COMPONENT DESCRIPTION (IMPROVEMENTS)	DESIGN REVIEW REFERENCE	REPORT CONCLUSIONS
03-305	Base and Bearing Caps	Ref. 14	Adequate, subject to inspection
03-307	Lube Oil Fittings-Internal	Phase 2	
03-310	Crankshaft and Main Bearings	Ref. 15	Adequate for Shoreham. River Bend Report to be submitted 11/84
03-315	Cylinder Block Liners and Water Manifold (see Section 2.4)	Ref. 5,7,8	Adequate, subject to inspection.
03-317	Water Discharge Manifold	Phase 2	
03-330	Flywheel	Phase 2	
03-331	Flywheel Guard	Not Required	
03-335	Gear Case	Not Required	
03-340	Connecting Rods	Ref. 3,12	Adequate, subject to inspection.
03-341	Piston (AE Pistons installed, see Section 2.4)	Ref. 1, 2	Adequate
03-345	Tappets and Guides	Phase 2	
03-350	Camshaft-Cam Bearing and Cam Gear	Phase 2	
03-355	Idler and Miscellaneous Gears (see Section 2.4)		
03-359	Air Start Valve	Ref. 13	Adequate
03-360	Cylinder Head and Valves	Ref. 4	Adequate. Fire deck thickness and casting quality to be verified, and replaced where necessary. Group II heads require periodic leak testing
03-361	Cylinder Indicating Locks	Not Required	
03-362	Cylinder Head Covers	Phase 2	
03-365	Fuel Injection Equipment	Ref. 11	Adequate if inspection criteria are met
03-371	Fuel Pump Linkage	Phase 2	

TABLE 1
DESIGN REVIEWS
(Continued)

NOTE: DATA CURRENT TO 07/05/84

COMPONENT		DESIGN REVIEW	REPORT
NUMBER	DESCRIPTION (IMPROVEMENTS)	REFERENCE	CONCLUSIONS
03-375	Intake Manifold	Phase 2	
03-380	Exhaust Manifold	Phase 2	
03-385	Covers-Cylinder Block	Phase 2	
03-387	Crankcase Ventilator	Phase 2	
03-390	Rocker Arms and Pushrods (friction welded pushrods, see section 2.4)	Ref. 10,16	Rocker arms adequate, subject to inspection Pushrods upgraded to friction welded design which is adequate
03-402	Governor Drive	Phase 2	
03-410	Overspeed Trip	Phase 2	
03-413	Governor Linkage	Phase 2	
03-415	Governor	Phase 2	
00-420	Pressure Regulating Valve-Lube Oil	Phase 2	
03-420	Lube Oil Pump-Engine Driven	Phase 2	
03-425	Water Pump Jacket Water	Ref. 6	Replace impeller change material and eliminate keyway.
03-435	Jacket Water Fittings	Phase 2	
03-437	Turbocharger-Water Fittings	Phase 2	
03-441	Starting Air Lines	Phase 2	
03-442	Starting Air Distributor	Phase 2	
03-445	Fuel Booster Pump	Phase 2	
03-460	Strainer, Duplex Lube Oil	Phase 2	
03-465	Lube Oil Fittings	Phase 2	
03-467	Turbocharger Lube Oil Fittings	Phase 2	
NB-002	Intercooler	Phase 2	

TABLE 1
DESIGN REVIEWS
(Continued)

NOTE: DATA CURRENT TO 07/05/84

NUMBER	COMPONENT DESCRIPTION (IMPROVEMENTS)	DESIGN REVIEW	REPORT
		REFERENCE	CONCLUSIONS
03-475	Turbocharger and Intercooler Brackets	Phase 2	
MP-020	Turbocharger	Ref. 9	Modify prelube system. Periodic inspection of bearings
00-491	Air Inlet Adapter	Not Required	
00-495	Exhaust Outlet Adapter	Not Required	
03-503	Thermometer	Not Required	
03-500	Control Panel	Phase 2	
03-515	Thermostatic Valve	Phase 2	
03-520	Instruction Plates	Not Required	
03-525	Barring Device-Pneumatic	Phase 2	
03-530	Engine Platform	Not Required	
03-531	Platform, Ladder	Not Required	
03-540	Lube Oil Sump Tank	Phase 2	
03-550	Foundation Bolts	Phase 2	
03-630	Pyrometer Conduit	Phase 2	
03-650	Electrical Equipment	Phase 2	
03-688	Electrical Wiring	Phase 1	
03-689	Off Engine Wiring	Phase 2	
03-690	Safety Alarm On Engine	Phase 2	
03-691	Off Engine Alarm Sensors	Phase 2	
03-695	Safety Shutdown	Phase 2	
03-700	Standpipe	Phase 2	

TABLE 1
DESIGN REVIEWS
(Continued)

NOTE: DATA CURRENT TO 07/05/84

COMPONENT		DESIGN REVIEW	REPORT
<u>NUMBER</u>	<u>DESCRIPTION (IMPROVEMENTS)</u>	<u>REFERENCE</u>	<u>CONCLUSIONS</u>
03-715	Sub Base	Phase 2	
03-717	Auxiliary Skid	Phase 2	
03-800	Heater, Jacket, Water Heater, Lube Oil Sump Tank	Phase 2	
03-805	Intake and Exhaust Equipment	Phase 2	
03-810	Jacket Water Equipment	Phase 2	
03-820	Lube Oil Equipment	Phase 2	
03-825	Fuel Oil Equipment	Phase 2	

Design Review Report References:

1. Investigation of Type AF and AE Piston Skirts. TDI Owners Group letter OGTP-41; C.L. Ray Jr to H.R. Denton, 5/24/84.
2. The Influence of Thermal Distortion on the Fatigue Performance of AF and AE Piston Skirts; TDI Owners Group letter OGTP-72; C.L. Ray Jr to H.R. Denton, 6/14/84.
3. Design Review of Connecting Rods TDI Inline DSR-48 Emergency Diesel Generators; TDI Owners Group letter OGTP-79; 6/18/84.
4. Evaluation of Cylinder Heads of TDI Series R-4 Diesel Engines; TDI Owners Group letter OGTP-25; C.L. Ray Jr. to H.R. Denton, 5/14/84.
5. Design Review of TDI R-4 Series Emergency Diesel Generators Cylinder Blocks and Liners; TDI Owners Group letter OGTP-90; C.L. Ray Jr. to H.R. Denton, 6/25/84.
6. Emergency Diesel Generator Engine Driven Jacket Water Pump Design Review; TDI Owners Group letter TDI-15; W.J. Museler to H.R. Denton 4/16/84.
7. Emergency Diesel Generator Cylinder Head Stud Analysis; TDI Owners Group letter TDI-8; W.J. Museler to H.R. Denton, March 30, 1984.
8. Supplement to the Emergency Diesel Generator Cylinder Head Stud Stress Analysis; April 1984.
9. Design Review of Elliot Model 90G Turbocharger used on TDI DSR-48 and DSRV-16 Emergency Diesel Generator Sets; TDI Owners Group letter OGTP-26; C.L. Ray to H.R. Denton 5/14/84.
10. Design Review of Rocker Arm Capscrews; TDI Owners Group letter TDI-19; W.J. Museler to H.R. Denton, 4/25/84.
11. Design Review of Fuel Oil Injection Tubing; TDI Owners Group letter OGTP-8; C.L. Ray to H.R. Denton, 4/27/84.
12. Design Review of Connecting Rod Bearing Shells; W.J. Museler to H.R. Denton, 3/12/84.
13. Design Review of Air Start Valve Compressor Dimension and Stress Analysis; TDI Owners Group letter TDI0-5; W.J. Museler to H.R. Denton, 3/15/84.
14. Design Review of Engine Base & Bearing Caps; TDI Owners Group letter OGTP-10; C.L. Ray to H.R. Denton, 4/27/84.
15. Design Review of Crankshaft; TDI Owners Group letter TDI-17; W.J. Museler to H.R. Denton, 4/20/84.

16. Design Review of Pushrods; TDI C.ners Group letter TDI-16; W.J. Museler to H.R. Denton, 4/19/84.

2.3 Preservice Inspection

The purpose of the preservice inspection effort is to verify that the installation is complete and correct and that the manufactured quality of the engines comply with the design requirements. This will be done in three steps:

- (1) As built installation verification. This includes inspections by TDI and major subvendors to TDI, including Electric Products (electric generator), RTE Delta (switchgear), Elliot (turbocharger), and Woodward (governor). In addition, GSU inspects other components selected from industry experience information. The purpose of these inspections is to verify that the engine installation is complete and correct.
- (2) Preliminary testing of auxiliary components and systems. The purpose of these tests is to verify that auxiliary systems, interlocks, controls, and alarms operate in accordance with specifications. This includes system flushing, hydrostatic testing, relief valve testing for setpoint and seal leakage, initial startup, operation, and performance testing and vibration testing of pumps and compressors, performance testing of air dryers, and individual checkout of all electrical components and instrument loops.
- (3) Preservice disassembly inspection. The purpose of this inspection is to verify that the manufactured quality of the engines is in accordance with the requirements established by the TDI Diesel Generator Owners Group design reviews. This inspection involves removal of cylinder heads, pistons, connecting rods, and cylinder liners for detailed part-by-part inspection. In addition, the turbochargers will be disassembled for inspection. Inspection of the crankshaft, gear case, and camshaft will be performed in situ.

A summary of the engine component groups and inspection results are listed in Table 3A (Engine 1A) and 3B (Engine 1B). Where parts are replaced, the replacements are subjected to the same inspections.

