TDI DIESEL GENERATOR

DESIGN REVIEW AND QUALITY REVALIDATION REPORT

Prepared For

GULF STATES UTILITIES

RIVER BEND STATION

By

TDI DIESEL GENERATOR OWNERS GROUP

VOLUME 1

TDI DIESEL GENERATOR

DESIGN REVIEW

AND

QUALITY REVALIDATION

REPORT

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Thirteen U.S. nuclear utilities have formed the Transamerica Delaval, Inc (TDI) Diesel Generator Owners Group in order to address operational and regulatory issues relative to Transamerica Delaval diesel generator sets used for backup power supplies in U.S. nuclear power plants. The TDI Diesel Generator Owners Group established a comprehensive program, through a combination of design reviews, quality revalidations, engine tests and component inspections, to provide an in-depth assessment of the adequacy of the respective utilities' TDI diesel generators to perform their intended safety related functions.

The first major program element was characterized as Phase I and involved the resolution of generic known problems. A review of the accumulated operational experience resulted in the conclusion by the Owners Group Technical Staff that a limited number of components warranted priority attention and consideration as significant known problems with potentially generic applicability. Final reports for each of these components were submitted by the Owners Group to the NRC for review. The purpose of this accelerated review was to establish a basis for licensing plants with TDI diesel generators prior to completion of the follow up effort described below. This review has shown that with implementation of the Phase I report recommendations, TDI diesel generators can reliably perform their intended function.

The second major program element involved design reviews and quality revalidations of selected engine components. The Owners Group Design Review and Quality Revalidation Program (DR/QR) was established to perform these examinations for each owner's engine in order to assess each engine's ability to reliably perform its intended design function. The effort was conducted by a centralized team of engineering personnel with specialized skills in appropriate fields including diesel generator design, operation, and manufacture.

The first portion of the DR/QR Program involved reviewing the Engine Parts List and selecting the components of each engine that warranted a detailed design review and/or quality revalidation. Following component selection these components were subjected to either a design review, a quality revalidation, or both. Upon completion of these reviews, the inspection results, document packages, design review findings and calculation results were reviewed and approved by the Owners Group Technical Staff.

The third major program element involved specific component tests and inspections. The Owners Group Technical Staff, in evaluating specific engine components, provided technical recommendations to each Owner regarding special component inspections, preventive maintenance, and surveillance recommendations which will give added assurance that the engines and components perform their intended operational functions over the life of the plant. The implementation of these recommendations is a plant-specific function.

This final report for Gulf States Utilities (GSU) provides the results of this extensive investigation of 169 components of the TDI DSR-48 diesel generators at River Bend Station Unit 1. It forms the basis for the conclusion that the TDI diesel generators presently installed are fully capable of reliably performing their intended safety function.

1.0 INTRODUCTION

This report has been prepared for Gulf States Utilities by the TDI Diesel Generator Owners Group. The results of the Design Review and Quality Revalidation Program are specifically applicable to River Bend and are based on the generic program methodology briefly discussed in Section 2.0.

The purpose of this report is to provide the results of an extensive investigation of the design and manufacture of 169 components of the TDI DSR-48 diesel generators at River Bend. This report forms the basis for the conclusion that the TDI diesel generators presently installed are fully capable of performing their safety function as described in the River Bend Final Safety Analysis Report.

2.0 PROGRAM PLAN OVERVIEW

The TDI Owners Group Program Plan (the Plan) has been previously provided by reference (1). This overview of the Plan is provided to assist the reader in understanding the generic methodology by which the plant-specific results of Section 3.0 were obtained.

The Plan consists of two phases comprised of the following major elements:

Phase I
Generic Problem Resolution

Phase II
Component Selection
Task Description Preparation
Design Review
Quality Revalidation
Final Documentation

Each element is briefly discussed in the following sections.

2.1 GENERIC PROBLEM RESOLUTION - PHASE I

Using input from various nuclear data sources (INPO, SOERs, LERs, 10CFR50.55e reports & 10CFR21 reports, etc) as well as non-nuclear sources (marine and stationary TDI engine applications), a substantial data base of TDI engine/component operational experience has been accumulated.

A review of this data by the TDI Diesel Generator Owners Group Technical Staff resulted in the conclusion that a limited number of TDI engine components had evidenced sufficient adverse operating experience in one or more applications, such that they warranted priority attention and consideration as significant known problems with potentially generic applicability. Therefore, the Owners Group technical resources were heavily applied to these problem areas in order to expedite the reviews, tests and/or analyses necessary to resolve them. The purpose of this accelerated review was to establish a basis for licensing those plants with near term licensing needs prior to the completion of the Phase II effort.

Resolution of these problems has been pursued on a priority basis and was termed the Phase I effort. The generic known problem listing is generic only to the extent that a body of experience exists to suggest that a design type (or several design types) of a particular component in service in one or more TDI engine applications has not performed acceptably or may not have been designed adequately.

A listing of the identified generic components is included as Table 2.1. Reports on these components have been previously submitted to the NRC for review. Summary Phase II reports for the generic problems (Phase I components) as they apply to River Bend are included in Appendix I of this report.

The results of the reviews of these components are summarized in Section 3.0.

2.2 COMPONENT SELECTION

The diesel generator components to be subjected to the DR/QR Program were determined by a Component Selection Committee. Selection was based on the component's function and role in the overall operation of the engine, the component's nuclear and non-nuclear industry experience, and the Committee's engineering judgement. The selection process included a review of available operating information on TDI diesels and TDI recommended product improvements to ensure that relevant experience was considered.

As part of the component selection process, components were classified as either type A, B, or C. These classifications are based on the effect of the component's failure on the diesel generator performance. Type A components are those whose failure would result in diesel generator shutdown or failure to start in an accident mode. Type B components include those whose failure would result in reduced capacity of the diesel generator or the eventual failure of a Type A component if not detected. Components whose failure have little or no bearing on the effective use or operation of the diesel generator are classified as Type C.

Following classification, the Committee established appropriate design review and quality revalidation requirements. These requirements were then forwarded to the Design Review Group and Quality Revalidation Group for preparation of task descriptions.

Table 2.2 lists those components of the River Bend diesel generators which were reviewed by the Component Selection Committee. The Table identifies the results of the Component Selection process by showing which components required a design review (DR) and/or a quality revalidation (QR), and those components requiring no review. The Category identified in Table 2.2 refers to the Appendix I heading under which that component's DR/QR Summary Report is found.

2.3 TASK DESCRIPTION PREPARATION

The Design Review Group and the Quality Revalidation Group prepared task descriptions to define the tasks (reviews, inspections, calculations, etc.) to be performed to determine the adequacy of each component. The task descriptions included recommendations identified in the selection process as well as Design Review Group and/or Quality Revalidation Group recommended component inspections. These task descriptions provide, as applicable:

A. DR Task Descriptions
   1. Primary component function and required attributes,
   2. Applicable codes and standards,
   3. Alternative codes, standards, or analytical techniques,
   4. Analysis or evaluation to be performed to assure satisfactory design,
   5. Available verifications of TDI analysis (if any), and
   6. Final documentation requirements.

B. QR Task Descriptions (Component Revalidation Checklist)
   1. Component to be validated
   2. Attributes to be verified
   3. Methodology to be used (documentation review, NDE techniques, etc.)
   4. Acceptance criteria
   5. Final documentation requirements

In some cases the Design Review Group and the Quality Revalidation Group prepared task descriptions which required no additional Design Review or Quality Revalidation for certain components. The individual task descriptions in Appendix I contain the justification for this reduction in scope. In general, the basis for not requiring a Design Review and/or Quality Revalidation Report is the following:

Lead Engine Component Reviews - This component was reviewed on a lead engine. Any recommendations which supported the conclusions in the lead engine report are evaluated for applicability to the follow on engine component and included in the task description.

Experience - Either no adverse site or industry experience exists or if it does exist, the task description addresses its resolution.

Task descriptions for all components are included with each component's DR/QR Summary Report in Appendix I. Figure 2.1 graphically depicts the process followed in the DR/QR Program.

2.4 DESIGN REVIEW

The Design Review Group completed the design review in accordance with the task descriptions. Due to the number and diversity of the components and standards involved, the design review was tailored to each component. The actual design review was accomplished by using any one or more of the following methods, including: a) an independent calculation performed by the Design Review Group; b) an independent review of the adequacy, appropriateness or correctness of existing vendor and/or subvendor calculations; c) testing specified by the Design Review Group; or, d) other methods specified and approved in the task descriptions.

During implementation of the task descriptions, the Design Review Group specified quality attributes (in addition to those identified during the component selection process) for incorporation into the quality revalidation process. The Design Review Group also identified any components which may require corrective action to improve reliability of the diesel generators. This included recommendations such as increased frequency of component replacement and/or maintenance, or additional in-service inspection.

2.5 QUALITY REVALIDATION

The Component Quality Revalidation Group was provided with the quality attributes required to be revalidated. QR Task Descriptions were developed to identify methodology for verification of attributes. These task descriptions include applicable component descriptions, attributes to be verified, methodology, acceptance criteria, and type of documentation to be provided.

Each component required to undergo Quality Revalidation was subjected to a documentation review. This process identified and catalogued all appropriate documentation (e.g. material test reports, NDE, vendor/subvendor records, site records, etc) associated with the component. With assistance from Quality Engineering, each document was reviewed for acceptability. These document packages were then made available to the Design Review Group to assist in the engineering review. Important attributes identified by the Design Review Group, for which acceptable documentation did not exist in the component file, were verified by tests and/or inspections performed by the Quality Group.

Tests or inspections required to be performed on components were then forwarded to Quality Engineering to develop detailed methodology and procedures to be followed. These instructions were issued to Quality Inspection via the task description. Field inspections and tests were performed by qualified personnel. Depending upon the specified test or inspection, spare parts or surplus parts in lieu of installed parts were used as the test/inspection article. Results of inspections and tests were summarized by the Quality Revalidation Group and reviewed by the Design Review Group as necessary.

2.6 FINAL DOCUMENTATION

The DR/QR program has been completed for Gulf States Utilities. A summary of the results of this effort are contained in Section 3.0.

Appendix I contains component DR/QR Summary Reports which provide a detailed summary of the review and analysis performed on each component including references to supporting documentation and the recommendations and conclusions resulting from this effort.

Appendix II contains a comprehensive set of maintenance and surveillance recommendations for each component. These recommendations were derived from existing vendor recommendations and the individual component DR/QR Summary reports. The purpose of this Appendix is to provide the utility a basis for its maintenance and surveillance program which will maintain the qualification of its diesel generators for the life of the plant.

This entire report constitutes final documentation of the completion of the DR/QR Program on the River Bend TDI diesel generators pending final completion of a limited number of calculation packages involving nozzle loads, pipe support/restraints, and mechanical reports.

TABLE 2-1

PHASE I COMPONENTS (GENERIC PHASE I)

COMPONENT NUMBER	COMPONENT
MP-017	Turbocharger
03-305A,C,D,E	Base & Bearing Caps
03-310A	Crankshaft
03-315A&C	Cylinder Block & Liners
03-315E	Cylinder Head Studs
03-340A	Cylinder Rods
03-340B	Connecting Rod Bearing Shells
03-341A	Pistons
03-359	Airstart Valve Capscrews
03-360A	Cylinder Heads
03-365C	Fuel Oil Injection Tubing
03-390C&D	Main and Connecting Pushrods
03-390G	Rocker Arm Capscrews
03-425A	Jacket Water Pump
03-688B	Wiring & Termination

TABLE 2-2
RIVER BEND COMPONENT SELECTION RESULTS

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
F-068	Intercooler	X	X		Turbo, Intake, Intercooler & Exhaust
F-139	Tools Turbo			X	
F-161	Pyrometer Wire			X	
MP-020	Turbocharger	X	X		Turbo, Intake, Intercooler & Exhaust
00-420	Lube Oil Pressure Regulating Valve	X	X		Lube Oil
00-491A	Turbocharger - Air Inlet Adapter: Adapter			X	
00-491B	Turbocharger - Air Inlet Adapter: Mounting Hardware W/Flexible Connector			X	
00-495A	Turbocharger - Air Outlet Adapter - Adapter			X	
00-495B	Turbocharger - Air Outlet Adapter - Mounting Hardware			X	
00-520	Instruction Plate - Warning Plate			X	
03-CFR	Turbocharger Thrust Bearing Drip Lube System	X	X		Turbo, Intake, Intercooler & Exhaust
03-305A	Base and Bearing Caps: Base Assembly	X	X		Engine Base & Bearing Caps
03-305B	Base and Bearing Caps: Dowels			X	
03-305C	Base and Bearing Caps: Main Bearing Studs & Nuts	X	X		Engine Base & Bearing Caps
03-305D	Base and Bearing Caps: Main Bearing Caps	X	X		Engine Base & Bearing Caps

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-305E	Base and Bearing Caps - Through Bolting	X	X		Engine Base & Bearing Caps
03-305F	Base and Bearing Caps- Seals, Gaskets, Covers			X	
03-307A	Lube Oil Fittings: Internal - Headers	X	X		Lube Oil
03-307B	Lube Oil Fittings: Internal - Tubing & Fittings	X	X		Lube Oil
03-307C	Lube Oil Fittings Internal: Seals			X	
03-307D	Lube Oil Fittings Internal: Supports	X	X		Lube Oil
03-310A	Crankshaft	X	X		Crankshaft & Bearings
03-310B	Main Bearings	X	X		Crankshaft & Bearing
03-310C	Crankshaft & Bearings: Thrust Bearing Rings.	X	X		Crankshaft & Bearing
03-315A	Cylinder Block	X	X		Cyl. Block & Liners & Water Manifold
03-315B	Cylinder Block Liners & Water Manifold Cam Bearing Caps and Dowels			X	
03-315C	Cylinder Block Liners & Water Manifold - Cylinder Liner	X	X		Cyl. Block & Liners & Water Manifold
03-315D	Cylinder Block Liners & Water Manifold: Jacket Water Manifold & Piping	X	X		Cyl. Block & Liners & Water Manifold
03-315E	Cylinder Block Liners & Water Manifold: Studs	X	X		Cyl. Block & Liners & Water Manifold

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-315F	Cylinder Block Liner & Water Manifold: Cylinder Head Nuts	X	X		Cyl. Block & Liner & Water Manifold
03-315G	Cylinder Block Liners & Water Manifold: Seals & Gaskets	X	X		Cyl. Block & Liners & Water Manifold
03-317A	Water Discharge Manifold: Jacket Water Discharge Manifold	X	X		Jacket Water
03-317B	Water Dicharge Manifold: Coupling & Seals	X	X		Jacket Water
03-317C	Water Discharge Manifold: Supports	X	X		Jacket Water
03-330A	Flywheel	X	X		Flywheel
03-330B	Flywheel - Bolting	X	X		Flywheel
03-331A	Guards: Flywheel Guard Assembly			X	
03-331B	Guards: Rear Coil Guard			X	
03-335A	Front Gear Case: Gear Case			X	
03-335B	Front Gear Case: Gaskets and Bolting		X		Idler Gear Assembly & Front Gear Case
03-340A	Connecting Rods: Rods & Bushings	X	X		Connecting Rods
03-340B	Connecting Rods: Bearing Shells	X	X		Connecting Rods
03-341A	Pistons	X	X		Pistons
03-341B	Pistons: Rings	X	X		Pistons
03-341C	Piston: Pin Assembly	X	X		Pistons
03-345A	Tappets and Guides: Intake & Exhaust Tappet Assembly	X	X		Camshaft & Valve Train
03-345B	Tappets and Guides: Fuel Tappet Assembly	X	X		Camshaft & Valve Train

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-345C	Tappets and Guides: Fuel Pump Base Assembly	X	X		Camshaft & Valve Train
03-350A	Camshaft: Camshaft Assembly	X	X		Camshaft & Valve Train
03-350B	Camshaft: Camshaft Bearing	X	X		Camshaft & Valve Train
03-350C	Camshaft: Supports, Bolting and Gear	X	X		Camshaft & Valve Train
03-355A	Idler Gear Assembly: Crank To Pump Gear	X	X		Idler Gear Assembly & Front Gear Case
03-355B	Idler Gear Assembly: Idler Gear Assembly	X	X		Idler Gear Assembly & Front Gear Case
03-355C	Idler Gear Assembly: Gaskets & Bolting		X		Idler Gear Assembly & Front Gear Case
03-359	Air Start Valve	X	X		Air Start & Barring Device
03-360A	Cylinder Heads	X	X		Cylinder Heads & Valves
03-360B	Cylinder Head Valves: Intake & Exhaust Valves	X			Cylinder Heads & Valves
03-360C	Cylinder Head and Valves: Bolting and Gaskets	X	X		Cylinder Heads & Valves
03-360D	Cylinder Head and Values: Springs and Retainer	X	X		Cylinder Heads & Valves
03-361	Indicating Cocks			X	
03-362A	Subcovers	X	X		Camshaft & Valve Train
03-362B	Cylinder Head Covers: Gaskets and Bolting			X	
03-365A	Fuel Injection Equipment Fuel Injection Pump	X	X		Fuel Oil Injection

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-365B	Fuel Injection Equipment: Fuel Injection Tips	X			Fuel Oil Injection
03-365C	Fuel Injection Equipment - Tube Assembly	X	X		Fuel Oil Injection
03-365D	Fuel Injection Equipment: Supports	X	X		Fuel Oil Injection
03-371A	Fuel Pump Linkage: Fuel Pump Control Shaft, Linkage Assembly & Bearings	X	X		Fuel Oil Injection
03-371B	Fuel Pump Linkage: Fuel Pump Control Shaft: Linkage Assembly and Bearing	X	X		Fuel Oil Injection
03-371C	Fuel Pump Linkage: Automatic Shutdown Cylinder	X	X		Fuel Oil Injection
03-375	Air Intake Manifold and Piping	X	X		Turbo, Intake, Intrclr. & Exhaust
03-380A	Exhaust Manifold	X	X		Turbo, Intake, Intrclr. & Exhaust
03-380B	Exhaust Manifold: Gasket and Bolting	X	X		Turbo, Intake, Intrclr. & Exhaust
03-385A	Cylinder Block Covers: Covers and Relief Valves			X	
03-385B	Cylinder Block Covers: Gaskets and Bolting	X	X		Cyl. Block & Liners & Water Manifold
03-387A	Crankcase Ventilator: Crankcase Vacuum Fan	X	X		Crankshaft & Bearings
03-387B	Crankcase Ventilator - Oil Separator			X	
03-387C	Crankcase Ventilator - Fittings, Bolting, Supports			X	

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-387D	Crankcase Ventilator: Crankcase and Fluid Manometer			X	
03-390A	Intake & Intermediate and Exhaust Rocker Shaft Assembly	X	X		Camshaft & Valve Train
03-390B	Rocker Arms and Pushrods: Exhaust Rocker Shaft Assembly	X	X		Camshaft & Valve Train
03-390C	Main and Connector Pushrods	X	X		Camshaft & Valve Train
03-390D	Rocker Arms and Pushrods: Pushrods Connector.	X	X		Camshaft & Valve Train
03-390E	Rocker Arms and Pushrods: Bushings	X			Camshaft & Valve Train
03-390F	Rocker Arms and Pushrods: Lifters	X	X		Camshaft & Valve Train
03-390G	Rocker Arms and Pushrods: Miscellaneous Bolts & Drive Studs	X	X		Camshaft & Valve Train
03-402A	Governor Drive - Governor & Tachometer Drive Gear & Shaft	X	X		Overspeed Trip & Governor
03-402B	Governor Drive - Couplings, Pins & Keys	X	X		Overspeed Trip & Governor
03-410A	Overspeed Trip: Governor	X	X		Overspeed Trip & Governor
03-410B	Overspeed Trip: Governor and Accessory Drive Assembly	X	X		Overspeed Trip & Governor
03-410C	Overspeed Trip: Coupling (Flexible & Spider)	X	X		Overspeed Trip & Governor
03-410D	Overspeed Trip Vent Valve	X	X		Overspeed Trip & Governor
03-413	Governor Linkage	X	X		Overspeed Trip & Governor
03-415A	Governor Assembly: Woodward Governor	X	X		Overspeed Trip & Governor

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-415B	Governor Assembly Booster Servomotor	X			Overspeed Trip & Governor
03-415C	Governor Assembly Heat Exchanger	X	X		Overspeed Trip & Governor
03-420	Engine Driven Lube Oil Pump	X	X		Lube Oil
03-425A	Engine Driven Jacket Water Pump	X	X		Jacket Water
03-425B	Jacket Water Pump: Cover Plate			X	
03-435A	Jacket Water Fittings: Pipe & Fittings	X	X		Jacket Water
03-435B	Jacket Water Fittings: Piping, Tubing & Supports	X	X		Jacket Water
03-437A	Turbo Water Piping: Pipe & Fittings	X	X		Jacket Water
03-437B	Turbo Water Piping: Supports	X	X		Turbo Intake Intercooler & Exhaust
03-441A	Starting Air Manifold: Piping, Tubing and Fitting	X	X		Air Start & Barring Device
03-441B	Starting Air Manifold Valves, Strainers, Filters	X	X		Air Start & Barring Device
03-441C	Starting Air Manifold: Supports	X	X		Air Start & Barring Device
03-442A	Starting Air Distributor: Distributor Assembly	X	X		Air Start & Barring Device
03-442B	Starting Air Distributor: Tubing, Fittings & Gaskets	X	X		Air Start & Barring Device
03-445	Fuel Oil Booster Pump	X	X		Fuel Oil Injection
03-450A	Fuel Oil Header: Ejector Assemblies			X	
03-450B	Fuel Oil Header: Piping & Tubing	X	X		Fuel Oil Injection

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-450D	Fuel Oil Header: Fuel Oil Supports	X	X		Fuel Oil Injection
03-455A	Fuel Oil Filters & Strainers: Fuel Oil Filters	X			Fuel Oil Injection
03-455B	Fuel Oil Filters & Strainers: Strainers	X			Fuel Oil Injection
03-455C	Fuel Oil Filters & Strainer: Mounting Hardware	X	X		Fuel Oil Injection
03-460A	Lube Oil Full Pressure Strainer	X	X		Lube Oil
03-465A	Lube Oil Lines External: Tubing, Fittings, Couplings	X	X		Lube Oil
03-465B	Lube Oil Lines - External Supports	X	X		Lube Oil
03-465C	Lube Oil Lines - External: Valves	X	X		Lube Oil
03-467A	Turbocharger: Lube Oil Fitting - Pipe, Tubing, Fittings & Flexible Coupling	X	X		Lube Oil
03-467B	Turbocharger: Lube Oil Fittings - Supports	X	X		Lube Oil
03-475A	Turbocharger: Bracket	X	X		Turbo, Intake, Intrclr. & Exhaust
03-475B	Turbocharger - Bracket: Air Butterfly Valve Assembly	X	X		Turbo, Intake, Intrclr. & Exhaust
03-475C	Turbocharger: Bracket - Air Intake Piping	X	X		Turbo, Intake, Intrclr. & Exhaust
03-475D	Turbocharger - Bracket - Bolting & Gaskets	X	X		Turbo, Intake, Intercooler & Exhaust

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-475E	Turbocharger Bracket Pipe Support	X			Turbo, Intake, Intercooler & Exhaust
03-500A	Control Panel Assembly: Cabinet/System	X			Control Panel Assembly
03-500B	Control Panel Assembly: Annunciators			X	
03-500C	Control Panel Assembly: Circuit Breaker/Contact Blocks			X	
03-500D	Control Panel Assembly: Pressure Gauges			X	
03-500E	Control Panel Assembly: Hourmeter			X	
03-500F	Control Panel Assembly Accumulator	X	X		Control Panel Assembly
03-500G	Control Panel Valves	X	X		Control Panel Assembly
03-500H	Control Panel Assembly Pressure Switch	X	X		Control Panel Assembly
03-500I	Control Panel Assembly Pyrometers			X	
03-500J	Control Panel Assembly: Control Relays	X	X		Control Panel Assembly
03-500K	Control Panel Assembly: Solenoid Valves	X	X		Control Panel Assembly
03-500L	Control Panel Assembly: Tachometer			X	
03-500M	Control Panel Components: Piping, Tubing, Fittings		X		Control Panel Assembly
03-500N	Control Panel Assembly: Terminal Boards/Switches/ Wiring		X		Control Panel Assembly

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-503	Thermometer			X	
03-515	Jacket Water Thermostatic Valve	X	X		Jacket Water
03-520	Instruction Plate: Nameplate			X	
03-525A	Barring Device - Pneumatic: Barring Device Assembly			X	
03-525B	Barring Device - Pneumatic: Regulator Valve & Shut Off Valve	X	X		Air Start & Barring Device
03-525C	Barring Device - Pneumatic: Misc. Fitting, Hose, Filters Tubing			X	
03-525D	Barring Device Support Bracket	X	X		Air Start & Barring Device
03-530A	Platform - Front & Side: Side Platform Assembly			X	
03-530B	Platform - Front & Side: Front Platform Assembly			X	
03-530C	Platform - Front & Side: Platform - Bracing (with Attachments)			X	
03-531A	Platform Ladder Front: Platform Assembly			X	
03-531B	Platform Ladder Front - Bracing			X	
03-531C	Platform Ladder Front - Sub-Base			X	
03-540A	Lube Oil Sump Tank - Tank with Strainer Assembly		X		Lube Oil
03-540B	Lube Oil Sump Tank: Misc. Fittings, Gaskets, Pipe & Bolting Material, Valves	X	X		Lube Oil

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-540C	Lube Oil Sump Tank: Mounting Hardware	X	X		Lube Oil
03-550	Foundation Bolts: Anchors, Bolts, Misc. Hardware	X	X		Engine & Aux. Sub Base & Foundation Bolts
03-590	Special Tools: Asst. Engine Assembly Tools			X	
03-595	Spares			X	
03-630A	Pyrometer Conduit Assembly: Conduit	X	X		Engine Instrumentation & Wiring
03-630B	Pyrometer Conduit Assembly: Conduit Fittings	X	X		Engine Instrumentation & Wiring
03-630C	Pyrometer Conduit Assembly: Support	X	X		Engine Instrumentation & Wiring
03-630D	Pyrometer Conduit Assembly: Thermocouples	X			Engine Instumentation & Wiring
03-630E	Pyrometer Conduit Assembly: Gaskets			X	
03-650A	Emergency Diesel Generator	X	X		Generator
03-650B	Generator Control	X	X		Generator
03-650C	Generator - Shaft & Bearings		X		Generator
03-688A	Engine & Aux Module Wiring Material- Conduit & Fittings; Pyrometer Conduit Assembly- Conduit, Fitting, Supports	X	X		Engine Instrumentation & Wiring
03-688B	Engine & Aux. Module Wiring Material: Wiring & Terminations	X	X		Engine Instrumentation & Wiring

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-688C	Engine & Aux. Module Wiring Material: Boxes & Terminals		X		Engine Instrumentation & Wiring
03-689	Off Engine Safety Alarm Sensors Wiring	X	X		Engine Instrumentation & Wiring
03-690	On Engine Alarm Sensors	X	X		Engine Instrumentation & Wiring
03-691	Off Engine Alarm Sensors Level & Pressure Switches	X	X		Engine Instrumentation & Wiring
03-695A	Engine Shutdown Equipment: Tubing/Fittings & Supports	X	X		Engine Shutdown & Equipment
03-695B	Engine Shutdown Equipment: Valves, Regulator, Orifices	X	X		Engine Shutdown & Equipment
03-695C	Engine Shutdown Trip Switches	X	X		Engine Shutdown & Equipment
03-700A	Jacket Water Standpipe: Pipe, Fittings, Gaskets	X	X		Jacket Water
03-700B	Jacket Water Standpipe: Valves		X		Jacket Water
03-700C	Jacket Water Standpipe: Supports	X	X		Jacket Water
03-700D	Jacket Water Standpipe: Gauges			X	
03-700E	Jacket Water Standpipe: Switches	X	X		Jacket Water
03-700F	Jacket Water Standpipe: Misc. Bolting Mat.	X	X		Jacket Water
03-715A	Sub Base - Sub Base Engine & Generator	X	X		Engine & Aux. Sub Base & Foundation Bolts

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-715B	Sub Base Bolting	X	X		Engine & Aux. Sub Base & Foundation Bolts
03-717A	Aux Sub Base & Oil & Water Piping - Aux. Skid	X	X		Jacket Water
03-717B	Aux Sub Base & Oil & Water Piping - Jacket Water: Valves	X	X		Jacket Water
03-717C	Aux. Sub Base & Oil & Water Piping - Jacket Water - Pipe Couplings, Fittings, Orifices and Strainers	X	X		Jacket Water
03-717D	Aux Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X		Jacket Water
03-717F	Aux. Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X		Jacket Water
03-717G	Aux. Sub Base & Oil & Water Piping - Jacket Water: Supports	X	X		Jacket Water
03-717H	Aux. Sub Base & Oil & Water Piping - Lube Oil: Pipe and Fittings	X	X		Lube Oil
03-717I	Aux Sub Base & Oil & Water Piping - Lube Oil Valves	X	X		Lube Oil
03-717J	Aux. Sub Base & Oil & Water Piping - Lube Oil - Gaskets & Bolting	X	X		Lube Oil
03-717K	Aux. Sub Base & Oil & Water Water Piping - Lube Oil: Supports & Mounting Hardware	X	X		Lube Oil
03-717L	Aux. Sub Base & Oil & Water Piping - Lube Oil: Automatic Switchover Assembly	X	X		Lube Oil

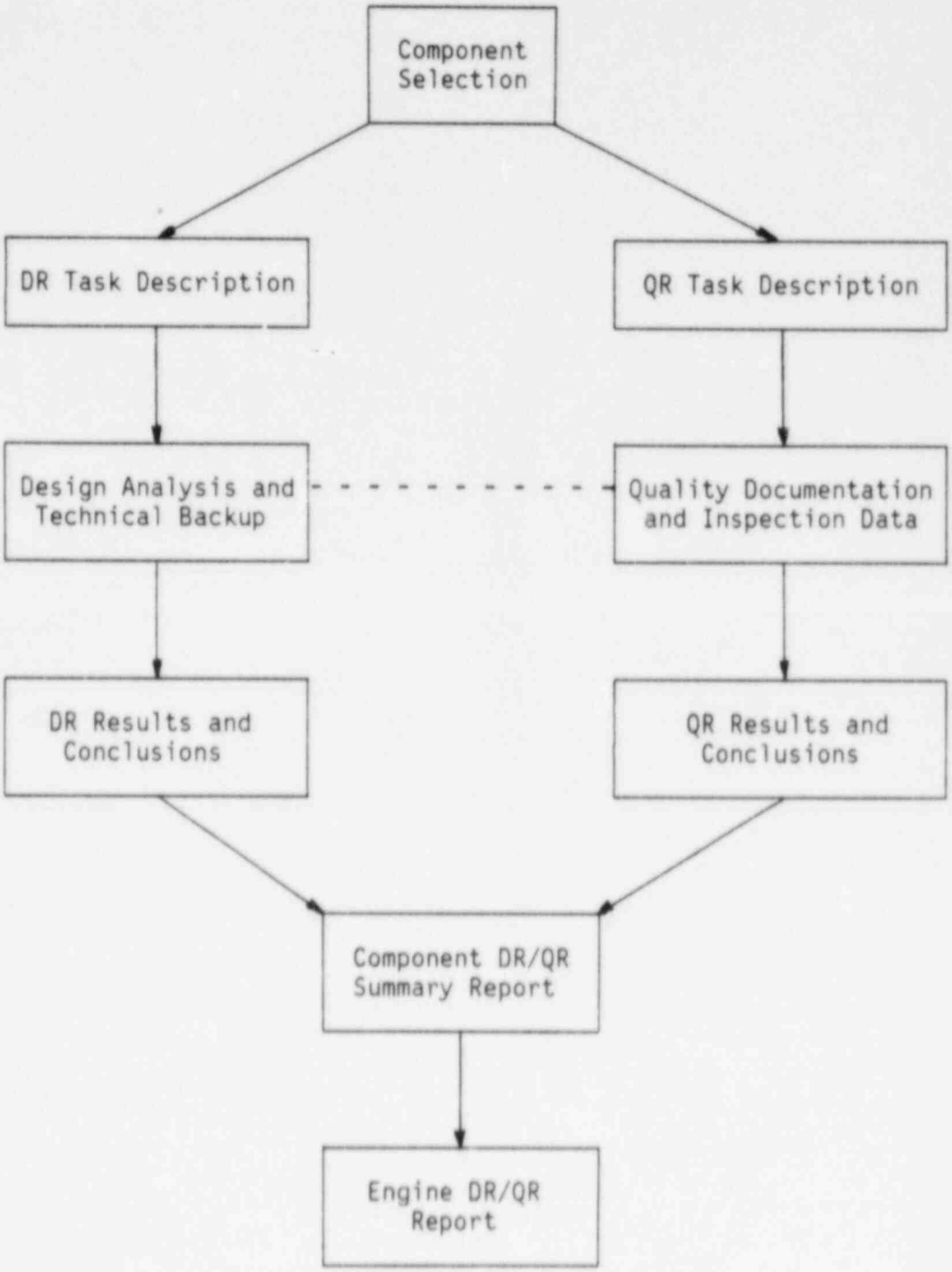
TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-717M	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Piping and Fittings	X	X		Fuel Oil
03-717N	Aux Sub Base & Oil & Water Piping - Fuel Oil: Valves	X	X		Fuel Oil
03-717P	Aux Sub Base & Oil & Water Piping - Fuel Oil - Gaskets & Bolting	X	X		Fuel Oil
03-717Q	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Supports	X	X		Fuel Oil
03-800A	Misc. Equipment - Heater, Jacket Water	X	X		Jacket Water
03-800B	Misc. Equipment - Heater, Lube Oil Sump Tank	X	X		Lube Oil
03-800C	Misc. Equipment - Starting Air Tank Relief Valve	X	X		Air Start & Barring Device
03-805A	Exhaust Silencer			X	
03-805B	Intake Air Filter	X	X		Turbo, Intake, Intercooler & Exhaust
03-805D	Flex Connections	X	X		Turbo, Intake, Intercooler & Exhaust
03-810A	Jacket Water Heat Exchanger			X	
03-810B	Jacket Water Standby Heater Pump	X	X		Jacket Water
03-820A	Lube Oil Heat Exchanger	X	X		Lube Oil
03-820B	Full Flow Lube Oil Filter	X	X		Lube Oil
03-820C	Before-and-After Lube Oil Pump	X	X		Lube Oil
03-820D	Oil Prelube Filter	X	X		Lube Oil
03-825A	Fuel Oil Booster Pump	X			Fuel Oil

TABLE 2-2 (continued)

Component Number	Component Description	DR Req'd	QR Req'd	No Review	Category
03-825C	Fuel Oil Filters & Strainers: Strainers	X	X		Fuel Oil
03-835A	Starting Air Tank	X	X		Air Start & Barring Device
03-835D	Starting Air Compressor	X			Air Start & Barring Device
03-835E	Misc Equipment: After Cooler			X	
03-835F	Air Start System - Starting Air Float Trap	X			Air Start & Barring Device
03-835G	Starting Air Tank Relief Valve	X	X		Air Start & Barring Device
03-835I	Air Dryer			X	
10-100	Watt Transducers			X	
10-300	Component Failure - Human Error			X	
10-400	Component Failures - Cause Unknown			X	
10-500	New Procedures			X	

FIGURE 2.1


Component Selection
DR Task Description
QR Task Description
Design Analysis and Technical Backup
Quality Documentation and Inspection Data
DR Results and Conclusions
QR Results and Conclusions
Component DR/QR Summary Report
Engine DR/QR Report

3.0 Results of Design Review and Quality Revalidation

The DR/QR Program implemented for the River Bend Station - Unit 1 TDI diesels was consistently performed with the generic methodology described in Section 2.0. The results of these reviews are summarized in this section. More detailed component summary reports are contained in Appendix I of this report.

Section 3.1 and 3.2 list the components of the River Bend diesel generators which have been reviewed under Phase I and Phase II respectively. The majority of these components are assessed to be acceptable for their intended service with unlimited life provided the recommendations identified are followed. These recommendations deal mainly with additional inspection requirements, and installation, operating and maintenance procedure improvements. In some cases, procurement specification recommendations are identified to aid the utility in its spare parts program.

Some of the components required modifications as identified in the recommended actions. The implementation of these recommended actions by the utility will result in a component which is acceptable for its intended service with unlimited life.

3.1 Summary Resolution of Sixteen Generic Components (Phase I)

The results of the Phase I program have been submitted to the NRC in a series of reports and supplements (Refs. 2 through 34) which covered the 16 generic components. The results of these reviews are summarized below.

Component	Acceptability	Recommended Action
Turbocharger (MP-022/3)	Unlimited Life	Additional testing and maintenance requirements. Revision of operating procedures. Additional analysis of the nozzle ring vane and capscrew.
Base and Bearing Caps (02-305A, 02-305C, 02-305D)	Unlimited Life	Additional maintenance and inspection requirements.
Crankshaft (02-310A)	Unlimited Life	Additional inspection and testing requirements.
Cylinder Block and Liner (02-315A, 02-315C)	Unlimited Life	Additional maintenance and inspection requirements.
Cylinder Head Studs (02-315E)	Unlimited Life	None
Connecting Rods: Connecting Rods and Bushings (02-340A)	Unlimited Life	Additional inspection requirements.
Connecting Rod Bearing Shells (02-340B)	Unlimited Life	Additional maintenance requirements.
Pistons (02-341A)	Unlimited Life	None
Air Start Valve (02-359)	Unlimited Life	Additional maintenance requirements.
Cylinder Heads (02-360A)	Unlimited Life	Additional maintenance requirements.
Fuel Injection Equipment: Tube Assembly (02-365C)	Unlimited Life	Additional testing and maintenance requirements. Procurement specification requirement.

Component	Acceptability	Recommended Action
Main and Connector Pushrods (02-390C, 02-390D)	Unlimited Life	Additional [illegible]rement requiremen[illegible]
Rocker Arm Capscrews (02-390G)	Unlimited Life	Additional maintenance requirements.
Jacket Water Pump (02-425A)	Unlimited Life	Additional maintenance and inspection requirements.
Wiring and Terminations (02-688B)	Unlimited Life	None

3.2 Summary Resolution of Phase II Components

Component	Acceptability	Recommended Action
	TURBO, INTAKE, INTERCOOLER & EXHAUST	
Turbocharger (MP-020)	Modifications	Additional Quality inspections recommended. Additional modifications and maintenance inspections recommended.
Turbocharger Thrust Bearing Drip Lube System (Small Bore Scope Only) (03-CFR)	Modifications	Addition of two-directional restraints at the by-pass shutoff valve near the sight glass and mid-span in the riser near the lube oil header branch connection. Verification that the final assembly of Engine B is similar to Engine A.
Intercooler (F-068)	Unlimited Life	Additional maintenance recommendations.
Intake Manifold & Piping (Large Bore Scope Only) (03-375)	Modifications	Additional maintenance recommendations. Additional Quality inspections recommended. Addition of seven ribs to flat plate on bottom of intake manifold. Verify torque of all bolts on the bottom rectangular flange.
Exhaust Manifold (03-380A)	Unlimited Life	Perform a visual inspection and a magnetic particle test on a sample of the circumferential pipe weld and corresponding heat affected zones.
Exhaust Manifold: Gasket & Bolting (03-380B)	Unlimited Life	Additional Quality inspections recommended.
Turbocharger Bracket and bolting (03-475A&D)	Unlimited Life	Additional Quality inspections recommended.
Turbocharger - Bracket: Air Butterfly Valve Assembly (03-475B)	Modifications	Addition of grease fittings per TDI SIM 322. Additional maintenance recommendations. Additional Quality inspections recommended.

Component	Acceptability	Recommended Action
Turbocharger Bracket: Air Intake Piping (Large Bore Scope (Only) (03-475C)	Modifications	Verification that all bolts on the 14-inch flanged connection, between the air-operated butterfly valve and the intercooler adapter pipe, are Grade A449 or better. Remove all pipe supports from the subject piping.
Turbocharger Bracket Pipe Supports (Large Bore Scope Only) (03-475E)	Modifications	All subject pipe supports should be removed.
Intake Air Filter (03-805B)	Unlimited Life	Inspect/replace the filter cartridges at 3-6 month intervals.
Flex Connections (03-805D)	Unlimited Life	None
	LUBE OIL	
Lube Oil Pressure Regulating Valve (00-420)	Unlimited Life	Additional maintenance recommendations.
Lube Oil Fittings-Internal Headers (Large Bore Scope Only) (03-307A-LB)	Unlimited Life	None
Lube Oil Fittings - Internal: Headers (Small Bore Scope Only) (03-307A-SB)	Unlimited Life	None
Lube Oil Fittings - Internal - Tubing and Fittings (Small Bore Scope Only) (03-307B)	Unlimited Life	None
Lube Oil Fittings - Internal: Supports (Small Bore Scope Only) (03-307D)	Unlimited Life	None

Component	Acceptability	Recommended Action
Engine Driven Lube Oil Pump (03-420)	Unlimited Life	None
Lube Oil Full Pressure Strainers (03-460A)	Unlimited Life	None
Lube Oil Lines External: Tubing, Fittings, Couplings (Large Bore Scope Only) (03-465A-LB)	Unlimited Life	Additional maintenance recommendations. Utilization of a minimum installation gap between the pipe ends of 0.132 inch.
Lube Oil Lines External: Tubing, Fittings, Couplings (Small Bore Scope Only) (03-465A-SB)	Modifications	Addition/modification of supports. Refer to DR/QR report 03-465B for details.
Lube Oil Lines - External Supports (Large Bore Scope Only) (03-465B-LB)	Unlimited Life	None
Lube Oil Lines External: Supports (Small Bore Scope Only) (03-465B-SB)	Modifications	Modification of tubing. Addition/modification of supports. Verification that the final assembly of Engine B is similar to Engine A. Refer to DR/QR report 03-465B for details.
Lube Oil Lines External - Valves (03-465C)	Unlimited Life	None
Generator Turbocharger - Lube Oil Fitting-Piping (Large Bore Scope Only) (03-467A-LB)	Modifications	Removal of the single tie-rod assembly surrounding the couplings.

Component	Acceptability	Recommended Action
Turbocharger - Lube Oil Fittings-Pipe, Tubing, Fittings and Flexible Couplings (Small Bore Scope Only) (03-467A-SB)	Modifications	Addition/modification of supports. Refer to DR/QR 03-467B for details.
Turbocharger - Lube Oil Fittings: Supports (Large Bore Scope Only) (03-467B-LB)	Unlimited Life	None
Turbocharger - Lube Oil Fittings: Supports (Small Bore Scope Only) (03-467B-SB)	Modifications	Addition of a two-directional restraint to the 3/4-inch diameter lube oil supply tubing in the riser. Verification that the final assembly of Engine B is similar to Engine A.
Lube Oil Sump Tank with Strainer Assembly and Mounting Hardware (03-540A&C)	Unlimited Life	Additional Quality inspections recommended.
Lube Oil Sump Tank - Miscellaneous Fittings, Gaskets, Pipe & Bolting Material, Valve (03-540B)	Design review of this component is not required based on the fact that there is no small bore piping associated with component 03-540B on this engine.	
Auxiliary Sub Base & Oil & Water Piping-Lube Oil: Pipe and Fittings (Large Bore Scope Only) (03-717H-LB)	Unlimited Life	None
Auxiliary Sub Base & Oil & Water Piping - Lube Oil: Pipe and Fittings (Small Bore Scope Only) (03-717H-SB)	Modifications	Addition/modification of supports. Refer to DR/QR report 03-717K for details.

Component	Acceptability	Recommended Action
Auxiliary Sub Base & Oil & Water Piping - Lube Oil: Valves (03-717I)	Unlimited Life	Additional maintenance recommendations.
Auxiliary Sub Base & Oil & Water Piping - Lube Oil: Gaskets & Bolting (03-717J)	Unlimited Life	None
Auxiliary Sub Base & Oil & Water Piping - Lube Oil: Supports & Mounting Hardware (Large Bore Scope Only) (03-717K)	Unlimited Life	None
Auxiliary Sub Base & Oil & Water Piping - Lube Oil: Supports and Mounting Hardware (Small Bore Scope Only) (03-717K-SB)	Modifications	Addition/modification of supports. Refer to DR/QR report 03-717K-SB for details.
Miscellaneous Equipment - Lube Oil: Sump Tank Heater (02-800B)	Unlimited life	Additional maintenance recommendations
Lube Oil Heat Exchanger (03-820A)	Unlimited life	Additional maintenance recommendations.
Full Flow Lube Oil Filter (03-820B)	Unlimited Life	Additional maintenance recommendations.
Before-and-After Lube Oil Pump (03-820C)	Unlimited Life	None
Oil Prelube Filter (03-820D)	Unlimited Life	Additional maintenance recommendations.

Component	Acceptability	Recommended Action
	ENGINE BASE & BEARING CAPS	
Base and Bearing Caps- Base Assembly, Main Bearing Studs and Nuts, and Main Bearing Cap (03-305A,C,D)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Base and Bearing Caps- Through Bolting (03-305E)	Unlimited Life	Additional Quality inspections recommended.
	CRANKSHAFT & BEARINGS	
Crankshaft (03-310A)	Unlimited Life (provided the engines are run at no greater than a 3130 kW load)	Complete inspection of the main journal oil hole between cylinders No. 5 and No. 6.
Main Bearings (03-310B)	Unlimited Life	Inspection of bearings to check for evidence of misalignment. Additional Quality inspections recommended.
Crankshaft and Bearing: Thrust Bearing Rings (03-310C)	Unlimited Life	Additional maintenance recommendations.
	CYLINDER BLOCK, LINERS & WATER MANIFOLD	
Cylinder Block (03-315A)	Unlimited Life	Material microstructure evaluation recommended. Implementation of routine inspections recommended.
Cylinder Block Liners & Water Manifold - Cylinder Liners (03-315C)	Unlimited Life	Additional Quality inspections recommended. Additional maintenance recommendations.
Cylinder Block - Liners and Water Manifold: Jacket Water Manifold and Piping (Large Bore Scope Only) (03-315D)	Unlimited Life	Additional maintenance recommendations.

Component	Acceptability	Recommended Action
Cylinder Block - Liners and Water Manifold: Studs (03-315E)	Unlimited Life	Additional Quality inspections recommended.
Cylinder Block - Liner and Water Manifold - Cylinder Head Nuts (03-315F)	Unlimited Life	Additional Quality Revalidation inspections recommended.
Cylinder Block - Liners and Water Manifold: Seals and Gaskets (03-315G)	Unlimited Life	Additional Quality inspections recommended.
Cylinder Block Covers: Gaskets & Bolts (03-385B)	Unlimited Life	Additional Quality inspections recommended.
	AIRSTART & BARRING DEVICE	
Air Start Valves (03-359)	Modifications	Implementation of TDI SIMS 329 and 360. Additional maintenance recommendations. Additional Quality inspections recommended.
Starting Air Manifold - Piping, Tubing, and Fittings (Large Bore Scope Only) (03-441A-LB)	Modifications	Modify supports in order to provide stiffer load paths and to relieve thermal restraint in certain directions. Additional maintenance recommendations.
Starting Air Manifold: Piping, Tubing, and Fittings (Small Bore Scope Only) (03-441A-SB)	Modifications	Addition/modification of supports. Refer to DR/QR report 03-441C for details.
Starting Air Manifold: Valves, Strainers, & Filters (03-441B)	Modifications	Additional maintenance recommendations. Addition of free flowing drains to the air distributor filter.

Component	Acceptability	Recommended Action
Starting Air Manifold: Supports (Large Bore Scope Only) (03-441C-LB)	Unlimited Life	None
Starting Air Manifold - Supports (Small Bore Scope Only) (03-441C-SB)	Modifications	Addition of supports. Installations on both Engines A and B should be similar. Refer to DR/QR report 03-441C-SB for details.
Starting Air Distributor: Distributor Assembly (03-442A)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Starting Air Distributor-Tubing, Fittings and Gaskets (03-442B)	This component review has been deleted. All Air Distributor Tubing is addressed under components 03-441A&C.	
Barring Device - Pneumatic: Regulator Valve, Shutoff Valve (03-525B)	Unlimited Life	Additional maintenance recommendations.
Barring Device - Pneumatic: Miscellaneous Fittings, Hose, Filters, Tubing (Small Bore Scope Only) (03-525C)	Unlimited Life	None
Barring Device Support Bracket (03-525D)	Unlimited Life	None
Starting Air Tank (03-835A)	Unlimited Life	The tank drain valve should be opened daily and excessive amounts of moisture should be reported to determine its cause.
Starting Air Compressor (03-835D)	Unlimited Life	Site operating and maintenance procedures should be reviewed to verify that the manufacturer's maintenance recommendations are met.

Component	Acceptability	Recommended Action
Air Start System: Starting Air Float Trap (03-835F)	Unlimited Life	Additional maintenance recommendations.
Starting Air Tank Relief Valve (03-835G)	Unlimited Life	None
	CONNECTING RODS	
Connecting Rods: Rods and Bushings (03-340A)	Unlimited Life	Verify that the torque loads on all connecting rod bolts are in accordance with the latest TDI recommended values.
Connecting Rod Bearing Shells (03-340B)	Unlimited Life	Additional maintenance recommendations.
	PISTONS	
Pistons (03-341A)	Unlimited Life	Additional Quality inspections recommended.
Piston: Rings (03-341B)	Unlimited Life	Additional maintenance requirements. Additional Quality Revalidation inspection recommendations.
Piston: Pin Assembly (03-341C)	Modifications	Replacement of the spiral ring retainers with waldes snap ring retainers (P/N 6E-003-067). Additional Quality inspections recommended. Additional maintenance inspections recommended.
	CAMSHAFT & VALVE TRAIN	
Tappets and Guides: Intake & Exhaust Tappet Assembly (03-345A)	Unlimited Life	Additional maintenance inspections recommended.
Tappets and Guides: Fuel Tappet Assembly (03-345B)	Unlimited Life	Additional maintenance inspections recommended.
Tappets and Guides- Fuel Pump Base Assembly (03-345C)	Unlimited Life	None

Component	Acceptability	Recommended Action
Camshaft: Camshaft Assembly (03-350A)	Unlimited Life	Additional maintenance inspections recommended. Additional Quality Revalidation inspections recommended.
Camshaft: Camshaft Bearing (03-350B)	Unlimited Life	None
Subcover (03-362A)	Unlimited Life	Additional Quality Revalidation inspections recommended.
Rocker Shaft Assemblies: Intake/Intermediate & Exhaust (03-390A&B)	Unlimited Life	None
Main and Connector Pushrods (03-390C&D)	Unlimited Life	Additional Quality inspections recommended. Recommended that the purchase order specify destructive verification of weld quality.
Rocker Arms & Pushrods: Bushings (03-390E)	Unlimited Life	Additional maintenance recommendations.
Rocker Arms and Pushrods - Miscellaneous Bolts and Drive Studs (03-390G)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections and testings recommended.
IDLER GEAR ASSEMBLY & FRONT GEAR CASE		
Front Gear Case Gasket and Bolting (03-335B)	Unlimited Life	None
Gear Train (03-350C, 03-355A, 03-355B)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Idler Gear Assembly-Bolting and Gaskets (03-355C)	Unlimited Life	None
FLYWHEEL		
Flywheel (03-330A)	Unlimited Life	None

Component	Acceptability	Recommended Action
Flywheel Bolting (03-330B)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
	ENGINE INSTRUMENTATION & WIRING	
Pyrometer Conduit Assembly: Thermocouples (03-630D)	Unlimited Life	Additional maintenance recommendations.
Engine and Auxiliary Module Wiring Material and Fittings: Pyrometer Conduct Assembly-Conduit Fittings, Supports (03-688A, 03-630A,B,C)	Modifications	Perform an upgrade on conduit supports. Addition of a support recommended.
Engine & Auxiliary Module Wiring Material: Wiring & Terminations (03-688B)	Unlimited Life	None
Engine & Auxiliary-Module Wiring Material - Boxes & Terminals (03-688C)	Unlimited Life	None
Off Engine Alarm Sensor Wiring (03-689)	Unlimited Life	None
On-Engine Alarm Sensors Off-Engine Alarm Sensors (03-690, 03-691)	Unlimited Life	None
	OVERSPEED TRIP & GOVERNOR	
Governor Drive - Governor & Tachometer Drive Gear and Shaft (03-402A)	Unlimited Life	Additional Quality inspections recommended.

Component	Acceptability	Recommended Action
Governor Drive: Couplings, Pins, and Keys (03-402B)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Overspeed Trip: Governor (03-410A)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Overspeed Trip: Governor and Accessory Drive Assembly (03-410B)	Unlimited Life	Additional Quality inspections recommended.
Overspeed Trip: Couplings (Flexible and Spider) (03-410C)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Overspeed Trip: Vent Valve (03-410D)	Unlimited Life	Additional maintenance recommendations.
Governor Linkage (03-413)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Governor Assembly: Woodward Governor (03-415A)	Unlimited Life	Additional maintenance recommendations. Additional Quality inspections recommended.
Governor Assembly Booster Servomotor (03-415B)	Unlimited Life	Additional Quality inspections recommended.
Governor Assembly Heat Exchanger (03-415C)	Unlimited Life	None
	ENGINE SHUTDOWN & EQUIPMENT	
Engine Shutdown Equipment - Tubing/ Fittings & Supports (Small Bore Scope Only) (03-695A)	Modifications	Addition of two-and three-directional restraints. Verification that final assembly of Engine B is similar to Engine A.

Component	Acceptability	Recommended Action
Engine Shutdown Equipment - Valves, Regulators, Orifices (03-695B)	Unlimited Life	Additional maintenance recommendations.
Engine Shutdown Trip Swtiches (03-695C)	Unlimited Life	None
	JACKET WATER	
Water Discharge Manifold - Jacket Water Discharge Manifold, Couplings, and Seals (Large Bore Scope Only) (03-317A&B)	Unlimited Life	Additional maintenance recommendations.
Water Discharge Manifold Supports (Large Bore Scope Only) (03-317C)	Unlimited Life	None
Engine Drive Jacket Water Pump (03-425A)	Modifications	Additional maintenance recommendations. Additional Quality inspections recommended. The impeller material should be changed from cast iron to the same spec. ductile iron as used on the Shoreham pump impellers (ASTM A-536 Grade 65-46-12). Eliminate the keyway on the impeller.
Jacket Water Fittings - Pipe & Fittings (Small Bore Scope Only) (03-435A)	Modifications	Addition/modification of supports. Refer to DR/QR report 03-435B for details.

Component	Acceptability	Recommended Action
Jacket Water Fittings - Pipings, Tubing and Supports (Small Bore Scope Only) (03-435B)	Modifications	Addition of a two-directional restraint at the top of the riser near the turbocharger exhaust flange on the ½-inch diameter tube from the engine jacket water return line to the turbocharger support brace. Modify the rubber grommet support at the turbocharger to a two-directional restraint. Installation of small bore piping and tubing system for Engine B, so that both engines are similar.
Turbo Water Piping - Pipe & Fittings (Small Bore Scope Only) (03-437A)	Modifications	Addition/modifications of supports. Refer to DR/QR report 03-437B for details.
Turbo Water Piping - Supports (Small Bore Scope Only) (03-437B)	Modifications	Installation of 2 two-directional restraints. U-bolts should be 3/8-diameter with suitable locking devices. Verification that final assembly of Engine B is similar to Engine A.
Jacket Water Thermostatic Valve (03-515)	Unlimited Life	Replace the power element at 3-5 year intervals. Perform a field inspection to verify that the valve body material is cast steel.
Jacket Water Standpipe: Pipe, Fittings, Gaskets (Small Bore Scope Only) (03-700A)	Unlimited Life	None
Jacket Water Standpipe: Valves (03-700B)	Unlimited Life	Additional maintenance recommendation. Additional Quality inspection recommended.
Jacket Water Standpipe: Supports (Small Bore Scope Only) (03-700C)	Unlimited Life	None
Jacket Water Standpipe: Switches (03-700E)	Unlimited Life	None

Component	Acceptability	Recommended Action
Jacket Water Standpipe and Miscellaneous Bolting (03-700F)	Unlimited Life	Verify as-built conditions of installed bolting material to the as-built drawings.
Auxiliary Sub Base & Oil & Water Piping: Jacket Water Valves (03-717B)	Unlimited Life (pending verification of satisfactory check valve orientation)	Additional maintenance recommendations.
Auxiliary Sub Base & Oil & Water Piping-Jacket Water: Pipe, Couplings, Fittings, Orifices & Strainers (Large Bore Scope Only) (03-717D-LB)	Unlimited Life	None
Auxiliary Sub Base & & Oil & Water Piping-Jacket Water: Pipe, Couplings, Fittings, Orifices, and Strainers (Small Bore Scope Only) (03-717D-SB)	Unlimited Life	None
Auxiliary Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting (03-717F)	Unlimited Life	None
Auxiliary Sub Base & & Oil & Water Piping-Jacket Water: Supports (Large Bore Scope Only) (03-717G-LB)	Unlimited Life	None
Auxiliary Sub Base & & Oil & Water Piping-Jacket Water: Supports (Small Bore Scope Only) (03-717G-SB)	Unlimited Life	None

Component	Acceptability	Recommended Action
Miscellaneous Equipment Jacket Water Heater (03-800A)	Unlimited Life	Additional maintenance recommendations.
Jacket Water Heat Exchanger (03-810A)	Unlimited Life	Additional maintenance recommendations.
Jacket Water Standby Heater Pump (03-810B)	Unlimited Life	None
	CYLINDER HEADS & VALVES	
Cylinder Heads (03-360A)	Unlimited Life	Additional maintenance recommendations.
Cylinder Head Valves: Intake and Exhaust Valves (03-360B)	Unlimited Life	Additional Quality Revalidation inspections recommended.
Cylinder Head and Valves: Bolting and Gaskets (03-360C)	Unlimited Life	Additional Quality Revalidation inspections recommended.
Cylinder Head and Valves: Springs and Retainer (03-360D)	Unlimited Life	None
	FUEL OIL INJECTION	
Fuel Injection Equipment: Fuel Injection Pump (03-365A)	Unlimited Life	Additional maintenance recommendations.
Fuel Injection Equipment: Fuel Injection Tips (03-365B)	Unlimited Life	Additional mainenance recommendations.
Fuel Injection Equipment: Tube Assembly (03-365C)	Unlimited Life	Additional Quality inspections recommended. Inspect compression fittings at both ends of each fuel injection line.