TABLE 3A
PRESERVICE INSPECTION SUMMARY
STANDBY DIESEL - 1A

Data current to: 09/26/84
Page 1 of 1

<u>Part Name</u>	<u>Part Number</u>	<u>Class</u>	<u>Results</u>
Turbocharger	MP-020	B	See Appendix 2
Base & Bearing Caps-Base Assembly	03-305A	A	See Appendix 2
Base and Bearing Caps	03-305D	A	See Appendix 2
Crankshaft	03-310A	A	See Appendix 2
Crankshaft Bearing-Bearing Shells	02-310B	A	See Appendix 2
Engine Cylinder Block	03-315A	A	See Appendix 2
Cylinder Block Liner	03-315C	A	See Appendix 2
Cylinder Block Stud	03-315E	B	See Appendix 2
Cylinder Block Nuts	03-315F	B	See Appendix 2
Connecting Rod	03-340A	A	See Appendix 2
Connecting Rod Bearing Shells	03-340B	None	See Appendix 2
Pistons	03-341A	A	See Appendix 2
Piston Rings	03-341B	A	See Appendix 2
Piston Pin Assembly	03-341C	A	See Appendix 2
Tappets & Guides-Intake & Exhaust	03-345A	A	See Appendix 2
Tappets & Guides-Fuel Tappet Assy	03-345B	A	See Appendix 2
Camshaft Assembly	03-350A	A	See Appendix 2
Camshaft-Supports, Bolting & Gear	03-350C	A	See Appendix 2
Idler Gear Assy Crank to Pump Gear	03-355A	A	See Appendix 2
Idler Gear Assembly	03-355B	A	See Appendix 2
Air Start Valve	03-359	A	See Appendix 2
Cylinder Head and Valves	03-360A	B	See Appendix 2
Cylinder Hd Vlvs-Intake & Exhst	03-360B	B	See Appendix 2
Cylinder Hd Vlvs-Bolting & Gaskt	03-360C	B	See Appendix 2
Cylinder Hd Vlvs-Sprngs & Retainrs	03-360D	B	See Appendix 2
Cylinder Head Subcover Assembly	03-362A	B	See Appendix 2
Fuel Injection Tube Assembly	03-365C	B	See Appendix 2
Fuel Pmp Lkge-Fuel Pmp Cntrl Shaft	03-371A	A	See Appendix 2
Fuel Pump Linkage	03-371B	A	See Appendix 2
Intake Manifold	03-375	B	See Appendix 2
Exhaust Manifold Gaskets & Bolting	03-380B	B	See Appendix 2
Intke & Intrmdte Rkr Arm Shft Assy	03-390A	B	See Appendix 2
Exhaust Rocker Arm Assemblies	03-390B	B	See Appendix 2
Pushrods-Intake and Exhaust	03-390C	B	See Appendix 2
Pushrod-Connector	03-390D	B	See Appendix 2
Rocker Arm Bolts & Drivestuds	03-390G	B	See Appendix 2
Govnr Drive Coupling, Pins, & Keys	03-402B	A	See Appendix 2
Overspeed Governor	03-410A	A	See Appendix 2
Governor Linkage	03-413	A	See Appendix 2
Governor Head Exchanger	03-415C	A	See Appendix 2
Jacket Water Pump	03-425A	A	See Appendix 2
Fuel Oil Filters & Strainers	03-455A	B	See Appendix 2
Trbochrgr Brkt-Air Btrfly Vlve Assy	03-475B	A	See Appendix 2

2.4 Rework & Replacement

A number of product improvements and upgrades are now available for TDI engines which improve reliability. GSU has elected to install a number of these improvements as detailed in Table 1. The following paragraphs describe the benefits of the significant upgrades.

- 1) Cylinder block and liners. The cylinder liners, cylinder head, studs and block liner landing surfaces will be modified to comply with TDI's current manufacturing specification. The modification reduces cylinder block stress by reducing mechanical interference between the cylinder head, block and liner, and by increasing the vertical distance between the stud threads in the block and the liner landing surface. These measurements will increase the margin against cylinder block cracking. Stud threads were cleaned using dies.
- 2) Pistons. The original pistons will be replaced by the improved model "AE" piston, the current TDI production standard, inspected to the criteria of the TDI Diesel Generator Owners Group. Available information indicates that the original heat treated and stress relieved AN pistons are acceptable for service. However, the AE pistons were considered desirable because of lower piston skirt stresses and favorable operating experience. As part of the AE piston installation, other TDI product improvements will be installed. These include improved piston rings to reduce the likelihood of liner scuffing during break-in, rework of piston crowns to reduce liner wear and oil consumption, and an improved piston pin retaining ring to improve maintainability.
- 3) Valve pushrods. The improved friction welded pushrods were installed as recommended by the TDI Owners Group Design Review.
- 4) Jacket water pump. The jacket water pump will be reworked to include a modular iron impeller without a keyway as recommended by the TDI Diesel Generator Owners Group.
- 5) Turbocharger. The turbocharger lubrication system will be modified to improve lubrication during starting and reduce thrust bearing wear. The turbocharger mounting bracket will be stiffened to reduce vibration and a turbocharger speed measuring device will be installed on one engine to obtain test data useful in verifying the adequacy of the prelubrication system.

- 6) Fuel injection equipment. Fuel injection tubing, shown by inspection to have ID surface defects deeper than the 0.004 inch acceptance criteria will be shrouded on a temporary basis to permit engine testing. The shrouding will contain fuel spray in the event of tubing rupture. By the end of 1984 TDI will be able to supply fuel injection tubing which has been given an autofrettage treatment to improve its fatigue resistance. This tubing has been ordered.

The original fuel injector tips with a 140 degree spray angle, will be replaced with an improved model with a 135 degree spray angle to eliminate fuel spray on cylinder walls and reduce liner wear. The 135 degree tips are the current TDI production standard.

The fuel injection pump return line will be replaced with heavier wall tubing as recommended by TDI.

- 7) Idler gear. An improved idler gear locknut will be installed as a TDI recommended product improvement.
- 8) Cylinder heads. New manufactured cylinder heads have been installed on diesel generator 1A. These cylinder heads are referred to as Group III heads in the TDI Owners Group design review report (Reference 4 in Table 1). These heads were 100% inspected as described in the detailed inspection reports.

2.5 Confirmatory Testing

The purpose of this activity is to verify engine reliability following engine inspection and rebuilding. Table 5 describes the tests to be performed. The preoperational tests described in Section 14.2.12.1.36 (Revised) will be performed in conjunction with the tests described in this section. The revised FSAR Section 14.2.12.1.36 is reproduced as Appendix 1 of this report.

The proposed testing program does not comply with the requirements of Regulatory Guide 1.108. The number of start tests is less than specified in Regulatory Guide 1.108, Section C.2.a(9), and the overload test described in Regulatory Guide 1.108, Section C.2.a(3), is not planned. With respect to the start tests, given the documented high starting reliability of the TDI engines, the proposed program of ten modified starts and two fast starts is considered an adequate demonstration of starting reliability. Additional fast starts would impose additional wear on the engines, thereby subjecting the engines to service for more severe than the expected plant service conditions.

The overload test is not considered necessary, because the River Bend Station diesels will not be operated above the continuous rating of 3,500KW. Therefore, testing at the overload rating is not considered necessary, and could reduce long term engine reliability by subjecting engine components to unnecessary stress cycles more severe than expected to occur in accident conditions.

In the event of component failures during testing, GSU will investigate the root cause, and take corrective action to remedy the problem and prevent reoccurrence. Retesting would be performed if the corrective action is considered to affect the test objectives i.e.:

- 1) the ability to deliver rated output, 2) the ability to start reliably, or 3) the torsional vibration characteristic of the crankshaft.

TABLE 5A
OPERATIONAL TESTING
STANDBY DIESEL "A"

NOTE: Testing not Complete
Data Current as of 09/05/84

TEST OBJECTIVE	ACCEPTANCE CRITERIA	RESULTS OR SCHEDULED COMPLETION
1) Manufacturer recommended test in accordance with TDI Service Information Memoranda #99		
a) Initial start, slow idle, No load, (15 minutes)	Operating parameters in the normal range Satisfactory crankcase inspection	Satisfactory
b) 450 rpm, no load, (30 minutes)	Adjust governor Overspeed trip satisfactory Verify generator differential shutdown Operating parameters in normal range Satisfactory crankcase inspection	Satisfactory
c) Generator phasing	Satisfactory Generator electrical checks Set electrical portion of governor	Satisfactory
d) 1 hour at 25% rated load	Operating parameters in normal range	Satisfactory
e) 1 hour at 50% rated load	Operating parameters in normal range	Satisfactory
f) 2 hours at 75% rated load	Operating parameters in normal range	Satisfactory
g) Return to 25% rated load	Operating parameters in normal range Verify parameters consistent with Step (d)	Satisfactory
h) 4 hours at 100% load (3500KW), followed by internal engine inspection, turbocharger vibration, bearing cooling and lubrication test	Operating parameters in normal range Crankcase inspection Crankshaft web deflection Piston skirt wear Cylinder liner wear Gear set wear Valves and rocker arms wear and clearances Cold compression pressure Generator winding temperature	Satisfactory
2) Engine timing and	Smooth operation	9/84

TABLE 5A
OPERATIONAL TESTING
STANDBY DIESEL "A"
(Continued)

NOTE: Testing not Complete
Data Current as of 09/05/84

TEST OBJECTIVE	ACCEPTANCE CRITERIA	RESULTS OR SCHEDULED COMPLETION
adjustments. 24 hours at 100% load. (power duration may vary)	Cylinder firing pressures in balance Operating parameters in normal range Crankcase web deflection	
3) Crankshaft torsional vibration test	Crankshaft stresses with allowable values	Test complete. Preliminary evaluation satisfactory. Final report in preparation.
4) Engine performance test. Demonstrate that each diesel operates within design parameters at 100% rated load, and demonstrate starting reliability.	Operating parameters in normal range. All start attempts successful.	
a) 24 hours at 100% rated load		10/84
b) Ten modified starts (Note 1) to the load required by a loss of offsite power (approximately 75% of rated load) and run for a minimum of one hour.		10/84
c) Two fast starts (Note 2) to 100% of rated load, and run for a minimum of four hours.		10/84

NOTES

1. 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. Modified starts may be conducted with the engine at operating temperature.
2. Fast starts are simulated "black starts" on simulation of an ESF signal with the engine on ready standby status.