Component	Acceptability	Recommended Action
Fuel Injection Equipment: Supports (Small Bore Scope Only) (03-365D)	Unlimited Life	None
Fuel Pump Linkage: Fuel Pump Control Shaft: Linkage Assembly & Bearings (03-371A&B)	Unlimited Life	Additional maintenance recommendations.
Fuel Pump Linkage: Automatic Shutdown Cylinder (03-371C)	Unlimited Life	None
Fuel Oil Booster Pump (03-445)	Unlimited Life	None
Fuel Oil Header - Piping and Tubing (Small Bore Scope Only) (03-450B)	Modifications	Addition/modification of supports. Refer to DR/QR report 03-450D for details.
Fuel Oil Header - Fuel Oil Supports (Small Bore Scope Only) (03-450D)	Modifications	Addition/modification of supports. Verification that the final assembly of Engine B is similar to Engine A. Refer to DR/QR report 03-450D for details.
Fuel Oil Filters & Strainers: Fuel Oil Filters (03-455A)	Unlimited Life	Installation of differential pressure gauges on the filter. Additional maintenance recommendations.
Fuel Oil Filters and Strainers: Mounting Hardware (03-455C)	Unlimited Life	None
Auxiliary Sub Base & Oil & Water Piping - Fuel Oil: Bolting & Gaskets (03-717L)	Unlimited Life	None

Component	Acceptability	Recommended Action
Auxiliary Sub Base & Oil & Water Piping - Fuel Oil: Piping & Fittings (Small Bore Scope Only) (03-717M)	Modifications	Addition of supports. Refer to DR/QR report 03-717Q for details.
Auxiliary Sub Base & Oil & Water Piping-Fuel Oil: Valves (02-717N)	Unlimited Life	Additional maintenance recommendations.
Auxiliary Sub Base & Oil & Water Piping - Fuel Oil: Supports (Small Scope Only) (03-717Q)	Modifications	Modify supports to permit axial pipe expansion. Flanges on the channel weldment to the pipe on support no. 03-717-01-UX should be mitered to provide clearance for adjacent piping on Engines A and B. Verification that the final assembly of Engine B is similar to Engine A.
Fuel Oil Booster Pump (03-825A)	Unlimited Life	None
Fuel Oil Filters & Strainers: Srainers (03-825C)	Unlimited Life	Additional maintenance recommendations.
	GENERATOR	
Emergency Diesel Generator (03-650A)	Unlimited Life	None
Generator Controls (03-650B)	Modifications	Replace field flashing relay with an enclosed relay. Additional cabinet ventilation recommended. Recommendation to increase reliability and performance. Additional maintenance and modification recommendations. Refer to DR/QR report 03-650B for details.
Generator: Shaft & Bearings (03-650C)	Unlimited Life	None

Component	Acceptability	Recommended Action
	CONTROL PANEL ASSEMBLY	
Control Panel Assembly: Cabinet/System (03-500A)	Unlimited Life	None
Control Panel Assembly: Annunciators (03-500B)	Unlimited Life	None
Control Panel Assembly: Accumulator (03-500F)	Unlimited Life	None
Control Panel Valves (03-500G)	Unlimited Life	Additional maintenance inspections recommended.
Control Panel Assembly - Pressure Switches (03-500H)	Unlimited Life	None
Control Panel Assembly - Control Relays (03-500J)	Unlimited Life	None
Control Panel Assembly - Solenoid Valves (03-500K)	Unlimited Life	None
Control Panel Components - Piping, Tubing, and Fittings (03-500M)	Unlimited Life	None
Control Panel Assembly Terminal Boards/Switches, Wiring (03-500N)	Unlimited Life	None
	ENGINE & AUXILIARY SUB BASE & FOUNDATION BOLTS	

Component	Acceptability	Recommended Action
Foundation Bolts-Anchors, Bolts & Miscellaneous Hareware (03-550)	Unlimited Life	None
Sub Base- Sub Base Engine - Engine and Generator (03-715A)	Unlimited Life	None
Sub Base - Bolting (03-715B)	Unlimited Life	None
Auxiliary Sub Base & Oil & Water Piping-Auxiliary Skid (03-717A)	Unlimited Life	None

4.0 SUMMARY/CONCLUSIONS

The TDI Diesel Generator Owners Group has completed its review of the TDI diesel generators installed at River Bend.

The scope and depth of this review as outlined in this report represents a significant effort by the TDI Diesel Generator Owners Group Technical Staff and Gulf States Utilities personnel.

Nuclear standby diesel generator reliability has been a major concern of the industry and the NRC. Although previous programs have been sponsored by the NRC, EPRI, and other industry groups to quantify and improve this reliability, the Design Review and Quality Revalidation effort summarized in this report is unprecedented in its approach and analytical detail. This effort has produced a detailed assessment of 169 TDI diesel generator components. Many of these components have been analyzed using analytical techniques which exceed the detailed engineering effort of the original design.

Extensive component inspections are an integral part of the DR/QR program. The performance of these inspections leaves no doubt as to the quality of these critical diesel generator components.

Thus, the TDI Diesel Generator Owners Group effort has gone a long way toward quantifying the reliability of the TDI Diesel Generator by establishing the acceptability of these critical engine components. In many cases, recommendations are made to improve component reliability and therefore improve overall diesel generator reliability.

The TDI Diesel Generator Owners Group believes that this extensive effort verifies the acceptability of the TDI diesel generators for nuclear service.

The results of this review, as outlined in Section 3.0 of this report, show that the important components of the TDI diesel generator have been assessed to be adequate for their intended function. In cases where component adequacy has been judged to be marginal, corrective action is recommended which will ensure the adequacy of the component.

This report supports the conclusion that the TDI diesel generators installed at River Bend are acceptable for their intended safety related function and, in addition, the incorporation of the maintenance and surveillance recommendations into the plant's existing program provides added assurance that these diesel generators will continue to perform their intended function for the life of the plant.

5.0 RECOMMENDATIONS

The purpose of the TDI Diesel Generator Owners Group Program was to assess the acceptability of the TDI Emergency Diesel Generator at River Bend and to make recommendations as required to improve the reliability of given components. These recommendations are summarized in section 3.0 and given in detail in Appendix I.

Additionally, the TDI Diesel Generator Owners Group Program has made recommendations concerning component maintenance and surveillance. These recommendations have been assembled from manufacturers manuals and the component DR/QR summary reports. These maintenance and surveillance recommendations are outlined in Appendix II.

Although the recommendations of this report are not requirements, their adoption by Gulf States Utilities will give added assurance that the TDI Emergency Diesel Generators installed at River Bend will perform their intended function for the life of the plant. These recommendations represent a conservative approach to insuring diesel generator reliability. In some cases, the utility may propose alternate means of insuring the reliability of their emergency diesel engines. Justification of these alternate means is the responsibility of the utility.

6.0 REFERENCES

Component DR/QR Summary Reports list references directly related to that component.

Ref. #			
1	TDI-3	3- 2-84	TDI Owners Group Program Plan
2	TDI-2	2-27-84	Investigation of Types AF and AE Piston Skirts
3	TDI-4	3-12-84	D.R. of Connecting Rod Bearing Shells
4	TDI-5	3-13-84	TDI D.G. Rocker Arm Capscrew Stress Analysis Report
5	TDI-6	3-23-84	TDI D.G. Air Start Valve Capscrew Dimensional and Stress Analysis Report
6	TDI-8	3-30-84	TDI D.G. Cylinder Head Stud Stress Analysis
7	TDI-14	4-13-84	TDI D.G. Supplement to the Cylinder Head Stud Stress Analysis and Supplement to the Air Start Valve Capscrew Dimension and Stress Analysis
8	TDI-15	4-16-84	TDI D.G. Report on Engine Driven Jacket Water Pump Design Review
9	TDI-16	4-19-84	TDI D.G. Report on Push Rods
10	TDI-17	4-20-84	TDI D.G. Report on the Evaluation of Emergency D.G. Crankshafts at Shoreham
11	TDI-18	4-24-84	TDI D.G. Report on the Evaluation of Emergency D.G. Wiring and Terminations of Shoreham
12	TDI-19	4-24-84	TDI D.G. Supplement to the Rocker Arm Capscrew Stress Analysis
13	OGTP-8	4-27-84	TDI D.G. Report on Fuel Injection Tubing Qualification Analysis
14	OGTP-9	5-14-84	TDI D.G. Report on D.R. of Connecting Rods of Inline DSR-48 Emergency D.G.
15	OGTP-10	4-27-84	TDI D.G. Report on D.R. of Engine Base and Bearing Caps
16	OGTP-25	5-14-84	TDI D.G. Cylinder Head Report

Ref. #			
17	OGTP-26	5-14-84	TDI D.G. Turbocharger Report
18	OGTP-39	5-24-84	Evaluation of Emergency D.G. Crankshafts at Shoreham and Grand Gulf Nuclear Power Station
19	OGTP-40	5-24-84	D.R. of Connecting Rods for TDI DSRV-4 Series Diesel Generators
20	OGTP-41	5-24-84	Investigation of Types AF & AE Piston Skirts
21	OGTP-57	6-05-84	Emergency D.G. Aux. Module Control Wiring and Termination Qualification Report for G.G.N.S.
22	OGTP-70	6-13-84	Emergency D.G. Aux. Module Control Wiring and Termination Qualification Report for C.P.S.E.S.
23	OGTP-72	6-14-84	The Infulence of Thermal Distortion on the Performance of AF and AE Piston Skirts
24	OGTP-74	6-15-84	EDG Aux. Module Control Wiring and Termination Qualification Report for San Onofre Nuclear Power Station Unit I
25	OGTP-76	6-15-84	Evaluation of E.D.G. Crankshafts at Midland and San Onofre Nuclear Generating Stations
26	OGTP-77	6-15-84	DR of Elliott Model 656 Turbocharger used on TDI DSRV-12-4 and DSRV-20-4 EDG sets
27	OGTP-79	6-18-84	DR of Connecting Rods of TDI Inline DSR-48 EDG
28	OGTP-80	6-18-84	DR of Engine Base and Bearing Caps for TDI DSRV-16 Diesel Engines
29	OGTP-90	6-25-84	DR of TDI R-4 and RV-4 series EDG Cylinder Blocks and Liners
30	OGTP-89	6-22-84	DR of Connecting Rod Bearing Shells for Transamerica Delavel Enterprise Engines
31	OGTP-111	7-6-84	Supplement to the Emergency Diesel Generator Engine Driven Jacket Water Pump Design Review
32	OGTP-129	7-24-84	Emergency D.G. Rocker Arm Capscrews Stress Analysis
33	OGTP-140	7-27-84	Report on Emergency D.G. Auxiliary Control Module Control Wiring & Termination Review
34	OGTP-147	8-1-84	Design Review of Elliott Model 65G Turbocharger used on TDI DSRV-12-4 & DSRV-20-4 Emergency D.G. Sets

Ref. #			
35	OGTP-181	8-10-84	Design Review of Engine Base and Bearing Caps for TDI DSRV-16 Diesel Engines
36	OGTP-190	8-14-84	Design Review of Elliott Model 90G Turbocharger used on TDI DSR-48 and DSRV-16 Emergency Diesel Generator Sets
37	OGTP-260	9-7-84	Design Review of Connecting Rods for TDI DSRV-4 Series Diesel Generators
38	OGTP-261	9-7-84	Design Review of Engine Base and Bearing Caps for TDI Diesel Engines
39	OGTP-263	9-7-84	Evaluation of Cylinder Heads of TDI Series R-4 Diesel Engines
40	OGTP-306	9-28-84	Survey of Start Experiences and Cause of Unscheduled Shutdowns of TDI Diesel Engines

TDI DIESEL GENERATOR

DESIGN REVIEW AND QUALITY REVALIDATION REPORT

Prepared For

GULF STATES UTILITIES

RIVER BEND STATION

By

TDI DIESEL GENERATOR OWNERS GROUP

VOLUME 2

How To Use This Report

Tabs in this report identify the following categories:

Turbo, Intake, Intercooler & Exhaust
Lube Oil
Engine Base & Bearing Caps
Crankshaft & Bearings
Cylinder Block, Liners & Water Manifold
Air Start & Barring Device
Connecting rods
Pistons
Camshaft & Valve Train
Idler Gear Assembly & Front Gear Case
Flywheel
Engine Instrumentation & Wiring
Overspeed Trip & Governor
Engine Shutdown & Equipment
Jacket Water
Cylinder Heads & Valves
Fuel Oil Injection
Generator
Control Panel Assembly
Engine & Auxiliary Sub-Base & Foundation Bolts

These categories have been defined to allow the reader to review a complete diesel generator subsystem in a convenient manner.

Within each category tabs identify River Bend specific component numbers.

A given component report can be found by:

a) If the component nubmer is known - use the alpha - numeric index which identifies the volume number and category in which the component report is located.

b) If only the component name is known - Section 3.2 may be used as a cross-reference to find the volume number where the component report may be found.

Some reports address more than one component. A tab is provided for each component. However, some components are combined under one report. Slip sheets are provided where required to reference back to the appropriate tab. Some components required more than one report. These are identified by the abbreviation LB-Large Bore and SB-Small Bore on the component number tabs.

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
F-068	Intercooler	X	X	Turbo, Intake, Intercooler & Exhaust	2
MP-020	Turbocharger	X	X	Turbo, Intake, Intercooler & Exhaust	2
00-420	Lube Oil Pressure Regulating Valve	X	X	Lube Oil	2
03-CFR	Turbocharger Thrust Bearing Drip Lube System	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-305A	Base and Bearing Caps: Base Assembly	X	X	Engine Base & Bearing Caps	2
03-305C	Base and Bearing Caps: Main Bearing Studs & Nuts	X	X	Engine Base & Bearing Caps	2
03-305D	Base and Bearing Caps: Main Bearing Caps	X	X	Engine Base & Bearing Caps	2
03-305E	Base and Bearing Caps - Through Bolting	X	X	Engine Base & Bearing Caps	2
03-307A	Lube Oil Fittings: Internal - Headers	X	X	Lube Oil	2
03-307B	Lube Oil Fittings: Internal - Tubing & Fittings	X	X	Lube Oil	2
03-307D	Lube Oil Fittings Internal: Supports	X	X	Lube Oil	2
03-310A	Crankshaft	X	X	Crankshaft & Bearings	2
03-310B	Main Bearings	X	X	Crankshaft & Bearing	2
03-310C	Crankshaft & Bearings: Thrust Bearing Rings.	X	X	Crankshaft & Bearing	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-315A	Cylinder Block	X	X	Cyl. Block & Liners & Water Manifold	2
03-315C	Cylinder Block Liners & Water Manifold - Cylinder Liner	X	X	Cyl. Block & Liners & Water Manifold	2
03-315D	Cylinder Block Liners & Water Manifold: Jacket Water Manifold & Piping	X	X	Cyl. Block & Liners & Water Manifold	2
03-315E	Cylinder Block Liners & Water Manifold: Studs	X	X	Cyl. Block & Liners & Water Manifold	2
03-315F	Cylinder Block Liner & Water Manifold: Cylinder Head Nuts	X	X	Cyl. Block & Liner & Water Manifold	2
03-315G	Cylinder Block Liners & Water Manifold: Seals & Gaskets	X	X	Cyl. Block & Liners & Water Manifold	2
03-317A	Water Discharge Manifold: Jacket Water Discharge Manifold	X	X	Jacket Water	4
03-317B	Water Dicharge Manifold: Coupling & Seals	X	X	Jacket Water	4
03-317C	Water Discharge Manifold: Supports	X	X	Jacket Water	4
03-330A	Flywheel	X	X	Flywheel	3
03-330B	Flywheel - Bolting	X	X	Flywheel	3
03-335B	Front Gear Case: Gaskets and Bolting		X	Idler Gear Assembly & Front Gear Case	3
03-340A	Connecting Rods: Rods & Bushings	X	X	Connecting Rods	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-340B	Connecting Rods: Bearing Shells	X	X	Connecting Rods	3
03-341A	Pistons	X	X	Pistons	3
03-341B	Pistons: Rings	X	X	Pistons	3
03-341C	Piston: Pin Assembly	X	X	Pistons	3
03-345A	Tappets and Guides: Intake & Exhaust Tappet Assembly	X	X	Camshaft & Valve Train	3
03-345B	Tappets and Guides: Fuel Tappet Assembly	X	X	Camshaft & Valve Train	3
03-345C	Tappets and Guides: Fuel Pump Base Assembly	X	X	Camshaft & Valve Train	3
03-350A	Camshaft: Camshaft Assembly	X	X	Camshaft & Valve Train	3
03-350B	Camshaft: Camshaft Bearing	X	X	Camshaft & Valve Train	3
03-350C	Camshaft: Supports, Bolting and Gear	X	X	Camshaft & Valve Train	3
03-355A	Idler Gear Assembly: Crank To Pump Gear	X	X	Idler Gear Assembly & Front Gear Case	3
03-355B	Idler Gear Assembly	X	X	Idler Gear Assembly & Front Gear Case	3
03-355C	Idler Gear Assembly: Gaskets & Bolting		X	Idler Gear Assembly & Front Gear Case	3
03-359	Air Start Valve	X	X	Air Start & Barring Device	3
03-360A	Cylinder Heads	X	X	Cylinder Heads & Valves	4

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-360B	Cylinder Head Valves: Intake & Exhaust Valves	X		Cylinder Heads & Valves	4
03-360C	Cylinder Head and Valves: Bolting and Gaskets	X	X	Cylinder Heads & Valves	4
03-360D	Cylinder Head and Values: Springs and Retainer	X	X	Cylinder Heads & Valves	4
03-362A	Subcovers	X	X	Camshaft & Valve Train	3
03-365A	Fuel Injection Equipment Fuel Injection Pump	X	X	Fuel Oil Injection	4
03-365B	Fuel Injection Equipment Fuel Injection Tips	X		Fuel Oil Injection	4
03-365C	Fuel Injection Equipment - Tube Assembly	X	X	Fuel Oil Injection	4
03-365D	Fuel Injection Equipment: Supports	X	X	Fuel Oil Injection	4
03-371A	Fuel Pump Control Shaft, Linkage Assembly & Bearings	X	X	Fuel Oil Injection	4
03-371B	Fuel Pump Linkage: Linkage Assembly and Bearing	X	X	Fuel Oil Injection	4
03-371C	Fuel Pump Linkage: Automatic Shutdown Cylinder	X	X	Fuel Oil Injection	4
03-375	Air Intake Manifold and Piping	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-380A	Exhaust Manifold	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-380B	Exhaust Manifold: Gasket and Bolting	X	X	Turbo, Intake, Intrclr. & Exhaust	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-385B	Cylinder Block Covers: Gaskets and Bolting	X	X	Cyl. Block & Liners & Water Manifold	2
03-387A	Crankcase Ventilator: Crankcase Vacuum Fan	X	X	Crankshaft & Bearings	2
03-390A	Intake & Intermediate and Exhaust Rocker Shaft Assembly	X	X	Camshaft & Valve Train	3
03-390B	Rocker Arms and Pushrods: Exhaust Rocker Shaft Assembly	X	X	Camshaft & Valve Train	3
03-390C	Main and Connector Pushrods	X	X	Camshaft & Valve Train	3
03-390D	Rocker Arms and Pushrods: Pushrods Connector.	X	X	Camshaft & Valve Train	3
03-390E	Rocker Arms and Pushrods: Bushings	X		Camshaft & Valve Train	3
03-390F	Rocker Arms and Pushrods: Lifters	X	X	Camshaft & Valve Train	3
03-390G	Rocke. Arms and Pushrods: Miscellaneous Bolts & Drive Studs	X	X	Camshaft & Valve Train	3
03-402A	Governor Drive - Governor & Tachometer Drive Gear & Shaft	X	X	Overspeed Trip & Governor	3
03-402B	Governor Drive - Couplings, Pins & Keys	X	X	Overspeed Trip & Governor	3
03-410A	Overspeed Trip: Governor	X	X	Overspeed Trip & Governor	3
03-410B	Overspeed Trip: Governor and Accessory Drive Assembly	X	X	Overspeed Trip & Governor	3
03-410C	Overspeed Trip: Coupling (Flexible & Spider)	X	X	Overspeed Trip & Governor	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-410D	Overspeed Trip Vent Valve	X	X	Overspeed Trip & Governor	3
03-413	Governor Linkage	X	X	Overspeed Trip & Governor	3
03-415A	Governor Assembly: Woodward Governor	X	X	Overspeed Trip & Governor	3
03-415B	Governor Assembly Booster Servomotor	X		Overspeed Trip & Governor	3
03-415C	Governor Assembly Heat Exchanger	X	X	Overspeed Trip & Governor	3
03-420	Engine Driven Lube Oil Pump	X	X	Lube Oil	2
03-425A	Engine Driven Jacket Water Pump	X	X	Jacket Water	4
03-435A	Jacket Water Fittings: Pipe & Fittings	X	X	Jacket Water	4
03-435B	Jacket Water Fittings: Piping, Tubing & Supports	X	X	Jacket Water	4
03-437A	Turbo Water Piping: Pipe & Fittings	X	X	Jacket Water	4
03-437B	Turbo Water Piping: Supports	X	X	Turbo Intake Intercooler & Exhaust	2
03-441A	Starting Air Manifold: Piping, Tubing and Fitting	X	X	Air Start & Barring Device	3
03-441B	Starting Air Manifold Valves, Strainers, Filters	X	X	Air Start & Barring Device	3
03-441C	Starting Air Manifold: Supports	X	X	Air Start & Barring Device	3
03-442A	Starting Air Distributor: Distributor Assembly	X	X	Air Start & Barring Device	3
03-442B	Starting Air Distributor: Tubing, Fittings & Gaskets	X	X	Air Start & Barring Device	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-445	Engine Driven Fuel Oil Booster Pump	X	X	Fuel Oil Injection	4
03-450B	Fuel Oil Header: Piping & Tubing	X	X	Fuel Oil Injection	4
03-450D	Fuel Oil Header: Fuel Oil Supports	X	X	Fuel Oil Injection	4
03-455A	Fuel Oil Filters & Strainers: Fuel Oil Filters	X		Fuel Oil Injection	4
03-455B	Fuel Oil Filters & Strainers: Strainers	X		Fuel Oil Injection	4
03-455C	Fuel Oil Filters & Strainer: Mounting Hardware	X	X	Fuel Oil Injection	4
03-460A	Lube Oil Full Pressure Strainer	X	X	Lube Oil	2
03-465A	Lube Oil Lines External: Tubing, Fittings, Couplings	X	X	Lube Oil	2
03-465B	Lube Oil Lines - External Supports	X	X	Lube Oil	2
03-465C	Lube Oil Lines - External: Valves	X	X	Lube Oil	2
03-467A	Turbocharger: Lube Oil Fitting - Pipe, Tubing, Fittings & Flexible Coupling	X	X	Lube Oil	2
03-467B	Turbocharger: Lube Oil Fittings - Supports	X	X	Lube Oil	2
03-475A	Turbocharger: Bracket	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-475B	Turbocharger - Bracket: Air Butterfly Valve Assembly	X	X	Turbo, Intake, Intrclr. & Exhaust	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-475C	Turbocharger: Bracket - Air Intake Piping	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-475D	Turbocharger Bracket Bolting & Gaskets	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-475E	Turbocharger - Bracket - Pipe Support	X		Turbo, Intake, Intercooler & Exhaust	2
03-500A	Control Panel Assembly: Cabinet/System	X		Control Panel Assembly	4
03-500F	Control Panel Assembly Accumulator	X	X	Control Panel Assembly	4
03-500G	Control Panel Valves	X	X	Control Panel Assembly	4
03-500H	Control Panel Assembly Pressure Switch	X	X	Control Panel Assembly	4
03-500J	Control Panel Assembly: Control Relays	X	X	Control Panel Assembly	4
03-500K	Control Panel Assembly: Solenoid Valves	X	X	Control Panel Assembly	4
03-500M	Control Panel Components: Piping, Tubing, Fittings		X	Control Panel Assembly	4
03-500N	Control Panel Assembly: Terminal Boards/Switches/ Wiring		X	Control Panel Assembly	4
03-515	Jacket Water Thermostatic Valve	X	X	Jacket Water	4
03-525B	Barring Device - Pneumatic: Regulator Valve Shut Off Valve	X	X	Air Start & Barring Device	3
03-525D	Barring Device Support Bracket	X	X	Air Start & Barring Device	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-540A	Lube Oil Sump Tank - Tank with Strainer Assembly		X	Lube Oil	2
03-540B	Lube Oil Sump Tank: Misc. Fittings, Gaskets, Pipe & Bolting Material, Valves	X	X	Lube Oil	2
03-540C	Lube Oil Sump Tank: Mounting Hardware	X	X	Lube Oil	2
03-550	Foundation Bolts: Anchors, Bolts, Misc. Hardware	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-630A	Pyrometer Conduit Assembly: Conduit	X	X	Engine Instrumentation & Wiring	3
03-630B	Pyrometer Conduit Assembly: Conduit Fittings	X	X	Engine Instrumentation & Wiring	3
03-630C	Pyrometer Conduit Assembly: Support	X	X	Engine Instrumentation & Wiring	3
03-630D	Pyrometer Conduit Assembly: Thermocouples	X		Engine Instumentation & Wiring	3
03-650A	Emergency Diesel Generator	X	X	Generator	4
03-650B	Generator Control	X	X	Generator	4
03-650C	Generator - Shaft & Bearings		X	Generator	4
03-688A	Engine & Aux Module Wiring Material- Conduit & Fittings; Pyrometer Conduit Assembly- Conduit, Fitting, Supports	X	X	Engine Instrumentation & Wiring	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-688B	Engine & Aux. Module Wiring Material: Wiring & Terminations	X	X	Engine Instrumentation & Wiring	3
03-688C	Engine & Aux. Module Wiring Material: Boxes & Terminals		X	Engine Instrumentation & Wiring	3
03-689	Off Engine Safety Alarm Sensors Wiring	X	X	Engine Instrumentation & Wiring	3
03-690	On Engine Alarm Sensors	X	X	Engine Instrumentation & Wiring	3
03-691	Off Engine Alarm Sensors Level & Pressure Switches	X	X	Engine Instrumentation & Wiring	3
03-695A	Engine Shutdown Equipment: Tubing/Fittings & Supports	X	X	Engine Shutdown & Equipment	3
03-695B	Engine Shutdown Equipment: Valves, Regulator, Orifices	X	X	Engine Shutdown & Equipment	3
03-695C	Engine Shutdown Trip Switches	X	X	Engine Shutdown & Equipment	3
03-700A	Jacket Water Standpipe: Pipe, Fittings, Gaskets	X	X	Jacket Water	4
03-700B	Jacket Water Standpipe: Valves		X	Jacket Water	4
03-700C	Jacket Water Standpipe: Supports	X	X	Jacket Water	4
03-700E	Jacket Water Standpipe: Switches	X	X	Jacket Water	4
03-700F	Jacket Water Standpipe: Misc. Bolting Mat.	X	X	Jacket Water	4

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-715A	Sub Base - Sub Base Engine & Generator	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-715B	Sub Base Bolting	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-717A	Aux Sub Base & Oil & Water Piping - Aux. Skid	X	X	Jacket Water	4
03-717B	Aux Sub Base & Oil & Water Piping - Jacket Water: Valves	X	X	Jacket Water	4
03-717C	Aux. Sub Base & Oil & Water Piping - Jacket Water - Pipe Couplings, Fittings, Orifices and Strainers	X	X	Jacket Water	4
03-717D	Aux Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X	Jacket Water	4
03-717F	Aux. Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X	Jacket Water	4
03-717G	Aux. Sub Base & Oil & Water Piping - Jacket Water: Supports	X	X	Jacket Water	4
03-717H	Aux. Sub Base & Oil & Water Piping - Lube Oil: Pipe and Fittings	X	X	Lube Oil	2
03-717I	Aux Sub Base & Oil & Water Piping - Lube Oil Valves	X	X	Lube Oil	2
03-717J	Aux. Sub Base & Oil & Water Piping - Lube Oil - Gaskets & Bolting	X	X	Lube Oil	2
03-717K	Aux. Sub Base & Oil & Water Water Piping - Lube Oil: Supports & Mounting Hardware	X	X	Lube Oil	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-717L	Aux. Sub Base & Oil & Water Piping - Lube Oil: Automatic Switchover Assembly	X	X	Lube Oil	2
03-717M	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Piping and Fittings	X	X	Fuel Oil	4
03-717N	Aux Sub Base & Oil & Water Piping - Fuel Oil: Valves	X	X	Fuel Oil	4
03-717P	Aux Sub Base & Oil & Water Piping - Fuel Oil - Gaskets & Bolting	X	X	Fuel Oil	4
03-717Q	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Supports	X	X	Fuel Oil	4
03-800A	Misc. Equipment - Heater, Jacket Water	X	X	Jacket Water	4
03-800B	Misc. Equipment - Heater, Lube Oil Sump Tank	X	X	Lube Oil	4
03-800C	Misc. Equipment - Starting Air Tank Relief Valve	X	X	Air Start & Barring Device	3
03-805B	Intake Air Filter	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-805D	Flex Connections	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-810B	Jacket Water Standby Heater Pump	X	X	Jacket Water	4
03-820A	Lube Oil Heat Exchanger	X	X	Lube Oil	2
03-820B	Full Flow Lube Oil Filter	X	X	Lube Oil	2
03-820C	Before-and-After Lube Oil Pump	X	X	Lube Oil	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-820D	Oil Prelube Filter	X	X	Lube Oil	2
03-825A	Fuel Oil Booster Pump	X		Fuel Oil	2
03-825C	Fuel Oil Filters & Strainers: Strainers	X	X	Fuel Oil	4
03-835A	Starting Air Tank	X	X	Air Start & Barring Device	3
03-835D	Starting Air Compressor	X		Air Start & Barring Device	3
03-835F	Air Start System - Starting Air Float Trap	X		Air Start & Barring Device	3
02-835G	Starting Air Tank Relief Valve	X	X	Air Start & Barring Device	3

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Intercooler UTILITY Gulf States Utilities

GROUP PARTS LIST NO. F-068 TASK DESCRIPTION NO. DR-06-F-068-1

SNPS GPL NO. F-068 CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience, except that previously addressed in the lead engine reports. Nuclear and non-nuclear industry experience shows a number of intercooler problems mainly due to engine vibration, however, these problems are not associated with the DSR-48 engine design.

- A review of the lead engine DR/QR reports (Shoreham/Comanche Peak).

- The intercooler at River Bend is similar in design to those in the lead engines, all being water-cooled, two pass, counter flow coolers manufactured by Young Radiator Company.

The following maintenance from the lead engine DR/QR report should be implemented:

- The intercooler should be inspected for leaks every month.

- The intercooler should be disassembled and cleaned each refueling outage.

- The drain connection on the intercooler inlet plenum should be verified open and cleaned daily.

There are no modifications required for this component, based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger UTILITY Gulf States Utilities

GROUP PARTS LIST NO. MP-020 TASK DESCRIPTION NO. DR-06-MP-020-0

SNPS GPL NO. MP-017 CLASSIFICATION TYPE A

TASK DESCRIPTIONS

A design review for this component is not required, based on the following:

- Design reviews for the lead engines, Shoreham and Comanche Peak, as well as Grand Gulf and Catawba, establish the acceptability of the Elliott Model BCO-90G turbocharger. This model turbocharger is used on all Owners Group DSRV-16 and DSR-48 diesel engines.

- The turbocharger operating conditions at River Bend will produce lower stresses in the turbochargers than at Shoreham.

- The engines and lube oil systems are similar to Shoreham diesels. These engines use the before and after pump and piping modifications to provide sufficient oil to the turbocharger prior to startup. The effectiveness of this modification on reducing turbocharger thrust bearing wear has been demonstrated at Shoreham.

The EDG Component Tracking System was reviewed for any applicable experience. The primary adverse experience associated with the turbocharger was rapid thrust bearing wear and broken nozzle ring capscrews and vanes. The thrust bearing wear was attributed to insufficient lubrication prior to engine start. The cause of the broken capscrews and vanes is currently under study, however, the number of capscrews retaining the nozzle ring has been increased from 4 to 8 for added security. Broken vanes are infrequent events which have not impaired engine operability in the past. A supplement to the Phase 1 report for 90G turbochargers will be issued to address nozzle ring and capscrew failures.

The drip lubrication system was modified to allow full oil flow to the turbocharger bearings prior to engine starts. The modification consists of a manually operated valve that allows the drip system orifice to be by-passed. This greatly increases the amount of oil supplied to the turbocharger by the before and after pump, and should significantly reduce bearing wear.

Quality inspections that were conducted to date at River Bend were satisfactory and the results are recorded in TER 06-035. The remaining inspections, as outlined by the site CQRC, should be completed:

- Perform a visual inspection on the bearings and nozzle ring for signs of wear and cracks for Engine 1B.

- Verify that SIM 300 was implemented and perform a Liquid Penetrant test on the welds retaining the nuts. In addition, verify that the nut is staked. Applicable to Engines 1A and 1B.

The following modifications and maintenance inspections were recommended in previous DR/QR reports and apply to the turbochargers at River Bend as well. These modifications/ inspections will help assure turbocharger reliability and performance:

- Revise appropriate operating procedures to use the by-pass valve to prelube the turbocharger bearings. The valve should be opened 1 to 2 minutes prior to engine start and closed approximately 30 seconds after the engine reaches full speed.

- The TDI recommended drip system should be retained for minimizing thrust bearing wear associated with automatic fast starts. The quantity of oil passing through the turbocharger should be measured and be at least 0.1 gph. Increased flow rates up to 0.35 gph are recommended to improve effectiveness of the drip system.

- For improved confidence in the reliability of the turbocharger, inspection of a thrust bearing for signs of excessive wear should be performed to verify the adequacy of the full flow prelube system. This inspection should be performed on a thrust bearing installed during or after implementation of the full flow prelube system and following an initial 100 engine starts or at the closest plant refueling outage but not to exceed 130 starts.

- The rotor axial clearance should be routinely checked in accordance with the TDI Instruction Manual. In addition, since trends of increasing clearance could signify thrust bearing degradation (even if the total displacement is within specification), any such trends should be reviewed.

- Since the nuclear standby diesel generator sets may undergo non-prelubed automatic fast starts not associated with a potential LOOP/LOCA event, the turbocharger thrust bearings of any River Bend engine should be inspected for excessive wear and, if necessary, replaced after experiencing no more than 40 such starts. This recommendation is applicable to all thrust bearings installed.

- Spectrochemical engine oil analysis should be incorporated into the TDI Instruction Manual. In addition, to further expand the preventive monitoring of the turbocharger thrust bearing, ferrographic engine oil analysis may be utilized. Particular attention should be paid to copper level and particulate size, which could signify thrust bearing degradation.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Turbocharger UTILITY Gulf States Utilities, River Bend Station

GPL NO. MP-020 REV. NO. 3

SNPS GPL NO. MP-020

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection on the bearings and nozzle ring for signs of wear and cracks.
3. Determine the end clearances (Rotor Float).
4. Verify that the proper number of bolts on the turbine inlet casing are installed.
5. Verify that the proper torque loads are applied to the bolts of the turbine inlet casing.
6. Perform a Liquid Penetrant test on the stationary nozzle ring for signs of adverse wear and cracking. (Perform an one engine only unless results are unsatisfactory).
7. Verify that SIM 300 was implemented and perform a Liquid Penetrant test on the welds retaining the core plug (hub nut). In addition, verify that the core plug is staked.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of the bearings
3. End clearances are in accordance with Elliot's recommendation.

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

4. Proper number of bolts on the turbine inlet casing

5. Proper torque loads are applied.

6. Lack of adverse wear and cracking on the stationary nozzle ring

7. Core plug is tack welded, surface integrity of the tack weld and core plug is staked

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. No cracks exist in the nozzle ring blade or housing. No excessive dents exist on the nozzle ring blade.

3. End clearances are in compliance with Elliot's Instruction Manual

4. Number of bolts are in compliance with Elliot's Instruction Manual.

5. Proper bolt torques were applied in accordance with the TDI Instruction Manual.

6-7. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

REFERENCES (continued)

Engine 1A (continued)

3. Table of Clearances, Section 6 of the Elliot's Instruction Manual (Rotor Float)

4-6. Approved Site NDE Procedures, Elliot's Instruction Manual, TDI Instruction Manual

7. Approved Site NDE Procedures, TER# 99-024

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-7. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER J. J. Power for JCK

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on the stationary nozzle ring with satisfactory results. This was reported by TER# 06-035.

3. The end clearances of the rotor float were determined to be in accordance with the vendor manual. This was reported by TER# 06-035.

4. The proper number of bolts were installed on the turbine inlet casing. This was reported by TER# 06-035.

COMPONENT REVIEW (continued)

Engine 1A (continued)

5. Torque loads were applied to the turbine inlet casing bolts in accordance with TDI requirements. This was reported by TER# 06-035.

6. A Liquid Penetrant test was performed on the stationary nozzle ring with satisfactory results. This was reported by TER# 06-035.

7. No inspection report has been received which fulfills this requirement.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

3. The end clearances of the rotor float were determined to be in accordance with the vendor manual. This was reported by TER# 06-035.

4. The proper number of bolts were installed on the turbine inlet casing. This was reported by TER# 06-035.

5. Torque loads were applied to the turbine inlet casing bolts in accordance with TDI requirements. This was reported by TER# 06-035.

6. Inspection was not required as engine 1A results were satisfactory.

7. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Sallita PROGRAM MANAGER J J Power for JCK

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

TURBOCHARGER THRUST BEARING DRIP LUBE SYSTEM
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-CFR

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the turbocharger thrust bearing drip lube system components and supports to withstand the effects of normal operating and earthquake loadings. The primary function of this tubing is to provide lube oil to the turbocharger thrust bearing prior to engine startup.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the tubing and supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objectives, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear and non-nuclear industry experience (see Appendix C).
- The Quality Revalidation Checklist results were reviewed for acceptability.
- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology of tubing and support for this evaluation.

IV RESULTS AND CONCLUSIONS

The tubing and supports, as defined by this Component Design Review, have been evaluated in accordance with Reference 1 and have been found acceptable with modifications, provided the final assembly of Engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and information contained in Reference 2, it is concluded that the tubing and supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications are implemented as detailed in Reference 3:

Engine A

- Add a two-directional restraint at the by-pass shutoff valve near the sight glass.
- Add a two-directional restraint approximately mid-span in the riser near the lube oil header branch connection.

Engine B

- This system was not installed at the time of the field walkdown. Therefore, it is recommended that the tubing and supports, including the above modifications, be installed similar to Engine A.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

2. Stone & Webster Calculation number 11600.60-NP(B)-0601-XH.

3. Memo No. 6480 from C. Malovrh (SWEC) to J. Kammeyer (SWEC) dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger Thrust Bearing Driplube System (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO.03-CFR

TASK DESCRIPTION NO.: DR-06-03-CFR-1

SNPS GPL NO. 03-CFR

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Perform an engineering review of the tubing and tubing supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

To provide lube oil to the turbocharger thrust bearing prior to engine startup.

ATTRIBUTE TO BE VERIFIED

Structural adequacy of the tubing and supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

IEEE 387

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group" Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations)

GROUP CHAIRPERSON J J Powers PROGRAM MANAGER D C Kammeyer

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Turbocharger Thrust Bearing Lubricant System

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-CFR

REV. NO. 1

SNPS GPL NO. 03-CFR

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawing for the lubricant system if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve R. Swartz PROGRAM MANAGER J. Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

COMPONENT REVIEW (continued)

Engine 1A (continued)

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sacco PROGRAM MANAGER J C Kammeyer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-CFR

Effective Printout Dates
River Bend: 10/10/84
Industry: 10/15/84

COMPONENT TYPE: Turbocharger Thrust Bearing Drip Lube System

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
Report concerning possible thrust bearing damage under hot start conditions while lube oil is above 160°F.	St. Lucie 1 LER: 335-79021 790625	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Potential problem with turbo bearing lubrication/ bearing smear if engines receive a repeat rapid start coincident with a loss of AC power.	Pt. Beach 1 LER: 266-79007 790424	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
GM notified VEPCO of potential thrust bearing problems under certain repeat start operating modes.	Surry 1 LER: 280-79017 790502	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
During normal operation the engine may reach operating speed prior to oil pressure being established at thrust.	Monticello LER: 263-79010 790426	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Inspection of turbo(s) revealed worn thrust bearing due to lack of lube oil during prelube while in the standby mode.	San Onofre 1 LER: 206-80039-2 801211	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Under repeat start modes there is a possibility that the turbo thrust bearing could be damaged.	Arkansas Nuc I LER: 313-79006, 790607	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
GM identified potential problem with turbo thrust bearing lube.	Conn. Yankee LER: 213-79009 790831	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Several repairs were made because of thrust bearing failures and insufficient oil during startup on TDI 8 cylinder engines in Taiwan.	Telex from PEI to LILCO 11/28/83	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Lube oil system supplies oil to turbo bearing during operating mode(s) only. Turbo thrust bearings may experience rapid wear because of this system.	Cleveland Electric (Perry) I & E 83-51 08/05/83 Duke Power 01/28/81, 04/34/82	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Distress on the turbine end bearing thrust face and shaft thrust face resulting from a dry start. Require instant oil flow at start signal.	Taiwan Power So. Calf. Edison letter from E.S. Ncilhattan (Elliot Co.) to A. Fleischer (TDI) 04/06/81 T-33	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Thrust bearing totally burned. Possibly due to lack of lubricant prior to engine start.	Kuosheng 2 TPC Nuc. Plant No.2 06/03/83 File No. T-45	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Turbocharger thrust bearings experienced excessive wear from lack of prelube oil during multiple fast starts of the diesel.	Catawba 04/05/84 File no. T-53 Pg. 7-2	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Lube oil is not supplied to the turbocharger thrust bearing until lube oil pump initiates upon engine start.	Grand Gulf No. 83-024 10/22/83	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Fast repeat starts of diesels may result in engine reaching operating speed before required oil pressure is reached at turbocharger hoist bearing. Cumulative damage from similar starts would result in turbocharger failure.	Kewaunee LER 305-79024, 790922 I & E 79-12	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Turbocharger thrust bearings experienced excessive wear resulting from lack of prebule oil during multiple fast starts of the diesel.	10CFR 50 .55E LILCO LTR SNRC-549, 10CFR21 TDI LTR To O.I.&E.	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Potential problem with lubrication thrust bearings resulting from lack of oil at startup.	TDI letter to O.I.&E. US NRC Dated 12/16/80.	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.
Diesel tripped from low turbocharger oil pressure	Zion 1 EPRI 121574	Lube oil is supplied by the keepwarm lube oil pump via a drip system prior to startup. See turbocharger task description MP-017.

NON-NUCLEAR

None

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Intake Manifold & Piping (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-375

TASK DESCRIPTION NO. DR-06-03-375-1

SNPS GPL NO. 03-375

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).
- A comparison of the intake manifold and piping spool pieces, fittings and supports for River Bend with Shoreham.

The following modification recommendations made on the lead engine DR/QR report should be implemented:

- Add seven ribs to flat plate on bottom of intake manifold (for details, reference Impell sketch No. SK-RB-IM-1 Rev. 0).
- Verify that all bolts on the bottom rectangular flange (which interfaces with the intercooler) are torqued as specified in Appendix 4 of the Delaval Instruction Manual, Vol. 1 for Model DSR-48.

The following maintenance recommendation from the lead engine report should be implemented to avoid misalignment and cracking problems on the intake manifold piping:

- Other castings may be tried in an attempt at a better fit.
- Bolt hole diameters on the intake manifold elbows may be increased from 1/16" oversize to 1/8" oversize. However under no circumstances shall any component be jacked to fit.

Quality inspections performed to date have been reviewed and are considered satisfactory. The following inspections are recommended to be performed for Engine 1B:

- Perform a visual inspection on the intake manifold elbows at the flange mating surfaces for cracks.

TASK DESCRIPTION (continued)

- Upon reinstallation, ensure that the manifold installation does not cause excessive stress on flange bolt holes due to misalignment.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Intake Manifold UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-375 REV. NO. 1

SNPS GPL NO. 03-375

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Perform a visual inspection on the intake manifold elbows at the flange mating surfaces for cracks.

3. Upon reinstallation, ensure that the manifold installation does not cause excessive stress on flange bolt holes due to misalignment.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Cracking in flange bolt areas

3. Proper installation of the intake manifolds is in accordance with the following TDI Instruction Procedures:

   a) Assure a clean and smooth surface on cylinder head and air inlet manifold.
   b) Install air elbow and check fit between cylinder head and elbow flange with feeler gauges. Also, check for freedom of movement of capscrews in the flange holes.
   c) Redrill or elongate flange holes as necessary to ensure freedom of movement of the elbow and the abutment of the elbow flange to the cylinder head.

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

d) Some filling or scraping may be necessary to assure a reasonably parallel surface, (less than one gasket thickness), between head surface and elbow flange and/or manifold surface and elbow flange.
e) Double gaskets and R.T.V. maybe used to adjust height and/or distance between mating parts.
f) Positively identify elbow to assure proper reinstallation.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. No cracks at the flange face bolt areas.

3. Installation of the intake manifold is in accordance with the TDI Instruction Procedures.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

Engine 1A

3. TDI Instruction Manual

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve R. Schwartz PROGRAM MANAGER D. C. Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on the intake elbow flange faces for indications of cracks with satisfactory results. This was reported by TER# 06-076.

3. During installation, it was verified that no undue stress was applied to the intake elbow flanges. This was reported by TER# 06-076.

Engine 1A

1. No EDGCTS Site experience documents are in evidence.

2-3. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

RESULTS AND CONCLUSION (continued)

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Vita A Salita PROGRAM MANAGER JC Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Exhaust Manifold

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-380A

TASK DESCRIPTION NO. DR-06-03-380A-0

SNPS GPL NO. 03-380A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).
- A comparison of the exhaust manifold piping spool pieces and fittings for River Bend with Shoreham.

Based on projected operating hours and temperatures (Ref. ROC between A. Palumbo (Impell) and V. Klco (Gulf States), "River Bend Exhaust Manifold Operating History," dated 10/26/84) the existing manifold is acceptable provided that the recommendations indicated in the maintenance program are implemented.

The following maintenance recommendation is required to be performed on the exhaust manifold:

- Perform a visual inspection and a magnetic particle test on a sample of the circumferential pipe weld and corresponding heat affected zones.

This is to be performed during the first refueling outage and alternate outages thereafter. However, diesel operation should not exceed 200 hours between inspections.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Exhaust Manifold: Gasket & Bolting

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-380B

TASK DESCRIPTION NO. DR-06-03-380B-0

SNPS GPL NO. 03-380B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham), and the applicable site and industry experience listed in the EDG Component Tracking System.

There are no maintenance or modification recommendations for this component.

The following Quality inspections should be performed on engine 1A:

- Verify that the proper torques were applied to the exhaust pipe flange capscrews.
- Perform a dimensional check of the capscrews to verify that the correct parts are installed in their appropriate locations.

The following quality inspections should be performed on engine 1B.

- Verify that the proper torque was applied to the exhaust pipe flange capscrews;
- Perform a dimensional check of the capscrews to verify that the correct parts are installed in their appropriate locations.
- Verify that the proper gasket material and bolting are installed at the manifold and flange connections;
- Verify at reinstallation that no binding exists on the exhaust manifold and no cracks exist at the manifold flange fillets by a visual inspection.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Exhaust Manifold - Gaskets & Bolting

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-380B

REV. NO. 2

SNPS GPL NO. 03-380B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the proper torques were applied to the exhaust pipe flange capscrews.
3. Perform a dimensional check of the capscrews.
4. Verify that the proper gasket material and bolting are installed at the manifold and flange connections.
5. Verify at reinstallation that no binding exists on the exhaust manifold and no cracks exist at the manifold flange fillets by a visual inspection.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper torque of the capscrews
3. Proper dimensions of the capscrews
4. Proper gasket material and bolting are installed.

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

5. No binding exists on the exhaust manifold and no cracks exist at the manifold flange fillets.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Torque is in accordance with the TDI Instruction Manual.

3. Review of inspection report by the Design Group

4. TDI Instruction Manual

5. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures, TDI Instruction Manual

3-5. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-5. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with unsatisfactory results. N&D 3446 remains open.

2-3. No inspection reports have been received which fulfill this requirement.

4. The proper gasket material and bolting were installed at the manifold and flange connections. This was reported by TER# 06-063.

5. During reinstallation, it was verified that no binding on the exhaust manifold existed and no cracks found at the manifold flange fillet. This was reported by TER# 06-063.

Note - Two of the three capscrews at the knee brace to engine attachment for cylinder 8 have been sheared off. This knee brace supports the exhaust manifold/water shroud. The disposition of this finding is to replace the sheared capscrews with SAE-grade 5 bolting. This was reported by TER# 06-063.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-5. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Vita A Salelli PROGRAM MANAGER [illegible]

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger Bracket and Bolting

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-475A&D

TASK DESCRIPTION NO. DR-06-03-475A&D-0

SNPS GPL NO. 03-475A&D

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

A design review report is not required for this component for the following reasons:

- The bracket is identical to that used at Shoreham. There is a vibration support strut, which is similar to that used at Shoreham but has jacket water circulated through it to provide a parallel heat-up of the engine and strut.
- The River Bend configuration has been analyzed and has been found similar to Shoreham, Ref. 2. For engine vibration loads and pipe loads that were assumed to be the same as those at Shoreham, bracket bolt loads and bracket stresses have been found acceptable.
- One of Shoreham's engines has operated 1700 hours without major failures of bolting. Bolt failures at Shoreham are attributable to thermal expansion problems with the Shoreham strut, which should not apply to the River Bend jacket water heated strut.

There are no maintenance or modification requirements identified in the lead engine report (Shoreham).

The following quality inspection should be performed for both station engines:

- Bolt torques should be verified to be in accordance with TDI requirements.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone & Webster Specification number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Lousiana.

2. Stone & Webster Calculation No. 11600.60-NM(B)-006-CZC-39

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger-Bracket: Air Butterfly Valve Assembly

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-475B

TASK DESCRIPTION NO. DR-06-03-475B-0

SNPS GPL NO. 03-475B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the lead engine DR/QR report.
- A review of the lead engine DR/QR report (Shoreham).
- Similarity between River Bend and lead engine components.

The following maintenance recommendation from the lead engine DR/QR report should be implemented:

- Locking devices on the valve linkages should be verified to be snug on a monthly basis.

The following modification should be made:

- Addition of grease fittings per TDI SIM 322.

Quality inspections performed to date have been reviewed and are considered satisfactory.

The following inspection has not been performed to date and is recommended:

- Perform a microhardness test on the shaft (TDI P/N 02-475-15AS) (Engine 1A).

Note: If this inspection is unsatisfactory, perform the same inspection on Engine 1B.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Turbocharger - Bracket - Air Butterfly Valve Assembly (w/actuator)

UTILITY Gulf States Utilities River Bend Station

GPL NO. 03-475B

REV. NO. 1

SNPS GPL NO. 03-475B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection of the air butterfly valve to shaft attachment pins for signs of distress. Document with photographs.
3. Perform a visual inspection of the shaft for signs of wear and distress. Document with photographs.
4. Verify the butterfly valve is properly installed.
5. Perform a microhardness test on the shaft (TDI P/N 02-475-15AS).

Engine 1B

1. Assemble and review existing documentation.

NOTE: If inspections performed on Engine 1A are unsatisfactory, perform identical inspections on Engine 1B.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of pins
3. Surface condition of shaft
4. Proper installation of the butterfly valve
5. Hardness of the shaft

Engine 1B

1. Quality status of Component Document Package

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-5. Review of inspection report by the Design Group

Engine 1B

1. Satisfactory Document Package

REFERENCES

Engine 1A

1. QCI No.52

2-4. Approved Site NDE Procedures

5. TER#s 99-002, 99-022

Engine 1B

1. QCI No.52

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-5. Inspection Reports

Engine 1B

1. Document Summary Sheet

GROUP CHAIRPERSON Steve M Schwartz PROGRAM MANAGER J C Kammeyer

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection of the air butterfly valve to shaft attachment pins was performed with no signs of wear, distortion, hole elongation, or pin looseness in evidence. This was reported by TER# 06-075.

3. A visual inspection of the butterfly shaft was performed with no signs of wear or distress in evidence. This was reported by TER# 06-075.

4. The restoration and installation of the air butterfly valve was witnessed. This was reported by TER# 06-075.

5. No inspection report has been received which fulfills this requirement.

NOTE: New gaskets were installed and the proper torque was applied to the fasteners in accordance with the Vendor Manual. This was reported by TER# 06-075.

No misalignment or cold sping was observed at the piping connections. This was reported by TER# 06-075.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Scletta PROGRAM MANAGER J C Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger Bracket Air Intake Piping (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-475C

TASK DESCRIPTION NO. DR-06-03-475C-0

SNPS GPL NO. 03-475C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).
- A comparison of the turbocharger bracket air intake piping spool pieces and fittings for River Bend with Shoreham.

The following modification recommendation made on the lead engine DR/QR report should be implemented:

- Verify that all bolts on the 14-inch flanged connection, between the air-operated butterfly valve and the intercooler adapter pipe, are Grade A449 or better.
- Remove all pipe supports from the subject piping.

There are no maintenance requirements from the lead engine DR/QR Report for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger Bracket and Bolting

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-475A&D

TASK DESCRIPTION NO. DR-06-03-475A&D-0

SNPS GPL NO. 03-475A&D

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

A design review report is not required for this component for the following reasons:

- The bracket is identical to that used at Shoreham. There is a vibration support strut, which is similar to that used at Shoreham but has jacket water circulated through it to provide a parallel heat-up of the engine and strut.
- The River Bend configuration has been analyzed and has been found similar to Shoreham, Ref. 2. For engine vibration loads and pipe loads that were assumed to be the same as those at Shoreham, bracket bolt loads and bracket stresses have been found acceptable.
- One of Shoreham's engines has operated 1700 hours without major failures of bolting. Bolt failures at Shoreham are attributable to thermal expansion problems with the Shoreham strut, which should not apply to the River Bend jacket water heated strut.

There are no maintenance or modification requirements identified in the lead engine report (Shoreham).

The following quality inspection should be performed for both station engines:

- Bolt torques should be verified to be in accordance with TDI requirements.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone & Webster Specification number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Lousiana.

2. Stone & Webster Calculation No. 11600.60-NM(B)-006-CZC-39

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Turbocharger Bracket - Bolting & Gasket

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-475D

REV. NO. 1

SNPS GPL NO. 03-475D

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection to verify that the bracket bolting is properly installed (i.e. gross misalignment and incomplete engagement of the threads should be recorded).
3. Determine the material of the bracket bolting.
4. Verify that the torque loads applied to the bolted joint connections are in accordance with the TDI Instruction Manual.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper installation of the bracket bolting
3. Material of the bracket bolting
4. Proper torque loads are applied to the bolted joint connections.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Bracket bolting is installed with proper alignment and complete engagement of the threads.

3. Material of the bracket bolting is AISI A-490.

4. The torque load on the bolted joint connections are in accordance with the TDI Instruction Manual.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2-4. Approved Site NDE Procedures, TDI Instruction Manual

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER D.C. Kensinger

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2-4. No inspection reports have been received which fulfill these requirements.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salcka PROGRAM MANAGER. L Kamm

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger Bracket Pipe Supports (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-475E

TASK DESCRIPTION NO. DR-06-03-475E-0

SNPS GPL NO. 03-475E

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham)
- All subject pipe supports are removed per the lead engine DR/QR report.

The following modification recommendation made on the lead engine DR/QR report should be implemented:

- All subject pipe supports are to be removed.

There are no maintenance recommendations for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Intake Air Filter UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-805B TASK DESCRIPTION NO. DR-06-03-805B-0

SNPS GPL NO. 10-114 CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience, except that previously addressed in the lead report.
- A review of the lead engine DR/QR report (Shoreham)
- The intake air filters at River Bend are the same as those used in the lead engine (AAF Model FTDM-30-8-4R) and are used in the same application.

The following maintenance from the lead engine DR/QR report should be implemented:

- Inspect/replace the filter cartridges at 3-6 month intervals

There are no modifications required for this component based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Flex Connections

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-805D

TASK DESCRIPTION NO. DR-06-03-805D-0

SNPS GPL NO. 10-109

CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).

The exhaust flex connection resides downstream of the turbocharger. A failure of the exhaust flex connection would result in exhaust gasses penetrating the boundary and escaping into the diesel room. This would not impair the diesels operability.

There are no maintenance or modification recommendations made based on the lead engine DR/QR report.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Pressure Regulating Valve

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 00-420

TASK DESCRIPTION NO. DR-06-00-420-0

SNPS GPL NO. 00-420

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry experience. There was no site experience listed in the Component Tracking System.
- A review of the lead engine DR/QR report (Comanche Peak).
- The lube oil pressure regulating valves at Comanche Peak and River Bend are identical.

The following maintenance from the lead engine DR/QR report should be implemented:

- Disassemble and clean valve at each refueling outage.
- If valve plugging becomes a problem, measure the dimensions of the valve internals for proper clearance and increase the frequency of valve disassembly/cleaning.

There are no modifications required for this component, based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

LUBE OIL FITTINGS - INTERNAL HEADERS
(LARGE BORE SCOPE ONLY)
COMPONENT PART NO. 03-307A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the lube oil internal headers for the effects of normal operating and earthquake loadings.

The primary function of the internal headers is to provide lube oil to the main crankshaft bearings, camshaft, and gear case.

The scope of piping embraced by this report includes the large bore (greater than 2-inch diameter) piping components referenced in TDI Parts Manual Vol. II for River Bend (Ref. 1) as TDI Part No. 03-307-03-AE.

Piping components are defined as piping spool pieces, elbows, tees, flanges, and the interconnecting welds. This scope is uniquely defined in terms of Transamerica Delaval, Inc. (TDI) part numbers in Reference 2.

II OBJECTIVE

The objective of this review was to verify the adequacy of the subject piping components for normal operating and earthquake loadings.

III METHODOLOGY

The evaluation of the piping components was performed in accordance with the philosophy and intent of ASME Code Section III, for Class 3 Nuclear Piping. Towards this end, a criteria document was developed, "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," which describes the background and provides the techniques for evaluating the subject piping and supports. This criteria is presented in its entirety in Reference 3.

Quality Revalidation Checklist results were reviewed for acceptability.

The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience.

IV RESULTS AND CONCLUSIONS

All piping stresses were within the design allowables specified by the ASME Section III Code.

There are no TERs associated with this component.

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review and the results are consistent with the final conclusions of this report.

Based on the above review, it is concluded that the subject piping components are adequate for their intended design function at River Bend.

V REFERENCES

1. TDI Parts Manual, Vol. II - River Bend.

2. "Supporting Calculations for the Evaluation of River Bend Diesel Generator Large Diameter Piping and Support," Impell Report No. 02-0630-1271, Rev. 0, October 1984.

3. "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984. This is included in Appendix III of the final DR QR report.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Fittings Internal Headers (Large Bore Scope Only)

UTILITY Gulf State Utilities Company

GROUP PARTS LIST NO. 03-307A

TASK DESCRIPTION NO. DR-06-03-307A-1

SNPS GPL NO. 03-307A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Evaluate structural integrity of the lube oil fittings-internal headers and piping spool pieces for the effects of normal operating and earthquake loadings by (a) comparison to previous analyses, (b) review of previous qualification documentation, and/or (c) actual performance of stress evaluation in accordance with the intent and philosophy of ASME III Class 3 and Impell Design Criteria.

Review information provided on TERs.

PRIMARY FUNCTION

To provide lube oil to the main crankshaft bearings, camshaft, and gear case.

ATTRIBUTE TO BE VERIFIED

Structural integrity of large bore (greater than 2 in. dia.) piping spool pieces and fittings to withstand the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

None

REFERENCES

"Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984.

DOCUMENTATION REQUIRED

Verified piping isometric, material specification, size and schedule, design parameters (temp., pressure), contents, and insulation.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Lube Oil Fittings - Internal-Headers

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-307A

REV. NO. 1

SNPS GPL NO. 03-307A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the headers if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor J Sabella PROGRAM MANAGER

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-307-A

Effective Printout Date 10/17/84

COMPONENT TYPE: Lube Oil Fittings-Internal Headers

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
No. 2 diesel generator hose from the lube oil header to camshaft tensioner broke. The hose failed because of its proximity to the cam chain and tensioner sprocket. The hose was replaced and clamped away from the cam chain.	LER Cooper 298-79034, 791107	Refers to small bore scope of work under Component No. 03-307A.
While preventive maintenance was being performed, it was found that the lower main bearing was scored. The bearing was damaged because it did not receive proper lubrication upon starting prior to reaching operating speed. A lube oil line that provides oil to the bearing was disconnected. The bearing was replaced, the oil line was connected, and proper operation will be verified prior to placing the diesel in service.	LER - No. Anna #2 339-82016 820323	Refers to small bore scope of work under Component No. 03-307A.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Fittings-Internal: Headers (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-307A

TASK DESCRIPTION NO. DR-06-03-307A-0

SNPS GPL NO. 03-307A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham), the DR/QR reports for Comanche Peak and Grand Gulf, and the applicable industry experience. Ther is no site experience for this component in the EDG Component Tracking Systc...

There are no maintenance or modification recommendations for this component.

A field walkdown was not possible due to component inaccessibility. However, this component will maintain its functional capability for all normal and earthquake loadings without modification based on review of the lead engine report.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Fittings-Internal-Tubing and Fittings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-307B

TASK DESCRIPTION NO. DR-06-03-307B-1

SNPS GPL NO. 03-307B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There are no site experiences for this component in the EDG Component Tracking System.

There are no maintenance or modification recommendations for this component.

A field walkdown was not performed due to component inaccessibility. However, due to spatial restrictions, all sections of unsupported tubing meet acceptable span lengths. Therefore, this component will perform its intended function for all normal and earthquake loadings.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Fittings Internal: Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-307D

TASK DESCRIPTION NO. DR-06-03-307D-0

SNPS GPL NO. 03-307D

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham). There is no site or industry experience for this component in the EDG Component Tracking System.

There are no maintenance recommendations for this component.

A field walkdown was not possible because of component inaccessibility. However, this component will maintain its functional capability for all normal and earthquake loadings without modifications based on review of the lead engine report.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Engine Driven Lube Oil Pump

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-420

TASK DESCRIPTION NO. DR-06-03-420-0

SNPS GPL NO. 03-420

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience, except that previously addressed in the lead engine report.
- A review of the lead engine DR/QR report (Shoreham)
- The engine driven lube oil pump at River Bend is the same as the pump used in the lead engine (Roper Pump Company, Fig. 2877, Type 2; TDI P/N RB-001-000) and is used for the same pumping application.

There are no maintenance or modification recommendations based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Full Pressure Strainer

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-460A

TASK DESCRIPTION NO.: DR-06-03-460A-0

SNPS GPL NO. 04-000

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Component Tracking System indicated that there was no significant applicable industry and/or site experience, except that which was previously addressed in the lead engine report.
- A review of the lead engine DR/QR report (Shoreham).
- The lube oil full pressure strainers in the River Bend engine and the lead engine are identical.

In accordance with the lead engine report, the TDI Manual presently specifies acceptable maintenance procedures; no additional recommendations are required.

There are no modifications required for this component, based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

LUBE OIL LINES EXTERNAL: TUBING, FITTINGS, COUPLINGS
(LARGE BORE SCOPE ONLY)
COMPONENT PART NO. 03-465A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the lube oil external tubing, fittings and couplings for the effects of normal operating and earthquake loadings.

The primary function of the lube oil external tubing, fittings and couplings is to carry lube oil from the engine drain to the lube oil sump tank, from the duplex strainer to the internal header, and from the prelube strainer to the engine.

The scope of piping embraced by this report includes the large bore (greater than 2-inch diameter) piping components as noted on the as-built information transmitted to and obtained during Impell field verification (Ref. 1).

Piping components are defined as piping spool pieces, elbows, tees, flanges, Dresser couplings, and the interconnecting welds. This scope is uniquely defined in terms of Transamerica Delaval, Inc. (TDI) part numbers in Reference 1.

II OBJECTIVE

The objective of this review was to verify the adequacy of the subject piping components for normal operating and earthquake loading.

III METHODOLOGY

The evaluation of the piping is performed in accordance with the philosophy and intent of the ASME Section III Code, for Class 3 Nuclear Piping. Towards this end, a criteria document was developed, "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," which describes the background and provides the techniques for evaluating the subject piping and supports. These criteria are presented in their entirety in Reference 2.

Quality Revalidation Checklist results were reviewed for acceptability.

The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience.

IV RESULTS AND CONCLUSIONS

All piping stresses were within the design allowables specified by the ASME Section III Code.

The movements at the 8-inch Dresser coupling are within the manufacturer's end movement requirements (Ref. 3). However, it is recommended that a minimum installation gap between the pipe ends of 0.132 inch be utilized in order to avoid contact of the pipe ends.

There are no service life constraints (Ref. 4) because this style of coupling has no significant history of failure. Shelf life (Ref. 4) is unlimited as long as the gaskets remain packaged and protected from the elements (light, water, etc). The coupling is marginal with respect to manufacturer's service condition limits and will be replaced by an upgraded model if leaks develop, per Reference 5.

All pipe loads on the engine, pump and sump tank were tabulated and issued for evaluation.

There are no TERs associated with this component.

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review and the results are consistent with the final conclusions of this report.

Based on the above review, it is concluded that the subject piping components, with the installation gap and maintenance item recommended above, are adequate for their intended design function at River Bend.

V REFERENCES

1. "Supporting Calculations for the Evaluation of River Bend Diesel Generator Large Diameter Piping and Support," Impell Report No. 02-0630-1271, Rev. 0, October 1984.

2. "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984. This is included in Appendix III of the final DR/QR report.

3. Dresser Pipe Couplings, Pipe Fittings, and Pipe Repair Products Catalog, No. 63.

4. Telecon between A. Palumbo (Impell) and M. Riley (Dresser Manufacturing Co.), dated June 5, 1984.

5. Letter from A. Palumbo (Impell) to J. Kammeyer (SWEC), "Dresser Couplings-River Bend," dated 10/29/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Lines-External Tubings, Fittings, Couplings (Large Bore Scope Only)

UTILITY Gulf State Utilities Company

GROUP PARTS LIST NO. 03-465A

TASK DESCRIPTION NO. DR-06-03-465A-0

SNPS GPL NO. 03-465A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Evaluate structural integrity of the lube oil lines-external piping spool pieces and fittings for the effects of normal operating and earthquake loadings by (a) comparison to previous analyses, (b) review of previous qualification documentation, and/or (c) actual performance of stress evaluation in accordance with the intent and philosophy of ASME III Class 3 and Impell Design Criteria.

Review information provided on TERs.

PRIMARY FUNCTION

To carry lube oil from the engine drain to the lube oil sump tank, from the duplex strainer to the internal header, and from the pre-lube strainer to the engine.

ATTRIBUTE TO BE VERIFIED

Structural integrity of large bore (greater than 2 in. dia.) piping spool pieces and fittings to withstand the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

None

REFERENCES

"Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984

DOCUMENTATION REQUIRED

Verified piping isometric, material specification, size and schedule, design parameters (temp., pressure), contents, and insulation.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Lube Oil Lines External - Tubing, Fittings & Coupling UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-465A REV. NO. 1

SNPS GPL NO. 03-465A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the tubing, fittings and couplings if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve M. Schwartz PROGRAM MANAGER X Kanning

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Walter A. Salerta PROGRAM MANAGER JC Kennedy Jr.

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-465A

Effective Printout Date: 10/17/84

COMPONENT TYPE: Lube Oil Lines External: Tubing, Fittings, Couplings

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
During full power operation, a nonisolatable lube oil leak was discovered. The diesel generator lube oil sample line failure was apparently caused by long-term vibration stresses. The copper tubing was replaced by stainless steel.	LER Kewaunee 305-79025, 790922	Refer to small bore scope of work.
Lube oil spraying from a cracked instrument line caused a fire. Instrument line cracked because of fatigue failure caused by vibrating pressure gauge.	LER San Onofre 1, 206-81017-1, 810714 NPRDS Hit 75	Refer to small bore scope of work.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Smoke detector in the diesel generator 1B cubicle alarmed. Investigation revealed smoke coming from the diesel generator 1B turbo-charger area. Investigation revealed no specific mechanical failure. Traces of lubricating oil were noted on a portion of the exhaust piping. The source of the oil could not be identified positively.	LER Maine Yankee 309-83024, 830615	Not applicable to subject evaluation because subject configuration has no oil lines above the exhaust manifold.
Diesel generator No. 1 sustained fire damage when fitting for a low lube oil pressure indicator failed. Lube oil ignited. Repairs made.	SER San Onofre, 55-81, 07/14/81 SOER 83-1	Refer to small bore scope of work.
Oil leaking on exhaust manifold caused fire. Cleaned seal gland nuts and replaced all gaskets.	NPRDS Robinson 2 830523, Hit 165	Not applicable to subject evaluation because subject configuration has no oil lines above the exhaust manifold.
Emergency diesel generator 1J developed an oil leak and was declared inoperable. This event was caused by an oil leak on the diesel engine. A gasket was replaced and the engine operated for 4 hours to vaporize any oil remaining in the exhaust port as per the manufacturer's recommendations.	LER North Anna 1, 338-81027, 810421	Concern is for an isolated gasket failure. Not applicable.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
At 1026 on 05/05/81 and 0915 on 05/06/81, diesel generator 2B was declared inoperable because of a lube oil leak. Cause for first event was a leaking O-ring on lube oil strainer. O-ring was replaced. Cause for second event was a fatigue failure, caused by vibration, of compression fitting on a copper line. Line was replaced with stainless steel and re-routed to reduce vibration.	LER Farley 2 346-81013, 810505	For first event, refer to lube oil strainer evaluation. For second event, there are no copper lines in the subject scope of evaluation.

NON-NUCLEAR

None

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Lines External: Tubing, Fittings, Couplings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-465A

TASK DESCRIPTION NO. DR-06-03-465A-1

SNPS GPL NO. 03-465A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience for this component in the EDG Component Tracking System.

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications/additions of supports. The necessity for similar modifications/additions on River Bend has been assessed by a field walkdown.

The field walkdown was performed in accordance with the small bore piping and tubing criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loading provided that the supports are modified/added as indicated in DR/QR report 03-465B.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Lines-External Supports UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-465B TASK DESCRIPTION NO. DR-06-03-465B-0

SNPS GPL NO. 03-465B CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).

Based on previous experience, supports appear to be adequate provided that the analysis of the corresponding piping (Component No. 03-465A) does not mandate modifications. If the piping analysis warrants modification to the supports, these modifications will be addressed in the DR/QR report for Component No. 03-465A.

There are no maintenance recommendations for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

LUBE OIL LINES EXTERNAL: SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-465B

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the lube oil external supports to withstand the effects of normal operating and earthquake loadings. The primary function of these supports is to provide adequate restraint to the external lube oil small bore piping/tubing.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the small bore piping/tubing supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience. See Appendix C for results.
- The Quality Revalidation Checklist results were reviewed for acceptability.
- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology for this evaluation.

IV RESULTS AND CONCLUSIONS

The supports, as defined by this Component Design Review and as shown in Reference 2, have been evaluated in accordance with Reference 1 and have been found acceptable with modifications, provided the final assembly of engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and information contained in Reference 2, it is concluded that the supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

Engine A

Lube Oil to Cam Shaft Bearing

- Tubing across cam shaft bearing cover is crimped. It is recommended that this tubing be replaced.

- In order to support the tubing of Component 03-465A, a two-directional restraint is recommended in the riser approximately 6 inches below the horizontal run crossing the cam shaft bearing cover plate.

Lube Oil to Rocker Arm Supply Header

- It is recommended that the conduit type one-bolt clip supports be replaced with two-bolt strap type two-directional restraints to assure positive tubing restraint.

- It is recommended that the nylon tube block support near the header be modified to increase the section properties of the bar stock structure to increase lateral and vertical stiffness.

Rocker Arm Supply Header

- It is recommended that the first restraint at Cylinder No. 1 be modified to a three-directional restraint to restrict axial motion. The remaining two-direcitonal restraints are to be shimmed to provide a proper sliding fit.

Engine B

The Engine B lube oil system installation was incomplete at the time of the walkdown. Therefore, it is recommended that the tubing and supports, including the above modifications, be installed on Engine B similar to Engine A.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

2. Stone & Webster Calculation numbers: 11600.60-NP(B)-0601-XH

3. Memo No. 6480 from C. Malovrh/SWEC to J. Kammeyer/SWEC dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Lines External Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

COMPONENT PART NUMBER 03-465B

TASK DESCRIPTION NO.: DR-06-03-465B-1

SNPS PART NUMBER 03-465B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Perform an engineering review of the small bore piping/tubing supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Provide adequate restraint of the small bore piping/tubing system in the intended support load direction.

ATTRIBUTE TO BE VERIFIED

Structural adequacy of the pipe/tube supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

IEEE 387

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations)

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Lube Oil Lines External - Supports

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-465B

REV. NO. 1

SNPS GPL NO. 03-465B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawing for the supports if available from the owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salerta PROGRAM MANAGER. [illegible]

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-465B

Effective Printout Date: 11/05/84

COMPONENT TYPE: Lube Oil Lines External: Supports

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
None		
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Lines External-Valves

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-465C

TASK DESCRIPTION NO. DR-06-03-465C-0

SNPS GPL NO. 99-465A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no siginificant applicable industry and site experience.
- A review of the lead engine DR/QR report (Comanche Peak).

The lube oil external valves at River Bend consist of one 2-inch and one 4-inch check valve which are manufactured by Center Line Inc. (TDI P/N KE-038-001 and KE-038-004, respectively).

There are no maintenance or modification recommendations required based on the lead engine DR/QR report.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

GENERATOR TURBOCHARGER - LUBE OIL FITTING - PIPING
(LARGE BORE SCOPE ONLY)
COMPONENT PART NO. 03-467A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the turbocharger-lube oil piping for the effects of normal operating and earthquake loadings.

The primary function of the piping is to carry lube oil from the turbocharger to the sump tank.

The primary function of the flexible couplings is to seal lube oil and accommodate thermal expansion.

The scope of piping embraced by this report includes the large bore (greater than 2-inch diameter) piping components as noted on the as-built information transmitted to and obtained during Impell field verification (Ref. 1).

Piping components are defined as piping spool pieces, elbows, tees, flanges, Dresser couplings and the interconnecting welds. This scope is uniquely defined in terms of Transamerica Delaval, Inc. (TDI) part numbers in Reference 1.

II OBJECTIVE

The objective of this review was to verify the adequacy of the subject piping components for normal operating and earthquake loading.

III METHODOLOGY

The evaluation of the piping was performed in accordance with the philosophy and intent of the ASME Section III Code, for Class 3 Nuclear Piping. Towards this end, a criteria document was developed, "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," which describes the background and provides the techniques for evaluating the subject piping and supports. This criteria is presented in its entirety in Reference 2.

Quality Revalidation Checklist results were reviewed for acceptability.

The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience.

IV RESULTS AND CONCLUSIONS

All piping stresses were within the design allowables specified by the ASME Section III Code.

The movements at the Dresser coupling are within the manufacturer's end movement requirements (Ref. 3). There are no service life constraints (Ref. 4) because these styles of couplings have no significant history of failure. Shelf life (Ref. 4) is unlimited as long as the gaskets remain packaged from the elements (light, water, etc.). The coupling is acceptable with respect to the manufacturer's service conditions.

To eliminate eccentric loading and potential coupling separation, it is recommended that the single tie-rod assembly surrounding the coupling be removed. Further details on this modification are summarized in Reference 5.

All pipe loads on the turbocharger and sump tank were tabulated and issued for evaluation.

There are no TERs associated with this component.

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review and the results are consistent with the final conclusions of this report.

Based on the above review, it is concluded that the subject piping components, with the modification recommended above, are adequate for their intended design function at River Bend.

V REFERENCES

1. "Supporting Calculations for the Evaluation of River Bend Diesel Generator Large Diameter Piping and Support," Impell Report No. 02-0630-1271, Rev. 0, October 1984.

2. "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984. This is included in Appendix III of the final DR/QR report.

3. Dresser Pipe Couplings, Pipe Fittings, and Pipe Repair Products Catalog, No. 63.

4. Telecon between A. Palumbo (Impell) and M. Riley (Dresser Modification Co.), dated June 5, 1984.

5. Letter from R. Markovich/G. Shears (Impell) to J. Kammeyer (SWEC), "Required Modifications for Validation of Impell's Design Review for Component No. 03-467A-River Bend," dated 10/29/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger-Lube Oil Fitting Piping (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-467A

TASK DESCRIPTION NO. DR-06-03-467A-0

SNPS GPL NO. 03-467A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Evaluate structural integrity of the turbocharger-lube oil fittings piping spool pieces and fittings, for the effects of normal operating and earthquake loadings by (a) comparison to previous analyses, (b) review of previous qualification documentation, and/or (c) actual performances of stress evaluation in accordance with the intent and philosophy of ASME III Class 3 and Impell Design Criteria.

Review information provided on TERs.

PRIMARY FUNCTION

To carry lube oil from the turbocharger to the sump tank.

ATTRIBUTE TO BE VERIFIED

Structural integrity of large bore (greater than 2 in. dia.) piping spool pieces and fittings to withstand the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

None

REFERENCES

"Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984.

DOCUMENTATION REQUIRED

Verified piping isometric, material specification, size and schedule, design parameters (temp., pressure), contents, and insulation.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Turbocharger - Lube Oil Fittings - Piping, Tubing, Fittings & Flexible Coupling

UTILITY Gulf States Utilities River Bend Station

GPL NO. 03-467A

REV. NO. 1

SNPS GPL NO. 03-467A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI-NO.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawing for the piping, tubing, fittings and flexible coupling if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve R Schwartz PROGRAM MANAGER C Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group precludes the issuance of a quality verified as-built drawing or sketch.

COMPONENT REVIEW (continued)

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nita A Salehi PROGRAM MANAGER DC Kammeyer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-467A

Effective Printout Date 10/17/84

COMPONENT TYPE: Turbocharger-Lube Oil Fitting-Pipe Tubing, Fittings and Flexible Coupling

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
During a 24-hour continuous test run, the lube oil line of the turbocharger broke. A stainless steel oil line was used for replacement and a line support was added.	Maanshan-Service Report TPC Nuclear Plant No. 3-Dated Dec. 9, 1983 (File No. T-45)	The subject turbocharger lube oil lines meet the ASME III rules for design and will perform their intended design function.
Two turbocharger pre-lube oil line failures occurred at the ferrule of a compression fitting during a diesel 1A extended run test. Both failures are considered to be caused by improper installation (over-tightening) of the tubing compression nut and excessive vibration. Additional clamps and an approved nut tightening procedure have been implemented.	Catawba Report "Extended Operation Tests and Inspections of Diesel Generators" dated 4/5/84 Pg. 7-3 (File No. T-53)	Refer to small bore scope of work in DR/QR 03-467A.

EXPERIENCE	REFERENCE DOCUMENTS	GRAND GULF STATUS
A temporary turbo-charger lube oil drain line leaked on diesel 1A. This temporary modification was made because the original drain line fatigued and failed prior to completion of the extended run test. This situation would not have adversely affected the engine's operation in an emergency condition. The drain was replaced. In addition, an improved permanent design will be installed by May, 1984.	Catawba Report "Extended Operation Tests and Inspections of Diesel Generators" Dated 4/5/84.	Isolated design problem. The subject lines meet the ASME III rules for design and will perform their intended design function.
NON-NUCLEAR		
Lube oil piping between engine and turbocharger breaks.	Letter 05/13/82 from City Homestead, Fla. to TDI (Oakland & New York) units 18 & 19.	The subject lube oil lines to turbocharger meet the ASME III rules for design and will perform their intended function.
Lube oil supply line to the turbocharger broken ½-inch nipple (twice) (02/17/77) engine No. 19.	Engine Incidence Report (City of Homestead, Fla.) dated 09/30/84 (File No. T-10)	Refer to small bore scope of work in DR/QR 03-467A.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger - Lube Oil Fittings - Pipe, Tubing, Fittings and Flexible Couplings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-467A

TASK DESCRIPTION NO. DR-06-03-467A-1

SNPS GPL NO. 03-467A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience for this component in the EDG Component Tracking System.

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications/additions of supports. The necessity for similar modifications/additions on River Bend has been assessed by a field walkdown.

The field walkdown was performed in accordance with the small bore piping and tubing criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loading provided that the supports are modified/added as indicated in DR/QR report 03-467B.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1) "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger-Lube Oil Fitting: Supports (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-467B

TASK DESCRIPTION NO. DR-06-03-467B-0

SNPS GPL NO. 03-467B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).

Based on previous experience, supports appear to be adequate provided that the analysis of the corresponding piping (Component No. 03-467A) does not mandate modifications. If the piping analysis warrants modification to the supports, these modifications will be addressed in the DR/QR report for Component No. 03-467A.

There are no maintenance recommendations for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

RIVER BEND STATION - UNIT 1

TURBOCHARGER - LUBE OIL FITTINGS: SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-467B

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the turbocharger lube oil tubing supports to withstand the effects of normal operating and earthquake loadings. The primary function of these supports is to provide adequate restraint of the tubing system in the intended support load direction.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the tubing supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience. See Appendix C for results.
- The Quality Revalidation Checklist results were reviewed for acceptability.
- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology for this evaluation.

IV RESULTS AND CONCLUSIONS

The tubing supports, as defined by this Component Design Review have been evaluated in accordance with Reference 1 and have been found acceptable with modifications, provided the final assembly of Engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and information contained in Reference 2, it is concluded that the tubing supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

ENGINE A

In order to support the tubing of Component 03-467A it is recommended that a two-directional restraint be added to the 3/4-inch diameter lube oil supply tubing in the riser approximately 8 inches below the cross fitting to restrain excessive bending motion at the turbo lube oil inlet connection.

ENGINE B

The Engine B turbo lube oil system installation was incomplete at the time of the walkdown. Therefore, it is recommended that the tubing and supports including the above modifications be installed similar to Engine A.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

2. Stone & Webster Calculation number 11600.60 NP(B)-0601-XH.

3. Memo No. 6480 from C. Malovrh/SWEC to J. Kammeyer/SWEC dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbocharger - Lube Oil Fittings & Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-467B

TASK DESCRIPTION NO. DR-06-03-467B-0

SNPS GPL NO. 03-467B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Perform an engineering review of the small bore piping and tubing supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Provide adequate restraint of the piping/tubing system in the intended support load direction.

ATTRIBUTE TO BE VERIFIED

Structural adequacy of the piping/tubing supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

IEEE 387

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations)

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT	Turbocharger - Lube Oil Fittings - Supports	UTILITY	Gulf States Utilities, River Bend Station
GPL NO.	03-467B	REV. NO.	1
SNPS GPL NO.	03-467B		

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI NO.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawing for the supports if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven R Schwartz PROGRAM MANAGER JC Kennedy

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sallo PROGRAM MANAGER J.C. Kennedy

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-467B

Effective Printout Date: 11/05/84

COMPONENT TYPE: Turbocharger - Lube Oil Fittings: Supports

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
None		
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Sump Tank With Strainer Assembly and Mounting Hardware

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-540A&C

TASK DESCRIPTION NO. DR-06-03-540A&C-0

SNPS GPL NO. 03-540A&C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

A design review report is not required for this component based on the following:

- A review of the EDG Component Tracking System indicated no significant applicable industry experience. No River Bend experience is reported.

- A review of the Shoreham, Grand Gulf, and San Onofre design reviews indicated concerns with sidewall frequency calculations contained in the seismic qualifications. The Shoreham, Grand Gulf, San Onofre and River Bend tanks are flat sided rectangular tanks. The seismic qualifications for all but River Bend quote no sidewall flexure modes. River Bend's seismic qualification quotes dishing of the tank sides as the first fundamental mode, Ref. 3, which is the expected result. The remainder of the results appear reasonable thus the seismic qualification documentation for the tank and mounting bolts is judged adequate. The AE reviewers of the seismic report have expressed a concern that supporting documentation had not been submitted with the summary report. This documentation has been requested from TDI, but based on the improved analytic methods reported in the summary report, the sump tank qualification is acceptable.

- Nozzle loads have been analyzed in Ref. 3 but appear small compared with Shoreham's nozzle loads. Shoreham's nozzle loads were found acceptable. Shoreham's piping configuration, and sump tank are similar to River Bend, consequently nozzle loads are judged to be acceptable for the sump tank at River Bend.

- The integrity of plate edge assembly welds is important in developing the strength of the tank. A review of the Shoreham and Grand Gulf design reports reveals a history of weld omissions and quality problems for these rectangular tanks. It is recommended that at next refueling outage, a sample of the tank seam and assembly welds be visually inspected. The inspection can be limited

to welds accessible through the strainer opening and on the tank exterior. The inspection should be expanded if there are indications of weld omissions, undercuts, or lack of fusion, etc. Any faulty welds should be repaired.

- Mounting bolt hardware at River Bend is different from that at Shoreham. Modifications recommended in the Shoreham design review report are not applicable to River Bend.

There are no maintenance recommendations associated with this component.

The following Quality inspection should be performed:

- Mounting bolt torques should be verified to be in accordance with TDI requirements.

PRIMARY FUNCTION

The tank is a sump for the collection of engine lubricating oil. The engine driven lube oil pump takes suction from this tank. Mounting hardware connects the tank to the auxiliary skid.

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

None per Ref. 1

REFERENCES

1. Stone & Webster Specification number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Louisiana.

2. Transamerica Delaval Instruction Manual Volume II, Model DSR-48, Serial Nos. 74039-2639 and 74040-2640, Gulf States Utilities River Bend Station, Unit 1.

3. Final Report, Volume II, Part I, "Seismic Qualification of TDI Diesel Generator Sets for Gulf States Utilities", River Bend Station, Unit 1, Document No. 74039-723, January 1982. Section VI.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Lube Oil Sump Tank - Tank with Strainer Assembly

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-540A

REV. NO. 1

SNPS GPL NO. 03-540A

TASK DESCRIPTIONS

No further review of Component 03-540A is required for the following reasons:

a) Component was reviewed on two lead engines with satisfactory results.

b) There is no significant industry or site experience for this component.

GROUP CHAIRPERSON Vitu A Salita

PROGRAM MANAGER [illegible]

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Sump Tank - Miscellaneous Fittings, Gaskets, Pipe & Bolting Material, Valve (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-540B

TASK DESCRIPTION NO. DR-06-03-540B-0

SNPS GPL NO. 03-540B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review of this component is not required based on the fact that there is no small bore piping associated with component 03-540B on this engine.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON PROGRAM MANAGER

RB2304/1

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Sump Tank With Strainer Assembly and Mounting Hardware

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-540A&C

TASK DESCRIPTION NO. DR-06-03-540A&C-0

SNPS GPL NO. 03-540A&C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

A design review report is not required for this component based on the following:

- A review of the EDG Component Tracking System indicated no significant applicable industry experience. No River Bend experience is reported.

- A review of the Shoreham, Grand Gulf, and San Onofre design reviews indicated concerns with sidewall frequency calculations contained in the seismic qualifications. The Shoreham, Grand Gulf, San Onofre and River Bend tanks are flat sided rectangular tanks. The seismic qualifications for all but River Bend quote no sidewall flexure modes. River Bend's seismic qualification quotes dishing of the tank sides as the first fundamental mode, Ref. 3, which is the expected result. The remainder of the results appear reasonable thus the seismic qualification documentation for the tank and mounting bolts is judged adequate. The AE reviewers of the seismic report have expressed a concern that supporting documentation had not been submitted with the summary report. This documentation has been requested from TDI, but based on the improved analytic methods reported in the summary report, the sump tank qualification is acceptable.

- Nozzle loads have been analyzed in Ref. 3 but appear small compared with Shoreham's nozzle loads. Shoreham's nozzle loads were found acceptable. Shoreham's piping configuration, and sump tank are similar to River Bend, consequently nozzle loads are judged to be acceptable for the sump tank at River Bend.

- The integrity of plate edge assembly welds is important in developing the strength of the tank. A review of the Shoreham and Grand Gulf design reports reveals a history of weld omissions and quality problems for these rectangular tanks. It is recommended that at next refueling outage, a sample of the tank seam and assembly welds be visually inspected. The inspection can be limited

to welds accessible through the strainer opening and on the tank exterior. The inspection should be expanded if there are indications of weld omissions, undercuts, or lack of fusion, etc. Any faulty welds should be repaired.

- Mounting bolt hardware at River Bend is different from that at Shoreham. Modifications recommended in the Shoreham design review report are not applicable to River Bend.

There are no maintenance recommendations associated with this component.

The following Quality inspection should be performed:

- Mounting bolt torques should be verified to be in accordance with TDI requirements.

PRIMARY FUNCTION

The tank is a sump for the collection of engine lubricating oil. The engine driven lube oil pump takes suction from this tank. Mounting hardware connects the tank to the auxiliary skid.

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

None per Ref. 1

REFERENCES

1. Stone & Webster Specification number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Louisiana.

2. Transamerica Delaval Instruction Manual Volume II, Model DSR-48, Serial Nos. 74039-2639 and 74040-2640, Gulf States Utilities River Bend Station, Unit 1.

3. Final Report, Volume II, Part I, "Seismic Qualification of TDI Diesel Generator Sets for Gulf States Utilities", River Bend Station, Unit 1, Document No. 74039-723, January 1982. Section VI.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Lube Oil Sump Tank - Mounting Hardware

UTILITY Gulf States Utilites, River Bend Stations

GPL NO. 03-540C

REV. NO. 1

SNPS GPL NO. 03-540C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documention.
2. Verify that the proper torque was applied to the bolting by reviewing existing documentation.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper bolt torque

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

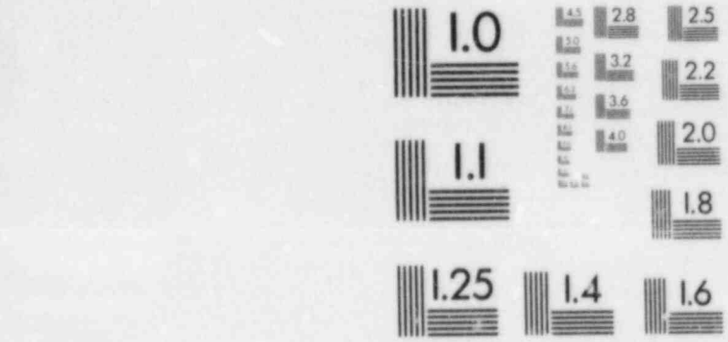
Engine 1A

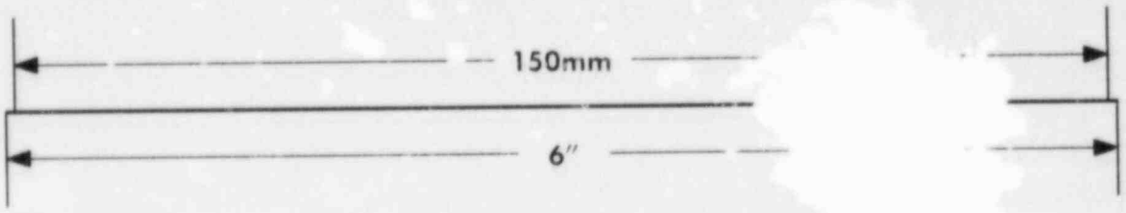
1. Satisfactory Document Package
2. Bolts were torqued in accordance with the TDI Instruction Manual

Engine 1B

Same as Engine 1A

IMAGE EVALUATION TEST TARGET (MT-3)





REFERENCES

Engine 1A

1. QCI No. 52

2. Site Documentation, TDI Instruction Manual

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve R Schwartz PROGRAM MANAGER

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. No documentation was available to verify the torque values.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

RESULTS AND CONCLUSION (continued)

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nicta J Seleta PROGRAM MANAGER JC Kanning

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub Base & Oil & Water Piping-Lube Oil: Pipe and Fittings (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717H

TASK DESCRIPTION NO. DR-06-03-717H-0

SNPS GPL NO. 03-717H

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry and site experience listed in the EDG Component Tracking System, and the lead engine DR/QR report (Comanche Peak).

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications to the skid piping and/or supports. Generic application of these modifications is not required for River Bend since the Comanche Peak modifications were not required for piping operability. The lead engine modifications were recommended in order to meet the intent and philosophy of the ASME Code for the boundary conditions and assumptions used in the Owners Group analysis. These boundary conditions and assumptions may be somewhat different from those used in the original manufacturer's analysis. Lead engine skid mounted large bore pipe modifications, as the apply to equipment nozzle loads, are addressed, if necessary, in the individual equipment design reviews.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub Base & Oil & Water Piping - Lube Oil: Pipe and Fittings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717H

TASK DESCRIPTION NO. DR-06-03-717H-1

SNPS GPL NO. 03-717H

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry and site experience.

There are no maintenance recommendations for this component. However, the lead engine report does address site specific additions of supports. The necessity for similar additions on River Bend has been assessed by a field walkdown.

The field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loading provided that the supports are modified/added as indicated in DR/QR report 03-717K.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Aux. Sub Base & Oil & Water Piping: Lube Oil: Valves UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717I TASK DESCRIPTION NO. DR-06-03-717I-0

SNPS GPL NO. 03-717I CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience, except that which was previously addressed in the lead report.
- A review of the lead engine DR/QR report (Shoreham)
- The auxiliary lube oil valves consist of two relief valves (TDI P/N KD-040-000, 74039-128) manufactured by Crosby Valve and Gage Company. They are similar in design and application to the relief valve reviewed in the lead engine report (TDI P/N KD-010-000).

The following maintenance from the lead engine DR/QR report should be implemented:

- Inspect, clean and lube the valves annually/each shutdown
- Check the lift pressure of the relief valves during the 5-year maintenance outages

A field inspection should be performed to verify that the relief valves are installed vertically, as recommended by the manfacturer.

There are no modifications required for this component.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub-Base & Oil and Water Piping Lube Oil-Gaskets & Bolting

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717J

TASK DESCRIPTION NO. DR-06-G3-717J-0

SNPS GPL NO. 03-717J

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry experience listed in the EDG Component Tracking System and the lead engine DR/QR reports (Shoreham/Comanche Peak). There is no site experience for this component.

There are no maintenance or modification recommendations for this component.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON

PROGRAM MANAGER

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub-Base & Oil & Water Piping - Lube Oil: Supports & Mounting Hardware (Large Bore Scope Only) UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717K TASK DESCRIPTION NO.: DR-06-02-717K-0

SNPS GPL NO. 03-717K) CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the applicable industry and site experience in the EDG Component Tracking System and the lead engine DR/QR report (Comanche Peak).

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications to the skid piping and/or supports. Generic application of these modifications is not required for River Bend since the Comanche Peak modifications were not required for piping operability. The lead engine modifications were recommended in order to meet the intent and philosophy of the ASME Code for the boundary conditions and assumptions used in the Owners Group analysis. These boundary conditions and assumtions may be somewhat different from those used in the original manufacturer's analysis. Lead engine skid mounted large bore pipe modifications, as they apply to equipment nozzle loads, are addressed, if necessary, in the individual equipment design reviews.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

AUXILIARY SUB-BASE AND OIL AND WATER PIPING-LUBE OIL:
SUPPORTS AND MOUNTING HARDWARE
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-717K

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the auxiliary sub-base lube oil supports and mounting hardware to withstand the effects of normal operating and earthquake loadings. The primary function of these supports is to provide adequate restraint of the small bore piping/tubing system in the intended support load direction.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the small bore piping/tubing supports to assure that the component will perform its intended design function during normal operation and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience. See Appendix C for results.

- The Quality Revalidation Checklist results were reviewed for acceptability.

- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology for this evaluation.

IV RESULTS AND CONCLUSIONS

The small bore piping/tubing supports, as defined by this Component Design Review have been evaluated in accordance with Reference 1 and have been found acceptable with modifications, provided the final assembly of Engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and information contained in Reference 2, it is concluded that the small bore piping/tubing supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

- It is recommended that the band type restraints on the ¼-inch vent lines on the lube oil filters of both engines be revised to be two-directional restraints.

- It is recommended that pipe support 03-717-01-TT located on the lube oil booster pump discharge piping to the prelube filter be modified to permit axial pipe expansion. This is typical on both engines.

In order to support the tubing of component 03-717H, it is recommended that the following supports be added:

- It is recommended that the $^{3}/_{8}$-inch diameter tubing bleed line from the lube oil inlet header to the engine driven lube oil pump suction line on Engine A be restrained with two-directional restraints at 4 ft-6 inch maximum span lengths. One restraint should be located on the riser above the suction line within 6 inches of the bend. This change is also applicable to Engine B when the similar tubing is installed.

- It is recommended that a two-directional restraint be added to the 1-inch NPS drain line adjacent to the drain valve on the lube oil cooler tube side drain. This is typical for both engines.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners Group," Report No. 11600.60-DC-02 Revision 0.

2. Stone & Webster Calculation number: 11600.60-NP(B)-0601-XH.

3. Memo No. 6480 from C. Malovrh (SWEC) to J. Kammeyer (SWEC) dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Aux. Sub. Base & Oil & Water Piping: Lube Oil Supports and Mounting Hardware (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-717K

TASK DESCRIPTION NO.: DR-06-03-717K-1

SNPS GPL NO. 03-717K

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Perform an engineering review of the piping and tubing supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Provide adequate restraint of the small bore piping/tubing system, in the intended support load directions

ATTRIBUTE TO BE VERIFIED

Structural adequacy of the piping and tubing supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

ASME III, CLASS 3, 1974 including summer '74 addenda

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group" Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations).

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Aux. Sub Base & Oil/Water Piping-Lube Oil Supports and Mounting Hardware

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-717K

REV. NO. 1

SNPS GPL NO. 03-717K

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the supports and mounting hardware if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON [signature] PROGRAM MANAGER [signature]

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a Quality verified as-built drawing or sketch.

COMPONENT REVIEW (continued)

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salotto PROGRAM MANAGER D C Kammeyer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-717K

Effective Printout Date: 11/05/84

COMPONENT TYPE: Auxiliary Sub-Base and Oil and Water Piping Lube Oil Supports and Mounting Hardware

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
Six inch channels cause interference with electrical box. TDI confirms the channels are not required.	E&DCR C-21, 706	This event is not related to piping or piping supports.
Pump mounting pads do not match mounting plates.	N&D 3720, 3804	This event is not related to piping or piping supports.
Interference problems with washer touching welds on lube oil cooler and jacket water cooler.	E&DCR C-21, 139	This event is not related to piping or piping supports.
Lube oil cooler and jacket water cooler support and sole plate bolt holes do not match.	E&DCR C-21, 139	This event is not related to piping or piping supports.
NUCLEAR		
10CFR50.55E filed after inspection revealed ASME III Class NF code requirements were violated.	Cleveland Electric 10CFR50.55E DAR No. 117	DR/QR review provides assurance that components will perform their intended design functions during normal operating and earthquake loadings.
NON-NUCLEAR		
None		

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

AUX. SUB BASE & OIL & WATER PIPING - LUBE OIL: AUTOMATIC SWITCHOVER ASSEMBLY

COMPONENT PART NO.: 03-717L

This component number has been deleted. River Bend does not utilize a Lube Oil Automatic Switchover Assembly.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Miscellaneous Equipment Lube Oil Sump Tank Heater UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-800B TASK DESCRIPTION NO. DR-06-03-800B-0

SNPS GPL NO. 03-800B CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry experience other than that previously addressed in the lead report. There was no site experience listed in the Component Tracking System.
- A review of the lead engine DR/QR report (Shoreham).
- The lube oil sump tank heaters at both Shoreham and River Bend are Chromolox Model TMO-620B.

The following maintenance from the lead engine DR/QR report should be implemented:

- Check calibration and inspect condition of thermostat and recalibrate or replace thermostat every outage.
- Measure heater insulation resistance and replace heater if degradation of insulation resistance is noted, every outage.
- Thoroughly clean heater element of coking and other deposits and inspect for signs of deterioration, every outage.
- Lube oil temperature will be verified daily during engine standby, and the thermostat will be recalibrated when necessary.

There are no modification recommendations for this component, however, replacement heaters should be supplied with moisture resistant terminal box covers.

Quality Revalidation is not required for this component.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Lube Oil Heat Exchanger UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-820A TASK DESCRIPTION NO: DR-06-03-820A-0

SNPS GPL NO. 10-104 CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the lead engine report. Also, the majority of industry experience with lube oil heat exchangers has been problems with leakage, usually resulting from corrosion of the tubes. This is not expected to be a problem at River Bend since the engine jacket water, which cools the lube oil in the exchanger, is treated with a corrosion inhibitor.

- A review of the lead engine DR/QR Report (Shoreham).

- The lube oil heat exchanger used at River Bend is of the same manufacturer and type as that used at Shoreham. They are manufactured by Thermxchanger, Inc., with the designation of 1612, Type NSP, single pass heat exchangers. In addition, the operating conditions of the exchangers (i.e., flowrates, temperatures, pressures, etc.) are similar for each plant and both exchangers are ASME III, Code Class 3.

The following maintenance from the lead engine DR/QR report should be implemented:

- During the refueling outages, the heat exchanger tube side should be inspected to assess the condition of the tubes and the tube sheet for fouling, corrosion, and other symptoms of deterioration. Gaskets and the packing rings at the floating tube sheet should be replaced during reassembly. The heat exchanger will be visually inspected daily for leakage as part of the daily routine surveillance of the emergency diesel generators.

- Spectrochemical analysis of lube oil samples should be performed approximately every three months to monitor the condition of the diesel engine. The results of the analysis are helpful in identifying jacket water leakage by interpretation of the concentration of chemical elements which are present in the corrosion inhibitor of the jacket water system.

TASK DESCRIPTIONS (continued)

There are no modification recommendations for this component based on the lead engine report.

Quality revalidation is not deemed necessary for this component

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PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Full Flow Lube Oil Filter UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-820B TASK DESCRIPTION NO. DR-06-03-820B-0

SNPS GPL NO. 10-106 CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the lead engine DR/QR report.
- A review of the lead engine DR/QR report (Comanche Peak).
- The full flow lube oil filter at River Bend is on the same manufacturer and series as that used at Comanche Peak (i.e., Commercial Filters, Series "P"), and they have similar design conditions.

The following maintenance recommendation from the lead engine DR/QR report should be implemented:

- The TDI Manual specifies filter element change over at 15 psid. This is acceptable from the viewpoint of filter design.

The manufacturer's procedures for taking the filter off line, changing the cartridges and venting and returning the filter to service are not included in the TDI Associated Publications Manual for River Bend. It is recommended that the Owner obtain the manufacturer's maintenance literature for incorporation into the TDI Associated Publications Manual and review/update site operating and maintenance procedures accordingly.

There are no modifications required for this component, based on the lead engine DR/QR report.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Before-and-After Lube Oil Pump UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-820C TASK DESCRIPTION NO. DR-06-03-820C-0

SNPS GPL NO. 10-113 CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that previously addressed in the lead engine report.
- A review of the lead engine DR/QR report (Shoreham).
- The pump used at River Bend is of the same manufacturer and Model No. as Shoreham (IMO Division of TDI, Model G3-DHS-187).

There are no maintenance or modification recommendations based on the lead engine report.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Oil Prelube Filter UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-820D TASK DESCRIPTION NO. DR-06-03-820D-0

SNPS GPL NO. 10-117 CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience.
- A review of the lead engine DR/QR report (Shoreham).
- The oil prelube filter at River Bend is of the same manufacturer and model number as that used at Shoreham (i.e., Commercial Filters, Model No. P1-2-2F). The filter element particle retention size is 10 microns, which is acceptable for its application.

The following maintenance recommendations from the lead engine DR/QR report should be implemented:

- The TDI Manual specifies filter element changeover at 15 psid. This is acceptable from the viewpoint of filter design.

The manufacturer's procedures for taking the filter off line, changing the cartridges and venting and returning the filter to service are not included in the TDI Associated Publications Manual for River Bend. It is recommended that the Owner obtain the manufacturer's maintenance literature for incorporation into the TDI Associated Publications Manual, and review/update site operating and maintenance procedures accordingly.

There are no modifications required for this component, based on the lead engine DR/QR reports.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Base And Bearing Caps - Base Assembly, Main Bearing Studs And Main Bearing Caps

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-305A,C,D

TASK DESCRIPTION NO. DR-06-03-305A,C,D-0

SNPS GPL NO. 03-305A,C,D

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for these components, based on a review of the applicable industry and site experience in the EDG Component Tracking System and the lead engine DR/QR report (Shoreham). The River Bend part numbers are different from those at Shoreham; a comparison of the part drawings showed no significant differences which would lower the factors of safety in the River Bend engine.

The following maintenance items are recommended to ensure reliability of the components:

- At each refueling outage, visual inspection of the area adjacent to the main bearing stud nut pockets of each bearing saddle shall be conducted. The inspection should be done several minutes after a thorough wipe down of the surfaces. Good lighting should be used for this inspection. Any crack thus detected must be investigated further before the engine is allowed to return to service.

- The mating surfaces of the base and cap should be thoroughly cleaned with solvent before any reassembly.

There are no modification recommendations for these components.

Quality inspections performed to date have been reviewed and are considered satisfactory.

The following Quality inspections are recommended to be performed:

- Verify preload torque applied to bearing cap stud nuts during engine installation/maintenance. Torque values of nuts to be in compliance with TDI Manual, Engines 1A and 1B.

- Perform a visual inspection of the #5 main bearing cap mating surface for evidence of fretting, Engine 1B.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Base and Bearing Caps - Base Assembly

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-305A

REV. NO. 2

SNPS GPL NO. 03-305A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a Liquid Penetrant test on the #5 main bearing saddle area. See attached sketch.
3. Visually inspect the cap mating surfaces for evidence of fretting.

Engine 1B

1. Assemble and review existing documentation.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of the base
3. Surface integrity of the cap mating surfaces

Engine 1B

1. Quality status of Component Document Package

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-3. Review of inspection report by Design Group

Engine 1B

1. Satisfactory Document Package

REFERENCES

Engine 1A

1. QCI No. 52

2-3. Approved Site NDE procedures

Engine 1B

1. QCI No. 52

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

1. Document Summary Sheet

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER J. Powers for JCK

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. A Liquid Penetrant test was performed on the main bearing saddle areas between cylinders 5 and 6 with satisfactory results. This was reported by TER# 06-036.

3. A visual inspection was performed on the cap mating surfaces with satisfactory results. This was reported by TER# 06-036.

Engine 1B

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

RESULTS AND CONCLUSION

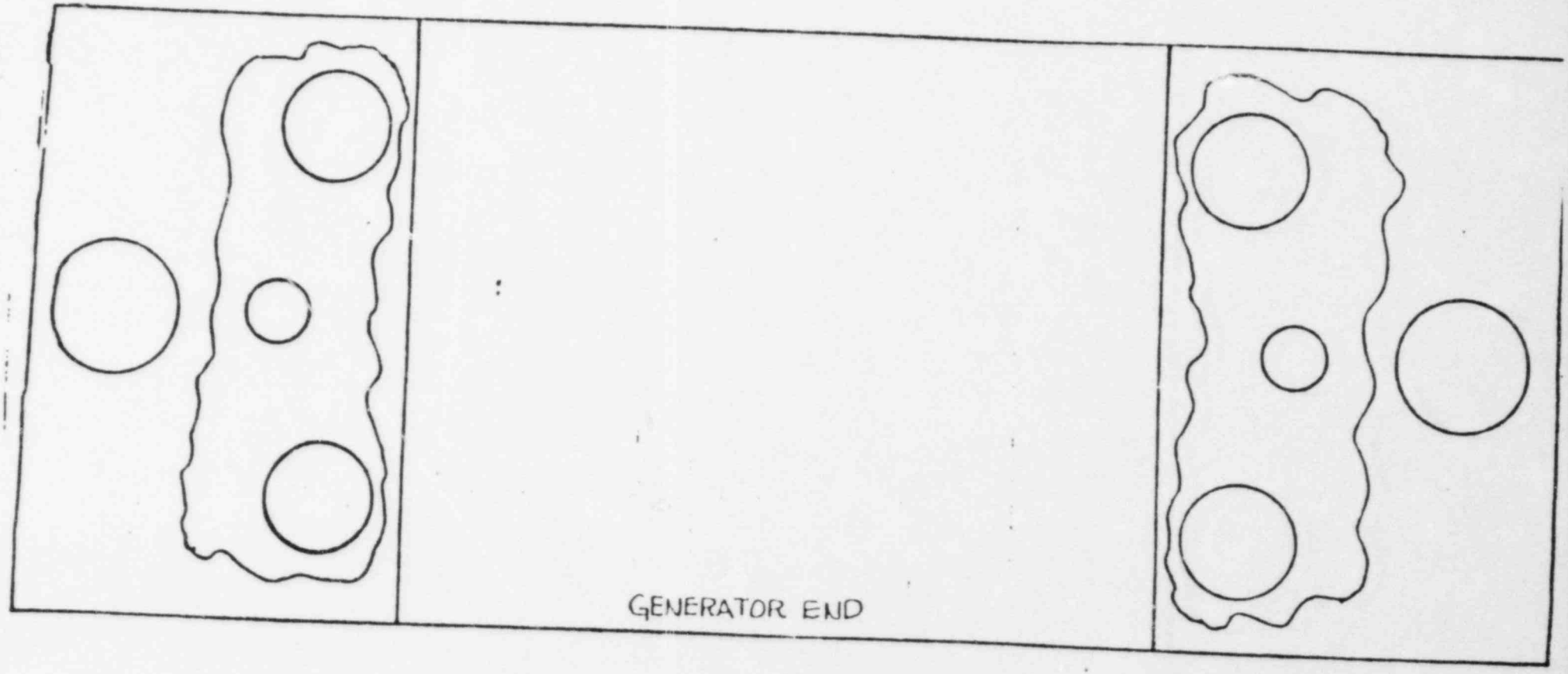
Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Vito A. Salete PROGRAM MANAGER for JCK



MAIN SADDLE BEARING No 5

TDI OWNERS GROUP

for

RIVER BEND STATION

BASE & BEARING CAPS: MAIN BEARING STUDS & NUTS

COMPONENT PART NO.: 03-305C

See Component Part No.: 03-305A

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Base And Bearing Caps - Base Assembly, Main Bearing Studs And Nuts, And Main Bearing Caps

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-305A,C,D

TASK DESCRIPTION NO. DR-06-03-305A,C,D-0

SNPS GPL NO. 03-305A,C,D

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for these components, based on a review of the applicable industry and site experience in the EDG Component Tracking System and the lead engine DR/QR report (Shoreham). The River Bend part numbers are different from those at Shoreham; a comparison of the part drawings showed no significant differences which would lower the factors of safety in the River Bend engine.

The following maintenance items are recommended to ensure reliability of the components:

- At each refueling outage, visual inspection of the area adjacent to the main bearing stud nut pockets of each bearing saddle shall be conducted. The inspection should be done several minutes after a thorough wipe down of the surfaces. Good lighting should be used for this inspection. Any crack thus detected must be investigated further before the engine is allowed to return to service.

- The mating surfaces of the base and cap should be thoroughly cleaned with solvent before any reassembly.

There are no modification recommendations for these components.

Quality inspections performed to date have been reviewed and are considered satisfactory.

The following Quality inspections are recommended to be performed:

- Verify preload torque applied to bearing cap stud nuts during engine installation/maintenance. Torque values of nuts to be in compliance with TDI Manual, Engines 1A and 1B.

- Perform a visual inspection of the #5 main bearing cap mating surface for evidence of fretting, Engine 1B.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Base and Bearing Caps - Main Bearing Caps

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-305D

REV. NO. 1

SNPS GPL NO. 03-305D

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection of the #5 main bearing cap mating surface for evidence of fretting.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of the main bearing cap

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on the #5 main bearing cap mating surface with satisfactory results. This was reported by TER# 06-037.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nuto A Saleto PROGRAM MANAGER D Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Base and Bearing Caps-Through Bolting

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-305E

TASK DESCRIPTION NO. DR-06-03-305E-0

SNPS GPL NO. 03-305E

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component, based on the lead engine DR/QR report (Shoreham), which establishes the acceptability of the block to base through bolts and nuts.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

There are no maintenance or modification recommendations for this component.

The following Quality inspection is recommended:

- Perform a dimensional verification of uniform washer thickness (not tapered) on accessible washers.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

DOCUMENTATION REQUIRED

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1
CRANKSHAFT
COMPONENT PART NO. 03-310A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for River Bend Station requires Design and Quality Revalidation reviews to determine the adequacy of the crankshafts for their intended service at River Bend. The primary function of the crankshaft is to convert reciprocating motion of the piston to rotary motion, and to transfer the resulting torque to the generator rotor. The manufacturer's part number for the crankshafts at River Bend is 03-310-05-AC. The forging and machining of this part for engine Nos. 74039 and 74040 was performed by Ellwood City Forge Corp.

II OBJECTIVE

The objective of this review was to evaluate the adequacy of the crankshafts for their intended use at River Bend.

III METHODOLOGY

The Emergency Diesel Generator Component Tracking System records were reviewed to determine the nuclear, non-nuclear, and River Bend experience of the crankshafts. River Bend Task Evaluation Reports (TERs), and pertinent literature specified on the Component Tracking System records were examined for information on the performance of the crankshafts (see Appendix C for results).

A modal superposition analysis of the crankshaft was performed. The pressure loading was obtained from the dynamic test at Shoreham Nuclear Power Station (Ref. 2). This analysis calculates the nominal shear stresses at each crank pin and main journal location.

The results of the torsiograph test performed by Stone and Webster were reviewed (Ref. 3).

The TDI Holzer calculations were reviewed by comparing the results with results obtained from the modal superposition analysis (Ref 1, 4).

The stress levels in the main journal oil holes and crankpin fillets were compared with the endurance limit.

The Quality Revalidation Checklist results were reviewed for acceptability.

IV RESULTS AND CONCLUSIONS

The modal superposition analysis determined the maximum amplitude of torsional stress to be 7357 psi between cylinder numbers 5 and 6 for a load at 3500 kW (Ref 4). At 3500 kW, the nominal stresses were found not to satisfy the requirements of DEMA, which are less than 5000 psi for a single order, and less than 7000 psi for combined orders (Ref. 5).

The results of the torsiograph test performed on DG1A (Engine No. 74039) were reviewed, and the natural frequencies and free-end amplitudes of vibration were found to be in agreement with the modal superposition analysis. It was determined that the nominal stresses during steady state conditions at 3130 kW load would satisfy DEMA requirements (Ref. 4).

The TDI Holzer calculations were found to be accurate and in agreement with the vibrational analysis.

The material certification reports for the crankshafts at River Bend indicate that the tensile strengths for the crankshaft material in engine Nos. 74039 and No. 74040 are within the original design specifications (Refs. 6 and 7). The factor of safety against fatigue failure in the main journal oil holes and crankpin fillets at 3500 kW load was found to be 1.36 and 1.29, respectively, based on a minimum ultimate tensile strength of 94 ksi for engine serial No. 74039 (Ref. 4).

The crankpin fillets and crankpin oil holes have been inspected with satisfactory results (see Appendix B). Main journal oil holes have been inspected with satisfactory results (see Appendix B).

The 700-hour, 3300-kW endurance run at Shoreham produced nominal stresses in the crankshaft equivalent to those at River Bend operating at 3130 kW. However, because of lower material strength in the River Bend crankshaft, the factor of safety at River Bend is less than at Shoreham (Ref. 8).

The information provided on the following TERs has been reviewed and is consistent with the final conclusions of this report: 06-031, 06-032, and 06-038.

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review and the results are consistent with the final conclusions of this report.

Based on the above review, it is concluded that the crankshafts in engine serial Nos. 74039 and 74040 are acceptable for their intended function at River Bend provided the engines are run at no greater than a 3130 kW load.

V REFERENCES

1. Yang, Roland, "Torsional and Lateral Critical Speed Analysis: Engine Numbers 74039/42 Delaval Enterprise Engine Model DSR-48, 3500kW/4889 BHP at 450 RPM for Stone & Webster Engineering Corp., Gulf States Utilities," Transamerica Delaval Inc., Engine and Compressor Division, Oakland, California, 3/5/75, Revised 5/4/77.

2. "Evaluation of Emergency Diesel Generator Crankshafts at Shoreham and Grand Gulf Nuclear Power Stations," Report No. FaAA-84-3-16, Failure Analysis Associates, Palo Alto, California, May 22, 1984.

3. "Crankshaft Torsional Vibration Measurements, River Bend Nuclear Power Station DGD1A," E. Bercel, Stone & Webster Engineering Corporation, Boston, Massachusetts, September 1984.

4. FAA support package SP-84-6-10(g).

5. Standard Practices for Low and Medium Speed Stationary Diesel and Gas Engines, Diesel Engine Manufacturers Association, 6th ed., 1972.

6. Material Certification Reports from Ellwood City Forge Co., Report No.9-3121 dated 5/15/80 for Engine No. 74939, and 6/6/80 for Engine No. 74040.

7. Material Certification Reports from American Bureau of Shipping, Report No. 80-PH38251-646 for Engine No. 74039 and Report No. 80-PH38415-110S for Engine No. 74040.

8. Memorandum to John Kammeyer from Paul Johnston/Lisa Shusto, October 18, 1984, Re: River Bend load that produces stress levels equal to those at a Shoreham of 3300 kW.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Crankshaft

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-310A

TASK DESCRIPTION NO: DR-06-03-310A-0

SNPS GPL NO. 03-310A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Review of River Bend site, nuclear and non-nuclear experience.

Review of TDI Holzer calculations and SWEC torsiograph tests.

Perform modal superposition of the crankshaft.

Compare stress levels at the oil holes with the endurance limit.

Review Quality Revalidation Checklist for acceptability.

Review information provided on TERs.

PRIMARY FUNCTION

The crankshaft converts reciprocating motion, component inertial forces, and gas pressure piston forces to rotary motion and torque at the output flange.

ATTRIBUTE TO BE VERIFIED

Sufficient strength, stiffness, frequency characteristics: material properties, surface finish, and bearing characteristics for EDG service.

SPECIFIED STANDARDS

Standard Practices for Low and Medium Speed Stationary Diesel and Gas Engines, Diesel Engine Manufacturer's Association; 6th ed., 1972.

REFERENCES

None

DOCUMENTATION REQUIRED

TDI drawings, test reports, experimental pressure vs. time curves, Holzer calculations for DSR-48 engine.

CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT	Crankshaft & Bearings - Crankshaft & Turning Gear	UTILITY	Gulf States Utilities, River Bend Station
GPL NO.	03-310A	REV. NO.	2
SNPS GPL NO.	03-310A		

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection of all crankpin journal surfaces for signs of scoring, wear or damage. Document with photographs.
3. Perform a Fluorescent Liquid Penetrant test on the entrance region to the oil holes.
4. Perform either Eddy Current inspections in the oil passageways or take impressions of the oil passageways.
5. Perform Eddy Current inspections of crankpin journal fillets 5, 7, and 8 (one engine only).
6. Perform a torsiograph on the crankshaft (one engine only).

Engine 1B

Same as Engine 1A.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of crankpin journals

3-4. Surface integrity of the oil hole entrance region and passageways

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

5 Surface integrity of the crankpin journal fillets

6. Stress on the crankshaft

Engine 1B

Same as Engine 1A.

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-6. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A.

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

3-4. Approved Site NDE Procedures, TER# 06-033

5-6. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A.

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-6. Inspection Report

DOCUMENTATION REQUIRED

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with unsatisfactory results. N&D 4317 remains open.

2. A visual inspection was performed on the crankpin journal with satisfactory results. This was reported by TER# 06-038.

3-4. An Eddy Current test and a Liquid Penetrant test were performed on the main journal oil holes at locations 7, 8, and 9. This was reported by TER# 06-031. An Eddy Current test and a Liquid Penetrant test were performed on the crankpin journal oil holes at locations 5, 6, 7 and 8. This was reported by TER#'s 06-032 and 06-038.

5. Eddy Current inspections were performed on crankpin journal fillets 5, 6, 7, and 8. The results were reported by TER# 06-038.

6. A torsiograph was performed for the crankshaft on engine 1A. The results were transmitted in the SWEC report "Crankshaft Torsional Vibration Measurements", for River Bend.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

3-4. An Eddy Current test and a Liquid Penetrant test were performed on the main journal oil holes at locations 7, 8 and 9. This was reported by TER# 06-031. An Eddy Current test and a Liquid Penetrant test was performed on the crankpin journal oil holes at locations 5, 6, 7 and 8. This was reported by TER#'s 06-032 and 06-038.

5. Inspection was not required as Eddy Current inspections for the crankpin journal fillets were performed for Engine 1A.