2.6 Post Test Inspection

Following the tests described in Section 2.5, GSU will perform an engine inspection consisting of the items in Table 6. The purpose of this inspection is to look for potential latent problems not discovered in earlier inspections and tests and verify readiness for further operation. The preoperational test phase, consisting of the tests defined in FSAR Section 14.2.12.1.36, (see Appendix 1), will begin upon satisfactory completion of the inspection and any required rework or retesting.

The post test inspection program is designed to provide a thorough engine inspection without major engine disassembly. Major disassembly is not considered necessary because of the thoroughness of the preservice inspection and design review program. Critical components can be adequately inspected by removing access covers and by oil analysis. The oil analysis will indicate abnormal wear of bushings and bearings and the elemental analysis will identify the component in distress. The oil analysis will also serve as a baseline for continued surveillance in the operating phase. Visual inspections to verify nominal wear, absence of discoloration, from overheating, water leakage, and absence of wear products (metal particles) will identify distress conditions in combination with oil analysis.

TABLE 6
POST TEST INSPECTIONS

COMPONENT		INSPECTION METHOD	RESULTS
NUMBER	DESCRIPTION		
03-305	Base and Bearing Caps	Visual for normal wear and absence of discoloration Oil analysis Torque verification	(By 12/84)
03-307	Lube Oil Fittings-Internal	Visual, for security	
03-310	Crankshaft and Main Bearings	Hot web deflection Thrust bearing clearance	
03-315	Cylinder Block Liners and Water Manifold	Visual for normal wear of liners Visual for cleanliness, water leakage	
03-317	Water Discharge Manifold	Visual for security and leaktightness	
03-330	Flywheel	Bolt Torque	
03-331	Flywheel Guard	Visual, for security	
03-335	Gear Case	Visual, for normal wear pattern, security	
03-340	Connecting Rods	Visual, for normal wear and absence of discoloration Oil analysis	
03-341	Piston	Visual for normal wear from crankcase Borescope inspection of piston crown and combustion chamber Oil analysis	
03-345	Tappets and Guides	Visual for normal wear Valve leak and clearances	
03-350	Cam Shaft-Cam Bearing and Cam Gear	Visual of cam lobes for normal wear Valve timing	
03-355	Idler and Miscellaneous Gears	Visual for normal wear and security	
03-359	Air Start Valve	Capscrew torque Borescope inspection from combustion chamber Leak tightness (air start supply filter)	

TABLE 6
POST TEST INSPECTIONS
(Continued)

COMPONENT		INSPECTION METHOD	RESULTS
NUMBER	DESCRIPTION		
03-360	Cylinder Head and Valves	Borescope inspection of combustion chamber and valves Leaktightness of gaskets Bar engine with cylinder cocks open for leakage	
03-365	Fuel Injection Equipment	Visual on tips for normal firing, roundness	
03-371	Fuel Pump Linkage	Visual for security and free movement	
03-375	Intake Manifold	Retorque bolts Visual for leak tightness, and security	
03-380	Exhaust Manifold	Retorque bolts Visual for leak tightness and security	
03-385	Covers-Cylinder Block	Retorque bolts	
03-387	Crankcase Ventilator	Visual for leak tightness and security	
03-390	Rocker Arms and Push Rods	Visual for normal wear and lubrication Valve lash and clearances	
03-402	Governor Drive	Visual for security	
03-410	Overspeed Trip	Visual for security	
03-413	Governor Linkage	Visual for security, free movement	
03-415	Governor	None. Verified during operation	
00-420	Pressure Regulating Valve-Lube Oil	None. Verified during operation	
03-420	Lube Oil Pump-Engine Driven	Visual for wear and clearances	
03-425	Water Pump-	Scheduled disassembly for	

TABLE 6
POST TEST INSPECTIONS
(Continued)

COMPONENT		INSPECTION METHOD	RESULTS
NUMBER	DESCRIPTION		
	Jacket Water	replacement of impeller	
03-435	Jacket Water Fittings	Visual for security and leaktightness	
03-437	Turbocharger-Water Fittings	Visual for security and leaktightness	
03-441	Starting Air Lines	Visual for security and leaktightness. Visual of air supply filter for free flow, cleanliness on engine side.	
03-442	Starting Air Distributor	Visual for security and leaktightness	
03-445	Fuel Booster Pump	Visual for security and leaktightness	
03-460	Strainer, Duplex Lube Oil	Visual for cleanliness Evaluate particles if found	
03-465	Lube Oil Fittings	Visual for leaktightness and security	
03-467	Turbocharger Lube Oil Fittings	Visual for leaktightness and security	
NB-002	Intercooler	Visual for leakage and security Retorque bolts	
03-475	Turbocharger and Intercooler Brackets	Retorque bolts Visual for integrity of welds, and security	
MP-020	Turbocharger	LD stationary nozzle ring Visual of thrust bearing Bolt torque verification	
00-491	Air Inlet Adapter	Visual for security	
00-495	Exhaust Outlet Adapter	Visual for security	
03-503	Thermometer	None. Verified during operation	

TABLE 6
POST TEST INSPECTIONS
(Continued)

COMPONENT NUMBER	DESCRIPTION	INSPECTION METHOD	RESULTS
03-500	Control Panel	None. Verified during operation	
03-515	Thermostatic Valve	None. Verified during operation	
03-520	Instruction Plates	None	
03-525	Barring Device-Pneumatic	None required	
03-530	Engine	Visual for security	
03-531	Platform, Ladder	Visual for security	
03-540	Lube Oil Sump Tank	Oil analysis Visual for leakage	
03-550	Foundation Bolts	Retorque	
03-630	Pyrometer Conduit	Visual for security	
03-650	Electrical Equipment	Visual of slip rings and brushes for wear and adjustment Visual for security Pedestal bearing oil analysis	
03-688	Electrical Wiring	Visual for security	
03-689	Off Engine Wiring	Visual for security	
03-690	Safety Alarm On Engine	None. Verified during operation	
03-691	Off Engine Alarm Sensors	None. Verified during operation	
03-695	Safety Shutdown	None. Verified during operation	
00-700	Standpipe	Visual for leakage, security	
03-715	Sub Base	Visual for integrity of grout	
03-717	Auxiliary Skid	Retorque bolting	
03-800	Heater, Jacket, Water Heater,	Visual for leakage and security of	

TABLE 6
POST TEST INSPECTIONS
(Continued)

COMPONENT		INSPECTION METHOD	RESULTS
NUMBER	DESCRIPTION		
	Lube Oil Sump Tank	corrections	
03-805	Intake and Exhaust Equipment	Visual for leakage and security	
03-810	Jacket Water Equipment	Visual for leakage and security	
03-820	Lube Oil Equipment	Visual for leakage and security	
03-825	Fuel Oil Equipment	Visual for leakage and security	

2.7 Surveillance and Monitoring

GSU will implement a program of preventative maintenance, surveillance and monitoring to ensure long term engine reliability. This program will be added to the report in a revision following the completion of engine testing and post test inspection.

3.0 CONCLUSIONS

GSU believes that the problems of the TDI diesel generators are now understood as a result of the work of the TDI Diesel Generator Owners Group and the TDI Diesel Owners. Solutions to those problems are provided for River Bend Station through the measures described in this report. This program includes all the recommended action of the TDI Diesel Generator Owners Group and Transamerica Delaval Inc. GSU believes these measures will provide reliable standby power for River Bend Station.

4.0 NRC QUESTIONS AND RESPONSES

(LATER)

APPENDIX 1

(Submitted 07-19-84 RBG-18244)

APPENDIX 2

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Turbocharger

Class: B

Part Number: MP-020

No. of Separate Inspections: 11

Attributes Verified and Sample Size:

1. Perform LP examination in stationary nozzle ring - Inspect 1 of 1.
2. Visual inspection of the turbocharger thrust bearing for advance wear - Inspect 1 of 1.
3. Inspect end clearance - Inspect 1 of 1.
4. Verified that proper number of bolts are installed and torqued according to TDI and Elliott Vendor Manuals - Inspect 8 of 8 bolts.

References::

1. F0570000 - S&W Inspection Plan
2. M4000455 - S&W Inspection Report
3. M4000591 - S&W Inspection Report

Inspection Results and Disposition:

1. No cracks in the nozzle ring blade or housing were observed. No excessive dents on the turbocharger nozzle ring blades were observed (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Turbocharger

Class: B

Part Number: MP-020

No. of Separate Inspections: 11

Inspection Results and Disposition:

2. The turbocharger thrust bearing was inspected for the lack of scoring or pitting (Unsatisfactory). The bearing was worn before any field engine operation commenced. Insufficient pre-lubrication was determined the cause of the bearing wear. The bearing was replaced and an improved pre-lubrication system was installed prior to field engine operation. The pre-lubrication system is initiated two minutes prior to engine surveillance testing and lubricates both the turbocharger and rocker arms. The drip flow orifice is maintained for thrust bearing lubrication during an engine fast start (Satisfactory).
3. End clearances were maintained in accordance with TDI tolerances (Satisfactory).
4. The proper number of bolts were verified installed and torqued in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Base and Bearing Caps -
Base Assembly

Class: A

Part Number: 03-305A

No. of Separate Inspections: 4

Attributes Verified and Sample Size:

1. Perform LP inspection of base, main bearing saddle area (2 surfaces) between #5 and #6 cylinders (see attached) - Inspect 1 of 8.
2. Perform visual inspection of cap mating surfaces for evidence of fretting - Inspect 1 of 8.