COMPONENT REVIEW (continued)

Engine 1B (continued)

6. Inspection was not required as a torsiograph was performed on the crankshaft for Engine 1A.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sollitto PROGRAM MANAGER X Kammerer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-310A

Effective Printout Date: 10/10/84

COMPONENT TYPE: Crankshaft

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
While feeding steam generators with the diesel driven auxiliary feed pump, the diesel tripped on low lube oil pressure. Steam generator level was maintained by using the steam driven auxiliary feed pump. The diesel failure resulted from a broken crankshaft. Inspection of the engine did not reveal a cause for the failure. A metallurgical analysis of the crankshaft is being conducted. Manufacturer. Electro-Motive Div. of GM.	LER, Trojan; 344-7700, 770324	Insufficient information in reference document for evaluation.
A Delaval diesel generator at Shoreham fractured its crankshaft at the crankpin and crankarm. Examination of 2 other diesels showed cracks on the crankshaft and crankpin bearing failure. Manufacturer: TDI	I&E Shoreham notice 83-58, 08/30/83	Problem associated with inadequate design. River Bend crankpins are adequately designed.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Cylinder No. 4 had excessive threading (grooved radially) on the crankshaft bearing. The crankpin was discolored and the cylinder liner was grooved in 3 places: 10 inches long by 1/16 inch deep. Manufacturer: TDI.	10CFR50.55E MP&L Grand Gulf 12/10/81, 04/15/82.	Problem not related to design. Problem caused by foreign material.
Info-procedure to measure crankshaft thrust clearance. Manufacturer: TDI.	TDI SIM 283	No impact on adequacy of crankshafts.
Crankshaft overall lengths have increased and therefore require a modified inspection cover. Installation is prevented becaused of interference with the lube oil strainer. Interference may be eliminated by effecting reduction in the length of the cover by reducing the flange thickness and facing the end plate from 11/16-inch to ¼-inch thickness.	TDI Letter to LILCO 01/10/84 S/N 74010/12 to Mike Herlihy (LILCO)	No impact on adequacy of crankshafts.
Info-instructions for flushing lube oil header.	TDI SIM 141	No impact on adequacy of crankshafts.
Crankshaft oil way plugs cracking resulting from the use of improper gauge of material issued for plugs. (M/V Pride of Texas)	Titan Navigation, Inc., Letter dated July 22, 1982	Per phone conversation with site personnel, oil hole plugs at River Bend use thicker gauge material.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
NON-NUCLEAR		
Experienced engine vibration at crankshaft resulting from vibration damper coupling failure. (M/V Columbia)	Hunton & Williams (12/29/83) to C. Seaman. Letter from M. Zbinden (State of Alaska) to D. Martini (TDI) dated 03/19/79. Letter from M. Zbinden to W. Hudson dated 02/02/79.	Not applicable since engines at River Bend do not have vibration dampers.
Currently checking the cause of excessive main engine crankshaft distortion. (M/V Columbia)	Hunton & Williams (12/29/83) to C. Seaman. Memo from M. Zbinden (State of Alaska) to R. Ward dated 12/10/80.	Insufficient information in reference document for evaluation.
During normal operation engine experienced a low lube oil pressure alarm. Engine was shut down for inspection and two cracks were found at the No. 5 crank pin.	Failure Analysis Report No. 0135 12/10/80 (File T-39). Memo TDI H. Schilling 12/15/80 to G.E. Trussell (File T-1). Memo TDI H. Schilling 12/14/80 to G.E. Trussell (File T-16).	Resulted from inadequate repair following failure of another component.
Crankshaft failed at No. 6 main bearing journal. Indications started at discontinuity that is located about 3/4-inch from oil hole opening. Failure was caused by fatigue.	Failure Analysis Report No. 0124 dated 12/11/79 (File T-16).	Not applicable since this engine had a 4th order critical at operating speed, and River Bend does not.
A bend is suspected on the crankshaft and the shaft consequently does not have the required support from each bearing, the risk of cracking is prevalent because of fatigue stressing during operation and load variations.	Telex from Bailey (TDI) to Delaval HQ. (File T-33). Enclosure 2 to SWEC letter dated 04/29/81 by G. Sandstrom (File T-36).	No indication of a bent crankshaft at River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Broken crankshaft and further extensive damage to the engine. City of St. Cloud, Fla.	Letter from Village of Rockville Centre to Smith & Gillespie Eng. Inc. 11/09/81 Eng. DG-SRV-16-4 Unit No. 7 City of St. Cloud (File T-63).	Resulted from failure of another component.
The original crankshaft was bent during the overspeed.	Sales order No. W-25354 07/13/81. Rafha Electric Co. Eng. No. 79003. Model DSR-F48 (File T-57)	No indication of a bent crankshaft at River Bend.
Repaired crankshaft No. 2 crankpin journal was reduced in diameter by 0.273 thousandths of an inch.	Telex from C. Just to Pratt (TDI) 07/27/83	Not relevant to design considerations at River Bend.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Main Bearings

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-310B

TASK DESCRIPTION NO. DR-06-03-310B-0

SNPS GPL NO. 03-310B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

A design review for this component is not required based on:

- The lead engine report for Shoreham establishes the acceptability of the main bearing shells for service in TDI DSR-48 diesel engines. The bearing shells used at River Bend are identical to those on the Shoreham engines. (TDI Part Nos. 03-310-03 OF, 03-310-03-OH).

- The engine operating parameters, main engine components, and loads at River Bend are similar to those at Shoreham. In addition, River Bend will reduce the qualified load for their engines in the future from 3500 kW to 3130 kW. This will reduce main bearing loads and further increase their margin of safety.

The review of the nuclear and non-nuclear experiences listed in the EDG Component Tracking System reports several diesels were found with overheated and scored bearings. These problems resulted from abnormal operating conditions involving contaminated oil or loss of lubrication and were not caused by the bearing design.

Because of the low operating hours on the engines, it is recommended that at the first fuel outage the bearings be inspected for evidence of misalignment. If harmful misalignment is discovered, corrective procedures should be implemented.

There are no modification recommendations for this component.

A liquid penetrant test was performed on the No. 7 main bearing shell from Engine 1A. The results were satisfactory as reported on TER 06-039.

The following quality inspections should be performed to assure component quality:

- Perform a dimensional check of the bearing shells to verify that thickness is within TDI specifications.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Crankshaft Bearings - Bearing Shells

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-310B

REV. NO. 1

SNPS GPL NO. 03-310B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a dimensional check of the bearing shells to verify thickness.
3. Perform a Liquid Penetrant test on the #5 main bearing shells.

Engine 1B

1. Assemble and review existing documentation.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper bearing thickness
3. Surface integrity of the bearing shells

Engine 1B

1. Quality Status of Component Document Package

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Dimensions are in accordance with the TDI Instruction Manual
3. Lack of scoring, galling or cracks

Engine 1B

1. Satisfactory Document Package

REFERENCES

Engine 1A

1. QCI No. 52
2. Approved Site NDE Procedures, TDI Instruction Manual
3. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

1. Document Summary Sheet

GROUP CHAIRPERSON Steve M Schultz PROGRAM MANAGER L Kammeyer

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

3. A Liquid Penetrant test was performed on the #7 main bearing shells with satisfactory results. This was reported by TER# 06-039.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salotto PROGRAM MANAGER J Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Crankshaft and Bearing: Thrust Bearing Rings UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-310C TASK DESCRIPTION NO: DR-06-03-310C-0

SNPS GPL NO. 03-310C CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR Reports (lead engines), which establish the acceptability of the thrust bearing ring assembly for its intended purpose.
- The applicable engine dimensions and operating parameters at River Bend are identical or very similar to those for the same component at Shoreham (Lead Engine).
- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and no site experience.

Maintenance recommendations based on the Comanche Peak DR/QR report to ensure proper performance under normal operating conditions are as follows:

- Measure thrust bearing ring clearance via "bump check" method to be performed in conjunction with crankshaft web deflection measurements at every outage. If the clearance is greater than the maximum allowed in the TDI Instruction Manual, then at least one bearing must be replaced. Bearings should also be replaced if they are cracked or gouged.
- Visually inspect thrust bearing ring for signs of cracks, gouges, wear or degradation at alternate outages.

There are no modifications recommendations for this component.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

CRANKCASE VENTILATOR - CRANKCASE VACUUM FAN

COMPONENT PART NO. 03-387A

This component has been deleted. No review is required.

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

CYLINDER BLOCK
COMPONENT PART NO. 03-315A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the cylinder blocks to determine the adequacy of design for the intended use at River Bend. The blocks are manufactured by TDI and are supplied under their part number 03-315-03-AE. The cylinder block forms the framework of the liquid cooled engine and provides passage for coolant and support for the cylinder liners and cylinder heads.

The results and conclusions of this report are written in anticipation of a final Phase I report (Ref. 1), which is pending confirmatory reviews required by FaAA's QA operating procedures. Inspection recommendations made for River Bend are subject to revision based on the final results and recommendations in the Phase I report of this document.

II. OBJECTIVE

The objective of the review was to evaluate the structural adequacy of the cylinder block for its intended use at River Bend Station.

III METHODOLOGY

In order to meet the stated objective the following methods were used:

- Review of liquid penetrant inspections of River Bend R-4 1A and 1B engine blocks.
- Review of engine operating conditions at River Bend and identification of any differences from those at Shoreham.
- Performance of dimensional check and evaluation of liner/block interaction.
- Evaluation of steady state stresses, alternating stresses and stiffness in key portions of the cylinder block.
- Evaluation of crack growth rate for cylinder block landing and counterbore diameter by comparison with conservative Shoreham data and analysis.

- Review of metallurgical/microstructural analysis of cylinder block material.
- Review of River Bend site, nuclear and non-nuclear experiences (see Appendix C).
- Review of Quality Revalidation Checklist results for acceptability.

IV RESULTS AND CONCLUSIONS

Diesel generators 1A and 1B have been inspected for block top cracks in the region adjacent to and between the cylinders. No cracked ligaments or stud-to-stud or stud-to-end cracks were found. Engine 1A has completed 124 hours of operation as of October 31, 1984. The load breakdown for this service is 1 hour at zero load; 14 hours at 25 percent; 21 hours at 50 percent; 11 hours at 75 percent; 76 hours at 100 percent; and 1 hour at 110 percent load. Engine 1B has completed 40 hours of operation as of October 31, 1984, with a load breakdown of 5 hours at 25 percent; 1 hour at 75 percent; 31 hours at 100 percent; and 3 hours at 110 percent load.

The engine operating conditions at River Bend were compared to those at Shoreham. No significant differences were found that would affect the structural integrity assessment of the River Bend blocks.

Results of dimensional inspection of the liners and of the mating block surfaces were used to evaluate the interaction of the block and liner in the analysis of steady and alternating stresses. These results were utilized in the cumulative damage analysis. The cumulative damage algorithm is explained in Reference 2.

Evaluation of steady state stresses, alternating stresses and stiffness in key portions of the cylinder block was accomplished as part of the strain gage testing at Shoreham and the results were included in the cumulative damage and crack growth analyses.

The power output for this engine is 3500 kW at 100 percent load. Maximum output required for LOOP/LOCA is 3130 kW. The duration of a LOOP/LOCA used in this analysis is 168 hours.

Strain gage testing of the original Shoreham EDG 103 block, inspection data from before and after testing, and materials testing were used as a basis to predict adequate life for cylinder blocks. The apparent rate of propagation of cracks between stud holes in the original Shoreham EDG 103 block, when compared with the River Bend LOOP/LOCA requirements, indicates that even if the River Bend engine 1B block had ligament cracks it is predicted to withstand with sufficient margin a LOOP/LOCA event. Engine 1A can also withstand a LOOP/LOCA event with sufficient margin provided that inspection results show no stud-to-stud or stud-to-end cracks whenever the engine is returned to emergency standby service after any period of operation in excess of 50 percent load.

Diesel generators 1A and 1B have completed limited operational experience. Both engines have been inspected and found to be without detectable block-top cracks. Further, the microstructure of block 1B has been examined and found to be representative of typical grey cast iron, Class 40. To improve engine reliability it is recommended that a material microstructure evaluation be performed on the 1A block at River Bend.

Application of the cumulative damage algorithm (Ref. 2) shows that the River Bend engine 1B block can perform for 700 hours at 100 percent load (or operation resulting in equivalent damage), without inspection, with sufficient margin for a LOOP/LOCA event.

The large difference between engines 1A and 1B inspection periods results from the conservative assumption that the fatigue resistance of engine block 1A is equal to the original Shoreham EDG103 block. Performance hours for engine 1A could be increased to the engine 1B levels if the material microstructure is shown to be representative of typical Class 40 grey cast iron. In the future, after additional engine operation without inspection has been accumulated, additional engine operation may be performed after inspection of the block top for detectable ligament, stud-to-stud or stud-to-end cracks. If none are found then additional engine operation may be performed until the future cumulative damage equals the total cumulative damage accrued to the last inspection. This process may be repeated indefinitely throughout the life of the engine.

The information provided on TER 06-040 has been reviewed and is consistent with the final conclusions of this report.

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review and the results are consistent with the final conclusions of this report.

Based on the above review, and implementation of routine inspections, it is concluded that the cylinder blocks are acceptable for their intended use at River Bend.

V. REFERENCES

1. Design Review of TDI-R4 Series Emergency Diesel Generator Cylinder Blocks and Liners. FaAA-84-5-4.

2. FaAA Support Package Number SP-84-6-12(g).

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Block-Liners and Water Manifold: Cylinder Block

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-315A

TASK DESCRIPTION NO. DR-06-03-315A-1

SNPS GPL NO. 03-315A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Review liquid penetrant inspections of River Bend DSR-8 engine block tops and review engine operating experience.

Review engine operating conditions of River Bend and indentification of any differences from those at Shoreham.

Perform dimensional check on cylinder block and cylinder liners and evaluate liner/block interaction.

Evaluate steady state stresses, alternating stresses and stiffness in key portions of the cylinder block.

Evaluate crack growth rate for cylinder block landing and counterbore diameter by comparison with conservative Shoreham data and analysis.

Review metallurgical/microstructural analysis of cylinder block top material.

Review of River Bend site, nuclear and non-nuclear experiences. (See Appendix C).

Review of Quality Revalidation Checklist results for acceptability.

Review information provided on TERs.

PRIMARY FUNCTION

To provide framework for engine components and to provide cooling water passages.

ATTRIBUTE TO BE VERIFIED

That components have sufficient strength and stiffness to react major loads.

SPECIFIED STANDARDS

None.

REFERENCES

None.

DOCUMENTATION RFQUIRED

Manufacturer's drawings for DSR-48 blocks, liners and studs, including all specifications for material, torques, valve train loads and gas cycles.

Engine operating history (time vs. load) for operation prior to block top inspection, and for total engine hours.

Anticipated engine operating profile (time vs. load) for fuel cycle, including pre-operational, qualification, and surveillance testing.

Engine factory test logs that report firing pressures and exhaust temperatures for each cylinder.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinder Block

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-315A

REV. NO. 2

SNPS GPL NO. 03-315A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Perform a dimensional check on the area around the cylinder liner for all cylinder block liner landings.

3. Perform a Liquid Penetrant or Magnetic Particle test on the cylinder block liner landing along the top landing surface, fillet radius, and vertical face adjacent to the landing surface. Three liner landings (5, 7 and 8) should be inspected with the liners removed. If linear indications are found, increase inspection plan to all liner landings.

4. Perform a Liquid Penetrant or Magnetic Particle test on the cylinder head mating surface on top of the cylinder block. The area between stud hole and liner, and between adjacent cylinder stud hole should be inspected. The inspection plan should include cylinders 5, 7 and 8. If linear indications are found, increase inspection plan to all cylinders.

5. Perform an Eddy Current test on the cylinder head stud holes if required (i.e., linear indications found at stud hole extending into threads).

6. Remove a sample from the cylinder block by drilling and cutting. The sample shall be tetrahedral in shape with a one inch square base and a height of 5/8 inch. Attachment B shows the location where the sample should be taken.

Engine 1B

1. Assemble and review existing documentation.

2. Perform a dimensional check on the area around the cylinder liner for all cylinder block liner landings.

TASK DESCRIPTIONS (continued)

Engine 1B (continued)

3. Perform a Liquid Penetrant or Magnetic Particle test on the cylinder block liner landing along the top landing surface, fillet radius, and vertical face adjacent to the landing surface. This inspection plan should be performed on a sample basis only.

4. Perform a Liquid Penetrant or Magnetic Particle test on the cylinder head mating surface on top of the cylinder block. The area between stud holes and liner, and between adjacent cylinder head and stud holes should be inspected. The inspection plan should be performed on a sample basis only.

5. Remove a sample from the cylinder block by drilling and cutting. The sample shall be tetrahedral in shape with a one inch square base and a height of 5/8 inch. Attachment B shows the location where the sample should be taken.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Dimensions of the cylinder block liner landing area

3-5. Surface integrity of the cylinder block liner landing

6. Samples taken from the cylinder block are in accordance with TER# 99-016.

Engine 1B

1. Quality status of Component Document Package

2. Dimensions of the cylinder block liner land area

3-4. Surface integrity of the cylinder block liner landing

5. Samples taken from the cylinder block are in accordance with TER# 99-016.

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of inspection report by the Design Group

3-4. See Attachment A

6. Review of inspection report by the Design Group

Engine 1B

1. Satisfactory Document Package

2. Review of inspection report by the Design Group

3-4. See Attachment A

5. Review of inspection report by the Design Group

REFERENCES

Engine 1A

1. QCI No.52

2. Approved Site NDE Procedures

3-4. TER#s 99-004, 99-018

5. FaAA Procedure NDE 11.8

6. TER# 99-016

Engine 1B

1. QCI No.52

2. Approved Site NDE Procedures

3-4. TER#s 99-004, 99-018

5. TER# 99-016

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-6. Inspection Report

Engine 1B

1. Document Summary Sheet

2-5. Inspection Report

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. A dimensional check of the area around the cylinder liner for all cylinder block liner landings was performed. This was reported by TER# 06-040.

3. A Liquid Penetrant test was performed on the cylinder block liner landings with satisfactory results. This was reported by TER# 06-040.

4. A Magnetic Particle test was performed on the cylinder head mating surface on top of the cylinder block with satisfactory results. This was reported by TER# 06-040.

5. No linear indications were found at the stud hole extending into the threads. Therefore, an Eddy Current test was not required.

6. No inspection report has been received which fulfills this requirement.

COMPONENT REVIEW (continued)

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-3. No inspection reports have been received which fulfill these requirements.

4. A Magnetic Particle test was performed on the cylinder head mating surface on top of the cylinder block with satisfactory results. This was reported by TER# 06-040.

5. Block sample has been forwarded to design for analysis.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nelle A. Smith PROGRAM MANAGER [illegible]

ACCEPTANCE CRITERIA

A. Area to be inspected

1. Top of Block
2. Liner counterbore

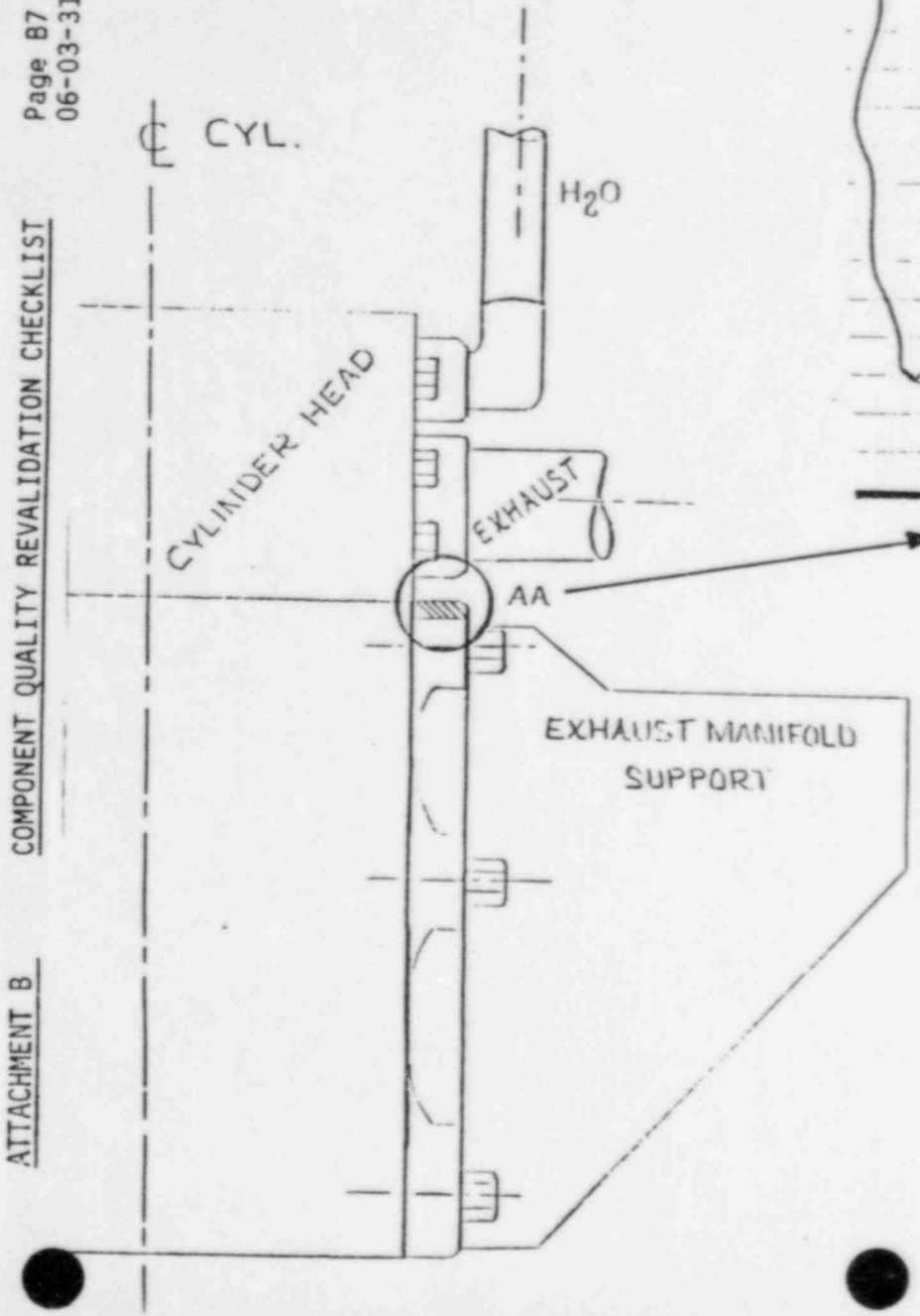
B. Reference Standard ASTM E125

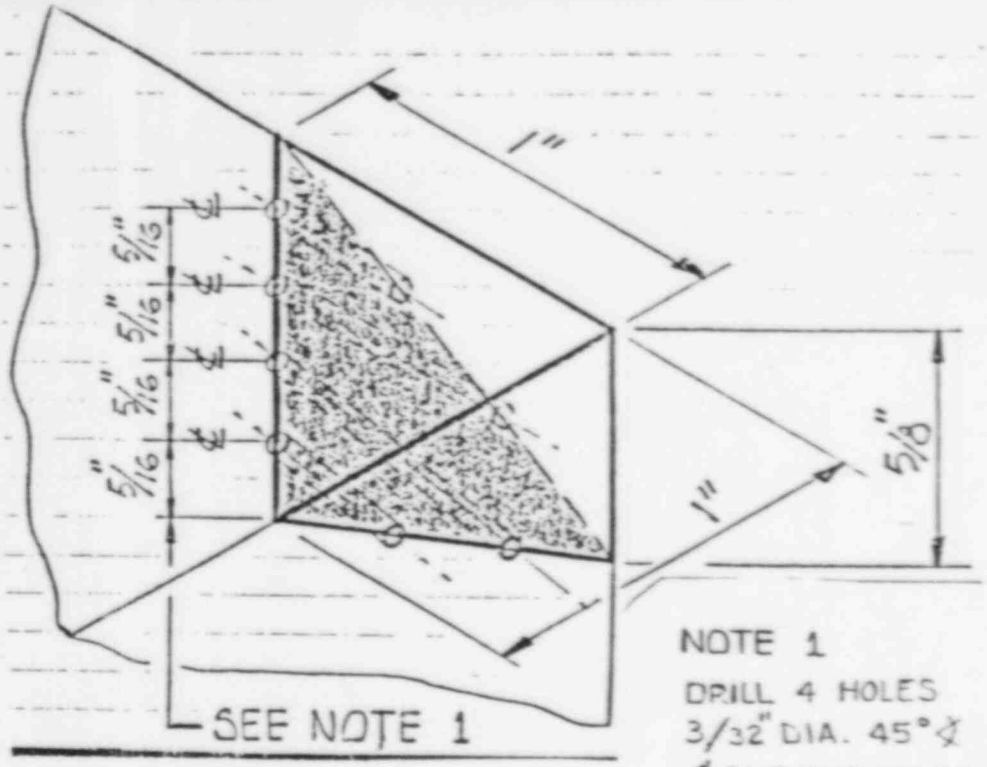
C. Evaluation of indications

1. Relevant indications are:
   a. Hot tears and cracks, linear indications that exceed ASTM E125 Class I-2
   b. Shrink that exceeds ASTM E125 Class II-3
   c. Inclusions that exceed ASTM E125 Class III-3
   d. Porosity that exceeds ASTM E125 Class V-1
2. All indications exceeding the specification listed above shall be documented and submitted to the Design Group.
3. Indications that do not exceed the ASTM E125 reference regardless of size and quantity are acceptable.

D. Non-Relevant Indication

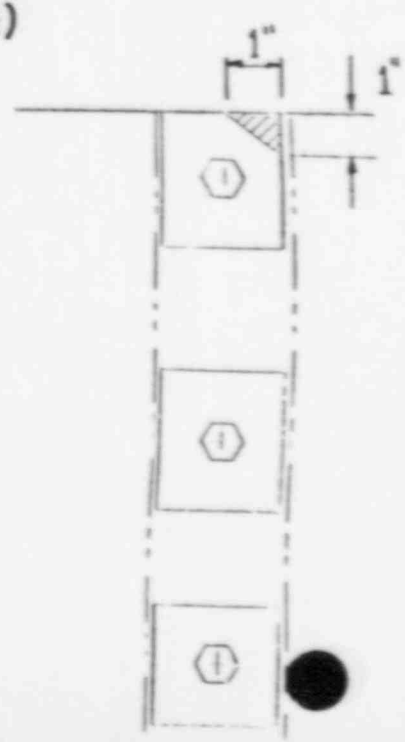
1. The indications referenced below shall be considered non-relevant.
   a. Magnetic writing
   b. Linear grain boundaries (carbon, ferrite, or graphite induced)
   c. Rounded grain boundaries (carbon, ferrite, or graphite induced)





ISOMETRIC DETAIL A-A
(DARKENED AREA INDICATES
CUTTING PLANE)

NOTE 1
DRILL 4 HOLES
3/32" DIA. 45° ∡
℄ CUT OUT PIECE
(SEE DETAIL ABOVE)



EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-315A

Effective Printout Date: 10/15/84

COMPONENT TYPE: Cylinder Block

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
Cylinder block repair due to corrosion.	SIM 247	River Bend blocks have been inspected and no corrosion noted. No impact on River Bend.
Gasket groove of 7R cylinder was cracked.	Service Report TPC Nuclear Plant No. 3 Maanshan Dec. 9, 1983 (File No. T-45)	River Bend blocks have been inspected. No impact on River Bend.
NON-NUCLEAR		
The forward outboard cylinder block of the starboard main engine of the vessel cracked because of entry of water from the cooling system into the air intake system of the engine.	Letter 04/21/83 J. Blain to W. Busch; Complaint C.A. No. H-83-2420 filed U.S. District Ct. 52, p. 4,; U.S. Salv. Assoc. Report 52-15573, 07/01/82 Amer. Bur. Ship. Report HA-81-2539, 12/16/81; Salv. Assoc. Report CH0830, 04/01/82.	No impact on River Bend. Reference intercooler report.
Block cylinder bores were found egg shaped.	Hunton & Williams to C. Seaman 12/29/83; Memo M. Zbinden to R. Ward 01/16/81.	River Bend blocks have been inspected. No impact on River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Extensive cracking of cylinder block.	Hunton & Williams to C. Seaman 12/29/83; Memo M. Zbinden to R. Ward 03/13/81.	River Bend blocks have been inspected. The aggressive inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.
Final cam tappet could not be placed into position because of deficient cylinder block.	Hunton & Williams to C. Seaman 12/29/83; M. Zbinden to File 04/29/81.	No impact on River Bend. Isolated initial assembly problem.
Cylinder blocks ordered because of previous ones fretting, distorting, and cracking. Head stud holes not machined properly per TDI's spec.	Hunton & Williams to C. Seaman 12/29/83; M. Zbinden to File 04/09/81; M. Zbinden to R. Ward 03/13/81.	River Bend blocks have been inspected. No impact on River Bend.
TDI blocks on mala-spiner class vessels are structurally stronger although rated less than half of Columbia's HP.	Hunton & Williams to C. Seaman 12/29/83; M. Zbinden to R. Lind 06/17/81.	No impact on River Bend.
Allegations made that cylinder block has experienced creep and cylinder block is heated during operation in the center and room temperature at the ends.	Hunton & Williams to C. Seaman 12/29/83; G. Trussell to D. Thompson 10/27/81.	River Bend blocks have been inspected. No impact on River Bend.
Engine derating will lessen thermal stresses of cylinder block.	SES Report 123-01, 04/83, pp. 4-6, 4-7.	River Bend blocks have been inspected. Not applicable to River Bend.
Observed deformation of cylinder liner block. Counterbore lip of cylinder block observed to have circumferential cracking.	SES Report 123-01, 04/83, pp. 3-14, 3-28, 6-3.	No circumferential cracking observed at River Bend on counterbore landing lip. No impact on River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Deformation of counterbore lip of cylinder liner block caused by metallic fatigue.	Engine Rebuild Report for Alaska 03/31/81, pp. I, I-10.	River Bend blocks have been inspected. No impact on River Bend.
Block deformation from cracks, metallic fatigue creep, overload of counterbore lip, close proximity of cooling water holes, close proximity of head retaining studs, and thread termination for studs level with counterbore depth is causing high stress concentration area.	Engine Rebuild Report for Alaska 03/31/81, pp. I-9, V, V-10, VI, VIII and Summary pp. 26, 27.	River Bend blocks have been inspected. No impact on River Bend.
Engine crankshaft out of alignment; possibly from engine block misalignment.	Engine Rebuild Report for Alaska 03/31/81, pp. V-10, V-12, VI.	Reference crankshaft Report on River Bend. No impact on River Bend.
Reported cracks between heads and liner bores.	Memo from E. Sigrist (TDI) to G.E. Trussell (TDI) dated 11/08/82 (File No. T-10) City of Homestead, Fla.	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.
Reported cracks between the head stud holes and liner bores.	Letter from R. Pratt (TDI) to John Smith City of Homestead, Fla., dated 06/17/82 (File No. T-2) City of Homestead, Fla.	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.
Engine block cracked from improper placing and tightening of head gaskets (April 1979).	Memo from E. Sigrist (TDI) to G. E. Trussell (TDI) dated 11/08/82 (File No. T-10) City of Homestead, Fla.	River Bend blocks have been inspected. The inspection for River Bend will monitor blocktop and ensure capacity for LOOP/LOCA.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Several cracks were discovered running from the cylinder cover bolt holes into liner. Cause of cracks not determined.	Letter from R. C. Grindeland (BIEHL) to C. Mathews (TDI) (TDI) 03/16/81 (File No. T-14)	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.
Distortion in upper deck and small cracks in cylinder block. New blocks have heavier external walls and interior bulkheads.	Report by George G. Sharp, Inc. "Overview of Reports, Analysis and Recommendations Re-propulsion Engines M/V Columbia" by July 26, 1983.	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.
Cylinder block fractures. Caused by the combination of diametral and vertical thermal expansion of the liner, cyclic stress from combustion pressure both radially from the liner and vertically through the head studs, and torque down stress of the studs themselves. Recommendations: cylinder head, studs machined to remove stud load stress, cracks repaired by Metalok technique and diameter of the upper liner collar reduced by 0.005 inches.	Letter from M. Lowrey (TDI) to H. Blanding (American Bureau of Shipping) dated 12/30/83 (File No. T-30). Letter from M. Lowrey (TDI) to H. Taylor (American Bureau of Shipping) dated 10/28/83 (File No. 5-30). Minutes of meeting between TDI and USSGLF on 12/20, 21, 1983 (File No. T-30). Letter from R. Bertz (USSGLF) to A. Barich (TDI) dated 04/07/83 (File No. (T-30). Letter from and USSGLF dated M. Lowrey (TDI) dated 07/14/83 (File No. T-30). Minutes of meeting between TDI R. Bertz (USSGLF) to 06/17/83 (File No. T-30).	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Cracks in the engine block at a point between the cylinder head hold-down studs and the cylinder liner bore. These cracks were repaired in Unit 18, but the same type of block cracks have appeared in several stud locations on both units 18 and 19.	Letter from A Muxo (City of Homestead) to C. S. Mathews and and R. J. Bazzini (TDI) dated 05/31/82 (File No. T-10). Letter from A. Muxo (City of Homestead) to C. S. Mathews dated 12/13/82 (File No. T-10). Letter from J. A. Smith (City of Homestead) to G. E. Trussell (TDI) 06/14/77 (File No. T-10). Comments by City of Homestead, Fla., on the observations of R. A. Pratt and G. E. Trussell tested in the Transamerica Delaval Survey Report, 08/10/82 (File T-10).	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.
Cylinder block cracking.	Minutes of meeting between USS Great Lakes Fleet Service Inc. and TDI dated 04/13/84 (File No. T-46). Telex from G. Trussell (TDI) to R. Bertz (USS-GLF) dated 04/08/83 (File No. T-46). Letter from R. Bertz (USS-GLF) to A. Barich (TDI) dated 04/07/83 (File No. T-46). Agenda TDI and USS-GLF dated 04/13/83 (File No. T-46). American Bureau of Shipping Report by D. W. Johnson, Report No. DL5702, dated 03/22/83. (File No. T-46).	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Cracks in engine block. Florida.	Letter 05/13/82 from City of Homestead, Fla. to TDI (Oakland and New York) Units 18 and 19 (File T-64).	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity for LOOP/LOCA.
Piston failed and hit block, causing crack. Could drill stop each leg of crack, then stitch up holes with a few supporting stitches along length of crack.	TDI letter to Metalok International 05/12/81 (File No. T-50), Greg Beshouri (TDI), D. Venning (Metalok Int. Assn. Ltd). Enterprise Oak (Geoff King) to Beshouri 05/28/81-2 (File T-50). Photocopy of preliminary report on crack on left cylinder (4th) by G.K. Rao (Bhel). Memo dated 05/11/81 Bob Bailey (Riyadh) to G. King (Oakland) (File T-50).	Isolated incident. Not a design related problem. No impact on River Bend.
Crack block on Unit No. 19.	Letter from John A. Smith (City of Homestead to G. E. Trussell (TDI) 06/17/77 (File No. T-55)	River Bend blocks have been inspected. The inspection for River Bend will monitor block top and ensure capacity LOOP/LOCA.
Eng. S/N 79002 exploded. Cylinder block damaged. Attributed to multiple head gaskets (2).	Rafha Electricity Co. and Suburbs, Saudi Co. Ltd., Saudi Arabia dated 07/12/81. No addressee or transmittal letter available. No. 3 gen. (File No. T-57).	Fracture attributed to installation of three rather than 2 head gaskets. No impact on River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Cylinder block fracture caused by high compressive stresses on the counterbore lip. Localized stress condition from the combinations of sharp internal corner for lip (1/32-inch radius), nearby drilling for water jacket or stud. Termination of stud threading at the same level, creep deformation, and fatigue. (M/V Columbia)	Engine Rebuild Report State of Alaska dated 03/31/81 Pg. iv.	River Bend blocks have been inspected. No impact on River Bend.
Cylinder block repaired by Metalok.	Telex 05/28/81 G. King (TDI) to Desrumeaux/Wilder/ Beshouri-Jizan 77036 TDI (File No. T-50)	River Bend blocks have been inspected and do not required repair.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Block Liners & Water Manifold - Cylinder Liner

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-315C

TASK DESCRIPTION NO. DR-06-03-315C-0

SNPS GPL NO. 03-315C

CLASSIFICATION TYPE A

TASK DESCRIPTION

Design review is not required for this component based on review of the lead engine DR/QR reports (Shoreham/Comanche Peak) and the reported applicable industry experience. There is no site experience in the EDG Component Tracking System.

Quality inspections conducted to date have been reviewed and are considered satisfactory. Three cylinder liners (5, 6, and 8) from engine 1A were found to be out of round by more than the allowable 5.1 mils. To speed up reassembly of engine 1A, GSU installed three acceptable liners from engine 1B as replacements. Of the three cylinder liners that were out of round, cylinder liner 8A was scrapped and liners 5A and 6A were reworked back to within specification.

The following Quality inspections as delineated in the CQRC are recommended:

- Determine the material of a spare cylinder liner
- Verify liner dimensions including bore, length, height, O.D. and shoulder height for cylinder liners 7 and 8 (Engine 1B only).
- Visually inspect all cylinder liners over the zone of piston travel (Engine 1B only).
- Visually inspect the outside pilot diameter where it contacts the cylinder block on all cylinder liners.

There are no modification recommendations for this component, however, the following is recommended as a maintenance item:

- Inspect the cylinder liners borescopically (visually if the cylinder heads are off) at every refueling outage for signs of progressive wear.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinder Block Liners & Water Manifold - Cylinder Liners

UTILITY Gulf States Utilities, River Bend Station

GPL NO. U3-315C

REV. NO. 3

SNPS GPL NO. 03-315C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify liner dimensions including bore, length, height, O.D. and shoulder height for all cylinder liners.
3. Visually inspect the outside pilot diameter where it contacts the cylinder block on all cylinders.
4. Visually inspect all cylinder liners over the zone of piston travel.
5. Determine the material of a spare cylinder liner.

Engine 1B

1. Assemble and review existing documentation.
2. Verify liner dimensions including bore, length, height, O.D. and shoulder height for cylinder liners 5, 7 and 8.
3. Visually inspect the outside pilot diameter where it contacts the cylinder block on all cylinders.
4. Visually inspect all cylinder liners over the zone of piston travel.

Note: Document all inspections will photographs.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper cylinder liner dimensions
3. Indications of contact spalling
4. Indications of scuffing and scoring
5. Material of spare cylinder liner

Engine 1B

1. Quality Status of Component Document Package
2. Proper cylinder liner dimensions
3. Indications of contact spalling
4. Indications of scuffing and scoring

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Liner dimensions are in accordance with the TDI Instruction Manual.

3-5. Review of inspection report by the Design Group

Engine 1B

1. Satisfactory Document Package
2. Liner dimensions are in accordance with the TDI Instruction Manual.

3-4. Review of inspection report by the Design Group

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures, TDI Instruction Manual

3-5. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

2. Approved Site NDE Procedures, TDI Instruction Manual

3-4. Approved Site NDE Procedures

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-5. Inspection Report

Engine 1B

1. Document Summary Sheet

2-4. Inspection Report

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. A dimensional check on all cylinder liners was performed including the bore, length, outside diameter and shoulder height. These dimensions were taken after machining of the cylinder liners. The results were reported by TER# 06-041.

COMPONENT REVIEW (continued)

Engine 1A (continued)

3. A visual inspection on the outside pilot diameter was performed for all cylinder liners with satisfactory results. This was reported by TER# 06-041.

4. A visual inspection was performed over the zone of piston travel for all cylinder liners, with indications of scuffing and scoring in evidence. This inspection was performed after honing of the liners. This was reported by TER# 06-041.

5. No inspection report has been received which fulfills this requirement.

Engine 1B

1. NO EDGCTS site experience documents are in evidence.

2. A dimensional check was performed on cylinders liners 4, 5, and 6 including the bore, length, outside diameter and shoulder height. The results were reported by TER# 06-041.

3. No inspection reports have been received which fulfill these requirements.

4. A visual inspection was performed over the zone of piston travel for cylinder liners 4, 5, and 6. Indications of light scuffing and scoring were in evidence for cylinder liner #4. This inspection was performed after honing of the liners. The results were reported by TER# 06-041.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sacta PROGRAM MANAGER

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

CYLINDER BLOCK - LINERS AND WATER MANIFOLD
JACKET WATER MANIFOLD AND PIPING
(LARGE BORE SCOPE ONLY)
COMPONENT PART NO. 03-315D

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the jacket water manifold and piping for the effects of normal operating and earthquake loadings.

The primary function of the jacket water manifold and piping is to carry water from the jacket water supply line to the engine inlet ports.

The scope of piping embraced by this report includes the large bore (greater than 2-inch diameter) piping components as noted on the as-built information transmitted to and obtained during Impell field verification (Ref. 1).

Piping components are defined as piping spool pieces, elbows, tees, flanges, and the interconnecting welds. This scope is uniquely defined in terms of Transamerica DeLaval, Inc. (TDI) part numbers in Reference 1.

II OBJECTIVE

The objective of this review was to verify the adequacy of the subject piping components for normal operating and earthquake loadings.

III METHODOLOGY

The evaluation of the piping was performed in accordance with the philosophy and intent of the ASME Section III Code, for Class 3 Nuclear Piping. Towards this end, a criteria document was developed, "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," which describes the background and provides the techniques for evaluating the subject piping. These criteria are presented in their entirety in Reference 2.

Quality Revalidation Checklist results were reviewed for acceptability.

The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience.

IV RESULTS AND CONCLUSIONS

All piping stresses were within the design allowables specified by the ASME Section III Code.

All pipe loads on the engine were tabulated and issued for evaluation.

There are no TERs associated with this component.

In order to provide adequate load transfer capabilities and strength at the flanged connections, the following maintenance recommendations should be implemented:

- Ensure that all bolts on the flange with a support attached are Grade A449 or better (based on ASME allowable stress) and torqued as specified in Appendix 4 of the Delaval Instruction Manual, Vol. I for Model DSR-48.

- Ensure that the bolts on all remaining flanges are Grade A449 or better (based on ASME allowable stress).

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review and the results are consistent witn the final conclusions of this report.

Based on the above review, it is concluded that the subject piping components, with the maintenance recommended above, are adequate for their intended design function at River Bend.

V REFERENCES

1. "Supporting Calculations for the Evaluation of River Bend Diesel Generator Large Diameter Piping and Supports," Impell Report No. 02-0630-1271, Rev. 0, October 1984.

2. "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984. This is included in Appendix III of the final DR/QR report.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Manifold Piping (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-315D

TASK DESCRIPTION NO. DR-06-03-315D-0

SNPS GPL NO. 03-315D

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Evaluate structural integrity of the jacket water manifold piping spool pieces and fittings for the effects of normal operating and earthquake loadings by (a) comparison to previous analyses, (b) review of previous qualification documentation, and/or (c) actual performance of stress evaluation in accordance with the intent and philosophy of ASME III Class 3 and Impell Design Criteria.

Review information provided on TERs.

PRIMARY FUNCTION

Carry jacket water from jacket water supply line to engine inlet ports.

ATTRIBUTE TO BE VERIFIED

Structural integrity of large bore (greater than 2 in. dia.) piping spool pieces and fittings to withstand the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

None

REFERENCES

"Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984.

DOCUMENTATION REQUIRED

Verified piping isometric, material specification, size and schedule, design parameters (temp., pressure), contents, and insulation.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT	Cylinder Block Liners & Water Manifold - Jacket Water Manifold & Piping	UTILITY	Gulf States Utilities, River Bend Station
GPL NO.	03-315D	REV. NO.	1
SNPS GPL NO.	03-315D		

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawing for the jacket water manifold and piping if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

COMPONENT REVIEW (continued)

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nita A. Sakta PROGRAM MANAGER [illegible]

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-315D

Effective Printout Date 10/17/84

COMPONENT TYPE: Cylinder Block Liners And Water Manifold - Jacket Water Manifold And Piping

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
During surveillance test, D2 diesel generator tripped on high crankcase pressure. Several days of troubleshooting showed that the diesel generator is operable if kept hot. It appears that cooling water leaks into the lube oil system and accumulates during shutdown periods.	LER Prairie Island 1, 282-79032, 791221	Within the subject scope of large bore piping, there is no way for cooling water to leak into lube oil Not applicable.
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Block-Liners and Water Manifold: Studs UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-315E TASK DESCRIPTION NO. DR-06-03-315E-0

SNPS GPL NO. 03-315E CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review of this component is not required based on the review of the Phase I generic report, the lead engine DR/QR reports (Shoreham/Comanche Peak), and the applicable industry experience listed in the EDG Component Tracking System. There is no reported site experience for this component.

A review of Gulf States correspondence to the Owners Group (Ref. 1) indicates that the River Bend cylinder head studs have been modified in accordance with the latest TDI and Owners Group recommendations (Ref. 2); additionally the most recent TDI and Owners Group head stud installation recommendations have been incorporated into the River Bend specification (Ref. 3). This recommendation along with the aforementioned modification to the head studs are consistent with the Owners Group letter to the Owners (Ref. 4).

There are no maintenance or modification recommendations for this component.

Quality inspections performed to date on Engine 1A, and the subsequent dispositions, have been reviewed and are considered satisfactory.

The following Quality inspections are recommended to be performed on Engine 1B:

- Perform a visual inspection for signs of distress. Examine four cylinders.
- Verify that the proper torque loads were applied by a review of existing documentation.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Gulf States Utilities letter to C. L. Ray; File No. 244.700; RGB-18,960 "Design Review of TDI R4 and RV4 series Emergency Diesel Generator Cylinder Blocks and Liners. (Dated 09/21/84).

2. River Bend - E&DCR C-22,975 "Machine Cylinder Head Studs."

3. River Bend - E&DCR C-24,972 "Installation of Head Studs."

4. Owners Group letter to J. Deddens, "Cylinder Head Stud Modification and revised OGTP-301-0-161 (dated 09/24/84) Installation Procedure."

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinder Block Liners & Water Manifold - Studs

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-315E

REV. NO. 1

SNPS GPL NO. 03-315E

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation
2. Perform a visual inspection of the head studs for signs of distress. Examine four cylinders per engine.
3. Determine the material of four studs.
4. Determine the hardness of one stud.
5. Verify the proper torque loads were applied by a review of existing documentation.

Engine 1B

1. Assemble and review existing documentation.
2. Perform a visual inspection of the head studs for signs of distress. Examine four cylinders per engine.
3. Verify the proper torque loads were applied by a review of existing documentation.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Signs of distress for the head studs

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

3. Material of studs

4. Hardness of studs

5. Proper stud torques

Engine 1B

1. Quality status of Component Document Package

2. Signs of distress for the head studs

3. Proper stud torque

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-4. Review of inspection report by the Design Group

5. Head studs are torqued to values between 80 and 120 ft-lbs.

Engine 1B

1. Satisfactory Document Package

2. Review of inspection report by the Design Group

3. Head studs are torqued to values between 80 and 120 ft-lbs.

REFERENCES

Engine 1A

1. QCI No. 52

2-4. Approved site NDE Procedures

5. QCI No. 52, memo from C. L. Ray to J. Deddens dated 09/24/84

REFERENCES (continued)

Engine 1B

1. QCI No. 52

2. Approved Site NDE Procedures

3. QCI No. 52, memo from C. L. Ray to J. Deddens dated 09/24/84

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

5. Document Summary Sheet

Engine 1B

1. Document Summary Sheet

2. Inspection Report

3. Document Summary Sheet

GROUP CHAIRPERSON Steven R. Schwartz PROGRAM MANAGER J. Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are inevidence.

2. A visual inspection was performed on thirty-two head studs for sign of distress. The results were reported by TER# 06-042.

3. A material comparator test was performed on four head studs. The results were reported by TER#'s 06-029 and 06-042.

COMPONENT REVIEW (continued)

Engine 1A (continued)

4. A hardness test was performed on four head studs. The results were reported by TER#'s 06-029 and 06-042.

5. A torque load of 100 ft-lb was applied to each stud. This was reported by TER# 06-042.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-3. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Vito A. Soleta PROGRAM MANAGER J C Kammerer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Block Liner & Water Manifold - Cylinder Head Nuts

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-315F

TASK DESCRIPTION NO. DR-06-03-315F-0

SNPS GPL NO. 03-315F

CLASSIFICATION TYPE B

TASK DESCRIPTION

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR reports which establish the acceptability of the cylinder head nuts for their intended purpose.
- A review of site, nuclear and non-nuclear industry experience in the EDG Component Tracking System indicated that there had been no design related failures associated with this component. The cylinder head nuts are identical on all the Owner's Group TDI Diesel Engines (TDI Part No. F-090-021).

The only adverse experience occurred at Shoreham and involved a cracked nut attributed to a forging lap during manufacturing, and did not impair engine operation. Quality inspections performed at River Bend on eight nuts from Engine 1A did not find any defective cylinder head nuts. This was reported on TER 06-043.

There are no maintenance or modification recommendations for this component.

The following Quality Revalidation inspections should be performed on Engine 1B to ensure component quality:

- Visually examine all nuts for identification markings.
- Verify the proper installation and torquing of the nuts.
- Perform a visual inspection of the nuts for signs of forging laps.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinder Block Liner & Water Manifold - Nuts

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-315F

REV. NO. 1

SNPS GPL NO. 03-315F

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual examination of all nuts for identification markings.
3. Verify the proper installation and torquing of the nuts.
4. Perform a visual inspection of the nuts for signs of forging laps.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper identification markings on nuts
3. Proper installation and torque loads are applied to the cylinder head stud nuts.
4. Nuts are free from forging laps.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package.

2. Identification markings of all nuts are recorded.

3. Torque values applied to the nuts are in compliance with TDI Instruction Manual.

4. Nuts are free from forging laps.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

3. Approved Site NDE Procedures, TDI Instruction Manual

4. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

DOCUMENTATION REQUIRED: (continued)

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER D. C. Hammerger

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual examination was performed on all nuts for identification markings. The results were reported by TER# 06-043.

3. In accordance with the TDI Instruction Manual, a torque load of 3600 ft-lb was applied to the nuts. This was reported by TER# 06-043.

4. A visual inspection was performed on eight random nuts with no forging laps found. This was reported by TER# 06-043.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-4. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salete PROGRAM MANAGER D. C. Hammerger

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Block-Liners and Water Manifold: Seals and Gaskets

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-315G

TASK DESCRIPTION NO: DR-06-03-315G-0

SNPS GPL NO. 03-315G

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the applicable industry experience and the lead engine DR/QR reports (Shoreham/Comanche Peak). There is no reported site experience for this component in the EDG Component Tracking System.

The following Quality inspections should be performed on Engines 1A and 1B:

- Review of the applicable site documentation should be performed to verify that the proper cylinder liner seals (TDI P/N JF-019-000) have been installed in the diesel generators.

There are no maintenance or modification recommendations for this component.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Block Covers: Gaskets & Bolts

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-385B

TASK DESCRIPTION NO.: DR-06-03-385B-0

SNPS GPL NO. 03-385B

CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on a review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience reported in the EDG Component Tracking System.

There have been cases of fastener failures on the cylinder block covers, however these failures are not attributed to design deficiencies of this component. Based on the lead engine DR/QR report, the recommended torque value of 30 ft-lbs is appropriate and the specified bolting and stud materials (SAE GR 5 and SAE GR 1120 respectively) are acceptable for their intended function of holding the covers onto the cylinder block. Isolated failures can occur when the torque is not applied properly or a lesser grade material is substituted. Barring any deviations as mentioned above the bolting is acceptable for use on the diesel engines.

There are no modification or maintenance recommendations for this component.

The following quality inspections are recommended to be performed on one engine:

- To verify that the proper torque is applied and the specified material is installed, plant personnel should review site documentation or perform the necessary inspection to make these determinations.
- Perform a visual inspection to verify that the gaskets are suitable for the environment.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI DIESEL GENERATOR

DESIGN REVIEW AND QUALITY REVALIDATION REPORT

Prepared For

GULF STATES UTILITIES

RIVER BEND STATION

By

TDI DIESEL GENERATOR OWNERS GROUP

VOLUME 3

How To Use This Report

Tabs in this report identify the following categories:

Turbo, Intake, Intercooler & Exhaust
Lube Oil
Engine Base & Bearing Caps
Crankshaft & Bearings
Cylinder Block, Liners & Water Manifold
Air Start & Barring Device
Connecting rods
Pistons
Camshaft & Valve Train
Idler Gear Assembly & Front Gear Case
Flywheel
Engine Instrumentation & Wiring
Overspeed Trip & Governor
Engine Shutdown & Equipment
Jacket Water
Cylinder Heads & Valves
Fuel Oil Injection
Generator
Control Panel Assembly
Engine & Auxiliary Sub-Base & Foundation Bolts

These categories have been defined to allow the reader to review a complete diesel generator subsystem in a convenient manner.

Within each category tabs identify River Bend specific component numbers.

A given component report can be found by:

a) If the component nubmer is known - use the alpha - numeric index which identifies the volume number and category in which the component report is located.

b) If only the component name is known - Section 3.2 may be used as a cross-reference to find the volume number where the component report may be found.

Some reports address more than one component. A tab is provided for each component. However, some components are combined under one report. Slip sheets are provided where required to reference back to the appropriate tab. Some components required more than one report. These are identified by the abbreviation LB-Large Bore and SB-Small Bore on the component number tabs.

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
F-068	Intercooler	X	X	Turbo, Intake, Intercooler & Exhaust	2
MP-020	Turbocharger	X	X	Turbo, Intake, Intercooler & Exhaust	2
00-420	Lube Oil Pressure Regulating Valve	X	X	Lube Oil	2
03-CFR	Turbocharger Thrust Bearing Drip Lube System	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-305A	Base and Bearing Caps: Base Assembly	X	X	Engine Base & Bearing Caps	2
03-305C	Base and Bearing Caps: Main Bearing Studs & Nuts	X	X	Engine Base & Bearing Caps	2
03-305D	Base and Bearing Caps: Main Bearing Caps	X	X	Engine Base & Bearing Caps	2
03-305E	Base and Bearing Caps - Through Bolting	X	X	Engine Base & Bearing Caps	2
03-307A	Lube Oil Fittings: Internal - Headers	X	X	Lube Oil	2
03-307B	Lube Oil Fittings: Internal - Tubing & Fittings	X	X	Lube Oil	2
03-307D	Lube Oil Fittings Internal: Supports	X	X	Lube Oil	2
03-310A	Crankshaft	X	X	Crankshaft & Bearings	2
03-310B	Main Bearings	X	X	Crankshaft & Bearing	2
03-310C	Crankshaft & Bearings: Thrust Bearing Rings.	X	X	Crankshaft & Bearing	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-315A	Cylinder Block	X	X	Cyl. Block & Liners & Water Manifold	2
03-315C	Cylinder Block Liners & Water Manifold - Cylinder Liner	X	X	Cyl. Block & Liners & Water Manifold	2
03-315D	Cylinder Block Liners & Water Manifold: Jacket Water Manifold & Piping	X	X	Cyl. Block & Liners & Water Manifold	2
03-315E	Cylinder Block Liners & Water Manifold: Studs	X	X	Cyl. Block & Liners & Water Manifold	2
03-315F	Cylinder Block Liner & Water Manifold: Cylinder Head Nuts	X	X	Cyl. Block & Liner & Water Manifold	2
03-315G	Cylinder Block Liners & Water Manifold: Seals & Gaskets	X	X	Cyl. Block & Liners & Water Manifold	2
03-317A	Water Discharge Manifold: Jacket Water Discharge Manifold	X	X	Jacket Water	4
03-317B	Water Dicharge Manifold: Coupling & Seals	X	X	Jacket Water	4
03-317C	Water Discharge Manifold: Supports	X	X	Jacket Water	4
03-330A	Flywheel	X	X	Flywheel	3
03-330B	Flywheel - Bolting	X	X	Flywheel	3
03-335B	Front Gear Case: Gaskets and Bolting		X	Idler Gear Assembly & Front Gear Case	3
03-340A	Connecting Rods: Rods & Bushings	X	X	Connecting Rods	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-340B	Connecting Rods: Bearing Shells	X	X	Connecting Rods	3
03-341A	Pistons	X	X	Pistons	3
03-341B	Pistons: Rings	X	X	Pistons	3
03-341C	Piston: Pin Assembly	X	X	Pistons	3
03-345A	Tappets and Guides: Intake & Exhaust Tappet Assembly	X	X	Camshaft & Valve Train	3
03-345B	Tappets and Guides: Fuel Tappet Assembly	X	X	Camshaft & Valve Train	3
03-345C	Tappets and Guides: Fuel Pump Base Assembly	X	X	Camshaft & Valve Train	3
03-350A	Camshaft: Camshaft Assembly	X	X	Camshaft & Valve Train	3
03-350B	Camshaft: Camshaft Bearing	X	X	Camshaft & Valve Train	3
03-350C	Camshaft: Supports, Bolting and Gear	X	X	Camshaft & Valve Train	3
03-355A	Idler Gear Assembly: Crank To Pump Gear	X	X	Idler Gear Assembly & Front Gear Case	3
03-355B	Idler Gear Assembly	X	X	Idler Gear Assembly & Front Gear Case	3
03-355C	Idler Gear Assembly: Gaskets & Bolting		X	Idler Gear Assembly & Front Gear Case	3
03-359	Air Start Valve	X	X	Air Start & Barring Device	3
03-360A	Cylinder Heads	X	X	Cylinder Heads & Valves	4

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-360B	Cylinder Head Valves: Intake & Exhaust Valves	X		Cylinder Heads & Valves	4
03-360C	Cylinder Head and Valves: Bolting and Gaskets	X	X	Cylinder Heads & Valves	4
03-360D	Cylinder Head and Values: Springs and Retainer	X	X	Cylinder Heads & Valves	4
03-362A	Subcovers	X	X	Camshaft & Valve Train	3
03-365A	Fuel Injection Equipment Fuel Injection Pump	X	X	Fuel Oil Injection	4
03-365B	Fuel Injection Equipment Fuel Injection Tips	X		Fuel Oil Injection	4
03-365C	Fuel Injection Equipment - Tube Assembly	X	X	Fuel Oil Injection	4
03-365D	Fuel Injection Equipment: Supports	X	X	Fuel Oil Injection	4
03-371A	Fuel Pump Control Shaft, Linkage Assembly & Bearings	X	X	Fuel Oil Injection	4
03-371B	Fuel Pump Linkage: Linkage Assembly and Bearing	X	X	Fuel Oil Injection	4
03-371C	Fuel Pump Linkage: Automatic Shutdown Cylinder	X	X	Fuel Oil Injection	4
03-375	Air Intake Manifold and Piping	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-380A	Exhaust Manifold	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-380B	Exhaust Manifold: Gasket and Bolting	X	X	Turbo, Intake, Intrclr. & Exhaust	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-385B	Cylinder Block Covers: Gaskets and Bolting	X	X	Cyl. Block & Liners & Water Manifold	2
03-387A	Crankcase Ventilator: Crankcase Vacuum Fan	X	X	Crankshaft & Bearings	2
03-390A	Intake & Intermediate and Exhaust Rocker Shaft Assembly	X	X	Camshaft & Valve Train	3
03-390B	Rocker Arms and Pushrods: Exhaust Rocker Shaft Assembly	X	X	Camshaft & Valve Train	3
03-390C	Main and Connector Pushrods	X	X	Camshaft & Valve Train	3
03-390D	Rocker Arms and Pushrods: Pushrods Connector.	X	X	Camshaft & Valve Train	3
03-390E	Rocker Arms and Pushrods: Bushings	X		Camshaft & Valve Train	3
03-390F	Rocker Arms and Pushrods: Lifters	X	X	Camshaft & Valve Train	3
03-390G	Rocker Arms and Pushrods: Miscellaneous Bolts & Drive Studs	X	X	Camshaft & Valve Train	3
03-402A	Governor Drive - Governor & Tachometer Drive Gear & Shaft	X	X	Overspeed Trip & Governor	3
03-402B	Governor Drive - Couplings, Pins & Keys	X	X	Overspeed Trip & Governor	3
03-410A	Overspeed Trip: Governor	X	X	Overspeed Trip & Governor	3
03-410B	Overspeed Trip: Governor and Accessory Drive Assembly	X	X	Overspeed Trip & Governor	3
03-410C	Overspeed Trip: Coupling (Flexible & Spider)	X	X	Overspeed Trip & Governor	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-410D	Overspeed Trip Vent Valve	X	X	Overspeed Trip & Governor	3
03-413	Governor Linkage	X	X	Overspeed Trip & Governor	3
03-415A	Governor Assembly: Woodward Governor	X	X	Overspeed Trip & Governor	3
03-415B	Governor Assembly Booster Servomotor	X		Overspeed Trip & Governor	3
03-415C	Governor Assembly Heat Exchanger	X	X	Overspeed Trip & Governor	3
03-420	Engine Driven Lube Oil Pump	X	X	Lube Oil	2
03-425A	Engine Driven Jacket Water Pump	X	X	Jacket Water	4
03-435A	Jacket Water Fittings: Pipe & Fittings	X	X	Jacket Water	4
03-435B	Jacket Water Fittings: Piping, Tubing & Supports	X	X	Jacket Water	4
03-437A	Turbo Water Piping: Pipe & Fittings	X	X	Jacket Water	4
03-437B	Turbo Water Piping: Supports	X	X	Turbo Intake Intercooler & Exhaust	2
03-441A	Starting Air Manifold: Piping, Tubing and Fitting	X	X	Air Start & Barring Device	3
03-441B	Starting Air Manifold Valves, Strainers, Filters	X	X	Air Start & Barring Device	3
03-441C	Starting Air Manifold: Supports	X	X	Air Start & Barring Device	3
03-442A	Starting Air Distributor: Distributor Assembly	X	X	Air Start & Barring Device	3
03-442B	Starting Air Distributor: Tubing, Fittings & Gaskets	X	X	Air Start & Barring Device	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-445	Engine Driven Fuel Oil Booster Pump	X	X	Fuel Oil Injection	4
03-450B	Fuel Oil Header: Piping & Tubing	X	X	Fuel Oil Injection	4
03-450D	Fuel Oil Header: Fuel Oil Supports	X	X	Fuel Oil Injection	4
03-455A	Fuel Oil Filters & Strainers: Fuel Oil Filters	X		Fuel Oil Injection	4
03-455B	Fuel Oil Filters & Strainers: Strainers	X		Fuel Oil Injection	4
03-455C	Fuel Oil Filters & Strainer: Mounting Hardware	X	X	Fuel Oil Injection	4
03-460A	Lube Oil Full Pressure Strainer	X	X	Lube Oil	2
03-465A	Lube Oil Lines External: Tubing, Fittings, Couplings	X	X	Lube Oil	2
03-465B	Lube Oil Lines - External Supports	X	X	Lube Oil	2
03-465C	Lube Oil Lines - External: Valves	X	X	Lube Oil	2
03-467A	Turbocharger: Lube Oil Fitting - Pipe, Tubing, Fittings & Flexible Coupling	X	X	Lube Oil	2
03-467B	Turbocharger: Lube Oil Fittings - Supports	X	X	Lube Oil	2
03-475A	Turbocharger: Bracket	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-475B	Turbocharger - Bracket: Air Butterfly Valve Assembly	X	X	Turbo, Intake, Intrclr. & Exhaust	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-475C	Turbocharger: Bracket - Air Intake Piping	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-475D	Turbocharger Bracket Bolting & Gaskets	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-475E	Turbocharger - Bracket - Pipe Support	X		Turbo, Intake, Intercooler & Exhaust	2
03-500A	Control Panel Assembly: Cabinet/System	X		Control Panel Assembly	4
03-500F	Control Panel Assembly Accumulator	X	X	Control Panel Assembly	4
03-500G	Control Panel Valves	X	X	Control Panel Assembly	4
03-500H	Control Panel Assembly Pressure Switch	X	X	Control Panel Assembly	4
03-500J	Control Panel Assembly: Control Relays	X	X	Control Panel Assembly	4
03-500K	Control Panel Assembly: Solenoid Valves	X	X	Control Panel Assembly	4
03-500M	Control Panel Components: Piping, Tubing, Fittings		X	Control Panel Assembly	4
03-500N	Control Panel Assembly: Terminal Boards/Switches/ Wiring		X	Control Panel Assembly	4
03-515	Jacket Water Thermostatic Valve	X	X	Jacket Water	4
03-525B	Barring Device - Pneumatic: Regulator Valve Shut Off Valve	X	X	Air Start & Barring Device	3
03-525D	Barring Device Support Bracket	X	X	Air Start & Barring Device	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-540A	Lube Oil Sump Tank - Tank with Strainer Assembly		X	Lube Oil	2
03-540B	Lube Oil Sump Tank: Misc. Fittings, Gaskets, Pipe & Bolting Material, Valves	X	X	Lube Oil	2
03-540C	Lube Oil Sump Tank: Mounting Hardware	X	X	Lube Oil	2
03-550	Foundation Bolts: Anchors, Bolts, Misc. Hardware	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-630A	Pyrometer Conduit Assembly: Conduit	X	X	Engine Instru-mentation & Wiring	3
03-630B	Pyrometer Conduit Assembly: Conduit Fittings	X	X	Engine Instru-mentation & Wiring	3
03-630C	Pyrometer Conduit Assembly: Support	X	X	Engine Instru-mentation & Wiring	3
03-630D	Pyrometer Conduit Assembly: Thermocouples	X		Engine Instu-mentation & Wiring	3
03-650A	Emergency Diesel Generator	X	X	Generator	4
03-650B	Generator Control	X	X	Generator	4
03-650C	Generator - Shaft & Bearings		X	Generator	4
03-688A	Engine & Aux Module Wiring Material- Conduit & Fittings; Pyrometer Conduit Assembly- Conduit, Fitting, Supports	X	X	Engine Instru-mentation & Wiring	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-688B	Engine & Aux. Module Wiring Material: Wiring & Terminations	X	X	Engine Instrumentation & Wiring	3
03-688C	Engine & Aux. Module Wiring Material: Boxes & Terminals		X	Engine Instrumentation & Wiring	3
03-689	Off Engine Safety Alarm Sensors Wiring	X	X	Engine Instrumentation & Wiring	3
03-690	On Engine Alarm Sensors	X	X	Engine Instrumentation & Wiring	3
03-691	Off Engine Alarm Sensors Level & Pressure Switches	X	X	Engine Instrumentation & Wiring	3
03-695A	Engine Shutdown Equipment: Tubing/Fittings & Supports	X	X	Engine Shutdown & Equipment	3
03-695B	Engine Shutdown Equipment: Valves, Regulator, Orifices	X	X	Engine Shutdown & Equipment	3
03-695C	Engine Shutdown Trip Switches	X	X	Engine Shutdown & Equipment	3
03-700A	Jacket Water Standpipe: Pipe, Fittings, Gaskets	X	X	Jacket Water	4
03-700B	Jacket Water Standpipe: Valves		X	Jacket Water	4
03-700C	Jacket Water Standpipe: Supports	X	X	Jacket Water	4
03-700E	Jacket Water Standpipe: Switches	X	X	Jacket Water	4
03-700F	Jacket Water Standpipe: Misc. Bolting Mat.	X	X	Jacket Water	4

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-715A	Sub Base - Sub Base Engine & Generator	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-715B	Sub Base Bolting	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-717A	Aux Sub Base & Oil & Water Piping - Aux. Skid	X	X	Jacket Water	4
03-717B	Aux Sub Base & Oil & Water Piping - Jacket Water: Valves	X	X	Jacket Water	4
03-717C	Aux. Sub Base & Oil & Water Piping - Jacket Water - Pipe Couplings, Fittings, Orifices and Strainers	X	X	Jacket Water	4
03-717D	Aux Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X	Jacket Water	4
03-717F	Aux. Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X	Jacket Water	4
03-717G	Aux. Sub Base & Oil & Water Piping - Jacket Water: Supports	X	X	Jacket Water	4
03-717H	Aux. Sub Base & Oil & Water Piping - Lube Oil: Pipe and Fittings	X	X	Lube Oil	2
03-717I	Aux Sub Base & Oil & Water Piping - Lube Oil Valves	X	X	Lube Oil	2
03-717J	Aux. Sub Base & Oil & Water Piping - Lube Oil - Gaskets & Bolting	X	X	Lube Oil	2
03-717K	Aux. Sub Base & Oil & Water Water Piping - Lube Oil: Supports & Mounting Hardware	X	X	Lube Oil	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-717L	Aux. Sub Base & Oil & Water Piping - Lube Oil: Automatic Switchover Assembly	X	X	Lube Oil	2
03-717M	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Piping and Fittings	X	X	Fuel Oil	4
03-717N	Aux Sub Base & Oil & Water Piping - Fuel Oil: Valves	X	X	Fuel Oil	4
03-717P	Aux Sub Base & Oil & Water Piping - Fuel Oil - Gaskets & Bolting	X	X	Fuel Oil	4
03-717Q	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Supports	X	X	Fuel Oil	4
03-800A	Misc. Equipment - Heater, Jacket Water	X	X	Jacket Water	4
03-800B	Misc. Equipment - Heater, Lube Oil Sump Tank	X	X	Lube Oil	4
03-800C	Misc. Equipment - Starting Air Tank Relief Valve	X	X	Air Start & Barring Device	3
03-805B	Intake Air Filter	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-805D	Flex Connections	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-810B	Jacket Water Standby Heater Pump	X	X	Jacket Water	4
03-820A	Lube Oil Heat Exchanger	X	X	Lube Oil	2
03-820B	Full Flow Lube Oil Filter	X	X	Lube Oil	2
03-820C	Before-and-After Lube Oil Pump	X	X	Lube Oil	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-820D	Oil Prelube Filter	X	X	Lube Oil	2
03-825A	Fuel Oil Booster Pump	X		Fuel Oil	2
03-825C	Fuel Oil Filters & Strainers: Strainers	X	X	Fuel Oil	4
03-835A	Starting Air lank	X	X	Air Start & Barring Device	3
03-835D	Starting Air Compressor	X		Air Start & Barring Device	3
03-835F	Air Start System - Starting Air Float Trap	X		Air Start & Barring Device	3
02-835G	Starting Air Tank Relief Valve	X	X	Air Start & Barring Device	3

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Air Start Valves UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-359 TASK DESCRIPTION NO. DR-06-03-359-0

SNPS GPL NO. 03-359 CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that previously addressed in the lead engine reports.
- A review of the lead engine DR/QR reports (Shoreham and Comanche Peak).
- Similarity between River Bend and lead engine components.

The following maintenance recommendations from the lead engine DR/QR report should be implemented:

- Remove, inspect and, if necessary, clean the air start valves during every refueling outage. The inspection should include inspection of the piston/cap and guide/housing sliding surfaces to evaluate severity of wear and corrosion present. This recommendation is based on discussions with TDI.
- Ensure that the dryer between the compressor after cooler and air receiver is functioning properly by blowing down the air receivers daily and noting any moisture content. Appropriate action should be taken if moisture is noted.

The following modifications should be implemented:

- TDI SIM 329 - Cooper Valve-To-Head Gasket in Lieu of Steel Gasket.
- TDI SIM 360 - Replace/Shorten Capscrews; Torque/Retorque Bolts to 150ft-lbs.

Quality inspections performed to date have been reviewed and are considered satisfactory.

The following Quality inspections have not been performed to date and are recommended:

TASK DESCRIPTIONS (continued)

- Perform a visual inspection to verify that adequate seating exists between the valve and valve ring (Engine 1B).
- Perform a visual inspection to verify that no carbon deposits exist on the valve internals (Engines 1A & 1B).
- Verify the hot torque values for the hold down capscrews (Engine 1A).
- Verify the initial and hot torque values for the hold down capscrews (Engine 1B).
- Perform a dimensional check of the hold down capscrews (sample of two) (Engine 1B).
- Perform a material comparator test on the hold down capscrews (Engines 1A & 1B).
- Verify that the locking pin is in the valve arm lock nut (Engine 1B).
- Perform a visual inspection on the air start valve for wear and corrosion (Engine 1B).

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Air Start Valve

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-359

REV. NO. 2

SNPS GPL NO. 03-359

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation including 10CFR21 response.
2. Perform a visual inspection to verify that adequate seating exists between the valve and valve ring.
3. Perform a visual inspection to verify that no carbon deposits exist on the valve internals.
4. Verify the intial and hot torque values for the hold down capscrews.
5. Perform a dimensional check of the hold down capscrews (sample of two).
6. Perform a material comparator test on the hold down capscrews.
7. Verify that the locking pin is in the valve arm lock nut.
8. Perform a visual inspection on the air start valve for wear and corrosion.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper seating of valve to valve ring

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

3. Lack of carbon deposits on the valve internals

4. Proper torque values

5. Length of capscrews

6. Material of capscrews

7. Locking pin is in the valve arm lock nut

8. Integrity of the air start valve

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. A continuous metallic appearing ring exists on the valve ring contact surface.

3. No carbon deposits exist on the valve internals.

4. Torque values are in accordance with the TDI Instruction Manual.

5-6. Review of inspection report by the Design Group

7. Lock pin is in the valve arm lock nut

8. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-8. Approved Site NDE Procedures, TDI Instruction Manual

REFERENCES (continued)

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-8. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. A visual inspection was performed on the air start valve seat area for all cylinders. This was reported by TER# 06-054.

3. No inspection report has been received which fulfills this requirement.

4. The torque load applied to the hold down capscrews was 150 ft-lbs which is in accordance with the TDI Instruction Manual. This was reported by TER# 06-054.

5. A dimensional check was performed on the two hold down capscrews for cylinder #8. This was reported by TER# 06-054.

6. No inspection report has been received which fulfills this requirement.

COMPONENT REVIEW (continued)

Engine 1A (continued)

7. The locking pin was verified to be installed in the valve arm lock nut for all engine air start valves. This was reported by TER# 06-054.

8. A visual inspection on the air start valve seat area was performed for all cylinders. The only discrepancy was a nick across the valve seating surface for the cylinder #8 valve . Subsequently, the valve was replaced. This was reported by TER# 06-054.

Engine 1B

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2-8. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

STARTING AIR MANIFOLD - PIPING, TUBING AND FITTINGS
(LARGE BORE SCOPE ONLY)
COMPONENT PART NO. 03-441A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Nuclear Station requires Design and Quality Revalidation reviews of the structural adequacy of the starting air manifold piping for the effects of normal operating and earthquake loadings.

The primary function of the starting air manifold is to provide adequate starting air from the off-skid supply piping to each engine cylinder.

The scope of piping embraced by this report includes the large bore (greater than 2-inch diameter) piping components as noted on the as-built information transmitted to and obtained during Impell field verification (Ref. 1), plus small bore piping, which is included because of the configuration.

Piping components are defined as piping spool pieces, elbows, tees, flanges, Dresser couplings, and the interconnecting welds. This scope is uniquely defined in terms of Transamerica Delaval, Inc. (TDI) part numbers in Reference 1.

II OBJECTIVE

The objective of this review was to verify the adequacy of the subject piping components for normal operating and earthquake loading.

III METHODOLOGY

The evaluation of the piping was performed in accordance with the philosophy and intent of the ASME Section III Code, for Class 3 Nuclear Piping. Towards this end, a criteria document was developed, "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," which describes the background and provides the techniques for evaluating the subject piping and supports. These criteria are presented in their entirety in Reference 2.

The Quality Revalidation Checklist results were reviewed for acceptability.

The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear and non-nuclear industry experience.

IV RESULTS AND CONCLUSIONS

All piping stresses were within the design allowables specified by the ASME Section III Code.

With respect to the Dresser couplings, Impell evaluated the couplings against the manufacturer's selection and service requirements. These include the design service conditions, relative end displacements from both translation and rotation of the joined pipes, and shelf and service life. The movements at the Dresser couplings are within the manufacturer's end movement requirements (Ref. 3). There are no service life constraints (Ref. 4) because this style of coupling has no significant history of failure. Shelf life (Ref. 4) is unlimited as long as the gaskets remain packaged and protected from the elements (light, water, etc.). The couplings are adequate with respect to the manufacturer's service condition limits.

It is recommended that support modifications be effected in order to provide stiffer load paths and to relieve thermal restraint in certain directions by partial support removal through bolt hole elongations. The support modifications are summarized in Reference 5.

Historical corrosion data for carbon steel starting air systems were not available. However, the subject starting air piping and interconnecting welds have a limiting wall thickness of 5.15 times that required (Ref. 2), which should be sufficient margin against corrosion.

In order to provide adequate load transfer capabilities and strength at the flanged connections, the following maintenance recommendations should be implemented:

- Ensure that all bolts on the flanges with supports attached are Grade A449 or better (based on ASME allowable stress) and torqued as specified in Appendix 4 of the Delaval Instruction Manual, Vol. I for Model DSR-48.

- Ensure that the bolts on all remaining flanges are Grade A449 or better (based on ASME allowable stress).

All pipe loads on the engine were tabulated and issued for evaluation.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review, it is concluded that the subject piping components, with the maintenance and modifications recommended above, are adequate for their intended design function at River Bend.

V REFERENCES

1. "Supporting Calculations for the Evaluation of River Bend Diesel Generator Large Diameter Piping and Support," Impell Report No. 02-0630-1271, Rev. 0, October 1984.

2. "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984. This is included in the Appendix III of the final DR/QR report.

3. Dresser Pipe Couplings, Pipe Fittings, and Pipe Repair Products Catalog, No. 63.

4. Telecon between A. Palumbo (Impell) and M. Riley (Dresser Manufacturing Co.), dated June 5, 1984.

5. Letter from R. Markovich/G. Shears (Impell) to J. Kammeyer (SWEC), "Required Modification for Validation of Impell's Design Review for Component No. 03-441A - River Bend," dated October 26, 1984.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Manifold Piping (Large Bore Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-441A

TASK DESCRIPTION NO. DR-06-03-441A-0

SNPS GPL NO. 03-441A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Evaluate structural integrity of the starting air manifold piping spool pieces and fittings for the effects of normal operating and earthquake loadings by (a) comparison to previous analyses, (b) review of previous qualification documentation, and/or (c) actual performance of stress evaluation in accordance with the intent and philosophy of ASME III Class 3 and Impell Design Criteria.

Review information provided on TERs.

PRIMARY FUNCTION

Provide adequate starting air from off-skid supply piping to each engine cylinder.

ATTRIBUTE TO BE VERIFIED

Structural integrity of large bore (greater than 2 in. dia.) piping spool pieces and fittings to withstand the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

None

PEFERENCES

"Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984

DOCUMENTATION REQUIRED

Verified piping isometric, material specification, size and schedule, design parameters (temp., pressure), contents, and insulation.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Starting Air Manifold - Piping, Tubing & Fittings

UTILITY Gulf States Utilities River Bend Station

GPL NO. 03-441A

REV. NO. 1

SNPS GPL NO. 03-441A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI-NO.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the piping, tubing and fittings if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nuta A Sakata PROGRAM MANAGER J C Kennedy

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-441A

Effective Printout Date: 10/17/84

COMPONENT TYPE: Starting Air Manifold - Piping, Tubing and Fittings

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
Manifold purge from air intake manifold to prevent moisture/corrosion.	TDI SIM 323	TDI SIM #323 is concerned with purging moisture from the starting air manifold. Historical data on corrosion in carbon steel starting air lines was not available. However, Impell evaluation of subject piping determined that the nominal available pipe wall thickness was greater than 5.15 times the minimum required. Therefore, there is adequate pipe margin against corrosion in the subject lines. TDI SIM #323 is concerned mainly with fouling of starting air valves from corrosion.
During a seismic event, the sensing line could fail. This would permit the starting pressure to bleed down to a point where the engines could not start if required. Corrective action is to install a restriction orifice between the isolation valve and starting air tank. The isolation valve must be seismically qualified.	10 CFR21 TDI Letter to OI&E US NRC dated 3/19/82 (TDI File No. T-69)	Concern is for small bore piping. Refer to the small bore report for this component.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Manifold: Piping, Tubing, and Fittings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-441A

TASK DESCRIPTION NO. DR-06-03-441A-1

SNPS GPL NO. 03-441A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience for this component in the EDG Component Tracking System.

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications/additions of supports. The necessity for similar modifications/additions on River Bend has been assessed by a field walkdown.

The field walkdown was performed in accordance with the small bore piping and tubing criteria document (Ref. 1) and concludes that this component will perform its intended function for normal and earthquake loading provided that the supports are modified/added as indicated in DR/QR report 03-441C.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1) "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Manifold: Valves, Strainers & Filters

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-441B

TASK DESCRIPTION NO. DR-06-03-441B-0

SNPS GPL NO. 03-441B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on a review of the EDG Component Tracking System for applicable industry and site experience and the lead engine DR/QR reports (Shoreham/Comanche Peak).

The components used at River Bend have been used on the lead engines with the exception of two check valves. There is no site experience with these two valves.

In addition, review of TDI Instruction Manual Volume II, Group Parts List 03-441 indicates River Bend engines have a starting air manifold purge line installed on the intake manifold (TDI SIM 323). This provides a method of drying and purging the starting air manifold, thereby increasing the reliability of the starting air valves.

The following maintenance recommendations from the applicable lead engine reports should be implemented at River Bend:

- The starting air admission valve has an "O"-Ring and a screened fitting, susceptible to wear and fouling. The "O"-Ring should be replaced and the screened fitting cleaned, every outage.
- The starting air valves should be disassembled, cleaned, inspected and reassembled to prevent fouling. They will be tested to assure leak tightness, every outage.
- Inspect for tightness of fittings and bolts and apply locking compound, during reassembly of component, every outage.
- The filter element should be inspected and cleaned/replaced on a monthly basis. In accordance with the manufacturer's recommendation, the filter should be changed before the maximum pressure drop of 25 psid.
- The strainer is recommended to be blown down daily and cleaned and inspected monthly. If the strainer is excessively dirty, the frequency of cleaning and inspecting should be increased.

TASK DESCRIPTION (continued)

The following modifications should be made:

- In accordance with TDI recommendation free flowing drains should be added to the air distributor filter. This is a design improvement which will help maintain a cleaner supply of starting air.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Manifold Supports (Large Bore Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-441C

TASK DESCRIPTION NO. DR-06-03-441C-0

SNPS GPL NO. 03-441C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).

Based on previous experience, supports appear to be adequate provided that the analysis of the corresponding piping (Component No. 03-441A) does not mandate modifications. If the piping analysis warrants modification to the supports, these modifications will be addressed in the DR/QR report for Component No. 03-441A.

There are no maintenance recommendations for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

STARTING AIR MANIFOLD - SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-441C

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the starting air manifold tubing supports to withstand the effects of normal operating and earthquake loadings. The primary function of these supports is to provide adequate restraint of the starting air manifold tubing components.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the tubing supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience. See Appendix C for results.
- The Quality Revalidation Checklist results were reviewed for acceptability.
- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology of this evaluation.

IV RESULTS AND CONCLUSIONS

The tubing supports, as defined by this Component Design Review, have been evaluated in accordance with Reference 1 and have been found acceptable with modifications.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and the information contained in Reference 2, it is concluded that the tubing supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

- The ¼-inch diameter tubes across the generator end of the engine from the air distributor to the bulkhead are not adequately supported. The existing tubing spacers should be provided with cover plates and the assemblies attached rigidly to Engine A.

In order to support the tubing of component 03-441A, it is recommended that the following supports be added:

Engine A

- The two 3/4-inch diameter tubes from the starting air headers to the inlet of the distributor air filter should be provided with two-directional restraints on the risers at the platform elevation.

- The ¼-inch diameter tubing from the air start header to the combustion air cooler should be provided with two-directional restraints at 4 ft-0 inch maximum span intervals. Location of the supports should allow for flexibility by providing a 6 inch minimum offset around bends.

- A two-directional restraint should be added on the ¼-inch diameter air start tubing on the left side of cylinder No. 8, approximately 6 inches below the horizontal run along the cylinder cover.

Engine A and B

- The ¼-inch diameter tubing risers to each cylinder (16 locations) should be provided with an additional two-directional restraint approximately 12 inches up from the horizontal tubing runs along the left side of the engine.

Engine B

- The two 3/4-inch diameter tubes from the starting air headers to the inlet of the distributor air filters should be provided with two-directional restraints on the risers approximately 12 inches down from the horizontal run (at the platform).

- The U-bolts around the air filter bodies are to be secured.

The Engine B air start tubing installation was incomplete at the time of the walkdown. Therefore, it is recommended that the tubing and supports including the above modifications be installed so that both installations on Engines A and B are similar.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

2. Stone & Webster Calculation number 11600.60-NP(B)-0601-XH

3. Memo No. 6480 from C. Malovrh/SWEC to J. Kammeyer/SWEC 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Manifold - Tubing Supports (Small Bore Scope Only) UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-441C TASK DESCRIPTION NO.: DR-06-03-441C-0

SNPS GPL NO. 03-441C CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Perform an engineering review of the tubing supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Provide adequate restraint to the starting air manifold tubing components.

ATTRIBUTE TO BE VERIFIED

Structural adequacy of the tubing supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

IEEE 387

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group" Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations).

GROUP CHAIRPERSON PROGRAM MANAGER

RB2284/1

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Starting Air Manifold - Supports UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-441C REV. NO. 1

SNPS GPL NO. 03-441C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the supports if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven R. Short PROGRAM MANAGER J. Kennedy

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor F. Galeta PROGRAM MANAGER [illegible]

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-441C

Effective Printout Date: 11/05/84

COMPONENT TYPE: Starting Air Manifold - Supports

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
None		
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Distributor: Distributor Assembly

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-442A

TASK DESCRIPTION NO. DR-06-03-442A-0

SNPS GPL NO. 03-442A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component, based on the Shoreham lead engine DR/QR report, which establishes the acceptability of the distributor assembly. The parts under review are the same as those of the lead engine.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

In addition to the normal maintenance tasks of water removal and filter replacement for the starting air system, the following maintenance recommendation from the lead engine DR/QR report should be implemented:

- Perform an inspection of the poppet valves and cams on all engines during refueling outages, to assess the degree of wear.

Based on a recent Grand Gulf site experience in which the starting air manifold vent became obstructed, the additional maintenance item listed below is recommended:

- Maintain surveillance inspections to assure that the starting air manifold vent remains open and effective.

There are no modification recommendations for this component.

The following Quality inspections are recommended to be performed on engines 1A and 1B.

- Verify the proper timing of the air start distributor as described in the TDI Manual.

- After verifying the correct timing of each starting air distributor, as described in the TDI Manual, the evaluation of wear on the cam and valve contacts should be performed as follows:

  1. Remove the distributor from the engine

  2. Visually inspect the wear marks on the cam lobes.

TASK DESCRIPTIONS (continued)

Note the position and orientation of the lube oil jet. Oil flow from the jet should cover the wear mark region on the cam lobe.

3. Visually inspect the wear marks on the end of each valve spool where it slides on the cam. Measure the average diameter of the "flat" worn area on the end of each spool to the nearest 1/64-inch. If the largest of these measurements is more than 1.5 times the smallest, an engineering evaluation of the observed wear should be performed and a superficial hardness measurement should be made on the end "wear flat" of each valve spool. If the hardness of any spool end is significantly below 30 Rc, it should replaced.

- Verify the installation of the follower lobe on the camshaft (one engine only)

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

STARTING AIR DISTRIBUTOR - TUBING, FITTINGS AND GASKETS

COMPONENT PART NO.: 03-442B

This component number has been deleted. All Air Distributor Tubing is addressed under component numbers 03-441A & C.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Barring Device - Pneumatic: Regulator Valve, Shutoff Valve

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-525B

TASK DESCRIPTION NO. DR-06-03-525B-0

SNPS GPL NO. 03-525B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience.
- A review of the lead engine DR/QR report (Shoreham)
- The barring device is used during maintenance operations only and is supplied by a source of service air which is independent of the D.G. starting air.

The following maintenance from the lead engine DR/QR report should be implemented:

- Daily draining of the air filter while the barring device is in use
- Replacement of elastomeric parts in the pneumatic regulator every 5 years

There are no modifications required for this component, based on the lead engine report.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Barring Device - Pneumatic: Miscellaneous, Fittings, Hose, Filters, Tubing (Small Bore Scope Only) UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-525C TASK DESCRIPTION NO. DR-06-03-525C-0

SNPS GPL NO. 03-525C CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR Report (Shoreham). There is no site or industry experience for ths component in the EDG Component Tracking System.

There are no maintenance or modification recommendations for this component.

A field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and indicates that this component will perform its intended design function for normal and earthquake loadings.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Barring Device Support Bracket

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-525D

TASK DESCRIPTION NO. DR-06-03-525D-0

SNPS GPL NO. 03-525D

CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- There is no significant industry experience reported for the barring device supports in the EDG Component Tracking System. There has been no adverse experience with this component at River Bend.

- The barring device used at River Bend is similar to that used at Shoreham. The barring device at Shoreham was found acceptable based on the fact that a flywheel cover is used which precludes the possibility that the barring device, if it were to become dislodged, might fall onto the flywheel or into the generator. The River Bend diesel has a similar pair of flywheel guards, Ref. 1.

There have been no maintenance or modification recommendations made for this component in the lead engine review.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. TDI Drawing number 100860, "Flywheel Guard Assembly".

2. Stone and Webster Specification number 244.700, Addendum 2, 08/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Lousiana.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Tank UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-835A TASK DESCRIPTION NO. DR-06-03-835A-1

CNPS GPL NO. 10-111 CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated no significant applicable industry experience, and no site experience.
- A review of the Shoreham and Comanche Peak lead engine DR/QR reports and the results of the ASME III program used at these two plants by TDI in which no major deficiencies in the tanks or their qualifying documentation was found.
- A detailed finite element analysis was performed by SDRC to seismically qualify the tank (Ref. 3).

The following maintenance recommendation from the lead engine report should be implemented:

- The tank drain valve should be opened daily and excessive amounts of moisture should be reported to determine its cause.

There are no modifications recommended for this component.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

ASME III per Ref. 1

REFERENCES

1. Stone & Webster Specification number 244.700, Addendum 2, 8/30/82, "Standby Diesel Generator System" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Louisiana.

2. ASME III Form N-1A for the Starting Air Tank - 76 cu.ft. Manufactured by Thermxchanger, Inc. Oakland, California, Vessel Number X12031-A6 4613 Drawing number D-1529, built 1981.

3. Final Report, Volume II Part 1, Seismic Qualification of TDI Diesel Generator Sets, Serial Numbers 74039/40, for Gulf States Utilities, River Bend Station - Unit 1.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Compressor UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-835D TASK DESCRIPTION NO. DR-06-03-835D-0

SNPS GPL NO. 10-112 CLASSIFICATION TYPE C

TASK DESCRIPTION

Design review for this component is not required based on the lead engine DR/QR report (Shoreham) and the applicable industry and site experience listed in the EDG Component Tracking System.

A 10CFR21 notification written against this component, and listed in the Component Tracking System, deals with the possibility of the loss of starting air due to a seismic event. This failure could take place along the sensing line connecting the starting air receiving tank to the air compressor. The receivers are seismic while the sensing line and compressor are non-seismic. The design at River Bend incorporates the recommended restriction orifice in the sensing line to allow sufficient time for valve closure prior to reaching the critical tank pressure of 150 psig, therefore, no corrective action is required by River Bend.

Site operating and maintenance procedures should be reviewed to verify that the manufacturer's maintenance recommendations are met.

There are no modification recommendations for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Telecon J.F. Carbonaro (SWEC) and V. Klco (GSU) on Staring Air Tank Sensing Line, 11/14/84.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Float Trap UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-835F TASK DESCRIPTION NO. DR-06-03-835F-0

SNPS GPL NO. 99-835C CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following.

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Comanche Peak)

The float trap at River Bend is a Hankison Model 505 while at Comanche Peak the float trap was supplied by Armstrong. However, both are similar in design and function.

The following maintenance from the lead engine DR/QR report should be implemented:

- Verify operability daily
- Disassemble and clean on an outage basis

There are no modifications from the lead engine report for this component.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Starting Air Tank Relief Valve

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-835G

TASK DESCRIPTION NO. DR-06-03-835G-0

SNPS GPL NO. 03-800C

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience.
- A review of the lead engine DR/QR report (Comanche Peak).
- The starting air tank relief valve at River Bend is of the same manufacturer and type as that used at Comanche Peak (Crosby Valve and Gage Co., Type JMBU).

There are no maintenance items or modifications recommended for this component based on the lead engine report.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Connecting Rods: Rods And Bushings

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-340A

TASK DESCRIPTION NO. DR-06-03-340A-0

SNPS GPL NO. 03-340A

CLASSIFICATION TYPE A

TASK DESCRIPTION

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no site experience and no significant applicable nuclear or non-nuclear industry experience not previously addressed.
- A review of the Comanche Peak and Shoreham DR/QR reports which establish the acceptability of the connecting rod assembly for its intended purpose.

There are no maintenance or modification recommendations for this component.

Quality inspections performed to date have been reviewed and are considered satisfactory.

The following Quality Revalidation inspection recommendations are made to ensure proper component quality and performance, and should be performed on both diesel engines:

- Verify that the torque loads on all connecting rod bolts are in accordance with the latest TDI recommended values.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Connecting Rods - Connecting Rods & Bushings

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-340A

REV. NO. 1

SNPS GPL NO. 03-340A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Perform a material comparator test on the connecting rods (sample of 3). Use spares if available.

3. Perform a hardness test on the connecting rods (sample of 3). Use spares if available.

4. Verify that the torque loads on all connecting rod bolts are in accordance with the latest TDI recommended values.

5. Perform a Liquid Penetrant test on the surface of the internal diameter of all the wrist pin bushings.

6. Perform a visual inspection on the upper connecting rod bushings eye oil passage without removing the bushing. Map machined surface conditions and look for surface flaws.

Engine 1B

1. Assemble and review existing documentation.

2. Verify that the torque loads on all the connecting rod bolts are in accordance with the latest TDI recommended values.

3. Perform a Liquid Penetrant test on the surface of the internal diameter of all wrist pin bushings.

4. Perform a visual inspection on the upper connecting rod bushings eye oil passage without removing the bushing. Map machined surface conditions and look for surface flaws.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Material of the connecting rods and bushings
3. Hardness of the connecting rods and bushings
4. Proper torque loads are applied to the connecting rod bolts
5. Surface integrity of the wrist pin bushings
6. Surface integrity of the connecting rod oil hole passage

Engine 1B

1. Quality status of Component Document Package
2. Proper torque loads are applied to the connecting rod bolts
3. Surface integrity of the wrist pin bushings
4. Surface integrity of the connecting rod oil hole passage

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Material to be AISI-4140
3. Review of inspection report by the Design Group
4. Torque loads on the connecting rod bolts are in accordance with the TDI Instruction Manual
5. Absence of linear indications on the internal diameter (bottom dead center ±15° only) of the wrist pin bushings (see Attachment A)
6. Review of inspection report by the Design Group

Engine 1B

1. Satisfactory Document Package
2. Torque loads on the connecting rod bolts are in accordance with the TDI Instruction Manual.

ACCEPTANCE CRITERIA (continued)

Engine 1B (continued)

3. Absence of linear indications on internal diameter (bottom dead center ±15° only) of the wrist pin bushings (see Attachment A).

4. Review of inspection report by the Design Group

REFERENCES

Engine 1A

1. QCI No. 52

2-3. Approved Site NDE Procedures

4. TDI Instruction Manual

5-6. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

2. TDI Instruction Manual

3-4. Approved Site NDE Procedures

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-6. Inspection Report

Engine 1B

1. Document Summary Sheet

2-4. Inspection Report

GROUP CHAIRPERSON Steve M. Schmitz PROGRAM MANAGER J C Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A material comparator test was performed on connecting rods 1, 2, and 3. The results were reported by TER#'s 06-028 and 06-044.

3. A hardness test was performed on connecting rods 2, 3, and 8. The results were reported by TER#'s 06-028 and 06-044.

4. No inspection report has been received which fulfills this requirement.

5. A Liquid Penetrant test was performed on the internal diameter of all wrist pin bushings. The results were reported by TER# 06-044.

6. A visual inspection was performed on the upper connecting rod bushing eye oil passages for all connecting rods with satisfactory results. This was reported by TER# 06-044.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

3. A Liquid Penetrant test was performed on the internal diameter for all wrist pin bushings. The results were reported by TER# 06-044.

4. A visual inspection was performed on the upper connecting rod bushing eye oil passage for all connecting rods with satisfactory results. This was reported by TER# 06-044.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nita H. Selcta PROGRAM MANAGER J. Kammer

LIQUID PENETRANT ACCEPTANCE CRITERIA

Acceptance criteria are generally included in the code or specification which establishes the required examination. Such specified criteria shall be used to determine the specific type, size and location of observed discontinuities.

When acceptance criteria is not specified in the documentaion establishing the requirement for the examination, the following relevant indications are unacceptable. Only indications with major dimensions greater that 1/16 inch shall be considered relevant.

a.) Wrought, Forged or Welded Items:

1. Any crack or linear indication

2. Rounded indications with dimensions greater than 1/8 inch for thickness less than 5/8 inch and greater than 3/16 inch for thickness of 5/8 inch and greater.

3. Four or more indications in line separated by 1/16 inch or less edge to edge.

4. Ten or more indications in any 6 square inches of area whose major dimension is no more than 6 inches with the dimensions taken in the most unfavorable location relative to the indications being evaluated.

b.) Bolts and Bolting Material Greater than 1 inch Normal Size

1. Any linear nonaxial indications.

2. Linear axial indications greater than 1 inch.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Connecting Rod Bearing Shells

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-340B

TASK DESCRIPTION NO. DR-06-03-340B-0

SNPS GPL NO. 03-340B

CLASSIFICATION TYPE A

TASK DESCRIPTION

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR reports which establishes the acceptability of the bearing shells for their intended purpose, with a margin of safety which will account for small variances in loading.
- The applicable engine dimensions and operating parameters at River Bend are identical or very similar to those for the same component at Shoreham (lead engine).
- A review of the EDG Component Tracking System site, nuclear, and non-nuclear experience.

Maintenance recommendations based on the Shoreham DR/QR report to ensure proper performance under normal operating conditions are as follows:

- Inspect and measure the connecting rod bearing shells to verify lube oil maintenance which affects wear rate. The visual and dimensional inspection of the bearing shells should be conducted at the fuel outage which precedes 500 hours of operation by at least the sum of hours of operation in a LOOP/LOCA event plus the expected hours of operation between outages.
- Perform an X-ray examination on all replacement bearing shells using a procedure with sufficient resolution to implement recommendations for acceptance criteria as documented in the TDI Owners Group connecting rod bearing shell Phase I Report.

No modifications are recommended for this component.

The Quality Revalidation requirements for this component have been completed and TER #06-045 has been reviewed and is consistent with the conclusions reached in the lead engine DR/QR reports.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT	Connecting Rods-Bearing Shells	UTILITY	Gulf States Utilities, River Bend Station
GPL NO.	03-340B	REV. NO.	1
SNPS GPL NO.	03-340B		

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection of the connecting rod bearing shells.
3. Perform a Liquid Penetrant test on the connecting rod bearing shells.
4. Perform a dimensional check of the connecting rod bearing shells.
5. Peform a Radiographic inspection on the upper and lower connecting rod bearing shells (100% inspection).
6. Perform an Eddy Current test on the connecting rod bearing shells as required to identify surface discontinuities.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2-3. Surface integrity of bearing shells

4. Proper bearing shell dimensions

5-6. Integrity of the bearing shells

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-3. Review of inspection report by the Design Group

4. Dimensions are in accordance with the TDI Instruction Manual

5. See Attachments A & B.

6. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-3. Approved Site NDE Procedure

4. TDI Instruction Manual or applicable drawing

5. FaAA NDE Procedure 9.2, TER# 99-011

6. Approved site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-6. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M. Short PROGRAM MANAGER J. C. Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on all connecting rod bearing shells. The results were reported by TER# 06-045.

3. A Liquid Penetrant test was performed on all connecting rod bearing shells with satisfactory results. This was reported by TER# 06-045.

4. A dimensional check of all connecting rod bearing shells was performed. The results were reported by TER# 06-045.

5. A Radiographic inspection was performed for all the upper and lower connecting rod bearing shells. The results were reported by TER# 06-045.

6. An Eddy Current test was performed on the connecting rod bearing shells with satisfactory results. This was reported by TER# 06-045.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on all connecting rod bearing shells. The results were reported by TER# 06-045.

3. A Liquid Penetrant test was performed on all connecting rod bearing shells. The results were reported by TER# 06-045.

COMPONENT REVIEW (continued)

4. A dimensional check of all connecting rod bearing shells was performed. The results were reported by TER# 06-045.

5. A Radiographic inspection was performed for all the upper and lower connecting rod bearing shells. The results were reported by TER# 06-045.

6. An Eddy Current test was performed on the connecting rod bearing shells with satisfactory results. This was reported by TER# 06-045.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nita A. Sekta PROGRAM MANAGER [illegible]

Component: Connecting Rod Bearing Shells, Upper and Lower.

Examination: X-ray, FaAA NDE 9.2 (R-48); FaAA NDE 9.2 (V-12, V-16, V-20).

Examination: Area

Upper Bearing Shell, see attached figures:

R-48: 0.050 inch area, 0.4 inch inward from each side to a line 1.4 inches inward from each side, extending circumferentially 2.5 inches on either side of the oil hole. This is the critical area.

V-12, V-16, V-20: 0.050 inch area, 0.4 inch inward from each side to a line 1.4 inches inward from each side, extending circumferentially 5.0 inches on either side of the center of the bearing. This is the critical area.

0.250 inch area, remainder of bearing.

Lower Bearing Shell: 0.250 inch area, all of bearing.

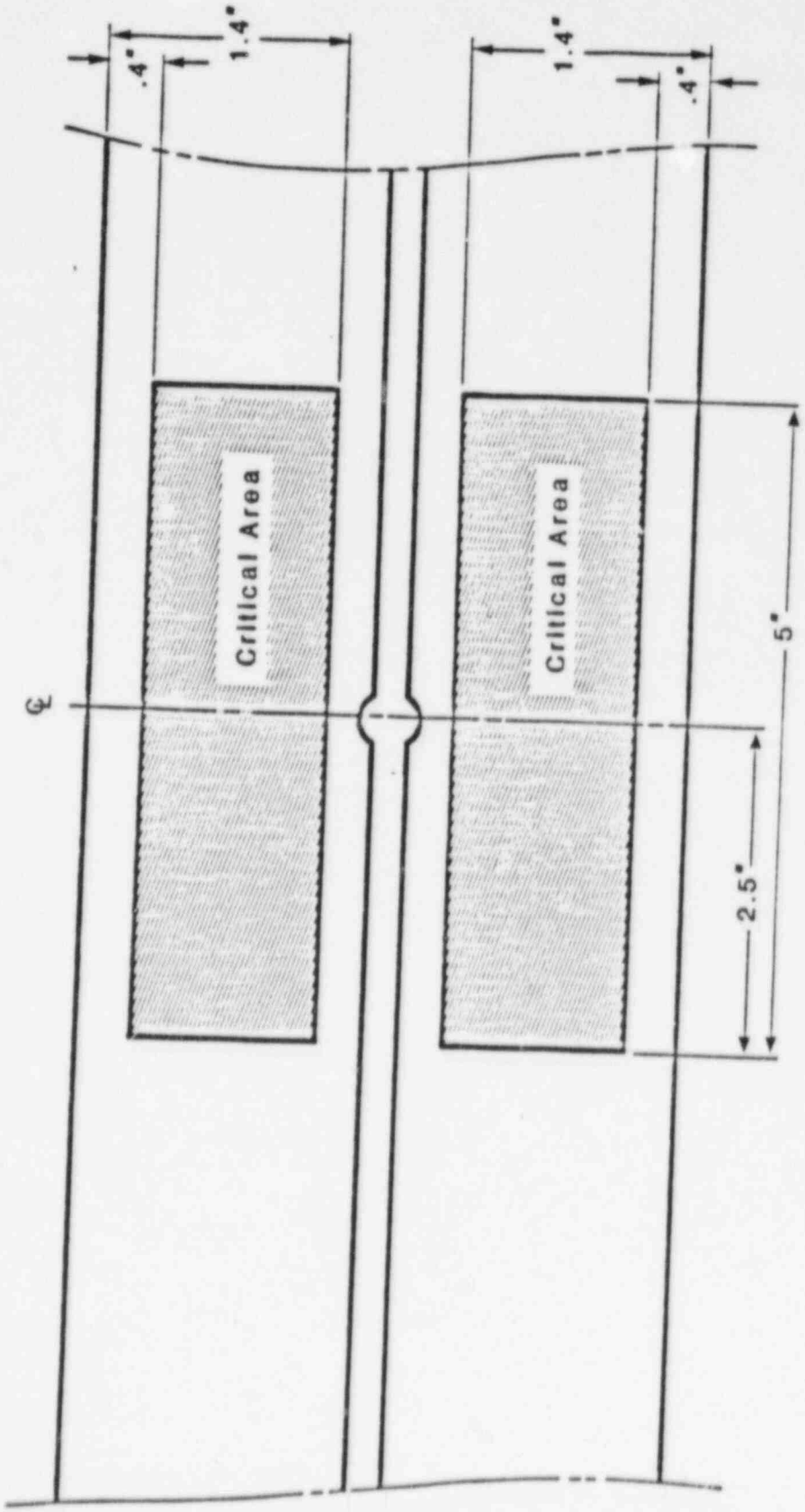
Acceptance: Criteria The following are unacceptable, based on 3/4 inch reference radiographs of ASTM E-155, for aluminum.

	UPPER BEARING 0.050 INCH AREA	UPPER & LOWER BEARING 0.250 INCH AREA
Gas Holes	0.050 diameter	Grade 5
Gas Porosity (Rounded)	Grade 5	Grade 7
Gas Porosity (Elongated)	Grade 3	Grade 5
Shrinkage Sponge	Grade 3	Grade 4
Foreign Material Less Dense	0.050 diameter	Grade 3
Foreign Material More Dense	0.050 diameter	Grade 4
Cracks	Unacceptable	Unacceptable
Shrinkage Cavity	Unacceptable	0.250

Note: ° Mottling/segregation and micro shrinkage shall not be evaluated for rejection.

° Radiographic features that are associated with the babbitt (lead alloy) layer on the bearing I.D. shall not be evaluated for rejection.

For further clarification of these criteria, please contact the Owners Group.



Ref: FaAA NDE 9.2

Failure Analysis Associates
2225 East Bayshore Road
P.O. Box 51470
Palo Alto, California 94303

DATE

DRAWN EMM

CHECKED

APP'D

DESCRIPTION: BEARING SHELL CRITICAL AREA; TDI R-48

TOLERANCES UNLESS OTHERWISE SPECIFIED
.X ±
.XX ±

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Pistons UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-341A TASK DESCRIPTION NO. DR-06-03-341A-0

SNPS GPL NO. 03-341A CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on a review of the lead engine DR/QR reports (Shoreham/Comanche Peak), the Phase I report and the applicable site and industry experience in the EDG Component Tracking System.

River Bend has changed piston skirts from the originally supplied AN skirts to the product improvement AE piston skirts. The AE piston skirt incorporates design changes such as thickening the stud boss region and blending the rib (which has also been thickened) more smoothly into the wrist pin bosses.

There are no maintenance or modification recommendations for this component.

Liquid penetrant tests performed by TDI on the stud and pin boss areas of all sixteen replacement AE skirts were satisfactory. The following Quality inspections as delineated in the CQRC are recommended:

- Perform a liquid penetrant test on the rib area near the wrist pin and on the rib at the intesection of the wrist pin boss to check for indications in the casting. If no rejectable indications are found, inspections should be performed on one station engine only.
- Visually inspect the piston crown outside diameter for scuffing, and the combustion bowl in the crown for pitting. (Engine 1B Only).

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Piston UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-341A REV. NO. 1

SNPS GPL NO. 03-341A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Prior to installation, perform a Liquid Penetrant test on the piston skirts. Map all linear indications in the stud boss area and document with photographs. In addition, "AN" pistons should be inspected adjacent to the wrist pin boss.

3. If Liquid Penetrant test results from task #2 reveal indications greater than 1/32 inch length, one of the following tasks should be performed:

   a) Remove the indications by surface conditioning or;
   b) Perform an Eddy Current test to determine if the indications must be removed.

4. Perform Liquid Penetrant test on the rib area near the wrist pin and on the rib at the intersection of the wrist pin boss to check for indications in the casting ("AE" Piston only). See attached sketch.

5. Visually inspect the piston skirt and crown outside diameters for scuffing, and the combustion bowl in the crown for pitting.

Engine 1B

Same as Engine 1A

NOTE: If no rejectable indications are found, inspections should be performed on one station engine only.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2-3. Surface integrity of the piston skirts

4. Surface integrity of the rib and rib area

5. Surface integrity of the piston skirts and crowns

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-5. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

3. TER# 99-027

4. TER# 99-010

5. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-5. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve M. Schwartz PROGRAM MANAGER J. Kammeyer

---

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. Liquid Penetrant tests were performed on all piston skirts ("AN" type) in the stud and pin boss areas with satisfactory results. This was reported by TER# 06-046.

3-4. No inspection reports have been received which fulfill these requirements.

5. A visual inspection was performed on all piston skirts and crowns. Minor pitting was evident in all piston crowns. This was reported by TER# 06-046.

Engine 1B

1. No EDGCTS Site experience documents are in evidence.

2-5. No inspection reports have been received which fulfill these requirements.

NOTE: All "AN" piston skirts from engine 1A & 1B were replaced with the product improved "AE" type pistons. These "AE" piston skirts were visually inspected and penetrant tested in the stud and pin boss area with satisfactory results. This was reported by TER# 06-046.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Saletta PROGRAM MANAGER J C Karmneyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Piston: Rings

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-341B

TASK DESCRIPTION NO. DR-06-03-341B-0

SNPS GPL NO. 03-341B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR Reports, which establish the acceptability of the piston rings for their intended purpose.
- The applicable engine dimensions and operating parameters at River Bend are identical or very similar to those for the same component at Shoreham (Lead Engine).
- A review of the EDG Component Tracking System applicable industry experience. No site specific experience is listed in the Component Tracking System.

Maintenance recommendations based on the Comanche Peak DR/QR Report to ensure proper performance under normal operating conditions are as follows:

- Inspect and measure replacement piston rings in accordance with TDI inspection and maintenance records.
- To assure freedom from harmful scuffing, the cylinder liners should be inspected at each refueling outage to evaluate liner wear and coke deposits. Ring replacements and cylinder liner honing should be performed with TDI maintenance procedures.
- When replacing engine oil use H.D. oil that exceeds series 3 standards. The base stock should be more resistant to thermal degradation and coke formation. The additive package should provide high detergent dispersant properties with high alkalinity and a high level of antiwear additive such as zinc dithiophosphate. Total Base Number (TBN) should be 12 to 15 for use with #2 fuel oil and a sulfated ash content of 1.5% to 2.0% is preferred. An engine oil with such properties, Mobilguard 412 or an equivalent product, may be used to insure improved lubrication.
- 135° fuel oil spray tips may be used if inspections results indicate a need for additional action to improve lubrication and reduce coke buildup.

TASK DESCRIPTIONS (continued)

The following Quality Revalidation inspection recommendations are made to ensure proper component quality and performance and should be performed on both diesel engines:

- Verify that the piston ring installation is in compliance with the TDI assembly requirements.
- Perform a visual inspection of the rings for signs of wear, pitting an flaking.
- Perform a visual inspection of the rings and ring grooves for carbon build up.

There are no modification recommendations for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Piston - Rings UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-341B REV. NO. 1

SNPS GPL NO. 03-341B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the piston ring installation is in compliance with the TDI assembly requirements.
3. Perform a visual inspection of the rings for signs of wear, pitting and flaking.
4. Perform a visual inspection of the rings and ring grooves for carbon build up.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Piston ring installation is in compliance with the TDI assembly requirements.
3. Surface integrity of piston rings
4. Carbon build up on rings and ring grooves

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. The piston rings are installed in accordance with the TDI Instruction Manual.

3-4. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. TDI Instruction Manual

3-4. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. New Muskegan piston rings were installed in compliance with the TDI assembly requirements. Piston ring end gaps and side clearances were recorded. The results were reported by TER# 06-047.

3-4. No inspection reports have been received which fulfill these requirements.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Saletta PROGRAM MANAGER J C Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Piston: Pin Assembly UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-341C TASK DESCRIPTION NO. DR-06-03-341C-0

SNPS GPL NO. 03-341C CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component based on review of the lead engine DR/QR reports (Shoreham/Comanche Peak) and the applicable industry experience. There is no site experience in the EDG Component Tracking System.

At present, River Bend uses spiral ring retainers (P/N F-108-030) to prevent lateral movement of the wrist pins. For increased engine reliability (as stated in the Shoreham DR/QR report) the following is recommended:

- Replace the spiral ring retainers with Waldes snap ring retainers (P/N 6E-003-067) at the first refueling outage.

Quality inspection reports have been reviewed for acceptability. Six wrist pins from Engine 1B displayed cracks and/or ground out areas. These six wrist pins, along with wrist pin number 7 from Engine 1A (wrist pin 7A had linear indications) were replaced with new ones. Results of all other Quality inspections conducted to date are satisfactory except for a material comparator test which gave inconclusive results. The following Quality inspections are recommended:

- Perform a material comparator test on one wrist pin and one spare making sure the known sample is AISI 8630.

- Perform a dimensional check on one spare wrist pin.

The following maintenance inspections are recommended for this component:

- Visually inspect all pins for chrome plate damage.

- Inspect end plugs and reroll or replace any that are loose.

Note: The above inspections should be performed during major engine overhauls and also whenever the pistons are removed and disassembled to an extent that such inspections are possible.

- Perform a liquid penetrant test or a magnetic test on all new or replacement pins before installation in engines.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Piston - Pin Assembly

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-341C

REV. NO. 2

SNPS GPL NO. 03-341C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a material comparator test on one wrist pin and one spare.
3. Perform a hardness test on one wrist pin and one spare.
4. Visually inspect the rolled-end oil plug installations.
5. Visually inspect the wrist pins for signs of distress.
6. Perform a dimensional check of one spare wrist pin.

Engine 1B

1. Assemble and review existing documentation.
2. Visually inspect the rolled-end oil plug installations.
3. Visually inspect the wrist pins for signs of distress.
4. Perform a dimensional check of one spare wrist pin.

NOTE: Inspections to be performed on four wrist pins - except where noted. (Engine 1A and 1B)

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Material of the wrist pins
3. Hardness of the wrist pins
4. Proper installation of rolled-end oil plugs
5. Surface integrity of the wrist pins
6. Proper wrist pin dimensions

Engine 1B

1. Quality status of Component Document Package
2. Proper installation of the rolled-end oil plugs
3. Surface integrity of the wrist pins
4. Proper wrist pin dimensions

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Material to be AISI-8630
3. Review of inspection report by Design Group
4. Piston pin assembly installed in compliance with the TDI Instruction Manual.

5-6. Review of inspection report by the Design Group

Engine 1B

1. Satisfactory Document Package
2. Piston pin assembly is installed in compliance with the TDI Instruction Manual.

3-4. Review of inspection report by the Design Group

REFERENCES

Engine 1A

1. QCI No.52

2-3. Approved Site NDE Procedures

4. Approved Site NDE Procedures, TDI Instruction Manual

5-6. Approved Site NDE Procedures

Engine 1B

1. QCI No.52

2. Approved Site NDE Procedures, TDI Instruction Manual

3-4. Approved Site NDE Procedures

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-6. Inspection Report

Engine 1B

1. Document Summary Sheet

2-4. Inspection Report

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A material comparator test was performed on the piston pin for cylinder 8. This was reported by TER#'s 06-030 and 06-048.

COMPONENT REVIEW (continued)

Engine 1A (continued)

3. A hardness test was performed on the piston pin for cylinder # 8. The results were reported by TER#'s 06-030 and 06-048.

4. A visual inspection was performed on all rolled-end oil plugs with each plug found tightly seated. This was reported by TER# 06-048.

5. A visual inspection was performed on all wrist pins with no indications of distress found. A Liquid Penetrant test was then performed on all wrist pin as indications were found on the #7 wrist pin. The result of these inspections were reported by TER# 06-048.

6. No inspection report has been received which fulfills this requirement.

Engine 1B

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. A visual inspection was performed on rolled-end oil plugs 3, 4, 5, 6, 7, and 8. This was reported by TER# 06-048.

3. A visual inspection was performed on wrist pins Nos. 3, 4, 5, 6, 7, and 8 with one or more indications found on each wrist pin. Subsequently, a Liquid Penetrant test was performed on wrist pins Nos. 6 and 7. The results of these inspections were reported by TER# 06-048.

4. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusion in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sabata PROGRAM MANAGER

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Tappets and Guides: Intake & Exhaust Tappet Assembly

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-345A

TASK DESCRIPTION NO: DR-06-03-345A-0

SNPS GPL NO. 03-345A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry experience and the lead engine DR/QR report (Comanche Peak). There is no reported site experience for this component in the EDG Component Tracking System.

The following routine maintenance is recommended for this component:

- Verify that the intake and exhaust tappet rollers are free to rotate, and that there is no measurable clearance between the cam rollers and roller pins. This inspection should take place at each outage using TDI inspection and maintenance record form 345-1-1.

There are no modification recommendations for this component.

Quality inspections performed on engines 1A and 1B have been reviewed and found to be satisfactory.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not requred

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Tappet & Guides - Intake Tappet Assembly

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-345A

REV. NO. 1

SNPS GPL NO. 03-345A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the intake and exhaust rollers are free to rotate and that no measurable clearance exists between the pin and roller.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Rollers are free to rotate and no measurable clearance exists between the pin and roller.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Rollers are free to rotate and no measurable clearance exists between the pin and roller.

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Approved Site NDE Procedures, TER# 99-003

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Diana M. Schwartz PROGRAM MANAGER JC Kennedy

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The intake and exhaust tappet rollers for cylinders 1, 2, 7 and 8 were verified to rotate freely. Additionally, there was no measurable movement between the pin and rollers. This was reported by TER# 06-049.

COMPONENT REVIEW (Continued)

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. Roller clearances and free movement of rollers were verified by the TDI vendor representative. This was reported by TER# 06-049.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined avove, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salita PROGRAM MANAGER J. Kenny

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Tappets and Guides: Fuel Tappet Assembly

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-345B

TASK DESCRIPTION NO: DR-06-03-345B-0

SNPS GPL NO. C3-345B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry experience and the lead engine DR/QR report (Comanche Peak). There is no reported site experience for this component in the EDG Component Tracking System.

The following routine maintenance is recommended for this component:

- Verify that the fuel tappet rollers are free to rotate and that there is no measurable clearance between the cam roller and roller pin. This inspection should take place at each outage using TDI inspection and maintenance record form 345-1-1.

The are no modification recommendations for this component.

Quality inspections performed on engines 1A and 1B have been reviewed and found to be satisfactory.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Tappet & Guides Fuel Tappet Assembly

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-345B

REV. NO. 1

SNPS GPL NO. 03-345B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the fuel tappet rollers are free to rotate and that no measurable clearance exists between the pin and roller.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Fuel tappet rollers are free to rotate and no measurable clearance exists between the pin and roller.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Rollers are free to rotate and no measurable clearance exists between the pin and roller.

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Approved Site NDE Procedures, TER# 99-003

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve McSchwartz PROGRAM MANAGER JC Kamsmeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. Roller clearances and free movement of rollers were verified by the vendor representative. This was reported by TER# 06-050.

COMPONENT REVIEW (continued)

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. Roller clearance and free movement of rollers were verified by the vendor representative. This has reported by TER# 06-050.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidat'on effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Galetta PROGRAM MANAGER D Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Tappets and Guides-Fuel Pump Base Assembly

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-345C

TASK DESCRIPTION NO. DR-06-03-345C-0

SNPS GPL NO. 03-345C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review of this component is not required for River Bend based on the following:

- A review of the EDG Component Tracking System indicates no nuclear and non-nuclear industry experience reported for this component. There is no site experience for this component.
- The fuel pump base used at River Bend (Part Number 1A-6173) is similar to that used at Shoreham, the differences being a larger center hole to accommodate a larger push rod and the addition of a drip trough. Shoreham's Engine 103 has had 1700 hours of operation without a problem with this type of fuel pump base.

No maintenance or modification requirements were identified in the lead engine DR/QR report (Shoreham).