References:

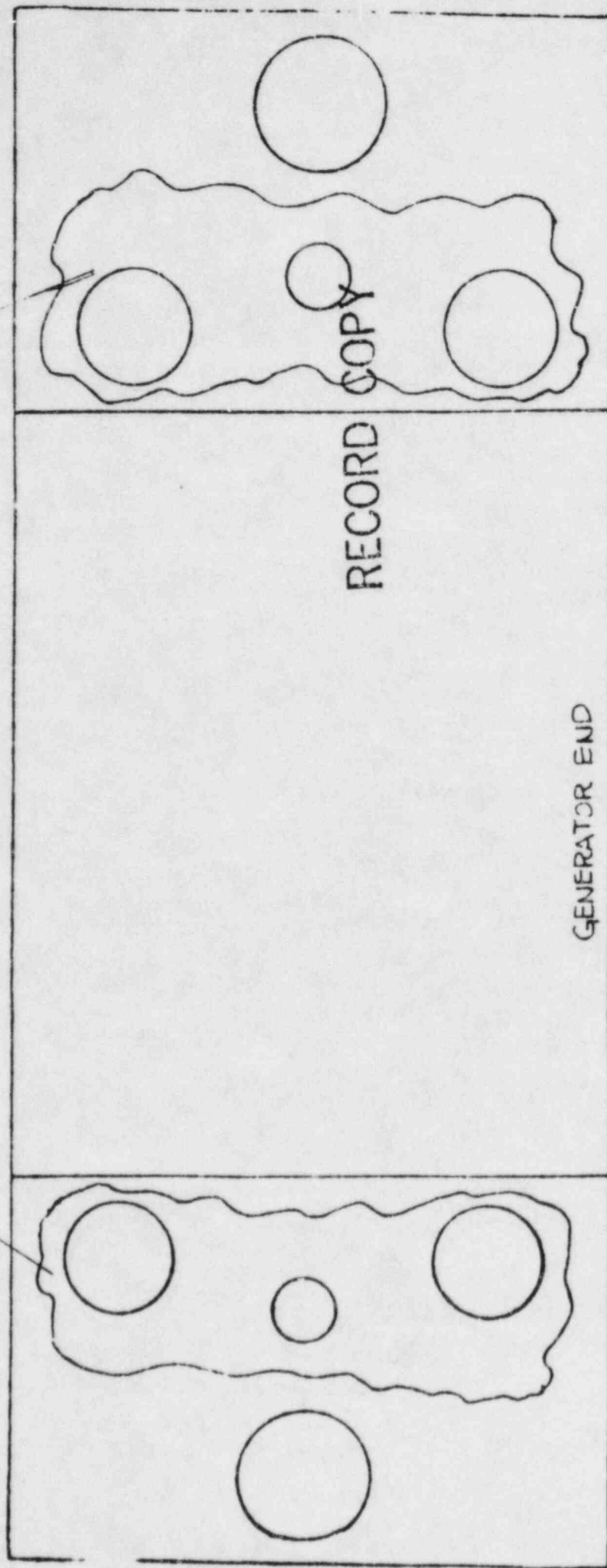
1. F06130000 - S&W Inspection Plan
2. M4000553 - S&W Inspection Report

Inspection Results and Disposition:

1. No indication of excessive wear, fretting, erosion or corrosion was observed in the main bearing saddle area (Satisfactory).
2. No indication of fretting was observed in the cap mating surfaces (Satisfactory).

HP TEST AREA

HP TEST AREA



GENERATOR END

MAIN SADDLE BEARING NO 5

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Base and Bearing Caps

Class: A

Part Number: 03-305D

No. of Separate Inspections: 2

Attributes Verified and Sample Size:

1. Perform visual inspection of cap mating surface for evidence of fretting. Look at main bearing cap between #5 and #6 cylinders - Inspect 1 of 11.

References:

1. F05690000 - S&W Inspection Plan
2. M4000547 - S&W Inspection Report

Inspection Results and Disposition:

1. No indication of excessive wear, fretting, erosion or corrosion was observed in the cap mating surface (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Crankshaft

Class: A

Part Number: 03-310A

No. of Separate Inspections: 56

Attributes Verified and Sample Size:

1. Perform visual inspection of crankpin journal surface for signs of distress - Inspect 8 of 8 journals.
2. Perform eddy current inspection of crankpin journal fillets - Inspect 7 of 16 crankpin journal fillets
3. Perform LP examination of crankpin journal fillets - Inspect 8 of 8 journals inspected.
4. Perform Torsiograph - Inspect 1 of 1 crankshaft.
5. Perform fluorescent LP of crankpin and main bearing oil hole entrance region - Inspect 7 of 15 holes (14 of 14 entrance regions).
6. Take dental impression of the crankpin and main bearing oil holes to a depth of 3 inches - Inspect 9 of 14 entrance regions.
7. Perform visual inspection of crankpin and main bearing oil holes for surface finish - Inspect 9 of 14 entrance regions.

References:

1. F05920000 - S&W Inspection Plan
2. M4000536 - S&W Inspection Report
3. M4000465 - S&W Inspection Report
4. M4000537 - S&W Inspection Report
5. M4000561 - S&W Inspection Report

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Crankshaft

Class: A

Part Number: 03-310A

No. of Separate Inspections: 56

References:

6. M4000538 - S&W Inspection Report
7. M-441 - S&W Rework Control Form

Inspection Results and Disposition:

1. Completed visual inspection of crankpin journal surfaces. No signs of distress evident (Satisfactory).
2. Performed eddy current inspections of crankpin journal fillets. No relevant indications evident (Satisfactory).
3. Performed LP examination of crankpin journal fillets. No relevant indications evident (Satisfactory).
4. Perform torsigraph test during engine break-in run. Results are consistent with TDI Owners Group design review and other engine torsigraph tests (Satisfactory).
5. Fluorescent LP of oil hole entrance region showed no relevant indications (Satisfactory).
6. Dental impressions showed 6 mils deep tool marks. This is within TDI Owners Group acceptance criteria of 20 to 40 mils (Satisfactory).
7. Visual inspection shows the crankshaft oil hole entrance regions having a polished surface finish (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Crankshaft Bearing -
Bearing Shells

Class: A

Part Number: 03-310B

No. of Separate Inspections: 2

Attributes Verified and Sample Size:

1. Perform LP on the main bearing between #5 and #6 crankpin -
Inspect 2 of 22 shell halves.

References:

1. F05680000 - S&W Inspection Plan
2. M4000549 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed LP on main bearing shell halves. Verified lack of scoring, galling. No linear indications evident (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Engine Cylinder Block

Class: A

Part Number: 03-315A

No. of Separate Inspections: 200

Attributes Verified and Sample Size:

1. Perform dimensional inspection (23 measurements per cylinder) of cylinder block liner (see attachment). Document actual measurements - Inspect 8 of 8 cylinders.
2. Perform LP inspection of cylinder block liner landing along top of landing surface, fillet radius, and vertical face adjacent to landing surface (Inspect all liner landings with liners removed) - Inspect 8 of 8 cylinders.
3. Perform MT inspection of engine block top, cylinder head mating surface. Inspections to include area adjacent to stud holes and between adjacent cylinders - Inspect 8 of 8 cylinders.

References:

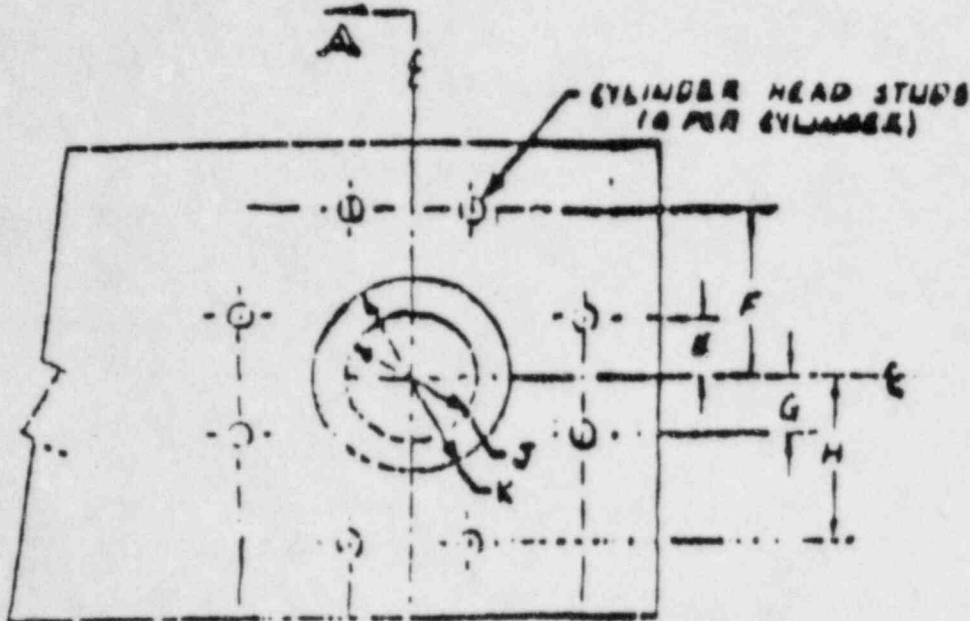
1. F05620000 - S&W Inspection Plan
2. M4000386 - S&W Inspection Report
3. M4000489 - S&W Inspection Report

Inspection Results and Disposition:

1. Dimensional inspection of cylinder block was performed and preliminary information is satisfactory. Awaiting final disposition from TDI Owners Group.
2. Completed LP inspection of the cylinder block liner landing. No indications evident (Satisfactory).
3. Completed MT of the engine block top. No indications observed (Satisfactory).