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone and Webster Specification Number 244.700, Addendum 2, 08/20/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Lousiana.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Camshaft: Camshaft Assembly

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-350A

TASK DESCRIPTION NO. DR-06-03-350A-0

SNPS GPL NO. 03-350A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR reports, which establishes the acceptability of the camshaft assembly for its intended purpose.
- A review of the EDG Component Tracking System indicated that there was no site experience and no significant applicable industry experience not previously addressed.
- The applicable engine dimensions and operating parameters at River Bend are identical or very similar to those for the same component at Shoreheam (lead engine). Cam lobe geometries for solid valve lifter at River Bend are different from Shoreham, but resulting camshaft loading is not significantly different.

The following maintenance recommendations from the lead engine DR/QR report should be implemented:

- Perform a visual inspection of all cam lobe surfaces for signs of cracking, pitting or spalling. Any signs of cracking, pitting or spalling shall be followed by a detailed analysis to evaluate the expected life based on the size and extent of surface distress and any corrective measures shall be implemented as indicated by this analysis. Signs of spalling shall result in immediate replacement of the cam.

There are no modification recommendations for this component.

The following Quality Revalidation inspection recommendations are made to ensure proper component quality and performance and should be performed on both diesel engines:

- Determine the material of the cam lobes by uses of a comparator.
- Visually inspect the cam lobes for indications of premature wear, pitting and spalling on Engine 1B.

TASK DESCRIPTIONS (Continued)

- Perform a hardness test on the cam lobes on Engine 1B.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Camshaft-Camshaft Assembly UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-350A REV. NO. 1

SNPS GPL NO. 03-350A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Visually inspect the cam lobes for indications of premature wear, pitting and spalling.
3. Determine the material of the cam lobes by uses of a comparator.
4. Perform a hardness test on the cam lobes.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Lack of wear, spalling and pitting on the camshaft lobes
3. Material of the cam lobes
4. Hardness of the cam lobes

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. No premature wear, spalling or pitting on the camshaft lobes

3. Material to comply with TDI requirements

4. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-4. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on the cam lobes with satisfactory results. No indications of premature wear, scoring or galling were in evidence. This was reported by TER# 06-051.

3. No inspection report has been received which fulfills this reqirement.

4. A hardness test was performed on three cam lobes. The results were reported by TER#'s 06-027 and 06-051.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-4. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Walter A Sakala PROGRAM MANAGER [illegible]

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Camshaft: Camshaft Bearing

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 02-350B

TASK DESCRIPTION NO. DR-06-03-350B-0

SNPS GPL NO. 03-350B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required based on the Shoreham lead engine DR/QR report which establishes the acceptability of the camshaft bearings.

A review of the EDG Component Tracking System indicates no significant applicable site or industry experience.

There are no maintenance or modification recommendations for this component.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Gear Train

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-350C, 03-355A, 03-355B

TASK DESCRIPTION NO. DR-06-03-350C-0, DR-06-03-355A-0, DR-06-03-355B-0

SNPS GPL NO. 03-350C, 03-355A, 03-355B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for these components based on the lead engine DR/QR report (Shoreham), which establishes the acceptability of the gear train assembly. The parts under review at River Bend are the same as those at Shoreham, except for the camshaft assembly; those differences were reviewed and their effect on the gear loads was found not to be significant. Crankshaft torsional load inputs from torsiograph tests at River Bend were used in calculations that compared gear loading at River Bend to those at Shoreham. Resulting gear tooth loads were found to not differ significantly from those at Shoreham.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

The following maintenance recommendations are made to ensure reliability of the components:

03-350C, Camshaft - Supports, Bolting and Gears:

- It is recommended that the cam gear be inspected during scheduled refueling outages. The inspection should be directed at potential pitting. Any abnormal situations or indications of progressive pitting should reported for an engineering evaluation. A photographic record of tooth surfaces should be maintained at the site to aid in the evaluation of the surface durability.

- If the cam gear and hub are disassembled and reassembled for any reason, it is essential that the nut be re-locked at the position corresponding to the prescribed torque range. Insertion of the cotter pin must be accomplished at a torque greater than 50-ft-lbf and less than 90 ft-lbf. If this is not possible, another bolt and/or nut and/or washer should be used.

TASK DESCRIPTIONS (continued)

03-355A, Idler Gear Assembly - Crank to Pump Gear:

- It is recommended that the crank to pump gear and especially the jacket water pump drive and driven gear be inspected during scheduled refueling outages. The inspection should be directed at potential pitting. Any abnormal situations or indications of progressive pitting should be reported for an engineering evaluation. A photographic record of tooth surfaces should be maintained at the site to aid in the evaluation of the surface durability.

03-355B, Idler Gear Assembly - Idler Gear Assembly:

- It is recommended that the idler gear be inspected during scheduled refueling outages. The inspection should be directed at potential pitting. Any abnormal situations or indications of progressive pitting should be reported for an engineering evaluation. A photographic record of tooth surfaces should be maintained at the site to aid in the evaluation of the surface durability.

- The mating surfaces between the idler gear and hub should be thoroughly cleaned with solvent prior to assembly to ensure that there is an adequate friction coefficient between the parts.

- If the idler gear and hub are disassembled and reassembled for any reason, it is essential that the nut be relocked at precisely the position corresponding to the prescribed torque range. The idler gear-to-hub bolt torque specification should be 80±20 ft-lbf. If the cotter pin cannot be inserted at a torque greater than 60 ft-lbf and less than 100 ft-lbf, another bolt, washer, and/or nut should be used.

There are no modification recommendations for these components.

Results of quality inspections that have been conducted to date have been reviewed and considered satisfactory.

It is recommended that the Quality inspections listed below be performed:

03-350C, Camshaft - Supports, Bolting and Gears:

- Verify that the proper torque values are applied to the bolts (cam to cam gear) on Engines 1A and 1B.

- Perform a visual inspection of the cam gear for signs of wear, pitting or any other discontinuities, on Engine 1B.

03-355A and B, Idler Gear Assembly - Crank to Pump Gear & Idler Gear:

- Perform a visual inspection on the idler gear teeth for signs of wear, pitting, or any other discontinuities, on Engine 1A.
- Determine the hardness of the crank to pump gear, on Engine 1A.
- Determine the material of the crank to pump gear, on Engine 1A. Material to be C1040.
- Perform a visual inspection on the crank to pump gear set teeth and idler gear teeth for signs of wear, pitting, or any other discontinuities on Engine 1B.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Camshaft - Supports, Bolting and Gears

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-350C

REV. NO. 1

SNPS GPL NO. 03-350C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the proper torque values are applied to the bolts (cam to cam gear).
3. Perform a visual inspection of the cam gears for sign of wear, pitting or any other discontinuities.
4. Determine the hardness of the cam gears.
5. Determine the material of the cam gears.

Engine 1B

1. Assemble and review existing documentation.
2. Verify that the proper torque values are applied to the bolts.
3. Perform a visual inspection of the cam gear for sign of wear, pitting or any other discontinuities.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper torque loads are applied to the bolts.

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

3. Surface integrity of the cam gears

4. Hardness of the cam gears

5. Material of the cam gears

Engine 1B

1. Quality status at Component Document Package

2. Proper torque loads are applied to the bolts

3. Surface integrity of the cam gears

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Torque values are in accordance with the TDI Instruction Manual.

3-4. Review of inspection report by the Design Group

5. Material of the cam gear is AISI-4340

Engine 1B

1. Satisfactory Document Package

2. Torque values are in accordance with the TDI Instruction Manual.

3. Review of inspection report by the Design Group

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures, TDI Instruction Manual

REFERENCES (continued)

Engine 1A (continued)

3-4. Approved Site NDE Procedures

5. Approved Site NDE Proceudres, TER# 99-013

Engine 1B

1. QCI No. 52

2. Approved Site NDE Procedures, TDI Instruction Manual

3. Approved Site NDE Procedures

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-5. Inspection Report

Engine 1B

1. Document Summary Sheet

2-3. Inspection Report

GROUP CHAIRPERSON Steve M Schwartz PROGRAM MANAGER J C Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

3. A visual inspection was performed for the cam gear. No indications of excessive wear were found. This was reported by TER# 06-052.

4. A hardness test was performed on the cam gear. The results were reported by TER#'s 06-026 and 06-052.

COMPONENT REVIEW (continued)

Engine 1A (continued)

5. A material comparator test was used to determine the material of the cam gear. The results were reported by TER#'s 06-026 and 06-052.

NOTE - It was verified that all bolts were in place and that lock tabs were secure on the camshaft gear adapter.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-3. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sabelli PROGRAM MANAGER J C Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Subcover UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-362A TASK DESCRIPTION NO. DR-06-03-362A-0

SNPS GPL NO. 03-362A CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry and site experience in the EDG Component Tracking System and the Lead Engine DR/QR reports (Shoreham/Comanche Peak).

There are no modification recommendations for this component.

Quality inspections conducted at River Bend found no indications in the subcover webs on either engine. Liquid penetrant examination of the subcover pedestals on Engine 1A also was satisfactory. These results were reported on TER 06-059.

The following Quality Revalidation inspection is recommended to assure component quality and should be completed on Engine 1B:

- Perform a liquid penetrant test of the subcovers on the machined surfaces of the rocker shaft assembly bolt boss (pedestal) for evidence of linear indications.

Quality inspections conducted at Catawba and Comanche Peak identified several cracked subcover pedestals. The majority of cracks in pedestals were located near the intermediate rocker arm assembly. The pedestals here are counterbored ½ inch deep to accept hollow dowels (bushings) that keep the rocker arm shafts from moving laterally under the loads generated by the connector pushrods. The reported pedestals each had a tight crack running down through the web between the counterbore and the machined surface. This type of cracking could be initiated by improper disassembly/assembly of the rocker shaft or an excessive interference fit between the rocker shaft dowel and the subcover pedestal counterbore (TDI drawings specify a clearance of .000 to .0015 inch). Metallurgical examination indicates that the crack, once initiated, may propagate by fatigue.

Although there is no documentation of engine failure directly attributed to cracked subcover pedestals, cracks that extend into the threaded portion of the hole for the rocker arm capscrews could cause a decrease in bolt torque. To prevent this possibility, the following inspection is recommended:

- Perform a liquid penetrant test on the machined surfaces of the subcover pedestals (connector pushrod side only) for signs of cracking at the counterbores.

TASK DESCRIPTIONS (continued)

This inspection is to be performed in conjunction with the rocker arm bushing inspections when the rocker arm shafts are removed from the subcovers. Subcovers with pedestal cracks that extend through the counterbore web down to the threads should be replaced. This inspection should be performed at 5-year intervals.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinders Head Covers Subcover Assembly

UTIILITY Gulf States Utilities, River Bend Station

GPL NO. 03-362A

REV. NO. 1

SNPS GPL NO. 03-362A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection on the web area of the subcover assembly and examine for indications of cracking (four per engine).
3. Perform a Liquid Penetrant test of the subcovers on the machined surfaces in the rocker shaft assembly bolt boss area [vertical and top machined surfaces] for evidence of linear indications.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Structural integrity of the subcovers
3. Evidence of linear indications in the bolt boss area

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-3. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-3. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven R. Schwarz PROGRAM MANAGER J. Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

COMPONENT REVIEW (continued)

Engine 1A (continued)

2. A visual inspection was performed on subcovers for cylinders 1, 3, 7 and 8 with satisfactory results. This was reported by TER# 06-059.

3. A Liquid Penetrant test of all subcovers was performed on the bolt seat area with satisfactory results. This was reported by TER# 06-059.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on subcovers for cylinders 2, 3, 5 and 7 with satisfactory results. This was reported by TER# 06-059.

3. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Saleta PROGRAM MANAGER J Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Rocker Shaft Assemblies: Intake/Intermediate & Exhaust

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-390A&B

TASK DESCRIPTION NO. DR-06-03-390A&B-0

SNPS GPL NO. 03-390A&B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR report, which establishes the acceptability of the rocker shaft assemblies for their intended purpose.
- A review of industry and site experience listed in the EDG Component Tracking System indicated there had been no design related failures associated with this component.

Quality inspections performed on both engines verified proper material specification. Visual inspections of the rocker arm assemblies found several chipped pushrod sockets that did not meet the acceptance criteria and the sockets were replaced. Quality inspections performed at other sites also found chipped and cracked pushrod sockets and swivel pads, but they did not seriously impair engine operation.

There are no maintenance or modification recommendations for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Rocker Arms & Pushrods - Intake and Intermediate Rocker Shaft Assembly

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-390A

REV. NO. 1

SNPS GPL NO. 03-390A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection of the intake and intermediate rocker arm assembly for signs of distress, linear indications and chipped pieces in the outer lips of the pushrod cups.
3. Determine the material of one intake and intermediate rocker arm shaft.

Engine 1B

1. Assemble and review existing documentation.
2. Perform a visual inspection of the intake and intermediate rocker a assembly for signs of distress, linear indications, and chippe pieces in the outer lips of the pushrod cups.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of the rocker arm assembly
3. Material of rocker arm shafts

Engine 1B

1. Quality status of Component Document Package
2. Surface integrity of the rocker arm assembly

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. No linear indications/chipped pieces in the outer lips of the pushrod cups

3. Material to be AISI-4142

Engine 1B

1. Satisfactory Document Package

2. No linear indications/chipped pieces in the outer lips of the pushrod cups.

REFERENCES

Engine 1A

1. QCI No. 52

2-3. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

2. Approved Site NDE Procedures

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

1. Document Summary Sheet

2. Inspection Report

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection of the intake and intermediate rocker arm assembly was performed with unsatisfactory conditions noted on pushrod cups 1, 6, 7, and 8. The results were reported by TER# 06-064.

3. A material comparator was performed on one intake rocker arm shaft. The results were reported by TER#'s 06-023 and 06-060.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection on the intake and intermediate rocker arm assemblies was preformed with unsatisfactory conditions noted on pushrod cups 1, 2, and 6. The results were reported by TER# 06-064.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Saleta PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Rocker Shaft Assemblies: Intake/Intermediate & Exhaust

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-390A&B

TASK DESCRIPTION NO. DR-06-03-390A&B-0

SNPS GPL NO. 03-390A&B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR report, which establishes the acceptability of the rocker shaft assemblies for their intended purpose.
- A review of industry and site experience listed in the EDG Component Tracking System indicated there had been no design related failures associated with this component.

Quality inspections performed on both engines verified proper material specification. Visual inspections of the rocker arm assemblies found several chipped pushrod sockets that did not meet the acceptance criteria and the sockets were replaced. Quality inspections performed at other sites also found chipped and cracked pushrod sockets and swivel pads, but they did not seriously impair engine operation.

There are no maintenance or modification recommendations for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Rocker Arms & Pushrods - Exhaust Rocker Shaft Assembly

UTIILITY Gulf States Utilities, River Bend Station

GPL NO. 03-390B

REV. NO. 1

SNPS GPL NO. 03-390B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection of the exhaust rocker arm assemblies for signs of distress, linear indications, and chipped pieces in the outer lips of the pushrod cups.
3. Determine the material of one rocker arm shaft.

Engine 1B

1. Assemble and review existing documentation.
2. Perform a visual inspection of the exhaust rocker arm assemblies for signs of distress, linear indications, and chipped pieces in the outer lips of the pushrod cups.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of the rocker arm assembly
3. Material of rocker arm shaft

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1B

1. Quality status of Component Document Package

2. Surface integrity of the rocker arm assemblies

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. No linear indications/chipped pieces in the outer lips of the pushrod cups.

3. Material to be AISI-4142

Engine 1B

1. Satisfactory Document Package

2. No linear indications/chipped pieces in the outer lips of the pushrod cups.

REFERENCES

Engine 1A

1. QCI No. 52

2-3. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

2. Approved Site NDE Procedures

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

1. Document Summary Sheet

2. Inspection Report

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection on the exhaust rocker arm assemblies (total of eight) was performed with no signs of distress, linear indications, and chipped pushrod cups found. This was reported by TER# 06-065.

3. A material comparator was performed on the exhaust rocker arm shaft. The results were reported by TER#'s 06-022 and 06-065.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection on the exhaust rocker arm assemblies was performed with no signs of distress, linear indications, and chipped pushrod cups found. This was reported by TER# 06-065.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

RESULTS AND CONCLUSION (continued)

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nicholas A Saleta PROGRAM MANAGER JC Kennedy

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Main and Connector Pushrods UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-390C&D TASK DESCRIPTION NO. DR-06-03-390C&D-0

SNPS GPL NO. 03-390C&D CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR Reports which establish the acceptability of the friction welded pushrods for their intended purpose.
- A review of the industry and site experience listed in the EDG Component Tracking System indicated there had been no design related failures associated with friction welded pushrods.

There are no maintenance or modification recommendations for this component.

Quality inspections were performed on a sample of main and connector pushrods from both engines. Liquid penetrant examination of these pushrods found no linear indications along the bond line.

The following Quality Inspections are recommended to assure proper component quality and performance and should be performed on all remaining pushrods (both engines):

- Verify that the main and connector pushrods are friction welded.
- Perform a liquid penetrant test on the friction welded main and connector pushrods. As an alternative, visual inspection may be used if a thorough wipedown of the surface is done to remove any coatings or deposits on the surfaces. No surface cracks should be allowed along the bond line between the rod end and the tube.

For future purchases of pushrods, it is recommended that the purchase order specify destructive verification of weld quality by sectioning random samples from each manufacturing lot.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON PROGRAM MANAGER

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Rocker Arms & Pushrods: Pushrods-Main and Connector UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-390C & D REV. NO. 2

SNPS GPL NO. 03-390C & D

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the main and connector pushrods are friction welded.
3. Perform a Liquid Penetrant or Magnetic Particle test on all main and connector pushrods. If the above NDE inspections cannot be performed, a visual inspection is acceptable if the surface is thoroughly cleaned to remove any coatings or deposits.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Main and connector pushrods are friction welded.
3. Surface integrity of all main and connector pushrods.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

ACCEPTANCE CRITERIA (continued)

Engine 1A (continued)

2. Main and connector pushrods are friction welded.

3. No surface cracks allowed along the bond line between the rod end and the tube.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

3. Approved site NDE Procedures, TER# 99-017, TER# 99-035

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve M. Schwartz PROGRAM MANAGER for JCR

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The new friction welded pushrods were installed. This was reported by TER#'s 06-066 and 06-067.

3. Liquid Penetrant tests were performed on the main and connector pushrods for cylinder No. 5. In addition, the connector pushrods on cylinders 1, 6 and 7 were penetrant tested. All results were satisfactory as reported by TER#'s 06-066 and 06-067.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

3. A Liquid Penetrant test was performed on the main and connector pushrods for cylinders 3 and 7 with satisfactory results. This was reported by TER# 06-067.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sacela PROGRAM MANAGER J J Power for JCK

TDI OWNERS GROUP

for

RIVER BEND STATION

ROCKER ARMS AND PUSHRODS: PUSHRODS CONNECTOR

COMPONENT PART NO.: 03-390D

See Component Part No.: 03-390C

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Rocker Arms & Pushrods: Bushings

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-390E

TASK DESCRIPTION NO. DR-06-03-390E-0

SNPS GPL NO. 03-390E

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR Reports which establishes the acceptability of the bushings for their intended purpose.
- The applicable engine dimensions and operating parameters at River Bend are identical or very similar to those for the same component at Shoreham (Lead Engine).
- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and no site experience.

Maintenance recommendations based on the Comanche Peak DR/QR Report to ensure proper performance under normal operating conditions are as follows:

- Visually inspect and measure the intake, intermediate, and exhaust rocker arm bushings. The periods of engine operation to wear the bushings from an initial clearance of 0.0045 inch (diametral) to 0.010 inch (value at which bushings should be replaced) were calculated to be 2300 hours - Intake, 730 hours - Intermediate, and 1300 hours - Exhaust. It is recommended that an inspection be conducted at the fuel outage which precedes the applicable number of engine hours of operation in a LOOP/LOCA event plus the expected hours of operating between outages.

No Quality Revalidation is required for this component. No modifications are recommended for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

ROCKER ARMS & PUSHRODS - LIFTERS

COMPONENT PART NO. 03-390F

River Bend Diesels are equipped with mechanical (solid) lifters.
No review is required.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Rocker Arms and Pushrods-Misc. Bolts and Drive Studs

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-390G

TASK DESCRIPTION NO. DR-06-03-390G-0

SNPS GPL NO. 03-390G

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the applicable industry experience, the Phase I report, and the lead engine DR/QR report (Comanche Peak). There is no site experience in the EDG Component Tracking System for this component.

The industry experience of rocker arm bolt failures has been attributed to insufficient preloading.

The maintenance recommendations for this component are as follows:

- Verify that the proper torque is applied to the rocker arm hold down bolts (365 ft-lbs).
- Verify that the rocker arm drive studs are tight and intact.

These inspections should be performed at each outage.

There are no modification recommendations for this component.

Quality inspections performed to date have been reviewed and found to be satisfactory with the exception of the material comparator results. All of the tested rocker arm bolts tested were outside of the accepted range for the material tested, it is therefore recommended that the capscrews be retested to verify that they are the proper material.

The following quality inspections should be performed on Engine 1B:

- Verify that the proper torque loads are applied to the rockerarm capscrews by either reviewing existing documentation or performing a physical inspection.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Rocker Arms & Pushrods - Misc. Bolts & Drive studs

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-390G

REV. NO. 1

SNPS GPL NO. 03-390G

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation
2. Perform a Magnetic Particle test on the thread root area of all capscrews for linear indications.
3. Perform a visual inspection on the drive studs for signs of irregularity.
4. Verify that the proper torque loads are applied to the rocker arm capscrews by reviewing existing documentation.
5. Determine the material of the capscrews (sample of four).
6. Determine the hardness of the capscrews (sample of four).

Engine 1B

1. Assemble and review existing documentation
2. Perform a Magnetic Particle test on the thread root area of all capscrews for linear indications.
3. Perform a visual inspection on the drive studs for signs of irregularity.
4. Verify that the proper torque loads are applied to the rocker arm capscrews by reviewing existing documentation.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of the thread root area of all capscrews

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

3. Proper installation of drive stud
4. Proper torque loads are applied.
5. Material of capscrews
6. Hardness of capscrews

Engine 1B

1. Quality status of Component Document Package
2. Surface integrity of the thread root area of all capscrews
3. Proper installation of drive stud
4. Proper torque loads are applied.

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. No linear indications in the thread root area of the capscrews
3. No movement of the drive stud in the rocker arm
4. Torque loads are in accordance with the TDI Instruction Manual.
5. Material is AISI 4140.
6. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-3. Approved Site NDE Procedures

4. TDI Instruction Manual

5-6. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

2-3. Approved Site NDE Procedures

4. TDI Instruction Manual

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-6. Inspection Report

Engine 1B

1. Document Summary Sheet

2-4. Inspection Report

GROUP CHAIRPERSON Steve M. Nichols PROGRAM MANAGER J. Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A Magnetic Particle test on the thread root area was performed for all rocker arm capscrews. The results were reported by TER# 0C-068.

COMPONENT REVIEW (continued)

Engine 1A (continued)

3. A visual inspection of the drive studs was performed with satisfactory results. This was reported by TER# 06-068.

4. A torque load of 365 ft-lbs was applied to the rocker arm capscrews in accordance with the TDI Manual. This was reported by TER# 06-068.

5. A material comparator test was performed on four rocker arm capscrews. This was reported by TER#'s 06-021 and 06-068.

6. A hardness test was performed on four rocker arm capscrews. This was reported by TER#'s 06-021 and 06-068.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. A Magnetic Particle test on the thread root area was performed for all rocker arm capscrews. The results were reported by TER# 06-068.

3. A visual inspection of the drive studs was performed with satisfactory results. This was reported by TER# 06-068.

4. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Vicki A Salita PROGRAM MANAGER J Kammeyer

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Front Gear Case Gasket and Bolting

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-335B

REV. NO. 1

SNPS GPL NO. 03-335B

TASK DESCRIPTIONS

No further review of component 03-335B is required for the following reasons:

a) Component was reviewed on two lead engines with satisfactory results.

b) There is no industry or site experience reported for this component.

c) Type C component - Failure has little bearing on the effective use or operation of D.G.

GROUP CHAIRPERSON Vito A. Salita PROGRAM MANAGER J C Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Gear Train

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-350C, 03-355A, 03-355B

TASK DESCRIPTION NO. DR-06-03-350C-0, DR-06-03-355A-0, DR-06-03-355B-0

SNPS GPL NO. 03-350C, 03-355A, 03-355B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for these components based on the lead engine DR/QR report (Shoreham), which establishes the acceptability of the gear train assembly. The parts under review at River Bend are the same as those at Shoreham, except for the camshaft assembly; those differences were reviewed and their effect on the gear loads was found not to be significant. Crankshaft torsional load inputs from torsiograph tests at River Bend were used in calculations that compared gear loading at River Bend to those at Shoreham. Resulting gear tooth loads were found to not differ significantly from those at Shoreham.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

The following maintenance recommendations are made to ensure reliability of the components:

03-350C, Camshaft - Supports, Bolting and Gears:

- It is recommended that the cam gear be inspected during scheduled refueling outages. The inspection should be directed at potential pitting. Any abnormal situations or indications of progressive pitting should reported for an engineering evaluation. A photographic record of tooth surfaces should be maintained at the site to aid in the evaluation of the surface durability.

- If the cam gear and hub are disassembled and reassembled for any reason, it is essential that the nut be re-locked at the position corresponding to the prescribed torque range. Insertion of the cotter pin must be accomplished at a torque greater than 50-ft-lbf and less than 90 ft-lbf. If this is not possible, another bolt and/or nut and/or washer should be used.

TASK DESCRIPTIONS (continued)

03-355A, Idler Gear Assembly - Crank to Pump Gear:

- It is recommended that the crank to pump gear and especially the jacket water pump drive and driven gear be inspected during scheduled refueling outages. The inspection should be directed at potential pitting. Any abnormal situations or indications of progressive pitting should be reported for an engineering evaluation. A photographic record of tooth surfaces should be maintained at the site to aid in the evaluation of the surface durability.

03-355B, Idler Gear Assembly - Idler Gear Assembly:

- It is recommended that the idler gear be inspected during scheduled refueling outages. The inspection should be directed at potential pitting. Any abnormal situations or indications of progressive pitting should be reported for an engineering evaluation. A photographic record of tooth surfaces should be maintained at the site to aid in the evaluation of the surface durability.

- The mating surfaces between the idler gear and hub should be thoroughly cleaned with solvent prior to assembly to ensure that there is an adequate friction coefficient between the parts.

- If the idler gear and hub are disassembled and reassembled for any reason, it is essential that the nut be relocked at precisely the position corresponding to the prescribed torque range. The idler gear-to-hub bolt torque specification should be 80±20 ft-lbf. If the cotter pin cannot be inserted at a torque greater than 60 ft-lbf and less than 100 ft-lbf, another bolt, washer, and/or nut should be used.

There are no modification recommendations for these components.

Results of quality inspections that have been conducted to date have been reviewed and considered satisfactory.

It is recommended that the Quality insnections listed below be performed:

03-350C, Camshaft - Supports, Bolting and Gears:

- Verify that the proper torque values are applied to the bolts (cam to cam gear) on Engines 1A and 1B.

- Perform a visual inspection of the cam gear for signs of wear, pitting or any other discontinuities, on Engine 1B.

03-355A and B, Idler Gear Assembly - Crank to Pump Gear & Idler Gear:

- Perform a visual inspection on the idler gear teeth for signs of wear, pitting, or any other discontinuities, on Engine 1A.
- Determine the hardness of the crank to pump gear, on Engine 1A.
- Determine the material of the crank to pump gear, on Engine 1A. Material to be C1040.
- Perform a visual inspection on the crank to pump gear set teeth and idler gear teeth for signs of wear, pitting, or any other discontinuities on Engine 1B.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Idler Gear Assembly - Crank to Pump Gear & Idler Gears

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-355A & B

REV. NO. 1

SNPS GPL NO. 03-355A & B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection on the crank to pump gear set teeth and idler gear teeth for signs of wear, pitting, or any other discontinuities.
3. Determine the hardness of the crank to pump gear and idler gears.
4. Determine the material of the crank to pump gear and idler gears.

Engine 1B

1. Assemble and review existing documentation.
2. Perform a visual inspection on the crank to pump gear set teeth and idler gear teeth for signs of wear, pitting, or any other discontinuities.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of the crank to pump gear and idler gears
3. Hardness of the gear
4. Material of the gear

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1B

1. Quality status of Component Document Package

2. Surface integrity of the crank to pump gear and idler gears

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ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-3. Review of inspection report by Design Group

4. a) Material to be AISI-4340 - Idler gear

b) Material to be C-1040 - crank to pump gear

Engine 1B

1. Satisfactory Document Package

2. Review of inspection report by Design Group

REFERENCES

Engine 1A

1. QCI No. 52

2-4. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

2. Approved Site NDE Procedures

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

Engine 1B

1. Document Summary Sheet

2. Inspection Report

GROUP CHAIRPERSON Steve M. Schwartz PROGRAM MANAGER J. Kanning

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection was performed on the crank to pump gear set teeth with satisfactory results. No indications of wear, pitting or any other discontinuities were found. This was reported by TER# 06-053.

3. A hardness test was performed on the idler gear. The results were reported by TER#'s 06-025 and 06-053.

4. A material comparator test was performed on the idler gear. The results were reported by TER#'s 06-025 and 06-053.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Sabeta PROGRAM MANAGER J Kennedy

TDI OWNERS GROUP

for

RIVER BEND STATION

IDLER GEAR ASSEMBLY

COMPONENT PART NO.: 03-355B

See Component Part No.: 03-355A

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Idler Gear Assembly-Bolting and Gaskets UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-355C REV. NO. 2

SNPS GPL NO. 03-355C

TASK DESCRIPTIONS

No further review of component 03-355C is required for the following reasons:

a) Component was reviewed on two lead engines with satisfactory results.

b) There is no industry or site experience reported for this component.

c) Type C component - Failure has little bearing on the effective use or operation of D.G.

GROUP CHAIRPERSON Nestor A. Faleta PROGRAM MANAGER J C Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Flywheel

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-330A

TASK DESCRIPTION NO. DR-06-03-330A-0

SNPS GPL NO. 03-330A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- There is no applicable significant industry or site experience listed in the EDG Component Tracking System.
- A review of the lead engine DR/QR report (Shoreham). The DR/QR report for Shoreham indicated a large factor of safety for the flywheel. Stresses in the flywheel at River Bend should be less than at Shoreham due to a smaller diameter (63 inch vs. 73 inch).

There are no maintenance or modification recommendations for this component.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Flywheel Bolting UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-330B TASK DESCRIPTION NO. DR-06-03-330B-0

SNPS GPL NO. 03-330B CLASSIFICATION TYPE A

TASK DESCRIPTIONS

A design review report is not required for this component based on the following:

- The flywheel bolting and loading at River Bend is nearly identical to Shoreham, which was found conditionally acceptable.
- A review of the EDG Component Tracking System indicated no significant applicable industry or site experience.
- A review of the lead engine report (Shoreham).

Inspection and replacement requirements were identified in the lead engine report (Shoreham) to resolve a concern over the possible intrusion of cutting oils into the flange connection when the bolt holes were reamed. These inspections/replacements are not required if the following conditions can be met:

1) SIM 64H must have been complied with at engine assembly. This includes precautions to keep the flywheel, generator shaft and crankshaft flanges dry and clean of any lubricant during assembly.

2) No lubricant should have been used during the reaming operation or to drive the bolts. If cutting fluids were used to ream the bolt holes, the flanges should have been disassembled, cleaned and then reassembled.

If documentation does not exist that these conditions have been met, then the flanges should be disassembled and reassembled to satisfy the above conditions or if minor amounts of lubricant are inferred from the assembly documentation, the bolts should be replaced after every increment of 300 hours of operation or at each refueling outage, whichever comes first.

Clarifications to SIM 64H are recommended in the lead engine report, which emphasize the need for flange cleanliness. It is recommended that the maintenance procedures at River Bend include precautionary notes to maintain the crankshaft, flywheel and generator shaft flange faces dry and free of lubricant throughout the assembly process. Cutting oils should be cleaned from the faces and no lubricants should be used when inserting the bolts.

The following quality inspection should be completed:

- Bolt torques should be verified to be in accordance with TDI requirements for both station engines.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Memorandum from Lisa Shusto (FAA) to Peter Titus (SWEC) dated November 5, 1984 Providing Torque excursions from QA Reference SP 84-6-10(g).

2. Stone & Webster Calculation Number 11600.60-NM(B)-001-CZC-004.

3. Stone & Webster Specification Number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Lousiana.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Engine And Auxiliary Module Wiring Material and Fittings; Pyrometer Conduit Assembly-Conduit, Fitting, Supports

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-688A & 03-630A, B, C

TASK DESCRIPTION NO. DR-06-03-688A-0 DR-06-03-630A,B,C-0

SNPS GPL NO. 03-688A & 03-630A,B,C

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no siginificant applicable industry and/or site experience.
- A review of the lead engine DR/QR report (Shoreham).
- A review of as-built drawings for River Bend.

The modifications listed in lead engine DR/QR report (Shoreham) are not applicable to River Bend because of the differences in the conduit layout and supports. Based on past experience, it is recommended to perform an upgrade to tighten, fix, replace or add missing conduit supports as required. In addition, conduits at Det. G (Dwg. 1EGS*EG1A Pages 1, 3 of 4) have to be secured (i.e. shim and tightened) as required.

Based on the review of as-built drawings (1EGS*EG1A Pages 1 to 4 and supplementary sketches), the results of analysis (Calc. No. 11600.60/CS-11) using input from the design specification (Spec. No. 244.700, Rev. 2, Pages 1-55 to 1-74) an additional support is required (Ref. memo from A.Y.C Wong to J. C. Kammeyer dated 11/20/84).

There are no maintenance recommendations for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION

PYROMETER CONDUIT ASSEMBLY: CONDUIT FITTINGS

COMPONENT PART NO.: 03-630B

See Component Part No.: 03-630A

TDI OWNERS GROUP

for

RIVER BEND STATION

PYROMETER CONDUIT ASSEMBLY: SUPPORT

COMPONENT PART NO.: 03-630C

See Component Part No.: 03-630A

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Pyrometer Conduit Assembly: Thermocouples

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-630D

TASK DESCRIPTION NO. DR-06-03-630D-0

SNPS GPL NO. 03-630D

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the lead engine DR/QR report Shoreham, which establishes the acceptability of the thermocouples for their intended purpose.
- A review of the EDG Component Tracking System indicates that there was no site experience, and no significant applicable nuclear or non-nuclear experience.
- The applicable engine dimensions and operating parameters at River Bend are identical or very similar to those for the same component at Shoreham.

Maintenance recommendations, based on the Shoreham DR/QR report, to ensure proper performance of the thermocouples during normal operation are as follows:

- Check that each thermocouple's indicated temperature is consistent with the engine's ambient temperature when the engine is cold. Any inconsistent reading traced to the thermocouple should result in replacement of the thermocouple. This should be performed during every fuel outage.
- Remove, clean, and inspect each thermocouple and thermocouple shield for indications of fatigue. Any indications of fatigue should result in replacement of the thermocouple and/or thermocouple shield. This will be performed during every other fuel outage.

No Quality Revalidation is required for this component.

There is no modification recommendations for this component.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION

ENGINE & AUX. MODULE WIRING MATERIAL - CONDUIT
& FITTINGS: PYROMETER CONDUIT ASSEMBLY - CONDUIT, FITTING, SUPPORTS

COMPONENT PART NO.: 03-688A

See Component Part No.: 03-630A

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Engine & Aux. Module Wiring Mat'l: Wiring & Terminations UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-688B TASK DESCRIPTION NO. DR-06-03-688B-0

SNPS GPL NO. 03-688B CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the lead engine DR/QR report for Shoreham and Comanche Peak.
- A review of the Phase I report for this component (see References).
- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience that had not been addressed in the Phase I report.

There are no maintenance/modification recommendations from the lead engine DR/QR reports for this component.

The visual inspection called for on the CQRC has been previously performed as part of the Phase I effort and has been documented in the Phase I report (See References). No further Quality Revalidation is required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Emergency Diesel Generator Auxiliary Module Control Wiring and Termination Qualification Review," prepared by Stone & Webster Engineering Corporation, July, 1984.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Eng. & Aux-Module Wiring Mat'l - Boxes & Terminals

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-688C

REV. NO. 1

SNPS GPL NO. 03-688C

TASK DESCRIPTIONS

No further review of component 03-688C is required for the following reasons:

a) Boxes and terminals were reviewed on the lead engine (Shorenam) and inspection results were satisfactory. In addition, terminals were reviewed as part of component 03-688B.

b) There is no site or industry experience reported for this component.

GROUP CHAIRPERSON Nelia A. Sacetta PROGRAM MANAGER, JC Kennedy

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Off Engine Alarm Sensor Wiring

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-689

TASK DESCRIPTION NO. DR-06-03-689-0

SNPS GPL NO. 99-691B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience.
- A review of the lead engine DR/QR report for Comanche Peak.

There are no maintenance/modification recommendations for this component.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT On-Engine Alarm Sensors / Off-Engine Alarm Sensors

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-690, 03-691

TASK DESCRIPTION NO. DR-06-03-690-0 / DR-06-03-691-0

SNPS GPL NO. 03-690, 99-691A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Based on review of the lead engine DR/QR report (Comanche Peak), a design review for the on and off-engine alarm sensors is not required for River Bend.

The on and off-engine alarm temperature sensors used on River Bend are supplied by a different manufacturer, but are of comparable quality to those used on Comanche Peak. The application of these instruments on River Bend is similar to Comanche Peak. Thermocouples F-540-146 are used to sense temperatures in the jacket water and lube oil systems for high/low alarms. The thermocouples can operate within ambient temperatures of -100°F to 300°F and are of adequate design to perform their intended functions.

The application of the on and off-engine alarm level and pressure sensors used on River Bend is similar to Comanche Peak. Magnetrol level switches F-528-044, sense lube oil sump level and actuate high/low level alarms. Barksdale pressure switches, F-577-086, sense air receiver pressure, actuating a low alarm. These instruments are of adequate design for their intended function at River Bend.

There is no River Bend site, nuclear or non-nuclear industry experience listed in the EDG Component Tracking System for the on and off-engine alarm sensors.

There are no maintenance recommendations for this component.

Quality Revalidation of the on and off-engine alarm sensors is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION

OFF ENGINE ALARM SENSORS - LEVEL & PRESSURE SWITCHES

COMPONENT PART NO.: 03-691

See Component Part No.: 03-690

COMPONENT DESIGN REVIEW CHECKL.ST
RIVER BEND STATION - UNIT 1

COMPONENT Governor Drive - Governor & Tachometer Drive Gear and Shaft

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-402A

TASK DESCRIPTION NO. DR-06-03-402A-0

SNPS GPL NO. 03-402A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component, based on the Shoreham lead engine DR/QR report, which establishes the acceptability of the governor drive gears and shafts.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

There are no modification or maintenance recommendations for this component.

The following Quality inspections are recommended to be performed on one station engine:

- Determine the material of the governor drive gear (P/N 02-411-01-0B) and governor driven gear (P/N 02-411-03-AB) by use of comparator. Material to be AISI 4142.

- Perform LP inspections of governor drive for fatigue cracks (after pre-operational or 100 hours running) in the following areas:

  (a) Gear/shaft contact surfaces and surfaces immediately adjacent;

  (b) Gear pins and bores;

  (c) Vertical shaft/gear keyway;

  (d) Reduced shaft diameter at coupling.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON J J Power PROGRAM MANAGER L Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Governor Drive: Couplings, Pins, and Keys UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-402B TASK DESCRIPTION NO. DR-06-03-402B-0

SNPS GPL NO. 03-402B CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component, based on the Shoreham lead engine DR/QR report which establishes the acceptability of the governor drive coupling, pins and keys.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

The following maintenance items are recommended to ensure reliability of this component:

- Replace the present neoprene elastomeric inserts in the Koppers couplings before placing the engines in emergency standby service.
- Modify the maintenance schedule in the TDI Instruction Manual to include checking the coupling tightness at refueling outages.
- Replace the elastomeric insert at refueling outages.

There are no modification recommendations for this component.

Quality inspections performed to date are considered satisfactory. The following quality inspections are recommended to be performed on Engine 1B:

- Perform a visual inspection of the coupling for degradation of material.
- Verify that the set screw and drive pins are locked in place in accordance with installations instructions.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Governor Drive: Coupling UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-402B REV. NO. 2

SNPS GPL NO. 03-402B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection of the coupling for degradation of material.
3. Verify the coupling material by reviewing existing documentation.
4. Verify that the set screw and drive pins are locked in place in accordance with installation instructions.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Surface integrity of coupling
3. Material of coupling is neoprene
4. Set screw and drive pins are locked in place.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of inspection report by the Design Group

3. Material of coupling is neoprene.

4. Set screw and drive pins are locked in place in accordance with installation instructions.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-4. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

3. Document Summary Sheet

4. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____ for JCK

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. A visual inspection was performed on the coupling with satisfactory results. This was reported by TER# 06-069.

3. The flexible element of the governor drive was replaced (N&D 2810) to assure that the coupling material is neoprene. This was reported by TER# 06-069.

4. The holes for the set screw and drive pin were found crimped thereby preventing them from backing out. In addition, the set screw was installed using Loctite RC 680. This was reported by TER# 06-069.

Engine 1B

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. No inspection report has been received which fulfills this requirement.

3. The flexible element of the governor drive was replaced (N&D 2810) to assure that the coupling material is neoprene. This was reported by TER# 06-069.

4. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Schiele PROGRAM MANAGER for JCK

RB2193/3

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Overspeed Trip Governor

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-410A

TASK DESCRIPTION NO. DR-06-03-410A-0

SNPS GPL NO. 03-410A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required, based on the Shoreham lead engine DR/QR report, which establishes the acceptability of the overspeed trip governor.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

The following maintenance items, from the lead engine DR/QR report (Shoreham), are recommended for River Bend to ensure reliability of the overspeed trip governor:

- Modify the surveillance testing procedures to include verification that the overspeed trip is correctly set to an overspeed trip setting of 518 rpm at every refueling outage, ensuring that the electric governor setting is properly returned to 450 rpm (and the mechanical backup governor returned to 460 rpm) following the overspeed test. The test is to be performed with no load on the engine by increasing the normal governor's speed setting(s) until a trip occurs. After several inspection periods, the history of the required adjustments should be reviewed to evaluate and possibly modify the testing interval.

- After setting the overspeed governor, the adjustment screw positions should be marked with torque-seal to reveal any unintended changes in the set positions.

There are no modification recommendations for this component.

The following quality inspections are recommended to ensure component quality and performance:

- Verify proper installation and calibration of the governor overspeed trip in accordance with the Installation and Oil Supply Topic of Woodward Documentation, TDI Manual, on Engine 1A and Engine 1B.

- Verify that proper operational procedures are used on the overspeed trip governor, in accordance with Woodward Documentation, TDI Manual, on Engine 1B.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON J J Power PROGRAM MANAGER J C Kammeyer

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Overspeed Trip - Governor UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-410A REV. NO. 1

SNPS GPL NO. 03-410A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify the proper installation and calibration of the governor overspeed trip.
3. Verify that the proper operational procedures are used on the governor.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Docuemt Package
2. Proper installation and calibration of the governor overspeed trip
3. Proper operational procedures are used on the governor.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Installation is done in accordance with the Woodward Documentation Section of the TDI Manual Vol. III under the Installation & Oil Supply topic.

3. Operational procedures are done in accordance with Woodward documentation.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-3. TDI Manual Vol. III, Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

3. The setting of the overspeed trip and governor in addition to operational checks were performed by TDI and Woodward representatives. This was reported by TER# 06-070.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-3. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sala PROGRAM MANAGER

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Overspeed Trip: Governor and Accessory Drive Assemb. UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-410B TASK DESCRIPTION NO. DR-06-03-410B-0

SNPS GPL NO. 03-410B CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component, based on the Shoreham lead engine DR/QR report, which establishes the acceptability of the overspeed trip and accessory drive gear and shafting. The component parts under review are identical.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

There are no maintenance or modification recommendations from the lead DR/QR report for this component.

It is recommended that the following Quality inspections be performed as delineated in the Component Revalidation Checklist for one station engine:

- Confirm gear assembly material by material comparator test.
- Perform visual inspection of assembled accessory drive gear and measure shaft/bearing clearance. This clearance can be measured by placing dial indicator on gear and manually moving gear in all directions.
- Visually inspect gear for wear, spalling, cracks.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Overspeed Trip: Couplings (Flexible and Spider) UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-410C TASK DESCRIPTION NO. DR-06-03-410C-0

SNPS GPL NO. 03-410C CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the Shoreham lead engine DR/QR report, which establishes the acceptability of the overspeed trip couplings. The parts under review are the same as those of the lead engine.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

The following maintenance recommendations should be implemented to improve the reliability of the River Bend design:

- Either modify the maintenance specifications to replace the Lovejoy coupling spiders at every fuel outage, or, during the fuel outages, test the coupling elastomer for hardness and replace if it has exceeded the coupling manufacturer's specification.
- Discontinue use of Loctite 680 on heavy interference fits, but use Loctite 609 in a manner prescribed by TDI SIM #363 during assembly.
- Modify the maintenance specifications to check for coupling shaft looseness during fuel outages.
- At the next refueling outage, remove the present Lovejoy couplings and replace with new units. The shafts upon which each half are to be mounted should be measured and machining modifications made to the coupling halves to keep the interference fit below 0.0005 inch. Other procedures outlined in SIM 363 should be followed, except with using Loctite 609 in place of 680 when reassembled.

There are no modification recommendations for this component.

The following Quality inspection is recommended to be performed:

- Perform a visual examination of the coupling for signs of wear, deterioration or any other discontinuities, on Engines 1A and 1B.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Overspeed Trip Vent Valve UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-410D TASK DESCRIPTION NO. DR-06-03-410D-0

SNPS GPL NO. 03-410D CLASSIFICATION TYPE A

TASK DESCRIPTIONS

A design review for this component is not required, based on the following:

- A review of the EDG Component Tracking System indicated that applicable industry experience has been addressed via the maintenance recommendation herein. There are no site experiences listed in the Component Tracking System.
- A review of the lead engine DR/QR report (Shoreham).
- The overspeed trip vent valve used at River Bend is the same valve as that used at Shoreham.

The following maintenance from the lead engine DR/QR report should be implemented:

- The valve o-rings should be replaced every 5 years.

There are no modifications required for this component based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Governor Linkage

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-413

TASK DESCRIPTION NO. DR-06-03-413-0

SNPS GPL NO. 03-413

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review of the governor linkage is not necessary for River Bend based on the following:

- Review of the EDG Component Tracking System indicates no significant industry experience items reported. No experience items are reported for the River Bend Station.
- Identical parts are used at Shoreham and River Bend. The Shoreham governor linkage was reviewed in detail and found acceptable, Ref. 2.
- Review of the governor linkage for both lead engines has indicated no inherent design flaws that cannot be addressed by appropriate maintenance procedures.

The following maintenance procedures have been recommended in the lead engine review and are recommended for River Bend:

- Monthly inspections for loose parts should be performed, and future tightening of this hardware due to loose parts should include the addition of lockwire to the lever arm clamp bolts and shaft roll pins.

Quality inspections performed to date have been reviewed and are considered satisfactory. The following Quality inspection is recommended to be performed for both station engines:

- Perform a visual inspection on the governor linkage for signs of corrosion, wear, pitting and discoloration.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone & Webster Specification number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Lousiana.

2. Stone & Webster Calculation number 11600.02-NM(B)-437-CZC-005 "Governor Linkage Assembly, Design Review and Seismic Qualification".

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Governor Linkage UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-413 REV. NO. 1

SNPS GPL NO. 03-413

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection on the governor linkage for signs of corrosion, wear, pitting and discoloration.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Integrity of the governor linkage

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Absence of corrosion, wear, pitting and discoloration on the governor linkage.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve R. Schwartz PROGRAM MANAGER J C Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. No inspection reports have been received which fulfill these requirements.

NOTE: Verification was made that during engine operation the governor and fuel pump linkages were free moving. This was reported by TER# 06-071.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nuta A Zaleta PROGRAM MANAGER JC Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Governor Assembly: Woodward Governor

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-415A

TASK DESCRIPTION NO. DR-06-03-415A-0

SNPS GPL NO. 03-415A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component, based on the lead engine DR/QR report (Shoreham), which establishes the acceptability of the Woodward governor.

A review of the EDG Component Tracking System indicates no significant applicable industry or site experience.

The TDI suggested maintenance schedules, outlined in their instruction manual, should be carefully followed, including daily checks of the oil level, governor settings, and mechanical connections, and annual replacement of the hydraulic oil.

In addition, the following maintenance recommendations should be implemented to improve component reliability:

- Modify the surveillance testing procedures to include an evaluation of the governor settings by means of the two tests given below:

  (a) Perform a test of the governor settings while under joint electrical and mechanical governor control, with the diesel generator off the grid in the isochronous mode;

  (b) Perform a test of the governor settings while under mechanical (only) governor control, with the diesel generator off the grid in the isochronous mode.

  These tests shall include examination of the engine speed transients during start and transient loading conditions. Included as part of the above tests is the verification that the engine set speed of 450 rpm is not exceeded by more than 11.2 percent (500 rpm max.) either during an engine start or during the largest single load reduction.

- Augment the setting adjustment procedures, as described in the Woodward manuals, to include tests of the governor response during an engine start to ensure agreement with the specifications indicated above.

TASK DESCRIPTIONS (continued)

- Modify the cleanness control specification to ensure that appropriate procedures are followed when adding or changing the governor oil so as not to contaminate fresh oil and the interior of the governor.

- Modify the maintenance schedules to ensure that the hydraulic actuator is vented per the Woodward Instructions when more than a half quart of oil is added to the unit.

There are no modification recommendations for this component.

The following Quality inspection is recommended to be performed:

- Review site instructions to ensure sufficient detail and clarity exists in order to properly set the governor.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Governor Assembly Booster Servomotor UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-415B TASK DESCRIPTION NO. DR-06-03-415B-0

SNPS GPL NO. 03-415B CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the applicable industry experience and the lead engine DR/QR reports (Shoreham/Comanche Peak). There is no site experience in the EDG Component Tracking System for this component.

There are no maintenance or modification recommendations for this component.

The following Quality inspection is recommended to be performed on all station engines:

- Verify that the following installation criteria are met on the booster servomotor:

  a. Booster servomotor is mounted at a lower level than governor.
  b. Inlet booster line is $^3/_8$ inch and the outlet booster line is at least ¼ inch.
  c. Oil lines should slope upward from the booster to the governor and should have a minimum number of loops or bends.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Governor Assembly Heat Exchanger

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-415C

TASK DESCRIPTION NO. DR-06-03-415C-0

SNPS GPL NO. 03-415C

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the lead engine DR/QR report.
- A review of the lead engine DR/QR reports (Shoreham/Comanche Peak).
- As with Shoreham and Comanche Peak, the River Bend governor was supplied by Woodward Governor Company and the heat exchanger was manufactured by Young Radiator Company, to Woodward Governor Specifications, for use with the governor assembly. The operating conditions for River Bend's heat exchanger are the same as Shoreham and Comanche Peak.

There are no maintenance items or modifications recommended for this component, based on the lead engine reports.

Quality inspections performed for this component have been reviewed and all required inspections have been completed with satisfactory results.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Governor Assembly - Heat Exchangers

UTILITY Gulf States Utilities River Bend Station

GPL NO. 03-415C

REV. NO. 1

SNPS GPL NO. 03-415C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the cooler is mounted below the oil level in the governor.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper installation of the cooler

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Cooler is mounted below oil level in accordance with TDI Manual Woodward Governor Co., Bulletin 36641B, pages 1-3.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures, TDI Parts Manual - Woodward Governor Co., Bulletin 36641B titled,"Governor Oil Heat Exchanger".

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve M. Schaft PROGRAM MANAGER J C Kammerer

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The cooler was verified to be mounted below the oil level in the governor. This was reported by TER# 06-072.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. The cooler was verified to be mounted below the oil level in the governor. This was reported by TER# 06-072.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salerta. PROGRAM MANAGER J C Kammeyer

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

ENGINE SHUTDOWN EQUIPMENT - TUBING/FITTINGS & SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-695A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the engine shutdown equipment - tubing/fittings and supports to withstand the effects of normal operating and earthquake loadings. The primary function of this component is to maintain the capability to effect engine shutdown.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the tubing and supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience. See Appendix C for results.
- The Quality Revalidation Checklist results were reviewed for acceptability.
- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology of this evaluation.

IV RESULTS AND CONCLUSIONS

The engine external tubing and supports, as defined by this Component Design Review, have been evaluated in accordance with Reference 1 and have been found acceptable with modifications provided the final assembly of Engine B is verified to be similar to Engine A.

The engine internal tubing and supports for Engine A high temperature bearing trip, as defined by this component review have been found to be acceptable based upon the results obtained from the review of the comparable components on the DSR-48 engines at Shoreham, and in the fact that a review of all nuclear and non-nuclear industry experiences indicates that there are no design problems that affect the structural integrity of this component. In addition, it should be noted that because of spatial restrictions all sections of unsupported tubing will meet acceptable span lengths.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review, and information contained in Reference 2, it is concluded that the tubing and supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

Engine A

- It is recommended that two-directional restraints be added to line E19, high temperature bearing trip tubing, between each engine casing connection similar to the installation on Engine B.

- It is recommended that three-directional restraints be added to lines E23H and E24 within 12 inches of the turbo mounted vibraswitch to minimize operating vibrations at the instrument connections.

Engine B

- The installation of the engine shutdown tubing system was incomplete at the time of the engine walkdown including the internal tubing. Therefore, it is recommended that the tubing and supports including the recommended modifications stated in this report be installed on Engine B similar to Engine A.

General

- All instrument tubing routed along the face of the governor end of both engines is not attached to the structure. Two-directional supports mounted to the engine casing should be provided within 4 feet - 0 inch maximum span intervals. Multi tube supports should be designed with spacers and cover plates. Location of supports should accommodate thermal expansion by providing a minimum of 6-inch offset around bends. Existing spacers between tubing supports need not be removed.

- The above is also applicable to tubing running along the sides of the engines.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

2. Stone & Webster Calculation number 11600.60-NP(B)-0601-XH

3. Memo No. 6480 from C. Malovrh/SWEC to J. Kammeyer/SWEC 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Engine Shutdown Equipment Tubing/Fittings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-695A

TASK DESCRIPTION NO.: DR-06-03-695A-1

SNPS GPL NO. 03-695A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Perform an engineering review of the tubing and supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Maintain capability to effect engine shutdown.

ATTRIBUTES TO BE VERIFIED

Structural adequacy of the tubing and supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

IEEE 387

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group" Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations).

GROUP CHAIRPERSON J J Power PROGRAM MANAGER J C Kammeyer

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Engine Shutdown Equipment - Tubing and Fittings UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-695A REV. NO. 1

SNPS GPL NO. 03-695A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the tubing and fittings if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nita A Saleta PROGRAM MANAGER J Kanning

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-695A

Effective Printout Dates: 11/05/84

COMPONENT TYPE: Engine Shutdown Equipment - Tubing/Fittings

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
Diesel tripped from high jacket water temperature caused by low lube oil level. Engine ran successfully after oil was added.	North Anna 2 LER 339-83054	Shutdown system worked properly. Does not affect component design or integrity.
Instrument line to cooling jacket water line was leaking. Cause found to be a crack in ¼" nipple.	Palisades LER 255-77000	This is an isolated event and has not occurred at River Bend. Does not affect component design or integrity.
Air leak found on pressure gauge sensing line. Fittings were tightened and diesel operated properly.	Zion 2 LER 304-75000	This failure probably resulted from improper tightening of fittings during installation and has not occurred at River Bend. Does not affect component design or integrity.
Engine tripped because of air leak on line to fuel shutoff pistons.	Zion 1 LER 295-80028	This event probably resulted from improper tightening of fittings during installation and has not occurred at River Bend. Does not affect component design or integrity.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Diesel tripped because a leak in a line to the master shutdown cylinder. Pipe nipple was replaced.	Zion 2 LER 304-77000	This probably resulted from inadequately supported piping. The design report for this component concludes that the lines are adequately supported.
Engine failed to start because of clogged orifice in air relay system.	Monticello NPRDS 770411	This is a maintenance item and does not affect component design integrity.
Diesel tripped because of split pipe nipple in control air system. Pipe nipple replaced.	Zion 2 LER 304-770691-1	Pipe nipples used at River Bend are schedule 80, which will prevent this problem.
Dirt particles clogged small bleed-off orifice in air relay air start system.	Monticello 1 NPRDS 770411	The valves, regulators and orifices are recommended to be cleaned on a routine basis (See Design Report for C3-695B).

NON-NUCLEAR

None

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Engine Shutdown Equipment - Valves, Regulators, Orifices

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-695B

TASK DESCRIPTION NO. DR-06-03-695B-0

SNPS GPL NO. 03-695B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Based on review of the DR/QR lead engine report (Comanche Peak), a design review for the engine shutdown equipment (valves, regulators, and orifices) is not required for River Bend.

The engine shutdown equipment used on River Bend is identical to that used at Comanche Peak, with regard to manufacturer and application. In addition, the configuration of this equipment on River Bend in the pneumatic shutdown system to trip on engine overspeed and to propagate the shutdown signal is also identical to Comanche Peak.

There is no site or non-nuclear industry experience listed in EDG Component Tracking System for this component. The nuclear industry experience listed does not show any significant problems applicable to River Bend design.

To minimize fouling of the engine shutdown equipment it is recommended that the equipment be inspected and cleaned and the elastomeric parts be replaced during each refueling outage. This recommended maintenance interval should be reassessed depending on the degree of system fouling.

There are no recommended modifications for the engine shutdown equipment (valves, regulators and orifices).

Quality Revalidation for the engine shutdown equipment valves, regulators and orifices is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Engine Shutdown Trip Switches

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-695C

TASK DESCRIPTION NO. DR-06-03-695C-0

SNPS GPL NO. 03-695C

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Based on a review of the lead DR/QR report (Comanche Peak), a design review for the engine shutdown trip switches is not required for River Bend.

The application and manufacturer of the engine shutdown trip switches used on River Bend are identical to those on Comanche Peak with the exception of a low pressure trip switch, F-573-378. This California Controls pressure switch is installed in the jacket water system and actuates to trip the diesel or low pressure. The switch has a narrow trip range and, therefore, is sensitive to the lower pressures in the jacket water system.

There is no site experience listed in the EDG Component Tracking System for the engine shutdown trip switches. The applicable nuclear and non-nuclear industry experiences listed do not indicate any generic or significant problems with the trip switches.

There are no maintenance or modification recommendations for the engine shutdown trip switches.

Quality Revalidation of the engine shutdown trip switches is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

COMPONENT DESIGN REVIEW CHECKLIST

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI DIESEL GENERATOR

DESIGN REVIEW AND QUALITY REVALIDATION REPORT

Prepared For

GULF STATES UTILITIES

RIVER BEND STATION

By

TDI DIESEL GENERATOR OWNERS GROUP

VOLUME 4

How To Use This Report

Tabs in this report identify the following categories:

Turbo, Intake, Intercooler & Exhaust
Lube Oil
Engine Base & Bearing Caps
Crankshaft & Bearings
Cylinder Block, Liners & Water Manifold
Air Start & Barring Device
Connecting rods
Pistons
Camshaft & Valve Train
Idler Gear Assembly & Front Gear Case
Flywheel
Engine Instrumentation & Wiring
Overspeed Trip & Governor
Engine Shutdown & Equipment
Jacket Water
Cylinder Heads & Valves
Fuel Oil Injection
Generator
Control Panel Assembly
Engine & Auxiliary Sub-Base & Foundation Bolts

These categories have been defined to allow the reader to review a complete diesel generator subsystem in a convenient manner.

Within each category tabs identify River Bend specific component numbers.

A given component report can be found by:

a) If the component nubmer is known - use the alpha - numeric index which identifies the volume number and category in which the component report is located.

b) If only the component name is known - Section 3.2 may be used as a cross-reference to find the volume number where the component report may be found.

Some reports address more than one component. A tab is provided for each component. However, some components are combined under one report. Slip sheets are provided where required to reference back to the appropriate tab. Some components required more than one report. These are identified by the abbreviation LB-Large Bore and SB-Small Bore on the component number tabs.

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
F-068	Intercooler	X	X	Turbo, Intake, Intercooler & Exhaust	2
MP-020	Turbocharger	X	X	Turbo, Intake, Intercooler & Exhaust	2
00-420	Lube Oil Pressure Regulating Valve	X	X	Lube Oil	2
03-CFR	Turbocharger Thrust Bearing Drip Lube System	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-305A	Base and Bearing Caps: Base Assembly	X	X	Engine Base & Bearing Caps	2
03-305C	Base and Bearing Caps: Main Bearing Studs & Nuts	X	X	Engine Base & Bearing Caps	2
03-305D	Base and Bearing Caps: Main Bearing Caps	X	X	Engine Base & Bearing Caps	2
03-305E	Base and Bearing Caps - Through Bolting	X	X	Engine Base & Bearing Caps	2
03-307A	Lube Oil Fittings: Internal - Headers	X	X	Lube Oil	2
03-307B	Lube Oil Fittings: Internal - Tubing & Fittings	X	X	Lube Oil	2
03-307D	Lube Oil Fittings Internal: Supports	X	X	Lube Oil	2
03-310A	Crankshaft	X	X	Crankshaft & Bearings	2
03-310B	Main Bearings	X	X	Crankshaft & Bearing	2
03-310C	Crankshaft & Bearings: Thrust Bearing Rings.	X	X	Crankshaft & Bearing	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-315A	Cylinder Block	X	X	Cyl. Block & Liners & Water Manifold	2
03-315C	Cylinder Block Liners & Water Manifold - Cylinder Liner	X	X	Cyl. Block & Liners & Water Manifold	2
03-315D	Cylinder Block Liners & Water Manifold: Jacket Water Manifold & Piping	X	X	Cyl. Block & Liners & Water Manifold	2
03-315E	Cylinder Block Liners & Water Manifold: Studs	X	X	Cyl. Block & Liners & Water Manifold	2
03-315F	Cylinder Block Liner & Water Manifold: Cylinder Head Nuts	X	X	Cyl. Block & Liner & Water Manifold	2
03-315G	Cylinder Block Liners & Water Manifold: Seals & Gaskets	X	X	Cyl. Block & Liners & Water Manifold	2
03-317A	Water Discharge Manifold: Jacket Water Discharge Manifold	X	X	Jacket Water	4
03-317B	Water Dicharge Manifold: Coupling & Seals	X	X	Jacket Water	4
03-317C	Water Discharge Manifold: Supports	X	X	Jacket Water	4
03-330A	Flywheel	X	X	Flywheel	3
03-330B	Flywheel - Bolting	X	X	Flywheel	3
03-335B	Front Gear Case: Gaskets and Bolting		X	Idler Gear Assembly & Front Gear Case	3
03-340A	Connecting Rods: Rods & Bushings	X	X	Connecting Rods	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-340B	Connecting Rods: Bearing Shells	X	X	Connecting Rods	3
03-341A	Pistons	X	X	Pistons	3
03-341B	Pistons: Rings	X	X	Pistons	3
03-341C	Piston: Pin Assembly	X	X	Pistons	3
03-345A	Tappets and Guides: Intake & Exhaust Tappet Assembly	X	X	Camshaft & Valve Train	3
03-345B	Tappets and Guides: Fuel Tappet Assembly	X	X	Camshaft & Valve Train	3
03-345C	Tappets and Guides: Fuel Pump Base Assembly	X	X	Camshaft & Valve Train	3
03-350A	Camshaft: Camshaft Assembly	X	X	Camshaft & Valve Train	3
03-350B	Camshaft: Camshaft Bearing	X	X	Camshaft & Valve Train	3
03-350C	Camshaft: Supports, Bolting and Gear	X	X	Camshaft & Valve Train	3
03-355A	Idler Gear Assembly: Crank To Pump Gear	X	X	Idler Gear Assembly & Front Gear Case	3
03-355B	Idler Gear Assembly	X	X	Idler Gear Assembly & Front Gear Case	3
03-355C	Idler Gear Assembly: Gaskets & Bolting		X	Idler Gear Assembly & Front Gear Case	3
03-359	Air Start Valve	X	X	Air Start & Barring Device	3
03-360A	Cylinder Heads	X	X	Cylinder Heads & Valves	4

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-360B	Cylinder Head Valves: Intake & Exhaust Valves	X		Cylinder Heads & Valves	4
03-360C	Cylinder Head and Valves: Bolting and Gaskets	X	X	Cylinder Heads & Valves	4
03-360D	Cylinder Head and Values: Springs and Retainer	X	X	Cylinder Heads & Valves	4
03-362A	Subcovers	X	X	Camshaft & Valve Train	3
03-365A	Fuel Injection Equipment Fuel Injection Pump	X	X	Fuel Oil Injection	4
03-365B	Fuel Injection Equipment Fuel Injection Tips	X		Fuel Oil Injection	4
03-365C	Fuel Injection Equipment - Tube Assembly	X	X	Fuel Oil Injection	4
03-365D	Fuel Injection Equipment: Supports	X	X	Fuel Oil Injection	4
03-371A	Fuel Pump Control Shaft, Linkage Assembly & Bearings	X	X	Fuel Oil Injection	4
03-371B	Fuel Pump Linkage: Linkage Assembly and Bearing	X	X	Fuel Oil Injection	4
03-371C	Fuel Pump Linkage: Automatic Shutdown Cylinder	X	X	Fuel Oil Injection	4
03-375	Air Intake Manifold and Piping	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-380A	Exhaust Manifold	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-380B	Exhaust Manifold: Gasket and Bolting	X	X	Turbo, Intake, Intrclr. & Exhaust	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-385B	Cylinder Block Covers: Gaskets and Bolting	X	X	Cyl. Block & Liners & Water Manifold	2
03-387A	Crankcase Ventilator: Crankcase Vacuum Fan	X	X	Crankshaft & Bearings	2
03-390A	Intake & Intermediate and Exhaust Rocker Shaft Assembly	X	X	Camshaft & Valve Train	3
03-390B	Rocker Arms and Pushrods: Exhaust Rocker Shaft Assembly	X	X	Camshaft & Valve Train	3
03-390C	Main and Connector Pushrods	X	X	Camshaft & Valve Train	3
03-390D	Rocker Arms and Pushrods: Pushrods Connector.	X	X	Camshaft & Valve Train	3
03-390E	Rocker Arms and Pushrods: Bushings	X		Camshaft & Valve Train	3
03-390F	Rocker Arms and Pushrods: Lifters	X	X	Camshaft & Valve Train	3
03-390G	Rocker Arms and Pushrods: Miscellaneous Bolts & Drive Studs	X	X	Camshaft & Valve Train	3
03-402A	Governor Drive - Governor & Tachometer Drive Gear & Shaft	X	X	Overspeed Trip & Governor	3
03-402B	Governor Drive - Couplings, Pins & Keys	X	X	Overspeed Trip & Governor	3
03-410A	Overspeed Trip: Governor	X	X	Overspeed Trip & Governor	3
03-410B	Overspeed Trip: Governor and Accessory Drive Assembly	X	X	Overspeed Trip & Governor	3
03-410C	Overspeed Trip: Coupling (Flexible & Spider)	X	X	Overspeed Trip & Governor	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-410D	Overspeed Trip Vent Valve	X	X	Overspeed Trip & Governor	3
03-413	Governor Linkage	X	X	Overspeed Trip & Governor	3
03-415A	Governor Assembly: Woodward Governor	X	X	Overspeed Trip & Governor	3
03-415B	Governor Assembly Booster Servomotor	X		Overspeed Trip & Governor	3
03-415C	Governor Assembly Heat Exchanger	X	X	Overspeed Trip & Governor	3
03-420	Engine Driven Lube Oil Pump	X	X	Lube Oil	2
03-425A	Engine Driven Jacket Water Pump	X	X	Jacket Water	4
03-435A	Jacket Water Fittings: Pipe & Fittings	X	X	Jacket Water	4
03-435B	Jacket Water Fittings: Piping, Tubing & Supports	X	X	Jacket Water	4
03-437A	Turbo Water Piping: Pipe & Fittings	X	X	Jacket Water	4
03-437B	Turbo Water Piping: Supports	X	X	Turbo Intake Intercooler & Exhaust	2
03-441A	Starting Air Manifold: Piping, Tubing and Fitting	X	X	Air Start & Barring Device	3
03-441B	Starting Air Manifold Valves, Strainers, Filters	X	X	Air Start & Barring Device	3
03-441C	Starting Air Manifold: Supports	X	X	Air Start & Barring Device	3
03-442A	Starting Air Distributor: Distributor Assembly	X	X	Air Start & Barring Device	3
03-442B	Starting Air Distributor: Tubing, Fittings & Gaskets	X	X	Air Start & Barring Device	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-445	Engine Driven Fuel Oil Booster Pump	X	X	Fuel Oil Injection	4
03-450B	Fuel Oil Header: Piping & Tubing	X	X	Fuel Oil Injection	4
03-450D	Fuel Oil Header: Fuel Oil Supports	X	X	Fuel Oil Injection	4
03-455A	Fuel Oil Filters & Strainers: Fuel Oil Filters	X		Fuel Oil Injection	4
03-455B	Fuel Oil Filters & Strainers: Strainers	X		Fuel Oil Injection	4
03-455C	Fuel Oil Filters & Strainer: Mounting Hardware	X	X	Fuel Oil Injection	4
03-460A	Lube Oil Full Pressure Strainer	X	X	Lube Oil	2
03-465A	Lube Oil Lines External: Tubing, Fittings, Couplings	X	X	Lube Oil	2
03-465B	Lube Oil Lines - External Supports	X	X	Lube Oil	2
03-465C	Lube Oil Lines - External: Valves	X	X	Lube Oil	2
03-467A	Turbocharger: Lube Oil Fitting - Pipe, Tubing, Fittings & Flexible Coupling	X	X	Lube Oil	2
03-467B	Turbocharger: Lube Oil Fittings - Supports	X	X	Lube Oil	2
03-475A	Turbocharger: Bracket	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-475B	Turbocharger - Bracket: Air Butterfly Valve Assembly	X	X	Turbo, Intake, Intrclr. & Exhaust	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-475C	Turbocharger: Bracket - Air Intake Piping	X	X	Turbo, Intake, Intrclr. & Exhaust	2
03-475D	Turbocharger Bracket Bolting & Gaskets	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-475E	Turbocharger - Bracket - Pipe Support	X		Turbo, Intake, Intercooler & Exhaust	2
03-500A	Control Panel Assembly: Cabinet/System	X		Control Panel Assembly	4
03-500F	Control Panel Assembly Accumulator	X	X	Control Panel Assembly	4
03-500G	Control Panel Valves	X	X	Control Panel Assembly	4
03-500H	Control Panel Assembly Pressure Switch	X	X	Control Panel Assembly	4
03-500J	Control Panel Assembly: Control Relays	X	X	Control Panel Assembly	4
03-500K	Control Panel Assembly: Solenoid Valves	X	X	Control Panel Assembly	4
03-500M	Control Panel Components: Piping, Tubing, Fittings		X	Control Panel Assembly	4
03-500N	Control Panel Assembly: Terminal Boards/Switches/ Wiring		X	Control Panel Assembly	4
03-515	Jacket Water Thermostatic Valve	X	X	Jacket Water	4
03-525B	Barring Device - Pneumatic: Regulator Valve Shut Off Valve	X	X	Air Start & Barring Device	3
03-525D	Barring Device Support Bracket	X	X	Air Start & Barring Device	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-540A	Lube Oil Sump Tank - Tank with Strainer Assembly		X	Lube Oil	2
03-540B	Lube Oil Sump Tank: Misc. Fittings, Gaskets, Pipe & Bolting Material, Valves	X	X	Lube Oil	2
03-540C	Lube Oil Sump Tank: Mounting Hardware	X	X	Lube Oil	2
03-550	Foundation Bolts: Anchors, Bolts, Misc. Hardware	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-630A	Pyrometer Conduit Assembly: Conduit	X	X	Engine Instrumentation & Wiring	3
03-630B	Pyrometer Conduit Assembly: Conduit Fittings	X	X	Engine Instrumentation & Wiring	3
03-630C	Pyrometer Conduit Assembly: Support	X	X	Engine Instrumentation & Wiring	3
03-630D	Pyrometer Conduit Assembly: Thermocouples	X		Engine Instumentation & Wiring	3
03-650A	Emergency Diesel Generator	X	X	Generator	4
03-650B	Generator Control	X	X	Generator	4
03-650C	Generator - Shaft & Bearings		X	Generator	4
03-688A	Engine & Aux Module Wiring Material- Conduit & Fittings; Pyrometer Conduit Assembly- Conduit, Fitting, Supports	X	X	Engine Instrumentation & Wiring	3

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-688B	Engine & Aux. Module Wiring Material: Wiring & Terminations	X	X	Engine Instrumentation & Wiring	3
03-688C	Engine & Aux. Module Wiring Material: Boxes & Terminals		X	Engine Instrumentation & Wiring	3
03-689	Off Engine Safety Alarm Sensors Wiring	X	X	Engine Instrumentation & Wiring	3
03-690	On Engine Alarm Sensors	X	X	Engine Instrumentation & Wiring	3
03-691	Off Engine Alarm Sensors Level & Pressure Switches	X	X	Engine Instrumentation & Wiring	3
03-695A	Engine Shutdown Equipment: Tubing/Fittings & Supports	X	X	Engine Shutdown & Equipment	3
03-695B	Engine Shutdown Equipment: Valves, Regulator, Orifices	X	X	Engine Shutdown & Equipment	3
03-695C	Engine Shutdown Trip Switches	X	X	Engine Shutdown & Equipment	3
03-700A	Jacket Water Standpipe: Pipe, Fittings, Gaskets	X	X	Jacket Water	4
03-700B	Jacket Water Standpipe: Valves		X	Jacket Water	4
03-700C	Jacket Water Standpipe: Supports	X	X	Jacket Water	4
03-700E	Jacket Water Standpipe: Switches	X	X	Jacket Water	4
03-700F	Jacket Water Standpipe: Misc. Bolting Mat.	X	X	Jacket Water	4

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-715A	Sub Base - Sub Base Engine & Generator	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-715B	Sub Base Bolting	X	X	Engine & Aux. Sub Base & Foundation Bolts	4
03-717A	Aux Sub Base & Oil & Water Piping - Aux. Skid	X	X	Jacket Water	4
03-717B	Aux Sub Base & Oil & Water Piping - Jacket Water: Valves	X	X	Jacket Water	4
03-717C	Aux. Sub Base & Oil & Water Piping - Jacket Water - Pipe Couplings, Fittings, Orifices and Strainers	X	X	Jacket Water	4
03-717D	Aux Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X	Jacket Water	4
03-717F	Aux. Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting		X	Jacket Water	4
03-717G	Aux. Sub Base & Oil & Water Piping - Jacket Water: Supports	X	X	Jacket Water	4
03-717H	Aux. Sub Base & Oil & Water Piping - Lube Oil: Pipe and Fittings	X	X	Lube Oil	2
03-717I	Aux Sub Base & Oil & Water Piping - Lube Oil Valves	X	X	Lube Oil	2
03-717J	Aux. Sub Base & Oil & Water Piping - Lube Oil - Gaskets & Bolting	X	X	Lube Oil	2
03-717K	Aux. Sub Base & Oil & Water Water Piping - Lube Oil: Supports & Mounting Hardware	X	X	Lube Oil	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-717L	Aux. Sub Base & Oil & Water Piping - Lube Oil: Automatic Switchover Assembly	X	X	Lube Oil	2
03-717M	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Piping and Fittings	X	X	Fuel Oil	4
03-717N	Aux Sub Base & Oil & Water Piping - Fuel Oil: Valves	X	X	Fuel Oil	4
03-717P	Aux Sub Base & Oil & Water Piping - Fuel Oil - Gaskets & Bolting	X	X	Fuel Oil	4
03-717Q	Aux. Sub Base & Oil & Water Piping - Fuel Oil: Supports	X	X	Fuel Oil	4
03-800A	Misc. Equipment - Heater, Jacket Water	X	X	Jacket Water	4
03-800B	Misc. Equipment - Heater, Lube Oil Sump Tank	X	X	Lube Oil	4
03-800C	Misc. Equipment - Starting Air Tank Relief Valve	X	X	Air Start & Barring Device	3
03-805B	Intake Air Filter	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-805D	Flex Connections	X	X	Turbo, Intake, Intercooler & Exhaust	2
03-810B	Jacket Water Standby Heater Pump	X	X	Jacket Water	4
03-820A	Lube Oil Heat Exchanger	X	X	Lube Oil	2
03-820B	Full Flow Lube Oil Filter	X	X	Lube Oil	2
03-820C	Before-and-After Lube Oil Pump	X	X	Lube Oil	2

Index (continued)

Component Number	Component Description	DR Req'd	QR Req'd	Category	Volume No.
03-820D	Oil Prelube Filter	X	X	Lube Oil	2
03-825A	Fuel Oil Booster Pump	X		Fuel Oil	2
03-825C	Fuel Oil Filters & Strainers: Strainers	X	X	Fuel Oil	4
03-835A	Starting Air Tank	X	X	Air Start & Barring Device	3
03-835D	Starting Air Compressor	X		Air Start & Barring Device	3
03-835F	Air Start System - Starting Air Float Trap	X		Air Start & Barring Device	3
02-835G	Starting Air Tank Relief Valve	X	X	Air Start & Barring Device	3

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

WATER DISCHARGE MANIFOLD-JACKET WATER
DISCHARGE MANIFOLD, COUPLINGS AND SEALS
(LARGE BORE SCOPE ONLY)
COMPONENT PART NO. 03-317A&B

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the jacket water discharge manifold for the effects of normal operating and earthquake loadings.

The primary function of the manifold piping is to carry jacket water from the engine ports to the jacket water standpipe.

The primary function of the coupling and seals is to seal jacket water and accommodate thermal expansion.

The scope of piping embraced by this report includes the large bore (greater than 2-inch diameter) piping components as noted on the as-built information transmitted to Impell and obtained during Impell field verification (Ref. 1), plus small bore piping, which was included because the configuration.

Piping components are defined as piping spool pieces, elbows, tees, flanges, Dresser couplings, and the interconnecting welds. This scope is uniquely defined in terms of Transamerica Delaval, Inc. (TDI) part numbers in Reference 1.

II OBJECTIVE

The objective of this review was to verify the adequacy of the subject piping components for normal operating and earthquake loadings.

III METHODLOGY

The evaluation of the piping was performed in accordance with the philosophy and intent of the ASME Section III Code, for Class 3 Nuclear Piping. Towards this end, a criteria document was developed, "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," which describes the background and provides the technique for evaluating the subject piping components and supports. These criteria are presented in their entirety in Reference 2.

Quality Revalidation Checklist results were reviewed for acceptability.

The TDI Emergency Diesel Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience.

IV RESULTS AND CONCLUSIONS

All piping stresses were within the design allowables specified by the ASME Section III Code.

The movements at the Dresser couplings (Style 65) are within the manufacturer's end movement requirements (Ref. 3). There are no service life constraints (Ref. 4) because these styles of couplings have no significant history of failure. Shelf life (Ref. 4) is unlimited as long as the gaskets remained packaged and protected from the elements (light, water, etc. The Style 65 couplings are marginal with respect to manufacturer's service condition limits. Note, however, that a slightly marginal gasket would develop a leak and would be replaced, as per Reference 5.

In order to provide adequate load transfer capabilities, the following maintenance recommendation should be implemented:

- Ensure that all bolts on the flange with the support attached are Grade A449 or better (based on ASME allowable stress) and torqued as specified in Appendix 4 of the Delaval Instruction Manual, Vol. 1 for Model DSR-48.

All pipe loads on the engine have been tabulated and issued for evaluation.

There are no TERs associated with this component.

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review, it is concluded that the subject piping components, with the implementation of the recommended maintenance described above, are adequate for their intended design function at River Bend.

V REFERENCES

1. "Supporting Calculations for the Evaluation of River Bend Diesel Generator Large Diameter Piping and Supports," Impell Report No. 02-0630-1271, Rev. 0, October 1984.

2. "Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984. This is included in Appendix III of the final DR/QR report.

3. Dresser Pipe Couplings, Pipe Fittings, and Pipe Repair Products Catalog, No. 63.

4. Telephone conversation between A. Palumbo (Impell) and M. Riley (Dresser Manufacturing Co.), dated June 5, 1984.

5. Letter from A. Palumbo (Impell) to Kammeyer (SWEC), "Dresser Couplings - River Bend", dated 10/29/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Discharge Manifold/Piping (Large Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-317A&B

TASK DESCRIPTION NO. DR-06-03-317A&B-1

SNPS GPL NO. 03-317A&B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Evaluate structural integrity of the jacket water discharge manifold piping spool pieces and fittings, for the effects of normal operating and earthquake loadings by (a) comparison to previous analyses, (b) review of previous qualification documentation, and/or (c) actual performance of stress evaluation in accordance with the intent and philosophy of ASME III Class 3 and Impell Design Criteria.

Review information provided on TERs.

PRIMARY FUNCTION

Carry jacket water from engine ports to jacket water standpipe.

ATTRIBUTE TO BE VERIFIED

Structural integrity of large bore (greater than 2 in. dia.) piping spool pieces and fittings to withstand the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

None

REFERENCES

"Design Criteria for Diesel Generator Large Diameter Piping for River Bend," Impell Report No. 02-0630-1270, Rev. 0, October 1984

DOCUMENTATION REQUIRED

Verified piping isometric, material specification, size and schedule, design parameters (temp., pressure), contents, and insulation.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Water Discharge Manifold: Jacket Water Discharge Manifold

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-317A

REV. NO. 1

SNPS GPL NO. 03-317A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the discharge manifold if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER DC Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Siletta PROGRAM MANAGER [illegible]

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Water Discharge Manifold - Coupling and Seals

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-317B

REV. NO. 1

SNPS GPL NO. 03-317B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify the type of Dresser coupling installed.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper Dresser coupling is installed.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Proper Dresser coupling is installed

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M Schwartz PROGRAM MANAGER J Kamm

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Sorlita PROGRAM MANAGER. X Kuenning

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-317A&B

Effective Printout Date: 10/17/84

COMPONENT TYPE: Water Discharge Manifold: Jacket Water Discharge Manifold, Couplings, & Seals

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
During monthly surveillance testing the "A" diesel generator was shut down because of substantial coolant leakage in the No. 12 cylinder cooling jacket outlet. The cause was determined to be a failed gasket in the cooling water jacket outlet of the No. 12 cylinder.	LER Vermont Yankee, 271-8104-810518	Maintenance concern. Not related to the subject structural evaluation.
NON-NUCLEAR		
Capscrew breakage in the exhaust jumpers between the cylinder heads and exhaust manifold.	Letter from J.A. Smith (City of Homestead) to G.E. Trussell (TDI) dated 06/14/77 (File No. T-10)	Not in large bore piping scope of work. No effect on subject evaluation.
Capscrew breakage in the exhaust jumpers between the cylinder heads and exhaust manifold.	Letter from John Smith (City of Homestead) to G.E. Trussell (TDI) dated 05/14/77 (File No. T-55)	Not in large bore piping scope of work. No effect on subject evaluation.

TDI OWNERS GROUP

for

RIVER BEND STATION

WATER DISCHARGE MANIFOLD: COUPLING & SEALS

COMPONENT PART NO.: 03-317B

See Component Part No.: 03-317A

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Water Discharge Manifold Supports (Large Bore Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-317C

TASK DESCRIPTION NO. DR-06-03-317C-0

SNPS GPL NO. 03-317C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).

Based on previous experience, supports appear to be adequate provided that the analysis of the corresponding piping (Component No. 03-317A&B) does not mandate modifications. If the piping analysis warrants modification to the supports, these modifications will be addressed in the DR/QR report for Component No. 03-317A&B.

There are no maintenance recommendations for this component.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Engine Driven Jacket Water Pump

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-425A

TASK DESCRIPTION NO. DR-06-03-425A-0

SNPS GPL NO. 03-425A

CLASSIFICATION TYPE A

TASK DESCRIPTION

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience, except that which was previously addressed in the lead engine reports.

- A review of the lead engine DR/QR reports (Shoreham/Comanche Peak)

The engine driven jacket water pump at River Bend is similar in design, but different in size, to the pump at Shoreham and the impeller material at River Bend is cast iron (with keyway) while at Shoreham it is ductile iron (without keyway). Also, the shaft is larger in the impeller area for the River Bend pump.

The following maintenance from the lead engine DR/QR should be implemented:

The castle nuts on the impeller and gear ends do not have a specified maximum torque "not to be exceeded". It is recommended that the following maximum torque values be included in the River Bend maintenance procedures:

impeller nut: 40-48 ft.-lbs.
gear nut: 77 ft.-lbs.

Quality inspection performed to date have been reviewed and are considered satisfactory.

The following Quality inspections are recommended to be performed (Engine 1A):

- Determine the hardness of the pump shaft.

- Determine the material of the pump shaft.

- Perform a visual inspection of the pump shaft for signs of excessive galling wear or scoring. Document any questionable items with photographs.
- Perform a visual inspection of the pump driven gears for signs of pitting or galling. Document any questionable items with photographs.
- Perform a Liquid Penetrant test on the gear teeth and transition area (gear to shaft).
- Perform a visual inspection on the wear ring for evidence of galling or excessive wear.

The following modification is required, based on the lead engine report:

The impeller material for the River Bend pump should be changed from cast iron to the same spec. ductile iron as used on the Shoreham pump impellers (ASTM A-536 Grade 65-46-12). The keyway on the impeller should be eliminated to reduce the stress concentration.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Jacket Water Pump UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-425A REV. NO. 1

SNPS GPL NO. 03-425A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Determine the hardness of the pump shaft.
3. Determine the material of the pump shaft.
4. Perform a visual inspection of the pump shaft for signs of excessive galling wear or scoring. Document any questionable items with photographs.
5. Perform a visual inspection of the pump driven gears for signs of pitting or galling. Document any questionable items with photographs.
6. Perform a Liquid Penetrant test on the gear teeth and transition area (gear to shaft).
7. Perform a visual inspection on the wear ring for evidence of galling or excessive wear.

Engine 1B

1. Assemble and review existing documentation.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Hardness of the jacket water pump shaft
3. Material of the jacket water pump shaft

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

4. Lack of excessive galling wear or scoring on the pump shaft

5. Lack of pitting or galling on the pump driven gears

6. Surface integrity of the gear teeth and transition area

7. Lack of scoring, galling or reduction of cross-sectional area on wear ring

Engine 1B

1. Quality status of Component Document Package

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of inspection report by the Design Group

3. Shaft material to be 303SS

4-7. Review of inspection report by the Design Group

Engine 1B

1. Satisfactory Document Package

REFERENCES

Engine 1A

1. QCI No. 52

2-7. Approved Site NDE Procedures

Engine 1B

1. QCI No. 52

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-7. Inspection report

Engine 1B

1. Document Summary Sheet

GROUP CHAIRPERSON Steven M. Schwartz PROGRAM MANAGER J C Kummerger

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A hardness test was performed on the jacket water impeller. The results were reported by TER#'s 06-020 and 06-073.

3-7. No inspection reports have been received which fulfill these requirements.

NOTE - A visual inspection was performed on the impeller to verify that the impeller is made of a ferritic material. The results revealed that the impeller is magnetic and has a slight rust film covering most of the impeller.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

RESULTS AND CONCLUSION (continued)

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Vito A Salito PROGRAM MANAGER JC Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Fittings - Pipe & Fittings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-435A

TASK DESCRIPTION NO. DR-06-03-435A-0

SNPS GPL NO. 03-435A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There are no site experiences for this component in the EDG Component Tracking System.

There are no maintenance or modification recommendations for this component.

A field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loadings provided the supports are added/modified as indicated in DR/QR report 03-435B.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

JACKET WATER FITTINGS - PIPING, TUBING AND SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-435B

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the jacket water small bore piping and tubing components and supports to withstand the effects of normal operating and earthquake loadings. The primary function of the small bore piping is to provide jacket water from the intake manifold to the exhaust water jacket, and the primary function of the tubing is to provide jacket water to the governor lube oil cooler and to the turbocharger support brace. The primary function of the supports is to provide adequate restraint of the small bore piping/tubing system in the intended support load directions.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the small bore piping/tubing and supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objectives, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear and non-nuclear industry experience. See Appendix C for results.

- The Quality Revalidation Checklist results were reviewed for acceptability.

- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology for this evaluation.

IV RESULTS AND CONCLUSIONS

The small bore piping/tubing and supports, as defined by this component design review, have been evaluated in accordance with Reference 1 and have been found acceptable with modifications provided final assembly of Engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and information contained in Reference 2, it is concluded that the piping/tubing and supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

- Engine A

  The 1/2-inch diameter tube from the engine jacket water return line to the tubocharger support brace requires a two-directional restraint at the top of the riser near the turbocharger exhaust flange. Also, the existing rubber grommet support at the turbocharger should be modified to a two-directional restraint.

- Engine B

  The Engine B jacket water system installation was incomplete at the time of the walkdown. It is recommended that the small bore piping and tubing systems, including the Engine A modifications listed above, be installed so that both engines are similar.

V REFERENCES

1. Stone & Webster Generic Design Review Report No. 11600.60-DC-02, Revision 0, "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing and Supports for the TDI Owners Group," included as Report No. 11600.60-DC-02 of the overall summary report.

2. Stone & Webster Calcualtion Numbers 11600.60-NP(B)-0601-XH.

3. Memo No. 6480 from C. Malovrh (SWEC) to J. Kammeyer (SWEC) dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Fittings - Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-435B

TASK DESCRIPTION NO.: DR-06-03-435B-2

SNPS GPL NO. 03-435B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Perform an engineering review of the small bore piping/tubing and supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Piping - Provide jacket water from the intake manifold to the exhaust water jacket.

Tubing - Provide jacket water to the governor lube oil cooler and to the turbocharger support brace.

Supports - Provide adequate restraint of the small bore piping/tubing system, in the intended support load directions

ATTRIBUTES TO BE VERIFIED

Structural adequacy of the piping/tubing and supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

IEEE 387

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group" Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations).

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Jacket Water Fittings - Supports

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-435B

REV. NO. 1

SNPS GPL NO. 03-435B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the supports if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

COMPONENT REVIEW (continued)

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Salerta PROGRAM MANAGER J C Kammeyer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-435B

Effective Printout Date: 11/05/84

COMPONENT TYPE: Jacket Water Fittings - Supports

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
None		
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbo Water Piping - Pipe & Fittings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-437A

TASK DESCRIPTION NO. DR-06-03-437A-0

SNPS GPL NO. 03-437A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience for this component in the EDG Component Tracking System.

There are no maintenance or modification recommendations for this component.

A field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loadings provided that supports are added/modified as indicated in DR/QR report 03-437B.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

TURBO WATER PIPING - SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-437B

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation review of the structural adequacy of the turbo water piping - pipe supports to withstand the effects of normal operating and earthquake loadings. The primary function of these supports is to provide adequate restraint of the small bore piping in the intended support load direction.

II OBJECTIVE

The objective of this review was evaluation of the small bore pipe supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear and non-nuclear industry experience. See Appendix C for results.

- The Quality Revalidation Checklist results were reviewed for acceptability.

- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology of this evaluation.

IV RESULTS AND CONCLUSIONS

The small bore pipe supports as defined by this Component Design Review have been evaluated in accordance with Reference 1 and have been found acceptable with modification provided the final assembly of Engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and information contained in Reference 2, it is concluded that the small bore pipe supports will perform their intended design function at River Bend under all normal operating and earthquake loadings, with the provision that the following recommended modifications be implemented as detailed in Reference 3:

Engine A

- It is recommended that the 2 two-directional restraints shown on Delaval drawing 101022 be installed as designed except that the U-bolts be 3/8-inch diameter with suitable locking devices.

Engine B

- The turbo-water piping and supports were not installed at the time of the field walkdown. Therefore, it is recommended that the piping and supports including the recommended modification stated in this report be installed on Engine B similar to Engine A.

V REFERENCES

1. Stone & Webster Generic Design Review Report No. 11600.60-DC-02, Revision 0, "Engineering Review Criteria Report for the Design Review of TDI Diesel Small Bore Piping, Tubing and Supports for the TDI Owners Group," included as Report No. 11600.60-DC-02 of the overall summary report.

2. Stone & Webster Calculation No. 11600.60-NP(B)-0601-XH.

3. Memo No. 6480 from C. Malovrh (SWEC) to J. Kammeyer (SWEC) dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Turbowater Piping: Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-437B

TASK DESCRIPTION NO.: DR-06-03-437B-1

SNPS GPL NO. 03-437B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Perform an engineering review of the small bore pipe supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Provide adequate restraint of the small bore piping system in the intended support load directions.

ATTRIBUTE TO BE VERIFIED

Structural adequacy of the small bore pipe supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

ASME III, CLASS E, 1974 including summer '74 addenda

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group" Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations).

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Turbo Water Piping - Supports

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-437B

REV. NO. 1

SNPS GPL NO. 03-437B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group.

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI-FSI-F11.1-020

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the supports if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve M. Schwartz PROGRAM MANAGER J C Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

COMPONENT REVIEW (continued)

Engine 1A (continued)

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a Quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Salerta PROGRAM MANAGER JC Kammeyer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-437B

Effective Printout Date: 11/05/84

COMPONENT TYPE: Turbo Water Piping: Supports

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
None		
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Thermostatic Valve

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-515

TASK DESCRIPTION NO. DR-06-03-515-0

SNPS GPL NO. 03-515

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham).
- The jacket water thermostatic valve at River Bend (Robertshaw Model I-1284-S-11, 5") is the same as Shoreham's jacket water valve, except the Shoreham valve body material is bronze, whereas the River Bend valve body material is cast steel according to the TDI Instruction Manual. A cast steel valve body is the recommended material per the Shoreham DR/QR report.

  The River Bend valve is ASME III qualified. Unlike the lead engine report for component 03-515, River Bend has no lube oil thermostatic valve, since it was found not necessary to maintain system temperature control and reliability.

The following maintenance from the lead engine DR/QR should be implemented:

- Replace the power element at 3-5 year intervals.

The lead engine report specified a modification to replace the bronze valves with cast steel valves. It is recommended that a field inspection be performed at River Bend to verify that the valve body material is cast steel in accordance with the TDI Instruction Manual. If so, there are no modifications required for this component at River Bend.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Stand Pipe: Pipe, Fittings, Gaskets (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-700A

TASK DESCRIPTION NO. DR-06-03-700A-0

SNPS GPL NO. 00-700A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience for this component in the EDG Component Tracking System.

There are no maintenance or modification recommendations for this component.

A field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and indicates that this component will perform its intended design function for normal and earthquake loadings.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owner's Group Report No. 11600.60-DC-02, Rev. 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Standpipe: Valves

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-700B

TASK DESCRIPTION NO. DR-06-02-700B-0

SNPS GPL NO. 00-700B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience.
- A review of the lead engine DR/QR report (Shoreham)

The following maintenance recommendations from the lead engine DR/QR should be implemented:

- Inspect the valves for packing leakage monthly
- Replace elastomeric parts every 5 years

There are no modifications recommended for this component.

The following Quality inspections are recommended:

- Verify the proper Jacket Water Valve is installed.
- Verify the proper installation of the Jacket Water Valve

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Stand Pipe: Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-700C

TASK DESCRIPTION NO. DR-06-03-700C-0

SNPS GPL NO. 00-700C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham). There is no site or industry experience for this component in the EDG Component Tracking System.

There are no maintenance or modification recommendations for this component.

A field walkdown was performed in accordance with the small bore piping and tubing criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loading.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1) "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Standpipe Switches

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-700E

TASK DESCRIPTION NO. DR-06-03-700E-0

SNPS GPL NO. 00-700E

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Based on a review of the DR/QR lead engine report (Comanche Peak), a design review is not required for River Bend.

The jacket water standpipe switch used at River Bend is similar to that used at Comanche Peak with regard to manufacturer and application, and both are identified as TDI Part No. F-577-066.

The River Bend site differs from Comanche Peak in the model number and operating range of the Dwyer Instruments low differential pressure switch, used for low level alarming on the jacket water standpipe. River Bend uses a Dwyer D/P switch, Model 1823-80, with operating range of 9 to 85 in. W.C. (set point established at level of 30.02 in. W.C. - falling). Comanche Peak has a Dwyer D/P switch, Model 1823-40, with operating range of 5 to 44 in. W.C. (set point is at 37 in. W.C. - falling).

The sensor tap located 43 in. below the centerline of the inlet flange on the jacket water standpipe is piped to the differential pressure switch identically for both River Bend and Comanche Peak sites.

The Dwyer Instruments low differential pressure switch is compatible with the treated cooling water contained in the jacket water standpipe and the environment at the River Bend location. The design function of the jacket water standpipe switch is adequate for intended service at River Bend.

There is no River Bend site experience, nuclear or non-nuclear industry experience, listed in the EDG Component Tracking System for this component.

There are no maintenance or modification recommendations for the jacket water standpipe switches.

Quality Revalidation for the jacket water standpipe switch is not deemed necessary.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Standpipe and Misc. Bolting

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-700F

TASK DESCRIPTION NO. DR-06-03-700F-0

SNPS GPL NO. 03-700F

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review of this component for River Bend is not required based on the following:

- A review of applicable industry and site experience indicated that no experience items have been reported in the EDG Component Tracking System.
- The standpipe and installation at River Bend is similar to Shoreham in size and similar to Comanche Peak in arrangement. Both were previously reviewed and found acceptable.
- A detailed analysis was performed to seismically qualify the standpipe, Ref. 3.

No maintenance or modifications were identified in the lead engine design reviews.

The following Quality inspection is recommended to be performed for both station engines:

- Verify as-built conditions of installed bolting material to the as-built drawing.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. TDI Drawings Nos. 101770, 03-700-01-CG

2. SWEC Specification #244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" for River Bend Station, Unit 1, Gulf States Utilities, West Feliciana Parish, Lousiana.

3. Final Report Volume II, Part I, Seismic Qualification of TDI Diesel Generator Sets, Serial Numbers 74039 and 74040, Gulf States Utilities, River Bend Station, Unit 1, Transamerica Delaval Inc., Engine & Compressor Div., Oakland, California.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub Base & Oil & Water Piping: Jacket Water Valves

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717B

TASK DESCRIPTION NO. DR-06-03-717B-0

SNPS GPL NO. 03-717B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience, except that previously addressed in the lead report.
- A review of the lead engine DR/QR report (Shoreham)
- The jacket water valves at River Bend consist of 2 check valves (TDI P/N NE-041-000, 74039-137) and a globe valve (TDI P/N 74039-130). These valves are similar to the jacket water valves in the lead engine and are acceptable for their application.

The following maintenance recommendations from the lead engine DR/QR report should be implemented:

- Inspect valves for leakage monthly

Proper orientation of the check valves should be verified by field inspection.

There are no modifications required for this component (pending verification of satisfactory check valve orientation) based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

AUX. SUB BASE & OIL & WATER PIPING - LUBE OIL ACTUATOR

COMPONENT PART NO.: 03-717-C

This component number has been deleted. River Bend does not utilize a Lube Oil Actuator.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Aux. Sub Base & Oil & Water Piping-Jacket Water: Pipe, Couplings, Fittings, Orifices and Strainers (Large Bore Scope Only) UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717D TASK DESCRIPTION NO. DR-06-03-717D-0

SNPS GPL NO. 03-717D CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry and site experience listed in the EDG Component Tracking System, and the lead engine DR/QR report (Comanche Peak).

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications to the skid piping and/or supports. Generic application of these modifications is not required for River Bend since the Comanche Peak modifications were not required for piping operability. The lead engine modifications were recommended in order to meet the intent and philosophy of the ASME Code for the boundary conditions and assumptions used in the Owners Group analysis. These boundary conditions and assumptions may be somewhat different from those used in the original manufacturer's analysis. Lead engine skid mounted large bore pipe modifications, as the apply to equipment nozzle loads, are addressed, if necessary, in the individual equipment design reviews.

No Quality Revalidation is required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub. Base & Oil & Water Piping - Jacket Water: Pipe, Couplings, Fittings, Orifices & Strainers (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717D

TASK DESCRIPTION NO. DR-06-03-717D-1

SNPS GPL NO. 03-717D

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry and site experience.

There are no maintenance recommendations for this component. However, the lead engine report does address site specific additions of supports. The necessity for similar additions on River Bend has been assessed by a field walkdown.

The field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loadings.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Aux. Sub Base & Oil & Water Piping - Jacket Water: Gaskets & Bolting

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-717F

REV. NO. 1

SNPS GPL NO. 03-717F

TASK DESCRIPTIONS

No further review of component 03-717F is required for the following reasons:

a) Component was reviewed on two lead engines with satisfactory results.

b) There is no significant industry experience and no site experience reported for this component.

GROUP CHAIRPERSON Victor J. Galetta PROGRAM MANAGER J.C. Kennington

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Aux. Sub Base & Oil & Water Piping-Jacket Water: Supports (Large Bore Scope Only) UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717G TASK DESCRIPTION NO. DR-06-03-717G-0

SNPS GPL NO. 03-717G CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry and site experience listed in the EDG Component Tracking System, and the lead engine DR/QR report (Comanche Peak).

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications to the skid piping and/or supports. Generic application of these modifications is not required for River Bend since the Comanche Peak modifications were not required for piping operability. The lead engine modifications were recommended in order to meet the intent and philosophy of the ASME Code for the boundary conditions and assumptions used in the Owners' Group analysis. These boundary conditions and assumptions may be somewhat different from those used in the original manufacturer's analysis. Lead engine skid mounted large bore pipe modifications, as the apply to equipment nozzle loads, are addressed, if necessary, in the individual equipment design reviews.

No Quality Revalidation is required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub. Base & Oil & Water Piping - Jacket Water: Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717G

TASK DESCRIPTION NO. DR-06-03-717G-1

SNPS GPL NO. 03-717G

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry and site experience.

There are no maintenance or modification recommendations for this component.

A field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loadings.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Miscellaneous Equipment Jacket Water Heater

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-800A

TASK DESCRIPTION NO. DR-06-03-800A-0

SNPS GPL NO. 03-800A

CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience, except that already addressed in the lead engine report. There is no site experience listed in the Component Tracking System.
- A review of the lead engine DR/QR report (Shoreham)

The jacket water immersion heater at River Bend is a Chromolox Model TM 1248. The heater is a 48 Kw, copper sheathed immersion heater. Unlike Shoreham, River Bend's jacket water standpipe contains only one immersion heater and therefore, the concern with the stagnant condition of the upper heater at Shoreham is not applicable to River Bend, nor is the required modification. Provisions should be made to include moisture resistant terminal enclosures on future replacement heaters.

The following maintenance from the lead engine DR/QR report should be included on an outage basis:

- Measure heater insulation resistance and replace heater if degradation of insulation is noted.
- Thoroughly clean heater elements of deposits and inspect for corrosion and other signs of deterioration.
- Check calibration and inspect condition of thermostat; recalibrate or replace as necessary.

In addition, jacket water temperature should be verified daily during standby operation. Proper jacket water treatment should be maintained and the thermostat calibrated when necessary.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Heat Exchanger

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-810A

TASK DESCRIPTION NO. DR-06-03-810A-0

SNPS GPL NO. 10-103

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience.
- A review of the lead engine DR/QR report (Shoreham).
- The River Bend heat exchanger is of similar design and operating conditions as the exchanger outlined in the lead engine DR/QR report. The heat exchangers are manufactured by Thermxchanger, Class "R", Type NSP, two pass heat exchangers.
- The River Bend heat exchanger is ASME III, Class 3.

Preventative maintenance of the jacket water heat exchangers should include the following:

- The jacket water heat exchanger and the associated service water piping should be flushed on a periodic basis to prevent fouling and corrosion in the the heat exchanger tube side.
- The heat exchanger tubes should be inspected at the 18-month maintenance outages to assess the condition of the tubes and the tube sheet for fouling and erosion.
- If leakage through the packing is visible it can be eliminated by careful bolt adjustment to compress the neoprene packing. To minimize this type of leakage, it is recommended that the packing rings be replaced and not reused if head removal is required, due to hardening of the packing.

There are no modifications required for this component based on the the lead engine DR/QR report.

No Quality Revalidation is required for this component.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Jacket Water Standby Heater Pump

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-810B

TASK DESCRIPTION NO. DR-06-03-810B-0

SNPS GPL NO. 10-107

CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience.
- A review of the lead engine DR/QR report (Shoreham)
- The jacket water standby heater pump at River Bend is of the same manufacturer and model number as that used in the lead engine (Crane Chempump Model GC-1½K) and is used in a similar application. Additionally, the River Bend pump is designed and fabricated to ASME III.

There are no maintenance or modification recommendations based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Heads

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-360A

TASK DESCRIPTION NO. DR-06-03-360A-0

SNPS GPL NO. 03-360A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review is not required for this component based on review of the Phase I report, the lead engine DR/QR reports (Shoreham/Comanche Peak), and the applicable industry experience in the EDG Component Tracking System. There is no site experience in the EDG Component Tracking System.

Quality inspections that have been performed to date have been reviewed. Six cylinder heads(2A, 3A, 4A, 6A, 8A, and 2B) were determined by ultrasonic testing to have fire deck thickness below the minimum allowable limit and were replaced. Two other cylinder heads (1A and 7A) were rejected due to indications in the valve seating surfaces.

At present, River Bend has Group III cylinder heads (definition and characteristics of Group III heads is given in the Phase I report) installed on their 1A and 1B engines. All of these cylinder heads have been inspected in accordance with Owners Group inspection criteria.

There are no modification recommendations for this component, however, the following maintenance items are recommended:

- Blow-over the engine after each operation of the engine to ensure against harmful effects of water leaks. In the event water is detected as a result of a cylinder head leak, the cylinder head should be replaced.
- Visually inspect the fuel injection port on each cylinder head for water leaks during the normal monthly engine run. If water leakage is detected, the cylinder head should be replaced.

PRIMARY FUNCTION

Not required

COMPONENT DESIGN REVIEW CHECKLIST

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinder Head Valves - Cylinder Head

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-360A

REV. NO. 1

SNPS GPL NO. 03-360A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Perform a Liquid Penetrant test of the intake and exhaust valve seating surfaces.

3. Perform a Magnetic Particle test on the fire deck area excluding the valve seating area.

4. Determine the thickness of the fire deck area by performing an Ultrasonic test at six locations on the deck. (See Attachment A)

Engine 1B

Same as Engine 1A

NOTE: For cylinder heads fabricated prior to September 1980, NDE inspections are to be performed on a 100% sample plan. For cylinder heads fabricated after September 1980, NDE inspections are to be performed on a 25% sample plan.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2-3. Surface integrity of the valve seating and fire deck area

4. Thickness of the fire deck area

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. No cracks allowed in the seating surface. Pin holes that do not exceed 1/32" diameter numbering 3 or less in one surface and not closer to each other than 1/8", are acceptable.

3. Acceptance criteria standard is ASTM E-125 for a Magnetic Particle test.

   A) Relevant indications are:

      1) Hot tears and cracks, linear indications that exceed ASTM E-125, Class I-1.

      2) Shrink that exceeds ASTM E-125, Class II-1.

      3) Inclusions that exceed ASTM E-125, Class III-1.

      4) Porosity that exceeds ASTM E-125, Class V-1.

   B) Any inclusion, shrink or porosity that exceeds ASTM E-125 is a reportable indication and shall be reported to the Design Group. In addition, linear indications exceeding 1/4" shall also be reviewed by the Design Group.

   C) Indications that do not exceed the ASTM E-125 as described in 3A are acceptable.

4. All fire deck thickness readings to be recorded. Nominal fire deck thickness is 0.500"; Minimum thickness is 0.400".

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2-4. Approved Site NDE Procedures, TER# 99-001, TER# 99-012

REFERENCES (continued)

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-4. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON [illegible] PROGRAM MANAGER [illegible]

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A Liquid Penetrant test was performed on the intake and exhaust valve seating surfaces for all cylinder heads with unsatisfactory results. The results were reported by TER# 06-055.

3. A Magnetic Particle test on the fire deck area was performed for all cylinder heads. The results were reported by TER# 06-055.

4. An Ultrasonic was performed for all cylinder heads. The results were reported by TER# 06-055.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nita A. Sakata PROGRAM MANAGER [illegible]

CALCULATION SHEET

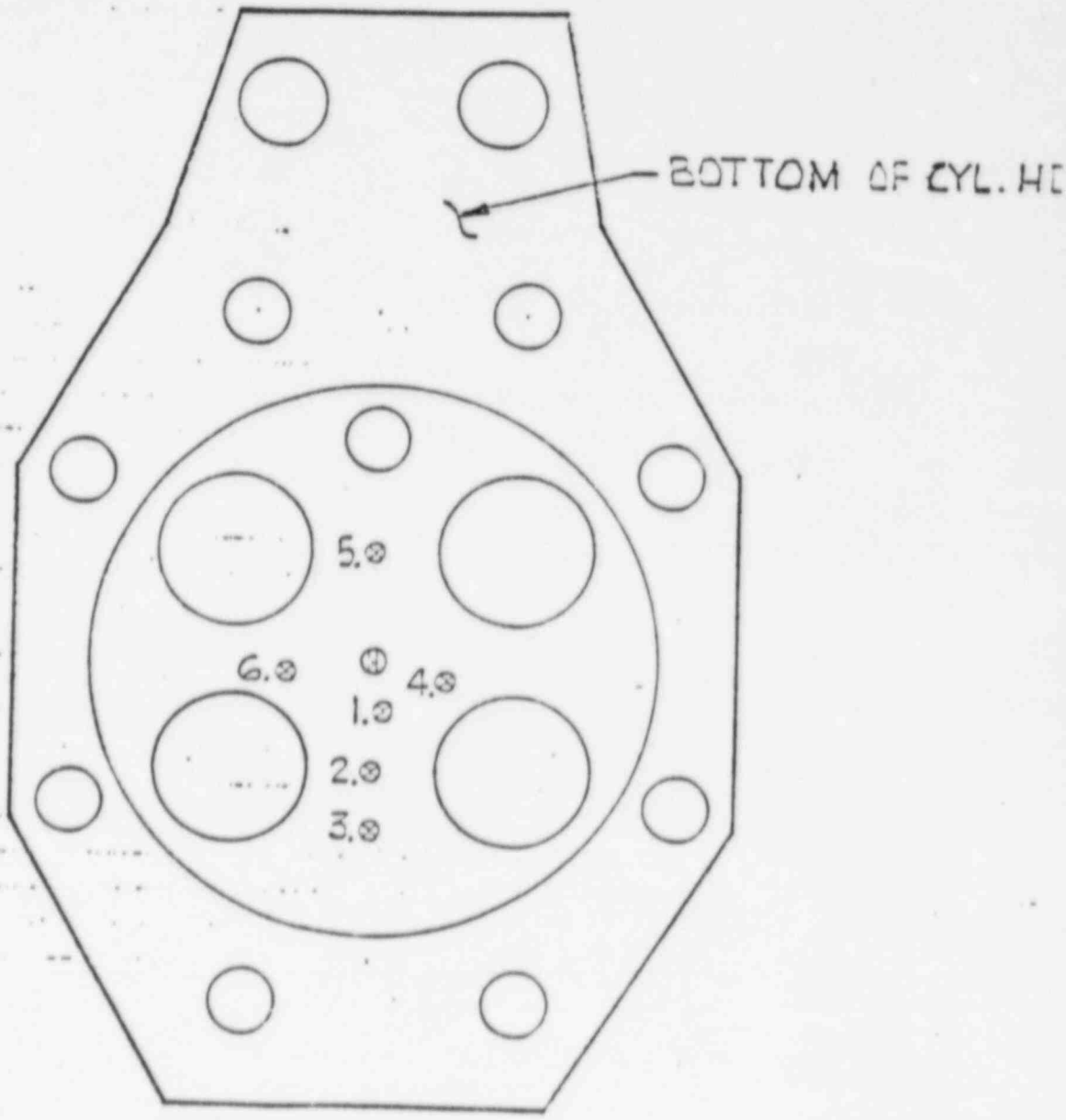
STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
11600.60		5 of 5

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE

SUBJECT/TITLE		QA CATEGORY/CODE CLASS
Attachment A	360A	

ULTRASONIC TEST OF THE FIRE DECK



THIS SKETCH SHOWS THE SIX LOCATIONS WHERE A U.T. IS TO BE PERFORMED TO DETERMINE THE THICKNESS OF THE FIRE DECK.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Head Valves: Intake and Exhaust Valves UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-360B TASK DESCRIPTION NO. DR-06-03-360B-1

SNPS GPL NO. 03-360B CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR reports which establish the acceptability of the cylinder head valves for their intended purpose.

- A review of site and applicable industry experience in the EDG Component Tracking System indicated there had been no design related failures associated with this component. The cylinder head valves are identical on all the Owner's Group TDI diesel engines (TDI Part No. 03-360-02-0D).

The primary nuclear and non-nuclear industry experiences associated with this component have been chrome plate flaking, scuffing, and scoring, and exhaust gas blowby due to lack of concentricity of the valve and seat. Because of the small number of hours nuclear service diesels are expected to operate between inspections, this will not noticeably affect engine performance.

Quality inspections conducted at River Bend identified some valves that did not meet the acceptance criteria. Valves with chrome plate damage were replaced and valves with poor seating were reworked to obtain uniform contact. Several valves were found to have indications near the friction weld where the chrome plating on the stem ends. It is believed that these indications are actually either the edges of the chrome plate or scuff marks from the ground, but unplated stem surface that exists between the chrome plate and the forged valve head (a band approximately 3/4 inches wide). This type of surface finish results during manufacturing and is not detrimental to the valve. There have been no reported incidents of valve separation in TDI diesel engines. The remaining Quality Revalidation inspection is recommended for engine 1B:

- Perform a visual examination of the valve and valve ring for scuffing and erosion on valve ring or valve seat area.

The valve inspections outlined in the lead engine DR/QR reports also applies to the engines at River Bend. The inspection should be performed for all new or reworked cylinder heads after an initial 500-600 hours of operation

- Remove the subcover bonnet and inspect the interior for soot, which indicates valve blowby. Corrective action should be taken if this condition is found to exist.

There are no modifications recommended for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinder Head Valves: Intake & Exhaust Valves

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-360B

REV. NO. 3

SNPS GPL NO. 03-360B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform a visual inspection to verify adequate valve seating.
3. Perform a visual examination of the valve and valve ring.
4. Perform a visual examination of the valve stems and at the contact area with the rocker arm to ensure adequate lubrication and clearance.
5. Perform a dimensional check of the valve to valve guide clearance.
6. Perform a Liquid Penetrant test on the blended radius of the stem head.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Linear metallic appearing ring on valve ring

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1A (continued)

3. Surface integrity of the valve and valve ring

4. Integrity of the valve stem surface

5. Proper valve to valve guide clearance

6. Surface integrity of the stem head

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Appearance of a uniform linear metallic ring on valve ring

3. No scuffing erosion on valve ring or valve seat area

4. No scuffing or scoring of chrome plate on valve stems

5. Review of inspection report by the Design Group

6. No cracking at the blended radius between the valve stem and valve head

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2-6. Approved Site NDE Procedures, TDI Instructions Manual

REFERENCES (continued)

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-6. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M Schoot PROGRAM MANAGER

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection of the valve seat area was performed. This was reported by TER# 06-056.

3. A visual inspection of the valve and valve ring was performed with satisfactory results. This was reported by TER# 06-056.

4. A visual inspection on the valve stems was performed with no indication of scuffing or scoring found. This was reported by TER# 06-056.

5. A dimensional check on valve stem diameters was performed for cylinders 3, 4, and 5. The results were reported by TER# 06-056.

6. A Liquid Penetrant test was performed on the blended radius between the valve stem and valve head for each valve on all cylinders. The results were reported by TER# 06-056.

COMPONENT REVIEW (continued)

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. A visual inspection of the valve seat area was performed. This was reported by TER# 06-056.

3. No inspection report has been received which fulfills this requirement.

4. A visual inspection on the valve stems was performed The results were reported by TER# 06-056.

5. A dimensional check was performed on the valve stem diameters. The results were reported by TER# 06-056.

6. Liquid Penetrant tests were performed on the blended radius of the intake and exhaust valves for the heads and replacement heads with unsatisfactory results. The results were reported by TER#'s 06-056 and 06-078.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor J. Sabella PROGRAM MANAGER [illegible]

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Head And Valves: Bolting And Gaskets

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-360C

TASK DESCRIPTION NO. DR-06-03-360C-0

SNPS GPL NO. 03-360C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience in the EDG Component Tracking System for this component.

There are no modification or maintenance recommendations for this component.

Quality inspections performed to date on engine 1A have been reviewed and found to be satisfactory.

The following Quality Revalidation inspections should be performed on engine 1B:

- Verify that the proper gaskets are installed in accordance with specification requirements;
- Perform a visual inspection of the gasket for signs of distress.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Cylinder Head Valves - Bolting & Gasket

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-360C

REV. NO. 1

SNPS GPL NO. 03-360C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the proper gaskets are installed in accordance with specification requirements.
3. Perform a visual inspection of the gasket for signs of distress.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Installation of proper gasket
3. No distortion, burn through or cracking of the gasket

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2-3. Inspection Report

ACCEPTANCE CRITERIA (continued)

Engine 1A

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52
2. Approved Site NDE Procedures, TDI Instruction Manual
3. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Review of inspection report by the Design Group

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven R Schenk PROGRAM MANAGER X Kammerer

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.
2. New "O" ring and flexitallic gaskets were installed on all eight cylinder heads in accordance with the TDI requirements and a vendor representative. This was reported by TER# 06-057.

COMPONENT REVIEW (continued)

Engine 1A (continued)

3. A visual inspection of the head seating area was performed during engine operation with no evidence of gasket leaks or burn through existing on any of the eight cylinder heads. This was reported by TER# 06-057.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-3. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Salerta PROGRAM MANAGER K Sammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Cylinder Head and Valves: Springs and Retainer

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-360D

TASK DESCRIPTION NO. DR-06-03-360D-0

SNPS GPL NO. 03-360D

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the Comanche Peak and Shoreham DR/QR reports, which establishes the acceptability of the valve spring and retainer for their intended purpose.
- A review of industry and site experience listed in the EDG Component Tracking System indicates that there has been no design related failures associated with this component. The valve springs are identical on all the Owners Group TDI diesel engines (TDI Part No. 03-360-02-OM).

There are no maintenance or modification recommendations for this component.

There have been several non-nuclear experiences where improperly shot peened springs were installed on some TDI engines. These springs failed during service and in some cases caused engine damage. Quality inspections conducted at River Bend verified that there are no defective springs installed in the diesel engines.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Valve Spring UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-360D REV. NO. 2

SNPS GPL NO. 03-360D

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Visually inspect and document the color code of the valve springs.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Proper color coding of the valve springs

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. No gray springs with brown stripes exist.

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures, TDI Parts Manual

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with unsatisfactory results. N&D 1780 remains open.

2. A visual inspection on the condition and color codes of the valve springs was performed. Valve springs which were shipped with the new replacement cylinder heads were black with a white stripe down the side. This was reported by TER# 06-058.

COMPONENT REVIEW (continued)

Engine 1B

1. All EDGCTS site experience documents were assembled and reviewed with unsatisfactory results. N&D 1780 remains open.

2. A visual inspection on the condition and color codes of the valve springs was performed. The color code of the valve spring was black with a yellow stripe down the side. This was reported by TER# 06-058.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Sale PROGRAM MANAGER

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Injection Equipment: Fuel Injection Pump

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-365A

TASK DESCRIPTION NO. DR-06-03-365A-1

SNPS GPL NO. 03-365A

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except for that which was previously addressed in the lead engine reports.
- A review of the lead engine DR/QR reports (Shoreham and Comanche Peak).
- The fuel injection pump used at River Bend is of the same manufacturer and type as that used at Shoreham (i.e, Bendix, type FDXE-26, No. 10-375636-5).