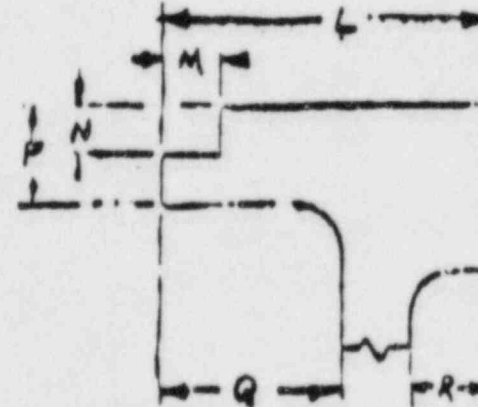
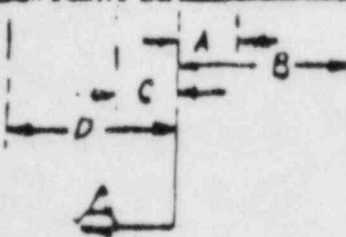
CYLINDER BLOCK

20F410
 Inspection Plan
 K122V10010302
 Attachment 1
 Rev 0
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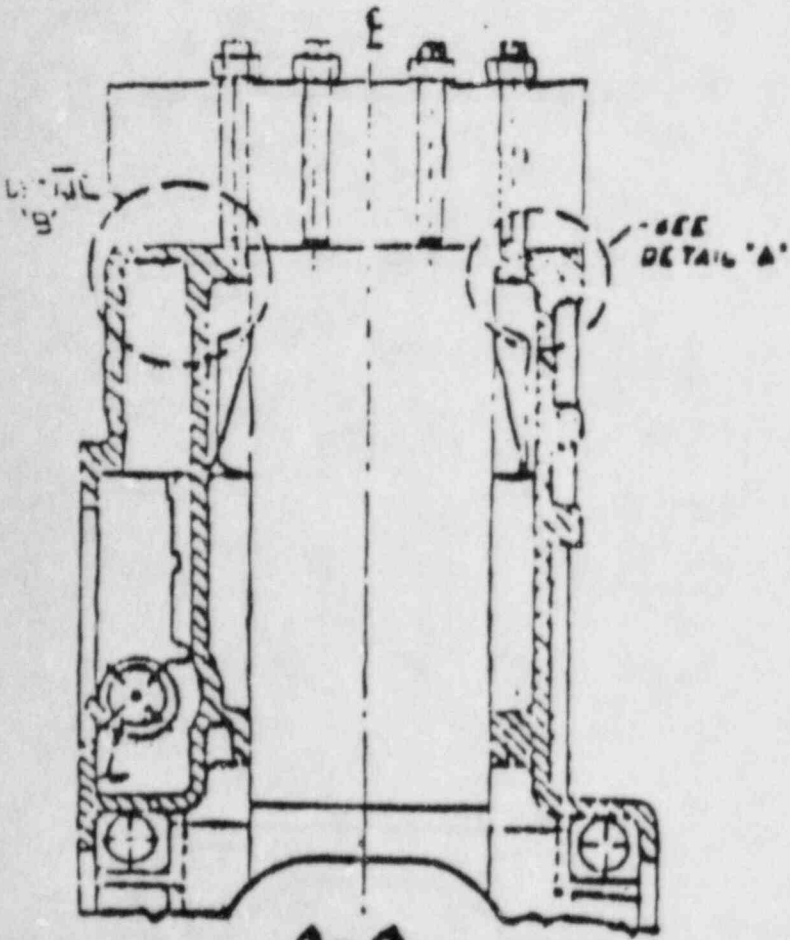


FRONT
 END
 OF
 BLOCK

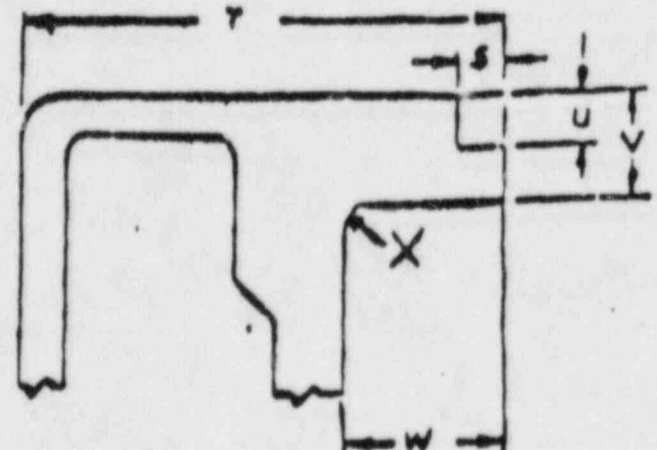
(TYPICAL FOR
 8 CYLINDERS)



DETAIL 'A'



A-A



DETAIL 'B'

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Block Liner

Class: A

Part Number: 03-315C

No. of Separate Inspections: 152

Attributes Verified and Sample Size:

1. Verify dimensions including bore, length, height, outside diameter and shoulder height (17 measurements per liner). Perform visual inspection of outside pilot diameter at top where it contacts cylinder block. Look for indications of contact spalling. Visually inspect piston liner over zone or piston travel. Look for indications of scuffing, scoring - Inspect 8 of 8 liners.
2. Sunnen hone used to machine crosshatch into liners - Inspect 8 of 8 liners.

References:

1. F06100000 - S&W Inspection Plan
2. M4000554 - S&W Inspection Report
3. M4000490 - S&W Inspection Report

Inspection Results and Disposition:

1. Visual inspection revealed a chipped liner. While satisfactory for engine operation, this liner was removed from service. Through verifying dimensions, two liners were removed because of out-of-roundness (Unsatisfactory) and replaced with Engine 1B liners that are within TDI tolerances (Satisfactory). The two out-of-round liner bores were machined with a sunnen hone to within TDI allowable tolerances and are used as spares.
2. Sunnen hone used to machine crosshatch into cylinder liners (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Block Stud

Class: B

Part Number: 03-315E

No. of Separate Inspections: 101

Attributes Verified and Sample Size:

1. Perform visual inspection of head studs for signs of distress - Inspect 32 of 64 studs (random sampling).
2. Perform hardness test - Inspect 1 of 64 (sample taken from the above selected 32 studs).
3. Perform material comparitor test - Inspect 4 of 64 (sample taken from the above selected 32 studs).
4. Verify installation torque at assembly - Inspect 64 of 64.

References:

1. F05840000 - S&W Inspection Plan
2. M4000425 - S&W Inspection Report
3. M4000433 - S&W Inspection Report
4. M4000523 - S&W Inspection Report
5. M4000657 - S&W Inspection Report

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Block Stud

Class: B

Part Number: 03-315E

No. of Separate Inspections: 101

Inspection Results and Disposition:

1. Random sampling of head studs showed 2 of 32 had nicked threads (Unsatisfactory). This is not considered unusual for threads removed at least two times. All (100%) of the cylinders block stud holes and studs were cleaned using taps and dies prior to reassembly (Satisfactory).
2. Hardness test was performed and preliminary information is satisfactory. Awaiting final disposition from TDI Owners Group.
3. Material comparator test was performed and preliminary information is satisfactory. Awaiting final disposition from TDI Owners Group.
4. Verified stud torque of 100 ft-lbs into the block (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Block Nuts

Class: B

Part Number: 03-315F

No. of Separate Inspections: 136

Attributes Verified and Sample Size:

1. Visual examination of all nuts for identifying marks - Inspect 64 of 64.
2. Visual inspection of nuts for forging laps - Inspect 8 of 64 (random sampling).
3. Verify proper installation of nut torque - Inspect 64 of 64.

References:

1. F05660000 - S&W Inspection Plan
2. M4000466 - S&W Inspection Report
3. M4000656 - S&W Inspection Report

Inspection Results and Disposition:

1. Identifying marks were examined and recorded (Satisfactory).
2. Inspected nuts for forging laps. None observed (Satisfactory).
3. Verified nut torque value of 3600 ft-lbs in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Connecting Rod

Class: A

Part Number: 03-340A

No. of Separate Inspections: 30

Attributes Verified and Sample Size:

1. Perform LP inspection of wrist pin bushing inside diameter surface
- Inspect 8 of 8.
2. Perform a visual inspection of upper connecting rod bushing eye oil passage without removal of bushing. Map machined surface conditions for surface flaws - Inspect 8 of 8.
3. Perform material comparitor test on connecting rods - Inspect 3 of 8.
4. Perform superficial hardness test on connecting rods - Inspect 3 of 8.
5. Perform eddy current on connecting rod oil holes for cracks -
Inspect 8 of 8.

References:

1. F05610000 - S&W Inspection Plan
2. M4000423 - S&W Inspection Report
3. M4000457 - S&W Inspection Report
4. M4000398 - S&W Inspection Report

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Connecting Rod

Class: A

Part Number: 03-340A

No. of Separate Inspections: 30

Inspection Results and Disposition:

1. Performed LP of wrists pins and observed no indications (Satisfactory).
2. Performed visual inspection of upper connecting rod bushing eye holes for flaws. No surface flaws evident (Satisfactory).
3. Performed material comparitor test on three connecting rods. Preliminary information is satisfactory. Awaiting final disposition from the TDI Owners Group.
4. Performed superficial hardness test on three connecting rods. Preliminary information is satisfactory. Awaiting final disposition from the TDI Owners Group.
5. Eddy current inspection of connecting rod oil holes showed no relevant indications (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Connecting Rod Bearing Shells

Class: None

Part Number: 03-340B

No. of Separate Inspections: 120*

Attributes Verified and Sample Size:

1. Perform RT inspection of upper and lower connecting rod bearing shells - Inspect 16 of 16.
2. Perform eddy current inspection to identify surface discontinuity - Inspect 16 of 16.
3. Visual inspection of bearing shells - Inspect 16 of 16.
4. Perform LP inspection of bearing shells - Inspect 16 of 16.
5. Measure dimensions in accordance with TDI specifications - Inspect 16 of 16.

NOTE (*): This includes 8 spare bearing shell halves and bearing shell halves which were inspected for use with Engine 1A.

References:

1. F06030000 - S&W Inspection Plan
2. M4000539 - S&W Inspection Report
3. M4000540 - S&W Inspection Report
4. M4000566 - S&W Inspection Report
5. M4000412 - S&W Inspection Report

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Connecting Rod Bearing Shells

Class: None

Part Number: 03-340B

No. of Separate Inspections: 120*

Inspection Results and Disposition:

1. All of Engine 1A, Engine 1B and spare bearing shell halves were radiographed at the River Bend Site and the results sent to the TDI Owners Group . The TDI Owners Group dispositioned 7 bearing shell halves as rejected (6 of 16 from Engine 1A; 1 of 16 from 1B; 0 of 8 from spares) (Unsatisfactory). Six bearing shell halves were dispositioned as suitable for lower shell use and 27 bearing shell halves were dispositioned as suitable for lower or upper shell service. Only bearing shells with a satisfactory RT inspection are used in Engine 1A at locations dispositioned for service (Satisfactory).
2. Eddy current inspections were performed on bearing shells with a "satisfactory" RT inspection (33 of 40). No relevant indications evident (Satisfactory).
3. Visual inspections of all 40 bearing shell halves showed minor pitting and scratches. This occurs due to required crankshaft turning, with the barring device, with no appreciable lubrication from the engine driven lube oil pump (Satisfactory).
4. Completed LP inspection of all 40 bearing shell halves. No indications evident (Satisfactory).
5. Verified dimensions are in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSFECTION REPORT

Part Name: Pistons

Class: A

Part Number: 03-341A

No. of Separate Inspections: 16

Attributes Verified and Sample Size:

1. Perform LP inspection of piston skirts. Map all linear indications in stud and boss areas - Inspect 8 of 8.
2. Perform visual inspection of skirt and crown outside diameter for scuffing and combustion bowl in crown for pitting - Inspect 8 of 8.

References:

1. F05640000 - S&W Inspection Plan
2. M4000399 - S&W Inspection Report
3. M4000546 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed LP inspection of new "AE" piston skirts at TDI. No indications evident (Satisfactory).
2. Performed visual inspection of "AE" piston skirts and crowns at TDI. Observed no defects (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Piston Rings

Class: A

Part Number: 03-341B

No. of Separate Inspections: 80

Attributes Verified and Sample Size:

1. Visual inspection of rings for wear, pitting, and flaking - Inspect 40 of 40.
2. Verify piston ring installation is in compliance with TDI assembly requirements - Inspect 40 of 40.

References:

1. F05830000 - S&W Inspection Plan
2. M4000595 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed a visual inspection of the piston rings. These are new "Muskegon" rings that showed no signs of wear, pitting, and flaking (Satisfactory).
2. Verified piston ring installation is in compliance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Piston Pin Assembly

Class: A

Part Number: 03-341C

No. of Separate Inspections: 29

Attributes Verified and Sample Size:

1. Perform visual inspection for signs of distress - Inspect 8 of 8 pins.
2. Perform material comparitor test - Inspect 1 of 8 pins.
3. Perform hardness test - Inspect 1 of 8 pins.
4. Perform visual inspection of rolled end plug installation - Inspect 8 of 8 pins.
5. Perform LP inspection for evidence of linear indications - Inspect 8 of 8 pins.

References:

1. F05910000 - S&W Inspection Plan
2. M4000421 - S&W Inspection Report
3. M4000400 - S&W Inspection Report
4. M4000556 - S&W Inspection Report
5. M4000557 - S&W Inspection Report

Inspection Results and Disposition:

1. Visual inspection shows one piston with surface defects (Unsatisfactory). This pin was replaced with a fully inspected Engine 1B pin to support Engine 1A test schedule. Observed no signs of distress on the replacement pin or the remaining Engine 1A pins (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Piston Pin Assembly

Class: A

Part Number: 03-341C

No. of Separate Inspections: 29

Inspection Results and Disposition

2. Material comparator test performed on one piston pin. Preliminary results are satisfactory. Awaiting final disposition from TDI Owners Group.
3. Hardness test performed on one piston pin. Preliminary results are satisfactory. Awaiting final disposition from TDI Owners Group.
4. Performed visual inspection of rolled end plugs and verified plugs tightly sealed (Satisfactory).
5. LP inspection showed indication on one piston pin with visual surface defects (Unsatisfactory). See Item 1 for explanation of change-out with a satisfactory piston pin. Observed no indications on the replacement pin (from Engine 1B) or the remaining Engine 1A pins (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Tappets and Guides - Intake
and Exhaust

Class: A

Part Number: 03-345A

No. of Separate Inspections: 16

Attributes Verified and Sample Size:

1. Visual check of roller clearances to be performed where accessible
- Inspect 8 of 16.

References:

1. F06010000 - S&W Inspection Plan
2. M4000451 - S&W Inspection Report
3. M4000820 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of intake and exhaust rollers for cylinders #1, #2, #7, and #8. All rollers rotate freely and there is no measureable movement between pin and rollers. Inspection performed before and after 24 hour run (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Tappets and Guides - Fuel
Tappet Assembly

Class: A

Part Number: 03-345B

No. of Separate Inspections: 8

Attributes Verified and Sample Size:

1. Visual check of roller to pin clearance and determine freedom of movement of pinto roller - Inspect 4 of 8.

References

1. F05820000 - S&W Inspection Plan
2. M4000452 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of fuel tappet rollers for cylinders #1, #2, #7, and #8. Verified all rollers rotated freely and there is no measurable movement between pin and rollers. Inspection performed before and after 24 hour run (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Camshaft Assembly

Class: A

Part Number: 03-350A

No. of Separate Inspections: 15

Attributes Verified and Sample Size:

1. Visually inspect cam lobes for indications of premature wear -
Inspect 12 of 24.
2. Verify material of cam lobes by use of superficial hardness test -
Inspect 3 of 24.

References:

1. F06070000 - S&W Inspection Plan
2. M4000449 - S&W Inspection Report
3. M4000822 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of cam lobes for cylinders #1, #2, #7, and #8 after the 24 hour run. No indications of premature wear, scoring, or galling were observed (Satisfactory).
2. Performed hardness test on camshaft lobes. Preliminary information indicates test is satisfactory. Awaiting final disposition from the TDI Owners Group.

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Camshaft - Supports, Bolting
and Gear

Class: A

Part Number: 03-350C

No. of Separate Inspections: 10

Attributes Verified and Sample Size:

1. Confirm, if possible, that torque values were properly applied on support coupling - Inspect 6 of 6.
2. Perform visual inspection of cam gears, where accessible, before and after test - Inspect 1 of 1.
3. Verifying material properties of cam gear by use of comparitor and superficial hardness test - Inspect 1 of 1.

References:

1. F059000000 - S&W Inspection Plan
2. M4000444 - S&W Inspection Report
3. M4000819 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified all support bolts are in place. Bolts are secured by lock tabs (Satisfactory).
2. Performed visual inspection of cam gear before and after 24 hour run. Observed no indication of excessive wear (Satisfactory).
3. Performed material comparitor and superficial hardness test of the cam gear. Preliminary information indicates the cam gear material is satisfactory. Awaiting final disposition from the TDI Owners Group.

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Idler Gear Assembly
Crank To Pump Gear

Class: A

Part Number: 03-355A

No. of Separate Inspections: 1

Attributes Verified and Sample Size:

1. Perform visual inspection of crank to pump gear for wear, pitting, or any other discontinuities on gear teeth. Inspect where accessible - Inspect 1 of 1.

References:

1. F05810000 - S&W Inspection Plan
2. M4000747 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of crank to pump gear teeth after loaded run. Observed no indications of wear, pitting, or any other discontinuities (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Idler Gear Assembly

Class: A

Part Number: 03-355B

No. of Separate Inspections: 3

Attributes Verified and Sample Size:

1. Visual inspection of gear teeth for pitting, wear, chips/nicks, where accessible - Inspect 1 of 1.
2. Perform hardness and material comparator test on gears - Inspect 1 of 1.

References:

1. F06060000 - S&W Inspection Plan
2. M4000448 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of gear teeth, where accessible, for signs of excessive wear. No pitting, wear, chips/nicks were observed (Satisfactory).
2. Verified performance of hardness and material comparator test on idler gear. Preliminary information is satisfactory. Awaiting final disposition from the TDI Owners Group.

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Air Start Valve

Class: A

Part Number: 03-359

No. of Separate Inspections: 35

Attributes Verified and Sample Size:

1. Verify adequate seating of valve and valve ring before performance testing - Inspect 8 of 8.
2. Verify hold down capscrew initial torque and hot torque - Inspect 16 of 16.
3. Dimensional check of hold down capscrew - Inspect 2 of 16.
4. Verify locking pin is in valve arm lock nut - Inspect 8 of 8.
5. Verify gasket seal to cylinder head is proper material - Inspect 8 of 8.

References:

1. F06020000 - S&W Inspection Plan
2. M4000454 - S&W Inspection Report
3. M4000495 - S&W Inspection Report
4. M4000597 - S&W Inspection Report
5. M4000643 - S&W Inspection Report

Inspection Results and Disposition:

1. Visual inspection for adequate seating revealed one air start valve with a defective valve seat (Unsatisfactory). The air start valve was replaced with a spare and inspected. No defective valve seat was observed on the air start valve replacement or the other seven Engine 1A valves (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Air Start Valve

Class: A

Part Number: 03-359

No. of Separate Inspections: 35

Inspection Results and Disposition:

2. Verified hold down capscrew initial torque is in accordance with TDI Manual (Satisfactory).
3. Performed dimensional check of 2 capscrews to verify compliance with TDI requirements (Satisfactory).
4. Verified locking pins are installed in each lock nut (Satisfactory).
5. Verified gasket seal to cylinder head is copper (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Head and Valves

Class: B

Part Number: 03-360A

No. of Separate Inspections: 208

Attributes Verified and Sample Size:

1. Perform LP inspection of exhaust and intake valve seating surfaces - Inspect 32 of 32.
2. Perform MT inspection of fire deck area, excluding valve seat area - Inspect 8 of 8.
3. Perform UT of fire deck (6 locations) to determine thickness between valve seats - Inspect 8 of 8.
4. Blue-check valves to valve seat - Inspect 32 of 32.

References:

1. F05630000 - S&W Inspection Plan
2. M4000411 - S&W Inspection Report
3. M4000488 - S&W Inspection Report
4. M4000544 - S&W Inspection Report
5. M4000607 - S&W Inspection Report

Inspection Results and Disposition:

1. Two of eight cylinder heads (#1 and #7) were rejected due to cracks observed in the valve seating surfaces (Unsatisfactory).
2. Performed MT with no indications observed in the fire deck area of cylinder heads #1 thru #8 (Satisfactory).

RIVER BFND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Head and Valves

Class: B

Part Number: 03-360A

No. of Separate Inspections: 208

Inspection Results and Disposition:

3. Five of eight cylinder heads (#2, #3, #4, #6, #8) were rejected due to having a fire deck thickness of less than 0.400 inches (Unsatisfactory). The other three cylinder heads (#1, #5, #7) had a fire deck thickness of less than 0.500 inches but greater than 0.400 inches.

All eight cylinder heads were rejected prior to field engine operation. Cylinder head #5 met TDI Owners Group criteria, but was rejected based on the TDI Owners Group recommendation to have a fire deck thickness of not less than 0.500 inches to eliminate the need for air roll requirements. These eight cylinder heads were replaced with eight new cylinder heads. Six spares were inspected prior to shipment from TDI under the attributes listed above and two spares were inspected at the site. Performed LP and MT on the eight cylinder head replacements with no indications observed. The cylinder head replacements have a fire deck thickness between the valve seats greater than 0.500 inches (Satisfactory).

4. All cylinder head valves were blue-checked into the valve seats before installation on Engine 1A. (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Head Valves -
Intake and Exhaust

Class: B

Part Number: 03-360B

No. of Separate Inspections: 268

Attributes Verified and Sample Size:

1. Before performance testing visually inspect valve and valve internals to determine valve ring and seat wear - Inspect 32 of 32.
2. Inspect stems to ensure adequate lubrication and clearance - Inspect 32 of 32.
3. Perform dimensional check on valves - Inspect 32 of 32.
4. Perform visual inspection of valve stem at contact area with rocker arm - Inspect 32 of 32.
5. Perform LP of the bended radius between valve stem and valve head - Inspect 32 of 32.

References:

1. F05880000 - S&W Inspection Plan
2. M4000418 - S&W Inspection Report
3. M4000458 - S&W Inspection Report
4. M4000483 - S&W Inspection Report
5. M4000502 - S&W Inspection Report
6. M4000545 - S&W Inspection Report
7. M4000609 - S&W Inspection Report
8. M4000641 - S&W Inspection Report

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Head Valves -
Intake and Exhaust

Class: B

Part Number: 03-360B

No. of Separate Inspections: 268

Inspection Results and Disposition:

1. No scuffing erosion on valve ring or valve seat area, scuffing or scoring of chrome plate on the valve stems, or signs of adverse wear, scoring or galling on the stem to rocker arm contact surface observed on any of the 32 valves (Satisfactory).
2. Performed dimensional check to TDI specifications for cylinders #3, #4, and #5 (total of 12 valve stems) with no scuffing or scoring of chrome plate on valve stems (Satisfactory).
3. Performed LP with linear indication observed on 3 of 32 at the bended radius between valve stem and valve head (Unsatisfactory).
4. No blue check was performed due to the rejection of the original eight cylinder heads (see Engine 1A Inspection Report for 03-360A).

All thirty-two cylinder head valves were dispositioned back to TDI due to the rejection of the eight cylinder heads. These eight cylinder heads and the thirty-two cylinder head valves were replaced. Twenty-four spare cylinder head valves were inspected prior to shipment from TDI under the attributes listed above and eight were inspected at the site. No scuffing erosion on valve ring or valve seat area was observed. No scuffing or scoring of chrome plate on valve stems was observed. No signs of adverse wear, scoring or galling on stem surface was observed. No indications were observed at the bended radius between valve stem and valve head (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Head Valves -
Bolting and Gasket

Class: B

Part Number: 03-360C

No. of Separate Inspections: 16

Attributes Verified and Sample Size:

1. Verify proper gaskets installed per engine specification requirements - Inspect 8 of 8 gaskets.
2. Visual inspection of gasket for signs of distress - Inspect 8 of 8 gaskets.

References:

1. F06050000 - S&W Inspection Plan
2. M4000648 - S&W Inspection Report
3. M4000727 - S&W Inspection Report

Inspection Results and Disposition:

1. Proper installation of new "O" rings and flexatallic gaskets in accordance with TDI specifications requirements (Satisfactory).
2. No gasket leaks or signs of distress were observed (Satisfactory)

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Head Valves -
Springs and Retainers

Class: B

Part Number: 03-360D

No. of Separate Inspections: 32

Attributes Verified and Sample Size:

1. Visually inspect and document color coded valve springs - Inspect 32 of 32 valve springs.

References:

1. F05870000 - S&W Inspection Plan
2. M4000397 - S&W Inspection Report
3. M4000624 - S&W Inspection Report

Inspection Results and Disposition:

1. Visually inspected color coded valve springs. Verified absence of gray springs with brown stripe downside. Black springs with stripe downside installed on each head (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Cylinder Head Subcover Assembly Class: B

Part Number: 03-362A

No. of Separate Inspections: 92

Attributes Verified and Sample Size:

1. Visual inspection of subcover assembly web area for indications of cracking - Inspect 4 of 8.
2. Perform LP inspection of bolt seat area for evidence of linear indications only - Inspect 88 of 88 bolt seats.

References:

1. F06040000 - S&W Inspection Plan
2. M4000415 - S&W Inspection Report

Inspection Results and Disposition:

1. Visual inspection of the subcover assembly web areas to #1, #3, #7, and #8 cylinders revealed no cracks (Satisfactory).
2. Completed LP inspection of bolt seat area for evidence of linear indications. No linear indications observed (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Fuel Injection Tube Assembly

Class: B

Part Number: 03-365C

No. of Separate Inspections: 8

Attributes Verified and Sample Size:

1. Verify performance of eddy current inspection of fuel injection tube inside diameter - Inspect 8 of 8.

References:

1. F056000000 - S&W Inspection Plan
2. M4000456 - S&W Inspection Report
3. M4000472 - S&W Inspection Report

Inspection Results and Disposition:

1. Eddy current examination revealed an indication exceeding TDI Owners Group acceptance criteria on 4 of 8 fuel injection tube assemblies (Unsatisfactory). River Bend has currently shrouded all fuel injection tubing with fire hose which eliminates the potential for personnel or fire hazards. This, however, will be replaced in the near future with an improved fuel injection tube with shrouding.

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Fuel Pump Linkage - Fuel
Pump Control Shaft

Class: A

Part Number: 03-371A

No. of Separate Inspections: 1

Attributes Verified and Sample Size:

1. Verify hardness of fuel pump control shaft by superficial hardness test - Inspect 1 of 1.

References:

1. F05860000 - S&W Inspection Plan
2. M4000443 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified performance of hardness test on fuel pump control shaft. Preliminary information is satisfactory. Awaiting final disposition from TDI Owners Group.

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Fuel Pump Linkage

Class: A

Part Number: 03-371B

No. of Separate Inspections: 8

Attributes Verified and Sample Size:

1. Visually inspect linkage and bearings to determine freedom of movement and adequate bearing lubrication is in compliance with TDI recommendations - Inspect 8 of 8.

References:

1. F060000000 - S&W Inspection Plan
2. M4000796 - S&W Inspection Report

Inspection Results and Disposition:

1. Each bearing was verified that proper lubrication was applied prior to engine operation in accordance with TDI recommendations and that the fuel pump linkage moves without unnecessary force (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Intake Manifold

Class: B

Part Number: 03-375

No. of Separate Inspections: 16

Attributes Verified and Sample Size:

1. Visually inspect all intake manifolds for cracks at both flange faces - Inspect 8 of 8.
2. Upon reinstallation ensure that manifold installation does not cause excessive stress on flange bolt holes due to misalignment - Inspect 8 of 8 manifold elbows.

References:

1. F05850000 - S&W Inspection Plan
2. M4000651 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of intake elbow flange faces with no cracks observed (Satisfactory).
2. Verified that no undue stress was applied to the intake elbow flanges during installation (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Exhaust Manifold Gaskets
and Bolting

Class: B

Part Number: 03-380B

No. of Separate Inspections: 32

Attributes Verified and Sample Size:

1. Verify proper material, bolting and knee braces installed at manifold and flange connections. Verify bolt torque - Inspect 12 of 12 capscrews and 4 of 4 knee braces.
2. Verify proper gasket material - Inspected 8 of 8.
3. Verify at reinstallation, no binding exists on manifold. Verify no cracks at manifold-flange weld joint - Inspect 8 of 8.

References:

1. F05990000 - S&W Inspection Plan
2. M4000635 - S&W Inspection Report

Inspection Results and Disposition:

1. Two of the three capscrews at the knee brace to engine attachment at cylinder #8 were sheared off. This knee brace supports the exhaust manifold/water shrouds (Unsatisfactory). All 12 knee brace bolts were replaced with higher grade bolts with proper dimensions and torqued in accordance with the TDI Manual (Satisfactory).
2. Verified proper gaskets and bolting at exhaust manifold to head connections (Satisfactory).
3. Verified no binding exist on manifold and that no cracks were evident at the manifold-flange weld joint (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Intake and Intermediate Rocker
Arm Shaft Assembly

Class: B

Part Number: 03-390A

No. of Separate Inspections: 49

Attributes Verified and Sample Size:

1. Perform visual inspection of intake and intermediate rocker arm assemblies for signs of distress and linear indications/chipped pieces in the outer lips of pushrod cups - Inspect 8 of 8 rocker arms and 24 of 24 pushrod cups.
2. Perform material comparitor test on one rocker arm assembly - Inspect 1 of 8.
3. Verify torque on capscrews - Inspect 16 of 16.

References:

1. F05940000 - S&W Inspection Plan
2. M4000406 - S&W Inspection Report
3. M4000420 - S&W Inspection Report
4. M4000649 - S&W Inspection Report

Inspection Results and Disposition:

1. Visual inspection revealed 5 of 24 chipped pushrod cups. (Unsatisfactory) While this would not adversely affect rocker arm operation, the chipped cups were removed and replaced with spare pushrod cups. The cups were replaced under the supervision of a TDI representative. No linear indications evident (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Intake and Intermediate Rocker
Arm Shaft Assembly

Class: B

Part Number: 03-390A

No. of Separate Inspections: 49

Inspection Results and Disposition:

2. Verified performance of material comparator test on the rocker arm shaft. The preliminary information is satisfactory. Awaiting final disposition from the TDI Owners Group.
3. Verified capscrews torqued in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Exhaust Rocker Arm
Assemblies

Class: B

Part Number: 03-390B

No. of Separate Inspections: 25

Attributes Verified and Sample Size:

1. Perform visual inspection of exhaust rocker arm assemblies for signs of distress and linear indications/chipped pieces in the outer lips of pushrod cups - Inspect 8 of 8.
2. Perform material comparator test on one rocker arm assembly - Inspect 1 of 8.
3. Verify torque on capscrews - Inspect 16 of 16

References:

1. F05770000 - S&W Inspection Plan
2. M4000407 - S&W Inspection Report
3. M4000422 - S&W Inspection Report
4. M4000652 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of exhaust rocker arm assemblies for signs of distress, linear indications, and chipped pushrod cups. None of these defects were evident (Satisfactory).
2. Verified performance of material comparator test. Preliminary information shows the test as satisfactory. Awaiting final disposition from the TDI Owners Group.
3. Verified capscrews were torqued in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Pushrods - Intake And Exhaust

Class: B

Part Number: 03-390C

No. of Separate Inspections: 19

Attributes Verified and Sample Size:

1. Verify installation of friction welded pushrods - Inspect 16 of 16.
2. Perform LP inspection on one cylinder for two pushrods and one connection pushrod - Inspect 3 of 16.

References:

1. F05800000 - S&W Inspection Plan
2. M4000414 - S&W Inspection Report
3. M4000428 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified new friction welded pushrods have been installed (Satisfactory).
2. Performed LP inspection of pushrods. Found no indications (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Pushrod-Connector

Class: B

Part Number: C3-390D

No. of Separate Inspections: 12

Attributes Verified and Sample Size:

1. Verify installation of new friction welded pushrod - Inspect 8 of 8.
2. Perform LP inspection on connector pushrod - Inspect 4 of 8.

References:

1. F05790000 - S&W Inspection Plan
2. M4000413 - S&W Inspection Report
3. M4000427 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified friction welded connector pushrods have been installed (Satisfactory).
2. Performed LP inspection on connector (4 of 4). No indications observed (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Rocker Arm Bolts
and Drivestuds

Class: B

Part Number: 03-390G

No. of Separate Inspections: 92

Attributes Verified and Sample Size:

1. Verify application of proper bolting and torque value - Inspect 32 of 32.
2. Perform MT inspection of rocker arm capscrews for linear indications (thread root area) - Inspect 32 of 32.
3. Verify material properties by use of comparitor and superficial hardness test - Inspect 4 of 32.
4. Visual inspection of drivestuds (rivets) - Inspect 24 of 24.

References:

1. F05780000 - S&W Inspection Plan
2. M4000447 - S&W Inspection Report
3. M4000448 - S&W Inspection Report
4. M4000464 - S&W Inspection Report
5. M4000650 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified proper torque of rocker arm shaft bolts in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Rocker Arm Bolts
and Drivestuds

Class: B

Part Number: 03-390G

No. of Separate Inspections: 92

Inspection Results and Disposition:

2. Performed MT inspection of rocker arm capscrews for linear indications. No indications observed (Satisfactory).
3. Verified performance of material comparator test and superficial hardness test on four rocker arm shaft bolts. Preliminary information in satisfactory. Awaiting final disposition from the TDI Owners Group.
4. Performed visual inspection of drivestuds (rivets). Verified no movement of rivets. All rivets are installed and are in good condition (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Governor Drive Coupling,
Pins, and Keys

Class: A

Part Number: 03-402B

No. of Separate Inspections: 4

Attributes Verified and Sample Size:

1. Verify coupling material does not degrade - Inspect 1 of 1.
2. Verify via documentation, the coupling material installed is neoprene - Inspect 1 of 1.
3. Verify set screw and drive pin are locked in place in accordance with installation instruction - Inspect 2 of 2 set screws and 1 of 1 drive pin.

References:

1. F06140000 - S&W Inspection Plan
2. M4000463 - S&W Inspection Report
3. M4000722 - S&W Inspection Report

Inspection Results and Disposition:

1. Documentation verifies replacement of flexible element of governor drive coupling material. The coupling material is neoprene (Satisfactory).
2. Verified the coupling material shows no signs of cracking or peeling (Satisfactory).
3. Verified set screws and drive pin are locked in place in accordance with installation instruction (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Overspeed Governor

Class: A

Part Number: 03-410A

No. of Separate Inspections: 2

Attributes Verified and Sample Size:

1. Verify proper installation and assembly of governor and calibration of overspeed trips - Inspect 1 of 1.
2. Review operational procedure used for governor - Inspect 1 of 1.

References:

1. F05960000 - S&W Inspection Plan
2. M4000723 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified operational checks and setting of governor and overspeed trip by Woodward and TDI (Satisfactory).
2. Witnessed three consecutive runs to 517 RPM. Verified the overspeed governor shut-down engine at this speed (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Governor Linkage

Class: A

Part Number: 03-413

No. of Separate Inspections: 3

Attributes Verified and Sample Size:

1. Verify the governor linkage is free-moving and fully adjustable during engine initial operation - Inspect 1 of 1.
2. Verify lock-nuts are properly installed - Inspect 2 of 2.

References:

1. F05750000 - S&W Inspection Plan
2. M4000726 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified that during engine operation the governor and fuel pump linkages were free-moving and that adjustment to the linkage assemblies could be readily performed (Satisfactory).
2. Verified that all lock-nuts were properly installed in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Governor Heat Exchanger

Class: A

Part Number: 03-415C

No. of Separate Inspections: 1

Attributes Verified and Sample Size:

1. Verify that the heat exchanger is mounted below the oil level in the governor - Inspect 1 of 1.

References:

1. F05740000 - S&W Inspection Plan
2. M4000424 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified that the heat exchanger is mounted below the oil level in the governor in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Jacket Water Pump

Class: A

Part Number: 03-425A

No. of Separate Inspections: 2

Attributes Verified and Sample Size:

1. Verify material of shaft with superficial hardness and material comparitor test - Inspect 1 of 1.
2. Disassemble jacket water pump and visually inspect gears to shaft contact for signs of excessive scoring wear on shaft and pitting or galling on gear teeth - Inspect 1 of 1.
3. LP roots of gear teeth and transition area (gear to shaft) - Inspect 1 of 1.
4. Visually inspect clearance ring for evidence of galling or excessive wear - Inspect 1 of 1.
5. Verify bearing surface contact between impeller and shaft to insure rebuilt pumps meet specifications - Inspect 1 of 1.
6. Verify material properties of impeller and perform superficial hardness test - Inspect 1 of 1.

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Jacket Water Pump

Class: A

Part Number: 03-425A

No. of Separate Inspections: 2

References:

1. F05730000 - S&W Inspection Plan
2. M4000446 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified performance of a superficial hardness test on the jacket water pump impeller. A visual inspection of the impeller was performed and revealed that the impeller was magnetic and had a slight rust film covering most of the impeller (Satisfactory). However, an improved water pump design with nodular iron material and without the shaft keyway will be satisfactorily inspected and installed on Engine 1A. The remaining inspections detailed above have been discontinued until the replacement jacket water pump is received.

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Fuel Oil Filters and Strainers

Class: B

Part Number: 03-455A

No. of Separate Inspections: 2

Attributes Verified and Sample Size:

1. Verify thru-bolt adequately installed on filters - Inspect 2 of 2.

References:

1. F05720000 - S&W Inspection Plan
2. M4000429 - S&W Inspection Report

Inspection Results and Disposition:

1. Verified torque on attachment bolts of the fuel oil filters and strainers in accordance with the TDI Manual (Satisfactory).

RIVER BEND TRANSAMERICA DELAVAL DIESEL 1A INSPECTION REPORT

Part Name: Turbocharger Brkt - Air
Butterfly Valve Assembly

Class: A

Part Number: 03-475B

No. of Separate Inspections: 5

Attributes Verified and Sample Size:

1. Inspect butterfly to shaft attachment pins for signs of distress - Inspect 3 of 3.
2. Perform visual inspection of shaft condition, lubrications, wear and distress - Inspect 1 of 1.
3. Verify installation and alignment of butterfly valve - Inspect 1 of 1.

References:

1. F06080000 - S&W Inspection Plan
2. M4000430 - S&W Inspection Report
3. M4000579 - S&W Inspection Report

Inspection Results and Disposition:

1. Performed visual inspection of butterfly valve shaft attachment pins. No signs of wear, distortion, hole elongations, and pin looseness evident (Satisfactory).
2. Performed visual inspection of butterfly shaft condition. No signs of wear or distress evident (Satisfactory).
3. Witnessed restoration and installation of the air butterfly valve. Verified new gaskets were installed and that proper torque was applied to the fasteners in accordance with the TDI Manual. No misalignment or cold spring was observed at piping connections (Satisfactory).