The following maintenance recommendation from the lead engine DR/QR report should be implemented:

- Disassemble, inspect, test and reassemble one pump at alternate refueling outages. Based on an evaluation of the pumps condition a decision can be made regarding the need to examine the remainder of the pumps.

There are no modifications required for this component, based on the lead engine report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Injection Equipment: Fuel Injection Tips

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-365B

TASK DESCRIPTION NO. DR-06-03-365B-0

SNPS GPL NO. 03-365B

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except for that which was previously addressed in the lead engine reports.
- A review of the lead engine DR/QR reports (Shoreham and Comanche Peak)
- The fuel injection nozzle assembly used at River Bend is of the same manufacturer and type as that used at Shoreham (i.e, Bendix, type H4L-400, Holder No. 10-328850-5, Tip No. 10-84802-29).

The following maintenance from the lead engine DR/QR report should be implemented:

- At each refueling outage each assembly should be disassembled, cleaned, inspected and reassembled. At this time each assembly should be pop tested and the spray pattern should be checked.
- TDI SIM 107 (cleaning spray tips) and SIM 108 (Tightening of Delivery Valve Holders) should be incorporated into the site maintenance procedures.

There are no modifications required for this component, based on the lead engine reports.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Injection Equipment: Tube Assembly

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-365C

TASK DESCRIPTION NO. DR-06-03-365C-0

SNPS GPL NO. 03-365C

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on a review of the EDG Component Tracking System for applicable industry and site experience (Refs. 2 and 3) and the lead engine DR/QR reports (Shoreham/Comanche Peak).

The fuel oil injection lines transfer fuel from the high pressure fuel injection pumps to the fuel injectors for the engine cylinders. The injection lines experience the extreme pulsating pressure of the plunger operated injection pumps. For TDI nuclear standby diesel generators, the pressure pulses are 3 ksi minimum pressure to 14.5 ksi maximum pressure. It was determined from fracture mechanics and fatigue analyses that flaws on the inner surface of the tubing potentially cause fatigue failure of the tubing from pulsating fuel pressure (Ref. 1).

Industry experience (Rev. 2) indicates a number of fuel leakage incidents involving the high pressure fuel oil tube assemblies. Such incidents are related to either failures or loosening of attachment fittings during engine operation, or tube failures because of manufacturing flaws on the inner surface exceeding the critical limit.

All TDI fuel injection tubing is 1/2 in. SAE 1008 or SAE 1010 steel manufactured to identical specification and is found to be suitable for nuclear standby diesel generator service (Ref. 1) when manufacturing flaws on the inner surfaces are below the critical limit.

The following maintenance recommendations for this component from the lead engine DR/QR report for Shoreham site should be performed monthly while the engine is operating:

- Inspect compression fittings at both ends of each fuel injection line.

There are no modification recommendations for this component.

TASK DESCRIPTIONS (continued)

Results of Quality inspections performed to date (TER# 06-060) have been reviewed but are considered unsatisfactory evidence of the fuel injection lines acceptability for the River Bend Station, since the inspections were not able to be completed.

Therefore, the following quality inspections as described on the Component Quality Review Checklist should be performed on all station engines:

- Perform a visual inspection on the fuel injection equipment for signs of leakage.
- All high pressure fuel lines are to be examined by an eddy current test on both ends of each tube (Ref. 4).

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Emergency Diesel Generator Fuel Oil Injection Tubing Qualification Analysis prepared for TDI Emergency Diesel Generator Owners Group April 1, 1984.

2. Emergency Diesel Generator Computer Tracking System - Industry Experience dated October 15, 1984.

3. Emergency Diesel Generator Computer Tracking System - River Bend Station dated October 10, 1984.

4. Failure Analysis Assoc. NDE Procedure 11.10 "Eddy Current Inspection Procedure - High Pressure Fuel Lines - Carbon Steel."

COMPONENT DESIGN REVIEW CHECKLIST

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Fuel Injection Equipment Tube Assembly

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-365C

REV. NO. 1

SNPS GPL NO. 03-365C

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Perform an Eddy Current test on the inside diameter of all the fuel injection tubing.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Integrity of the fuel injection tubing

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. The minimum detectable flaw size is rejectable (0.003" ± 0.0005").

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Approved Site NDE Procedures, TER# 99-006, FaAA NDE Procedure 11.10

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven R. Schwartz PROGRAM MANAGER J. Kamminga

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. An Eddy Current test was performed on the inside diameter of all fuel injection tubing with unsatisfactory results. The results were reported by TER# 06-060.

COMPONENT REVIEW (continued)

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. An Eddy Current test was performed on the inside diameter of all fuel injection tubing with satisfactory results. The results were reported by TER# 06-060.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Sileta PROGRAM MANAGER [illegible]

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Injection Equipment Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-365D

TASK DESCRIPTION NO. DR-06-03-365D-1

SNPS GPL NO. 03-365D

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham). There is no site or industry experience for this component in the EDG Component Tracking System.

A visual inspection of the support elastomer should be performed for deteriation or degradation at each refueling outage. Any inserts found unsatisfactory should be replaced.

A field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and indicates that this component will maintain its functional capability for normal and earthquake loadings.

There are no modification recommendations for this component.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Pump Linkage:
Fuel Pump Control Shaft:
Linkage Assembly & Bearings UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-371A&B TASK DESCRIPTION NO DR-06-03-371A&B-0

SNPS GPL NO. 03-371A&B CLASSIFICATION TYPE A

TASK DESCRIPTION

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the lead engine report.
- A review of the lead engine DR/QR reports (Shoreham/Comanche Peak).
- The components at River Bend are identical to those in the lead engine.

The following maintenance recommendation from the lead engine DR/QR report should be implemented:

- To maintain proper control shaft alignment, check lubrication cups monthly and fill as required.

There are no modifications required for these components based on the lead engine report.

All Quality inspections have been completed with satisfactory results.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Fuel Pump Linkage - Fuel Pump Control Shaft

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-371A

REV. NO. 1

SNPS GPL NO. 03-371A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Determine the hardness of the shaft.

Engine 1B

1. Assemble and review existing documentation.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Hardness of the shaft

Engine 1B

1. Quality status of Component Document Package

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. Review of inspection report by the Design Group

ACCEPTANCE CRITERIA (continued)

Engine 1B

1. Satisfactory Document Package

REFERENCES

Engine 1A

1. QCI No.52

2. Approved Site NDE Procedures

Engine 1B

1. QCI No.52

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

1. Document Summary Sheet

GROUP CHAIRPERSON Steve M Schwartz PROGRAM MANAGER JC Kamminga

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. A hardness test was performed on the fuel pump control shaft. The results were reported by TER#'s 06-024 and 06-061.

Engine 1B

1. No EDGCTS site experience documents are in evidence

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A. Salata PROGRAM MANAGER DC Kanninger

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

Fuel Pump Linkage:
Fuel Pump Control Shaft:
COMPONENT Linkage Assembly & Bearings UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-371A&B TASK DESCRIPTION NO. DR-06-03-371A&B-0

SNPS GPL NO. 03-371A&B CLASSIFICATION TYPE A

TASK DESCRIPTION

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the lead engine report.
- A review of the lead engine DR/QR reports (Shoreham/Comanche Peak).
- The components at River Bend are identical to those in the lead engine.

The following maintenance recommendation from the lead engine DR/QR report should be implemented:

- To maintain proper control shaft alignment, check lubrication cups monthly and fill as required.

There are no modifications required for these components based on the lead engine report.

All Quality inspections have been completed with satisfactory results.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

COMPONENT DESIGN REVIEW CHECKLIST

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Fuel Pump Linkage-Linkage Assembly & Bearings

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-371B

REV. NO. 1

SNPS GPL NO. 03-371B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Visually inspect the linkage and bearings to determine freedom of movement.
3. Ensure that site bearing lubrication procedures are in compliance with the TDI Instruction Manual.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Linkage and bearings are free to move.
3. Site bearing lubrication procedures are in compliance with the TDI Instruction Manual.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Linkage and bearings are free to move without unnecessary force.

3. Site bearing lubrication procedures are in compliance with the TDI Instruction Manual.

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved site NDE Procedures

3. Approved site NDE Procedures, TDI Instruction Manual

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2-3. Inspection Report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve M Schwartz PROGRAM MANAGER J C Kammeyer

COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The linkage was verified to be free moving. This was reported by TER# 06-062.

3. All bearings were properly lubricated prior to engine operation. This was reported by TER# 06-062.

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2-3. No inspection reports have been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Nilla A. Salet PROGRAM MANAGER JC Kammeyer

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Pump Linkage: Automatic Shutdown Cylinder UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-371C TASK DESCRIPTION NO. DR-06-03-371C-0

SNPS GPL NO. 03-371C CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and/or site experience.
- The applicable engine dimensions and operating parameters at River Bend are identical or very similar to those for the same component at Shoreham (Lead Engine).

No modification or maintenance recommendations are required for this component.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Oil Booster Pump UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-445 TASK DESCRIPTION NO. DR-06-03-455-0

SNPS GPL NO. 03-445 CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience.
- A review of the lead engine DR/QR report (Shoreham)
- The fuel oil booster pump at River Bend is of the same manufacturer and Model No. as that used in the lead engine (Brown and Sharpe Mfg. Co., Model 3S) and is used in a similar application.

There are no maintenance or modifications recommendations based on the lead engine report.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Oil Header - Piping and Tubing (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-450B

TASK DESCRIPTION NO. DR-06-03-450B-1

SNPS GPL NO. 03-450B

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience. There is no site experience for this component in the EDG Component Tracking System.

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications/additions of supports. The necessity for similar modifications/additions on River Bend has been assessed by a field walkdown.

The field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and concluded that this component will perform its intended function for normal and earthquake loading provided that the supports are modified/added as indicated in DR/QR report 03-450D.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

FUEL OIL HEADER - FUEL OIL SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-450D

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the fuel oil header tubing supports to withstand the effects of normal operating and earthquake loadings. The primary function of these supports is to provide adequate restraint of the small bore piping/tubing system in the intended support load direction.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the small bore piping/tubing supports to assure that the component will perform its intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for River Bend site, nuclear, and non-nuclear industry experience. See Appendix C for results.
- The Quality Revalidation Checklist results were reviewed for acceptability.
- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison of walkdown data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology of this evaluation.

IV RESULTS AND CONCLUSIONS

The small bore piping/tubing supports, as defined by this Component Design Review, have been evaluated in accordance with Reference 1 and have been found acceptable with modifications provided the final assembly of Engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review and information contained in Reference 2, it is concluded that the small bore piping/tubing supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

Engine A

Engine Driven Fuel Oil Pump To Filter

- It is recommended that the nylon tube block support located between the check valve and filter and mounted to the engine casing be modified to increase the section properties of the flat bar structure, which will increase the support stiffness and ability to carry lateral piping loads. The connection to the engine should utilize a minimum of two bolts.

Fuel Oil Filter To Supply Header

- It is recommended that the nylon tube block support in the riser be modified to increase the section properties of the flat bar structure to increase the support stiffness and ability to carry lateral piping loads. The connection to the engine should utilize a minimum of two bolts.

- In order to support the tubing of component 03-450B, it is recommended that a two-directional restraint be added in the riser at approximately platform elevation to eliminate the overspan condition.

Fuel Oil Supply And Recirculation Headers

- It is recommended that the first restraint at cylinder No. 1 be modified to a three-directional restraint to restrict axial motion on both headers. The remaining two-directional restraints are to be shimmed to provide a proper sliding fit.

Fuel Oil Drip Return Header

- It is recommended that the first restraint at cylinder No. 8 be modified to a three-directional restraint to restrict axial movement. The remaining restraints should be installed as two-directional restraints with the proper sliding fit utilizing 3/8-inch diameter U-bolts in lieu of existing 3/16-inch diameter U-bolts. Suitable thread locking devices are advised.

Engine B

The Engine B fuel oil system installation was incomplete at the time of the walkdown. Therefore, it is recommended that the system and supports including the modifications above be installed so that both Engines A and B systems are similar.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners Group," Report No. 11600.60-DC-02. Revision 0.

2. Stone & Webster Calculation number 11600.60-NP(B)-0601-XH

3. Memo No. 6480 from C. Malovrh/SWEC to J. Kammeyer/SWEC dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Oil Headers and Tubing Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-450D

TASK DESCRIPTION NO.: DR-06-03-450D-1

SNPS GPL NO. 03-450D

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Perform an engineering review of the small bore piping and tubing supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Provide adequate restraint of the small bore piping/tubing system in the intended support load directions.

ATTRIBUTE TO BE VERIFIED

Structural adequacy of the tubing and supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

IEEE 387

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations).

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Fuel Oil Header - Fuel Oil Supports

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-450D

REV. NO. 1

SNPS GPL NO. 03-450D

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the supports if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steven M Schwartz PROGRAM MANAGER J C Kammerer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a quality verified as-built drawing or sketch.

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Galella PROGRAM MANAGER D. Harmeyer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-450D

Effective Printout Date 11/05/84

COMPONENT TYPE: Fuel Oil Headers Supports

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
None		
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

Fuel Oil Filters & Strainers:

COMPONENT Fuel Oil Filters UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-455A TASK DESCRIPTION NO. DR-06-03-455A-0

SNPS GPL NO. 03-455A CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the lead engine report.
- A review of the lead engine DR/QR report (Shoreham).

The fuel oil filter at River Bend is a Nugent Model No. 1555-ISH-DN-W. This is the same manufacturer and series filter as that used in the lead engine and both filters have the same design pressure (200 psig), test pressure (300 psig), clean pressure drop (3-5 psid), changeover ΔP (20 psid), maximum particle retention size (3-5 μm) and collapse strength (100 psid).

The following maintenance recommendations from the lead engine DR/QR should be implemented:

- The filter differential pressure should be checked monthly and procedures should be established for replacing the filter element at or before the manufacturer's specified maximum of 20 psid.
- Air should be purged from the filters after maintenance.

In accordance with the lead engine report, differential pressure gauges should be installed on the filter for monitoring ΔP.

All required Quality inspections have been completed with satisfactory results.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Fuel Oil Filters & Strainers - Fuel Oil Filters UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-455A REV. NO. 1

SNPS GPL NO. 03-455A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that the bolting is adequately installed on the fuel oil filters.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status fo Component Document Package
2. Proper installation of bolting

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. The installation of the bolting is in accordance with the TDI requirements.

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No. 52

2. Approved Site NDE Procedures

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection report

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve R. Schmit PROGRAM MANAGER J C Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The attachment bolts of the fuel oil filters and strainers were torqued in accordance with the vendor manual. This was reported by TER# 06-074.

COMPONENT REVIEW (continued)

Engine 1B

1. No EDGCTS site experience documents are in evidence.

2. No inspection report has been received which fulfills this requirement.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Salelo PROGRAM MANAGER J C Kammeyer

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

FUEL OIL FILTERS & STRAINERS FUEL OIL STRAINER

COMPONENT PART NO.: 03-455B

This component number has been deleted. Fuel oil strainers are addressed under component number 03-825C.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Oil Filters and Strainers: Mounting Hardware

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-455C

TASK DESCRIPTION NO. DR-09-03-455C-0

SNPS GPL NO. 03-455C

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience.
- A review of the lead engine reports for Comanche Peak and Shoreham indicated substantial design margins.

There are no maintenance or modification recommendations for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub. Base & Oil & Water Piping - Fuel Oil: Piping & Fittings (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717M

TASK DESCRIPTION NO. DR-06-03-717M-0

SNPS GPL NO. 03-717M

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the review of the lead engine DR/QR report (Shoreham) and the applicable industry experience.

There is no site experience for this component in the EDG Component Tracking System.

There are no maintenance recommendations for this component. However, the lead engine report does address site specific modifications/additions of supports. The necessity for similar modifications/additions on River Bend has been assessed by a field walkdown.

The field walkdown was performed in accordance with the small bore piping criteria document (Ref. 1) and concluded that this component will performs its intended function for normal and earthquake loading provided that the supports are added as indicated in DR/QR report 03-717Q.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1) "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub Base & Oil & Water Piping: Fuel Oil Valves

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717N

TASK DESCRIPTION NO. DR-06-03-717N-0

SNPS GPL NO. 03-717N

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry or site experience, except for that previously addressed in the Shoreham DR/QR report.
- A review of the lead engine DR/QR reports (Shoreham/Comanche Peak)
- The auxiliary sub base fuel oil valves at River Bend consists of a 1" x 1½" relief valve manufactured by Crosby Valve and Gage Company (type JMB-WR-B; TDI P/N 74039-129). This valve is similar in design and application to the fuel oil booster pump relief valve used at Comanche Peak.

The following maintenance recommendation from the lead engine DR/QR report should be implemented:

- The valve should be disassembled and clean at each refueling outage.

Proper valve orientation (i.e., vertical installation) should be verified by field inspection. Pending satisfactory completion of the above inspection, there are no modifications required for this component based on the lead engine DR/QR report.

There is no Quality Revalidation required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Auxiliary Sub Base - Oil & Water Piping - Fuel Oil: Bolting and Gaskets

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717P

TASK DESCRIPTION NO. DR-06-03-717P-0

SNPS GPL NO. 03-717P

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the review of applicable industry experience listed in the EDG Component Tracking System and the lead engine DR/QR reports (Shoreham/Comanche Peak). There is no site experience for this component.

There are no maintenance or modification recommendations for this component.

Quality revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON

PROGRAM MANAGER

RB2680/1

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

AUXILIARY SUB-BASE AND OIL AND WATER PIPING -
FUEL OIL: SUPPORTS
(SMALL BORE SCOPE ONLY)
COMPONENT PART NO. 03-717Q

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the structural adequacy of the auxiliary sub-base fuel oil piping supports to withstand the effects of normal operating and earthquake loadings. The primary function of these supports is to provide adequate restraint of the small bore piping/tubing system in the intended support load direction.

II OBJECTIVE

The objective of this review was to perform an engineering evaluation of the small bore piping/tubing supports to assure that the components will perform their intended design function during normal operating and earthquake loadings.

III METHODOLOGY

In order to meet the stated objective, the following methods were used:

- The TDI Emergency Diesel Generator Component Tracking System was reviewed for the River Bend site, nuclear, and non-nuclear industry experience. See Appendix C for results.
- The Quality Revalidation Checklist results were reviewed for acceptability.
- Engine A, assembled, was evaluated using actual walkdown data. Engine B, not totally assembled, was evaluated by comparison data to Engine A and lead engine (Shoreham) reports.

Refer to the review procedures as described in Reference 1 for a detailed methodology of this evaluation.

IV RESULTS AND CONCLUSIONS

The piping/tubing supports, as defined by this component design review, have been evaluated in accordance with Reference 1 and have been found acceptable with modifications provided the final assembly of Engine B is verified to be similar to Engine A.

There are no TERs associated with this component.

The Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusion of this report.

Based on the above review and information contained in Reference 2, it is concluded that the supports will perform their intended design function at River Bend under all normal operating and earthquake loadings with the provision that the following recommended modifications be implemented as detailed in Reference 3:

- Support Nos. 03-717-01-UX and 03-717-01-UT on Engines A and B should be modified to permit axial pipe expansion.
- Flanges on the channel weldment to the pipe on support no. 03-717-01-UX should be mitered to provide clearance for adjacent piping on Engines A and B.

V REFERENCES

1. "Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group," Report No. 11600.60-DC-02, Revision 0.

2. Stone & Webster Calculation number 11600.60 NP(B)-0601-XH

3. Memo No. 6480 from C. Malovrh/SWEC to J. Kammeyer/SWEC dated 11/07/84.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Aux. Sub. Base & Oil & Water Piping - Fuel Oil: Supports (Small Bore Scope Only)

UTILITY Gulf States Utilities

GROUP PARTS LIST NO 03-717Q

TASK DESCRIPTION NO.: DR-06-03-717Q-1

SNPS GPL NO. 03-717Q

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Perform an engineering review of the small bore piping and tubing supports to provide additional assurances that the component will perform its intended design function during normal operating and earthquake loading.

PRIMARY FUNCTION

Provide adequate restraint of the small bore piping/tubing system, in the intended support load directions

ATTRIBUTES TO BE VERIFIED

Structural adequacy of the piping and tubing supports due to the effects of normal operating and earthquake loadings.

SPECIFIED STANDARDS

ASME III, CLASS 3, 1974 including summer '74 addenda

REFERENCES

"Engineering Review Criteria Document for the Design Review of TDI Diesel Small Bore Piping, Tubing, and Supports for the TDI Owners' Group" Report No. 11600.60-DC-02, Revision 0.

DOCUMENTATION REQUIRED

Delaval design documentation (specifications, calculations, drawings, etc.). In lieu of information from Delaval, the following information is required: verified support sketches and piping isometrics, material specifications, pipe size and schedule, and operating parameters (pressure, temperature, load combinations).

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Aux. Sub Base and Oil/Water Piping-Fuel Oil Supports

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-717Q

REV. NO. 1

SNPS GPL NO. 03-717Q

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

2. Obtain sufficient data to support the design review effort. This may be accomplished by developing quality verified as-builts in accordance with Procedure DG-7, or by the Design Group performing a field walkdown.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

2. Information necessary for the design review effort.

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

2. Review of detailed information by the Design Group

ACCEPTANCE CRITERIA (continued)

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

2. Procedure DG-7

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Quality verified as-built isometric drawings for the supports if available from the Owner.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Steve M Schwartz PROGRAM MANAGER JC Kammeyer

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COMPONENT REVIEW

Engine 1A

1. No EDGCTS site experience documents are in evidence.

2. The Design Group will be responsible for closing out the as-built drawings as per Procedure DG-7. The as-built drawings will be Quality verified by the appropriate site Quality organization. The performance of an engineering walkdown by the Design Group, precludes the issuance of a Quality verified as-built drawing or sketch.

COMPONENT REVIEW (continued)

Engine 1B

Same as Engine 1A

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Victor A Sokolic PROGRAM MANAGER J C Kammeyer

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 02-717Q

Effective Printout Dates:
River Bend: 10/10/84
Industry: 10/15/84

COMPONENT TYPE: Auxiliary Sub-Base Oil & Water Piping-Fuel Oil: Supports

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
None		
NUCLEAR		
Supports omitted during assembly of fuel oil bypass lines.	San Onofre 1 LER 206-77000, 770510	Review of supports indicates that all fuel oil supports have been installed at River Bend.
10 CFR 50.55E filed, support not built to ASME III Class NF as required.	10 CFR 50.55E Cleveland Electric DAR No. 117 dated 02/17/83	DR/QR provides assurance that components will perform their intended design function during normal operating and earthquake loadings.
NON-NUCLEAR		
None		

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Oil Booster Pump UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-825A TASK DESCRIPTION NO. DR-06-03-825A-0

SNPS GPL NO. 10-108 CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no siginificant applicable industry and site experience.
- A review of the lead engine DR/QR report (Shoreham).
- The fuel oil booster pump used at River Bend is of the same manufacturer and model number as that used at Shoreham (IMO Division of TDI, Model No. A6D8-118). The operating conditions for this component are similar at River Bend and Shoreham.

There are no maintenance items or modifications recommended based on the lead engine DR/QR report.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Stone & Webster "Specification for Standby Diesel Generator Systems" Specification No. 244.700, Addendum 2, 08/30/82.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Fuel Oil Filters & Strainers: Strainers

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-825C

TASK DESCRIPTION NO. DR-06-03-825C-0

SNPS GPL NO. 99-825E

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated that there was no significant applicable industry and site experience, except that which was previously addressed in the Comanche Peak report.
- A review of the lead engine DR/QR reports (Shoreham & Comanche Peak).
- The duplex fuel oil strainer at River Bend is a Hayward Manufacturing Co., Model No. 50S-CS while the duplex fuel oil strainer at Shoreham was an Air Maze, Model No. D3A18XDL. The design conditions of the two strainers are similar and the Hayward strainer is furnished with an 80 mesh strainer element which satisfies the filtration requirements of both the engine driven and motor driven fuel oil booster pumps.

The following maintenance recommendation from the lead engine DR/QR report should be implemented:

- The TDI Manual specifies strainer element changeover at 15 psid. This is acceptable from the viewpoint of strainer design.

The manufacturer's procedures for disassembling, cleaning/changing the strainer element, venting and reassembling the strainer are not contained in the TDI Associated Publications Manual for River Bend. It is recommended that the manufacturer's maintenance literature be obtained, and site operating and maintenance procedures be reviewed and updated as necessary to reflect the manufacturer's recommendations.

The Shoreham report identified a potential modification of replacing the existing strainer element (300 mesh) with a coarser design since the existing element is finer than that required by the fuel oil pumps. This potential modification is not applicable to River Bend since the Hayward strainer has an element (80 mesh) which is not too fine for its intended application.

Quality Revalidation is not required for this component.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Fuel Oil System - Fuel Oil Duplex Strainer

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-825C

REV. NO. 3

SNPS GPL NO. 99-825E

TASK DESCRIPTIONS

Engine 1A

No further review of component 03-825C is required for the following reasons

a) There is no site or industry experience reported for this component.

b) Component was reviewed on the lead engines (Shoreham - under component 03-455B/Comanche Peak) with satisfactory results.

GROUP CHAIRPERSON Victor A Salcita PROGRAM MANAGER, [illegible]

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

EMERGENCY DIESEL GENERATOR
COMPONENT PART NO. 03-650A

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reveiws of the generator to determine its adequacy for its intended use at River Bend. The primary function of the generator (AC Synchronous Generators, serial Nos. 17408442/43, manufactured by Electric Products Division, Portec, Inc.) is to supply all safety related loads in the event of loss of offsite power during a LOCA and to supply the normal safe shutdown loads.

River Bend Unit 1 has two diesel generators to supply the ESF loads of Divisions I and II. These diesel generators are each rated at 3500 kW and are supplied by TDI. A third diesel-generator rated at 2600 kW is dedicated to supply the high pressure core spray (HPCS) system in the event of a LOCA. The third diesel generator is not supplied by TDI and therefore is not subject to this review.

II OBJECTIVE

The objective of this review was to verify the generator's ability to maintain emergency bus voltage under emergency loading conditions.

III METHODOLOGY

The maximum coincident demand on the diesel generators was compared with the continuous and short-term ratings of the generator. NRC Safety Guide 9.0 (Ref. 1), Regulatory Guide 1.9 (Ref. 2), and IEEE Standard 387-1977 (Ref. 3) were reviewed regarding the ratings.

The sequential loading of the generators as specified in the proposed amendment to the FSAR (Ref. 4) was examined. Using the generator parameters determined by the vendor's shop tests (Ref. 5), minimum generator voltage was computed for each step of the sequential load. Calculations (Ref. 6) were performed to verify that the minimum generator terminal voltage is in excess of 75 percent of the rated voltage. The qualification tests (Ref. 7) were reviewed to verify that the voltage recovers to 90 percent of the rated voltage in less than two seconds due to the action of the regulator.

River Bend site experience, as reported in Component Tracking System printouts, was reviewed. In addition, nuclear and non-nuclear industry experience was reviewed.

The design of the brush arrangement was reviewed for adequacy (Ref. 6). Comparison was made with the brush arrangement at Shoreham.

The generator maintenance program was reviewed with regard to brushes and slip rings (Ref. 5).

The procurement specification, 244-700 (Ref. 4), was reviewed in the light of IEEE Std. 387-1977, NRC Regulatory Guide 1.9, and Safety Guide 9.0. Qualification tests (Ref. 7) were reviewed with regard to the test procedure imposed by IEEE Std. 387.

Quality Revalidation Checklist results were reviewed for acceptability.

IV RESULTS AND CONCLUSIONS

Examination of the sequential loading as specified in Reference 4 shows that the maximum continuous load will be 3130 kW on Division I diesel generator (1EGS*EG1A) in the event of a LOCA when the HPCS diesel generator (1E22*S001G) fails to start. Each generator has a continuous rating of 3500 kW. Therefore, it is concluded that the continuous rating of each generator is adequate.

Calculations (Ref. 6) show that the minimum voltage of the generator during automatic sequencing in the event of a LOCA will not drop below 92.0 percent of the rated voltage. Qualification tests (Ref. 7) show that the generator terminal voltage recovers to 100 percent of the rated voltage within 0.25 seconds. Based upon the calculations and results of the qualification tests, the performance of the generator is acceptable with regard to the specified minimum voltage (75 percent of the rated voltage as per procurement specifications, Ref. 8) and recovery time.

River Bend, nuclear and non-nuclear industry experience listed in the Component Tracking System was reviewed. The results of the review are given in Appendix C of this report. It was found that the incidents were not of a generic nature and do not impact the conclusions of this report.

Evaluation of the design of the brushes and brush holders at River Bend and comparison with those at Shoreham show that the brushes and brush holders are selected and designed adequately for both generators (Ref. 5).

No cases of failure of the brushes or slip rings has been reported at River Bend. Maintenance procedures recommended by the manufacturer (Ref. 5) are adequate.

The procurement specifications (Ref. 4) reflect the relevant standards (Ref. 1, 2, and 3). Qualification tests comply with the relevant standards (Ref. 3).

The information provided on TER 06-077 has been reviewed and is consistent with the final conclusions of this report.

Quality Revalidation Inspection results identified in Appendix B have been reviewed and considered in the performance of this design review, and the results are consistent with the final conclusions of this report.

Based on the above review, it is concluded that the emergency diesel generator is acceptable for its intended use at River Bend.

V REFERENCES

1. NRC Safety Guide 9.0, "Selection of Diesel Generator Set Capability for Standby Power Supplies," dated 03/10/71.

2. NRC Regulatory Guide 1.9, "Selection, Design and Qualification of Diesel-Generator Units used as Standby (On Site) Electrical Power Systems of Nuclear Power Plants," Rev. 2, December 1979.

3. IEEE Std. 387-1977, "Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations."

4. Proposed FSAR Amendment, Tables 8.3-2A, 8.3-2B, 8.3-2C, Letter to C.L. Ray from R.W. Helmick dated October 31, 1984. Reference Number RBG-19,334.

5. Portec Instruction Manual Operation, Maintenance for AC Synchronous Generator S.N. 174053909 and Portec Test Report, May 3, 1975.

6. Support Package FaAA-SP-84-6-45(g).

7. Test results, Document Number 74039-721, Gulf States Utilities Company, River Bend Station, Engine Serial No. 74039, September 15, 1981.

8. Spec. No. 244-700, Add. #2, 08/30/84, Standby Diesel Generators System River Bend Station - Unit 1, GSU.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT I

COMPONENT Emergency Diesel Generator UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-650A TASK DESCRIPTION NO. DR-06-03-650A-0

SNPS GPL NO. 03-650A CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Verify the adequacy of the continous and short term rating to meet the worst case loads on the 4.16-kV ESF buses of Divisions I and II.

Verify that the drop in the generator terminal voltage during the sequential loading of the generator does not exceed the specified value as per relevant IEEE Standards and NRC Regulatory Guides.

Identify and resolve any recurrent patterns of component failure listed on the Emergency Diesel Generator Component Tracking System.

Verify the design adequacy of the brush arrangement and compare it with that at Shoreham Nuclear Power Station (SNPS).

Review the generator maintenance program with regard to brushes and slip rings.

Verify that the generator procurement specifications reflect the relevant NRC Regulatory Guides and IEEE Standards and that the shop tests are in compliance with the IEEE Standards.

Review the Quality Revalidation Checklist results for acceptability.

Review information provided on TERs.

PRIMARY FUNCTION

Supply all safety related electrical loads in the event of a loss of offsite power (LOOP).

ATTRIBUTE TO BE VERIFIED

Ability to maintain emergency bus voltage under emergency loading conditions.

SPECIFIED STANDARDS

ANSI Standard C50.10 "General Requirements for Synchronous Machines."

ANSI Standard C50.12 "General Requirements for Salient Pole Synchronous Generators."

IEEE No. 115 "Test Procedures for Synchronous Machines."

NEMA MG-1 "NEMA Standard for Motors and Generators."

IEEE 323 (General Guide for Qualifying Class I Electrical Equipment for Nuclear Generating Stations).

IEEE Std. 387-1977 (Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations).

REFERENCES

Diesel generator procurement specification.

DOCUMENTATION REQUIRED

Site information on the generator exciter including:

1. Manufacturers instruction, operation, and maintenance manual.
2. Diesel generator procurement specification.
3. Qualification test data.
4. Diesel generator onsite test data.
5. Single line diagram for emergency bus system.
6. Nameplate data for emergency bus loads.

Manufacturer's information including generator data sheet.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Generator UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-650A REV. NO. 2

SNPS GPL NO. 03-650A

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.

Engine 1B

Same as Engine 1A

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package

Engine 1B

Same as Engine 1A

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package

Engine 1B

Same as Engine 1A

REFERENCES

Engine 1A

1. QCI No.52

Engine 1B

Same as Engine 1A

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with unsatisfactory results. N&D 3535 remains open.

Engine 1B

1. All EDGCTS site experience documents were assembled and reviewed with unsatisfactory results. N&D 3545 remains open.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

RESULTS AND CONCLUSION (continued)

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON Vita A Salta PROGRAM MANAGER [illegible]

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-650A

Effective Printout Date 10/10/84

COMPONENT TYPE: Emergency Diesel Generator

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
While lifting rotor for transport to diesel generator building, the rigging caused damage to small portion of armature.	N&D 3535, 3545 dated 04/18/83 and 06/28/83	While lifting the rotor of generator IEGS*EG1B during installation one pole washer was broken. Damage was repaired in the presence of vendor Rep. Repair procedure was as per vendor spec. #B.1. Action in this item is satisfactory. No impact on the conclusions of the report.
Generator installation manual is unavailable. Obtain installation manual directly from source.	E & DCR C-21, 269	Instruction manual has been supplied. No impact on the conclusions of this report.
NUCLEAR		
When diesel generator A was started, a high pitch vibration was noted. Rotor pole cap was thrown clear of rotor.	LER Robinson 2, 261-70000 701207	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
Diesel generator failed to accept load. Cause was undersized generator leads.	SER St. Lucie 1, 12-80, 800317	Equipment not made by TDI or Portec. No relevance to the conclusions of this report.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Brushes looked white hot while running.	NPRDS Davis-Besse 1, 810318, Hit 24	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
EDG-1 slip ring repair.	NPRDS Davis-Besse 1, 81-4-2, Hit 91	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
During test, generator stator high temperature alarm was received.	LER Prairie Island 1, 282-74000, 740809	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
During electrical switching operations, the E1 diesel breaker to the Unit 3 emergency bus failed to close because linkage in the breaker cubicle elevator mechanism cell switch was bent.	EPRI Peach Bottom 3 062775 DG-E1	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
DG-E1 tripped on "A" phase differential relay after generator had been paralleled.	EPRI Peach Bottom 2 121977 DG-E1	False trip of protective relays. Does not concern the issues addressed in the report.
Short between one coil to stator caused by loose laminations.	EPRI Pilgrim 1, 101178, DG-1B	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
Diesel generator brush rigging damaged by arcing.	NPRDS Brunswick 2, 830203 Hit 212	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
480V ground due to grounded stator lead.	NPRDS 10CFR50.55E San Onofre 1, 760609, Hit 196	One lead of the auxiliary generator was grounded. The lead was retaped and the generator was returned to service. Isolated incident. No impact on the conclusions of the report.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Engine reached full speed and unit breaker tripped. Cause: broken ring type lug in the CT circuit.	NPRDS Millstone 1 820913, Hit 179	Problem with relay circuit. Does not concern the issues addressed in the report. Equipment not made by TDI or Portec.
Detroit Edison experienced high vibrations on its diesel generator.	I&E FERMI, Notice 83-51, 05/28/83	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
Auxiliary generator drive pulley failed. Cause: Original weld failed.	NPRDS San Onofre 1, 760114, Hit 189	This is an isolated incident. Does not concern the issues addressed in this report.
Failure of breaker to close due to bent linkage.	NPRDS Peach Bottom 2 750627, Hit 187	Problem with circuit breaker. Does not concern the issues addressed in the report. Equipment not made by TDI or Portec.
Diesel generator inoperable due to overheating of ventilation cowling.	NPRDS Fitzpatrick, 820819, Hit 228	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
Diesel generator failed to accept load due to undersized exciter leads.	MP&L 83-024 10/22/83	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
Diesel generator inoperable due to overheating of ventilation cowling.	NPRDS Fitzpatrick 820819, Hit 227	Equipment not made by TDI or Portec. No impact on the conclusions of this report.
Generator stator coils burned.	Service Report TPC Nuclear Plant No. 3 Maanshan, dated 12/09/81 (File T-45)	Equipment not made by TDI or Portec. No impact on the conclusions of this report.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
DG-1A lost excitation voltage to the generator field. Loss of the generator field automatically opened the D/G breaker. The auxiliary operator then manually tripped the diesel. A GM-EMD Part No. 8283002 spring coil assembly which holds a generator brush in place vibrated loose.	Maine-Yankee 309-82040 821211	This is an isolated incident. Equipment not made by TDI or Portec. No impact on the conclusions of the report.
During surveillance tsting, D-G E4 breaker failed to close.	Peach Bottom 2, 102175 DG-E4	Circuit breaker problem. Not related to the issues addressed in this report. Equipment was not made by Portec or TDI. No impact on conclusions of the report.
NON-NUCLEAR		
One incoming line of generator suffered a cable lug failure which arced out and cracked an insulator in the generator terminal box.	Rafha/Saudi Arabia. Telex from Bailey (TDI) to Delaval HQ (File T-33)	Isolated incident. Failure does not impact the conclusions of this report.
Fatigue failure of generator terminal lug.	Rafha/Saudi Arbia. IOC from Bailey (TDI) to G. King (TDI) dated 05/12/81	Isolated incident. Failure does not impact the conclusions of this report.
Boloit Power System, Sitka, Alaska, generator lost its field because a lead between collector rings and field coils shorted to rotor.	I & E Circular 80-23 Sitka, Alaska	Equipment not made by TDI or Portec. No impact on conclusions of this report.

TDI OWNERS GROUP

for

RIVER BEND STATION - UNIT 1

GENERATOR CONTROLS
COMPONENT PART NO. 03-650B

I INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program for the River Bend Station requires Design and Quality Revalidation reviews of the generator controls (manufactured by Electric Products Division, Portec, Inc.), Part No. 72-10300-100 to determine the adequacy of the design for the intended use at River Bend. The primary functions of the generator controls are to provide field current for the generator and to regulate the voltage of the 4.16-kV emergency bus. This is accomplished by the static exciter, which is the subject of this report.

The static exciter consists of the following subcomponents:

- The diode bridge rectifier assembly and diverter silicon controlled rectifiers (SCRs), which together supply the field current.
- The voltage regulator, which controls the SCR firing circuits such that generator output voltage is maintained constant.
- The SCR firing circuits, which supply firing pulses to the diverter SCRs.
- Power potential transformers (PTs), current transformers (CTs) and linear reactors, which supply the required ac voltage to the rectifier bridge and SCRs.
- The field flashing circuit, which ensures self excitation of the generator.

The generator control cabinets as discussed in this report consist of a double depth set of cabinets, three cabinets wide. The bridge rectifier assembly, the voltage regulator, the SCR firing circuits, and the field flashing circuit are contained in the left-front cabinet. This cabinet will be referred to as the exciter cabinet. The power PT is in the bottom of the right cabinet and is mounted on the floor halfway between the front and rear panels. The power CTs and linear reactors are mounted in the left-rear and center-rear cabinets. The cabinet behind the left front is designated left rear. The governor controls and motor driven potentiometer are mounted in the center-front cabinet.

II. OBJECTIVE

The objective of the review was to verify the adequacy of the design and construction of the static exciter for its intended use at River Bend.

III METHODOLOGY

The Emergency Diesel Generator Component Tracking System (Ref. 1) was reviewed for industry experience and the following subcomponents were identified for a detailed design review:

- The diode bridge rectifier assembly and the diverter SCRs.
- The voltage regulator.
- The motor-driven potentiometer.
- The field flashing circuit.
- Linear reactors in the power circuit.

Detailed design review calculations (Ref. 2) were performed for the above subcomponents. Specifically, calculations were made to verify the adequacy of the following:

- Continuous and surge current ratings of the diodes and the SCRs.
- The ratings of the components of the motor-driven potentiometer circuit.
- The ratings of the components of the field flashing circuit.
- Thermal design of the linear reactors.

The design of the voltage regulator was evaluated qualitatively (Ref. 2).

The diesel generators at River Bend were inspected on October 8, 1984 (Ref. 3). Construction details, arrangement and mounting of the subcomponents of the static exciter were studied.

Recommendations for maintenance procedures or modifications were made to address the various design and construction deficiencies found in the above subcomponents of the static exciter.

Other failure incidents reported in the EDG Component Tracking System printouts not involving the above subcomponents were reviewed and the results are given in Appendix C of this report.

Quality Revalidation Checklist results were reviewed for acceptability. Applicable TERs were reviewed.

IV RESULTS AND CONCLUSIONS

The Emergency Diesel Generator Component Tracking System does not list any incidents related to the operation of the generator controls at River Bend. One incident listed is a report from the exciter cabinet assembler (RTE Switchgear), which identifies a potential problem in a panel similar to those at River Bend. The problem involves apparent damage to a high voltage knife-switch disconnect for one of the sensing potential transformers in the exciter system. This problem has apparently been resolved (Ref. 4) by replacing the switch connection with one of a new design. This problem has not been reported in any other site experience or industry experience listing and is not considered a generic design inadequacy.

Through correspondence with Portec (Ref. 5), notification of a potential problem with a Westinghouse current transformer (CT) has been received. This CT is not rated for the proper temperature range of operation and a substitute transformer has been selected by Portec. The Portec part number for the CT is A-01616-4 and although Reference 5 does not list River Bend as one of the sites having this CT, the Portec assembly list for the exciter (Ref. 6) does show that it was used in assembling the River Bend exciter. It is recommended that GSU identify the CT that is installed and make arrangements with Portec for replacement if necessary.

Notification of a potential design deficiency in the relay logic circuits associated with the field flashing circuit in the exciter at River Bend was received (Ref. 7). During preoperational testing, signals that would normally cause the engine to start were disabled to facilitate testing of relay logic. It was discovered that in the event that the engine does not start, the field flashing relay is latched in the closed condition and can only be opened by operation of the exciter manual reset. The field flashing resistor, which dissipates 5000-7500 watts, is located adjacent to electronic components of the exciter and will generate excessive heat if energized for a prolong period of time. Excessive heat in this location could damage the nearby electronic components. Normally, the field flashing resistor carries current for 2 to 5 seconds and is disconnected when the generator output builds up to about 60 percent of rated voltage. Damage to these components will prevent the generator from performing its safety function.

As part of the investigation of this incident, Comanche Peak Steam Electric Station, which also has TDI emergency diesel generators, was contacted. The relay logic at Comanche Peak precludes the occurrence of this problem by employing a time delay relay that resets the exciter control circuits (and causes the field flashing relay to open) in the event that the engines have not started within 5 seconds after the emergency start signal. We recommend that the relay logic in generator controls at River Bend be modified to include this function or an equivalent function. Further, until such modifications are made, a procedure should be implemented so that all starts are monitored and a manual reset of the exciter is performed in the event of a failed start.

This problem has not been reported at any other site, nor has it appeared on the site or industry Component Tracking System. Although a detailed survey of each plant has not been conducted, this problem is not considered a generic design inadequacy.

- The case of the field flashing relay is inadequate for the application. This is a relay operated from the 125-V (nominal) battery source and it closes its contacts to supply the field flashing current. Failure of the relay to close would make the diesel generator unavailable to supply the safety related loads within the 10-second time requirement. Several failures of this relay have been reported in industry experience as a result of dirty relay contacts. It is recommended that this relay be replaced by an enclosed relay. Detailed recommendations are given in Attachment 1 of this report.

- Thermal calculations for the linear reactors that supply current to the exciter show that the temperature rating of the coil insulation will be exceeded if additional cabinet ventilation is not provided. The reactor coils are built with Class B insulation, which is rated for 130 degrees C (266 degrees F). Procurement specifications (Ref. 8) require that the generator controls operate with a maximum ambient air temperature in the diesel room of 122 degrees F or 50 degrees C. Calculations (Ref. 2) show that at rated current and a surrounding air temperature of 50 degrees C the internal temperature of the coils is 125 degrees C. However, the reactors are mounted inside the left-rear and center-rear generator control cabinets, which are vented but not force ventilated. The heat generated by the reactors themselves will cause a temperature rise of at least 10 degrees C. The coils, therefore, will operate slightly higher than the temperature rating of the insulation if ventilation is not provided. Detailed recommendations for ventilation of the cabinets are discussed in Attachment 1.

Qualitative evaluation of the design of the voltage regulator indicates that although this subcomponent can perform its intended functions, several desirable features that ensure high reliability and performance have not been incorporated in the design. These features are power supply bypassing, coating of all adjustable potentiometer spindles with Glyptol lacquer, using MIL style multi-turn sealed potentiometers, soldering integrated circuits (ICs) to the printed circuit board (PC) directly instead of mounting in sockets, using double sided PCs, conformal coating of the PC boards, and shielding signal leads. Detailed recommendations to incorporate these features are made in Attachment 3 of this report. When the recommendations are implemented, the long-term reliability and performance of the voltage regulator will be enhanced. As the voltage regulator in its present state is adequate to meet its intended functions, implementation of the recommendations of Attachment 3 is left to the discretion of GSU.

Inspection of the bus components reviewed in this report (Ref. 3) revealed the following construction and mounting inadequacies:

- The diodes and the SCRs of the bridge rectifier assembly are mounted on the heat sink by tapped holes, contrary to the manufacturer's recommendations. Westinghouse, the manufacturer of the diodes and SCRs, specifically recommends against mounting using tapped holes.

- The generator control cabinets are inadequately ventilated.

- Power cables are terminated with up to three lugs on one stud, contrary to good wiring practice.

These deficiencies do not presently endanger the diodes and SCR, but for continued safe operation, these deficiencies should be remedied to ensure proper thermal and electrical contact with the heat sinks to prevent loosening of the diodes from vibration, and to ensure proper contact at all cable terminations. Remedial measures are recommended in the form of maintenance and modification procedures as detailed in Attachment 1 of this report, and design and construction modifications as detailed in Attachment 2 of this report. The recommendations of Attachment 1 may be implemented without significant modification of the existing equipment. These recommendations will allow monitoring of the temperature of the diodes and the SCRs. The recommendations of Attachment 2 involve remounting of the diodes, installing cooling fans in the exciter cabinet and redesign of the cable terminations. These recommendations may be implemented at the first refueling outage of the plant or earlier at the discretion of GSU.

Recommendations to remedy the design and construction deficiencies are organized as follows:

- Attachment 1 - the recommendations are to be implemented prior to placing the engine in emergency standby service to enable monitoring of the diodes. Recommendations are also made concerning the field flashing relay, linear reactors, heatsink wiring, and voltage regulator.

- Attachment 2 - the recommendations are to be implemented at the first refueling outage of the plant or earlier at the discretion of GSU to alleviate the need for the maintenance procedures in Sections IA, IB, and IC of Attachment 1.

- Attachment 3 - the recommendations are to be implemented at the discretion of GSU to enhance the long-term reliability and performance of the voltage regulator.

Other incidents of failures reported in the EDG Component Tracking System not involving the subcomponents considered in this report were reviewed. The results are given in Appendix C of this report. It was found that the failures were not of generic nature and do not impact the conclusions of this report.

The information provided on TER 06-077 dated November 1, 1984, has been reviewed and is consistent with the final conclusions of this report.

Quality Revalidation Inspection results identified in Appendix B of this report have been reviewed and considered in the performance of this design review and the results are consistent with the final conclusions of this report.

Based upon the above review, it is concluded that the generator controls are adequate for their intended use at River Bend if all the recommendations of Attachment 1 of this report are adopted. The recommendations of Attachment 2 of this report should be implemented at the first refueling outage of the plant or earlier the discretion of GSU so that the recommendations in Section IA, IB, and IC of Attachment 1 are no longer necessary Recommendations of Attachment 3 of this report may be implemented at the discretion of GSU to improve the long-term reliability.

V REFERENCE

1. Component Tracking System printout for River Bend Station, Component Part. No. 03-650B, dated 10/10/84.

2. FaAA design review support package SP-84-6-46 (g).

3. Alexander Kusko, Inc. Trip Report, River Bend Station, dated 10/08/84.

4. Letter from Mr. B. G. Schultz of Stone and Webster to Mr. W. J. Cahill, Jr., of GSU dated March 7, 1984.

5. Letter from H. A. Ashby of Portec dated 08/02/84.

6. Portec assembly list No. 72-10300-100.

7. Letter from Mr. R. W. Helmick of River Bend Nuclear Group to Mr. C. L. Ray of Duke Power Company dated 11/02/84.

8. Stone and Webster Procurement Specification 244-700 dated May 5, 1980, Rev. 2.

Attachment 1

River Bend Station
Maintenance and Modification Procedures - Generator Controls

I. BRIDGE RECTIFIER ASSEMBLY

A. Diode Mounting

1. Monitor the maximum temperature attained by the diodes by placing a temperature-sensitive label on the most visible face of the hexagonal body of the diode.

2. The temperature sensitive label should be of the type that permanently blackens when its temperature has been reached or exceeded.

3. The temperature rating of the labels should be 275 degrees F. Omega brand model BE-275 or equivalent (Ref. 1) is recommended.

4. The label should be inspected before and after each running of the emergency generator.

5. If the temperature label indicates that the specified temperature has been exceeded, perform an electrical test of the diode (Ref. 2), remove the diode from the heatsink and inspect the mounting threads of the heatsink and the diode.

6. Replace the diode and the heatsink as required to assure that proper mounting tightness, 360 in-lbs (Ref. 3) and thread condition is maintained.

B. SCR Mounting

1. Monitor the SCR maximum temperature as in I.A above.

2. Use Omega brand model BE-210 or equivalent (Ref. 1) for 210 degrees F.

3. Tighten to 300 in-lbs (Ref. 4).

C. Heatsink

1. Coat the side of the lugs and mounting bolt for the lugs that attach to the bottom of the diode and SCR heatsinks with Glyptol lacquer (Ref. 5).

2. Apply the Glyptol on a readily visible side so that relative motion of the lugs with respect to one another or with respect to the mounting bolt can be detected.

3. Inspect the connections after each monthly test of the emergency generator.

4. Retighten connections that appear to have loosened. Remove old Glyptol and reapply if connections are retightened.

II. VOLTAGE REGULATOR BOARDS

A. Adjustment Potentiometers

1. Coat one side of the adjustment screw for each of the five adjustment potentiometers on the printed circuit board of the voltage regulator with Glyptol lacquer.

2. If adjustments are needed, remove the Glyptol and reapply when the adjustment procedure is complete.

B. Printed Circuit Board

1. At each refueling outage, remove the covers of the voltage regulator enclosures and inspect the components mounted on the printed circuit boards. Check for cleanliness and proper mounting of components. Report any abnormal conditions to engineering for evaluation.

C. Spare Parts

1. It is recommended that an adequate supply of spare parts be maintained.

III. FIELD FLASHING RELAY

A. Replace the FF relay (a dc contactor, Class P10 Cat No. P102D12 made by Gould Distribution and Control Division, Ref. 6) by an equivalent dc contactor rated as follows: Coil voltage, 100-140 V; contact voltage, 140 V DC; contact current, 90A dc. The relay should be of the enclosed type of prevent particles of dirt from being deposited on the contacts.

IV. POWER CIRCUIT LINEAR REACTORS

A. The generator control cabinets must be ventilated or cooled so that the air temperature in the cabinets in the vicinity of the reactors does not exceed 50 degrees C (122 degrees F).

V. REFERENCES

1. 1983 Omega Temperature Measurement Handbook, Omega Engineering, Inc., Q05.

2. Portec Static Exciter Voltage Regulator Model 72-10300-100 Instruction Manual.

3. Westinghouse Power Semiconductor Manual pp R35-R38.

4. Westinghouse Power Semiconductor Manual pp S35-S28.

5. Gerber Electronics Catalog, p. 585 - General Cement Production Bulletin.

6. Portec Dwg. D72-10300-710.

Attachment 2

River Bend Station
Recommendations for Design and Construction
Modifications - Generator Controls

I. Bridge Rectifier Assembly

A. Exciter Cabinet Ventilation

1. The bridge rectifier assembly in the exciter cabinet (left-front cabinet) must be ventilated so that the air temperature inside the cabinet in the vicinity of the bridge rectifier assembly does not exceed a temperature of 50 degrees C (122 degrees F).

2. Ventilation may be accomplished by supplying chilled air to the cabinets, by installing exhaust fans or by other means. If chilled air is used, care must be taken to avoid condensation within the cabinet.

B. Diode Mounting

1. The diodes should be mounted on the heatsinks with drilled holes, nuts, and lockwashers, and tightened to the proper torque (Ref. 1).

C. SCR Mounting

1. The SCRs should be mounted on the heatsinks with drilled holes, nuts, and lockwashers, and tightened to the proper torque (Ref. 2).

D. Heatsink Connections

1. The bolted-on lug arrangement must be redesigned so that there are not more than two lugs on each bolt.

2. Heatsink anodizing must be removed in the contact areas of all bolts and bus bar studs.

3. Current-carrying surfaces of lugs must not be separated by washers or nuts.

III. REFERENCES

1. Westinghouse Power Semiconductor Manual pp R35-R38.

2. Westinghouse Power Semiconductor Manual pp S35-S38.

Attachment 3

River Bend Station
Modifications Recommended to Improve
Long-Term Reliability - Generator Controls

I. VOLTAGE REGULATOR

A. Circuit Design

1. Power Supply Bypassing

The purpose of power supply bypassing is to prevent ac noise voltage generated outside the voltage regulator circuit from interfering with its operation and to prevent voltages generated by the circuit itself from propagating in the circuit. Inspection of the PC board and the voltage regulator schematic shows that power supply bypassing has been almost completely neglected in the circuit design. The following modifications are recommended:

a. The power supply terminals of each individual integrated circuit (IC) should be bypassed with a 0.01 - 0.1 F ceramic capacitor from its supply terminals to ground (Ref.1). The high current buffers (U3, U5, U[illegible] Portec Drawing No. D72-13000-710 Rev. B, Schematic-SVS Regulator with paralleling) require bypassing capacitors of 0.1 F so that transients will not get back to the ICs (Ref. 2).

b. In addition to the high frequency bypass capacitor, a large value capacitor (approximately 10 F) is required for voltage regulator op amp U1, Portec Drawing No. D72-13000-710, Schematic-SVS Regulator with paralleling. This is because of the presence of CR31 and R73.

2. Shielding and Routing of External Signal Leads

Shielding and proper routing of signal leads external to the PC board is intended to prevent electromagnetically induced noise voltages from entering the signal leads. This is done by using shielded signal leads and by routing the leads so as to maximize the distance between the signal and high current leads. These techniques have been neglected in the wiring of the voltage regulator.

The following modifications are recommended.

a. Shielded signal leads should be used for the connections between the motor-driven potentiometer and the voltage regulator.

b. A high frequency bypass capacitor providing an in-circuit low frequency cutoff of no less than 1 kHz be installed to reduce high frequency noise on the feedback signal without interfering with the feedback loop operation.

c. The leads for the SCR gate signals should be run in separate bundles away from the current carrying leads.

3. Current Feedback Signal

The purpose of the current feedback signal is to improve the closed loop response of the voltage regulator. The current feedback signal is derived from a sensing transformer that measures one of the diode currents in the bridge rectifier. The following modification should be made to improve the stability of the voltage regulator while providing the same performance.

Replace the single-phase current sensing circuit with a three-phase current sensing circuit. This requires the use of a three-phase sensing transformer and a three-phase bridge rectifier circuit on the PC board. Additional stability is provided by reducing the filtering requirements of the feedback signal, which are presently provided by a resistance-capacitance filter on the PC board.

B. Construction

1. Vibration Protection

Reliable mounting of components on the PC board and the proper selection of components is necessary to assure that the voltage regulator can withstand the vibration encountered during seismic events, construction or maintenance. However, the design of the board does not appear to be adequate from these conditions. At a minimum, the following modifications should be made:

a. The nine integrated circuits on the PC board that are presently mounted in sockets should be soldered directly to the PC board (Ref. 3).

b. The voltage range and stability adjustment potentiometer (R4 and R5) are unsealed, one turn commercial grade devices. General recommendations in Reference 4 suggest that MIL style components should be used in such Class 1E applications. These potentiometers should be replaced with MIL style, sealed, multi-turn potentiometers to improve the reliability and stability of these components.

2. Printed Circuit Board Construction

It is essential that the PC board construction be suitable for the reliability, mechanical, environmental and electromagnetic requirements of the Class 1E application. The following modifications should be made to assure adequacy of the design.

a. The present PC board is a single-sided board (i.e., copper circuit on one side and components on the other). Double-sided PC boards are commonly used in noise sensitive applications and where high reliability is necessary. The extra copper layer provides additional bypassing of high frequency AC noise.

b. The PC board should be conformally coated as a final step in manufacturing. Conformal coating prevents humidity and airborne particles from affecting the operation of the circuitry.

c. Components should be soldered directly to the PC board. If sockets are used, retaining mechanisms must be provided to hold the components in the sockets.

V. REFERENCES

1. Roberge, J. K., "Operational Amplifiers - Theory and Practice," p. 444, John Wiley & Sons, Inc., New York 1975.

2. Stout D., and M. Kaufman, "Handbook of Operational Amplifier Circuit Design," p. 3-27. McGraw-Hill Book Co., New York 1976.

3. "IEEE Trail-Use Guide for Class 1E Control Switchboards for Nuclear Power Generating Stations," IEEE Std. 420-1973, p. 8, Sec. 4.1.2.

4. "IEEE Standard: Criteria for Protecting Systems for Nuclear Power Generating Stations," IEEE Std. 279-1971, p. 8, Sec. 7.3.

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Emergency Generator Controls UTILITY Gulf Station Utilities

GROUP PARTS LIST NO. 03-650B TASK DESCRIPTION NO. DR-06-03-650B-0

SNPS GPL NO. 03-650B CLASSIFICATION TYPE A

TASK DESCRIPTIONS

The design review of the generator controls focuses on the generator exciter. Specific steps to the design review are:

- Review the site experience reported in the Component Tracking System.
- Contact site personnel to obtain additional background information on the exciter.
- Identify Component Tracking System events that are related to the design of the equipment.
- Perform a site inspection to gather additional information on the construction, installation, operation, and environment of the equipment. These inspections constitute the quality revalidation effort for this component.
- The exciter is typically organized as three assemblies: 1) the bridge rectifier assembly, consisting of diodes and thyristors; 2) the voltage regulator consisting of one or more printed circuit boards; and 3) a motor driven potentiometer. Design review calculations are performed to verify the adequacy of these assemblies.
- Recommend maintenance procedures or modifications as needed to assure the adequacy of the exciter.
- Verify that all design related events listed in the Component Tracking System are addressed by the design review.
- Review information provided on TERs.

PRIMARY FUNCTION

Provides field current for the generator and regulates the generator AC output voltage.

ATTRIBUTE TO BE VERIFIED

Diodes in bridge assemblies: cooling, current and voltage rating.

Diode surge current ratings.

Bridge assembly construction and wiring.

Silicon controlled rectifier in bridge assembly: cooling, current and voltage ratings.

Voltage regulator design and construction.

Motor driven potentiometer component ratings.

Potential transformers, current transformers and linear reactors: Proper mounting and cooling.

SPECIFIED STANDARDS

Not required

REFERENCES

Diesel generator procurement specification.

DOCUMENTATION REQUIRED

Site information on the generator exciter including:

Manufacturers instruction manual.

Diesel generator procurement specification.

Diesel generator onsite test data

Manufacturer's information including:

Electrical schematics for the exciter, all assemblies and sub-assemblies within the exciter.

A description of the exciter's circuit configuration.

Industry standard part numbers for all power handling components, integrated circuits and other parts purchased by the manufacturer.

DOCUMENTATION REQUIRED (continued)

Heat sink configurations for the major power semiconductors.

Design data for the power handling magnetic components.

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Generator - Generator Control

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-650B

REV. NO. 3

SNPS GPL NO. 03-650B

TASK DESCRIPTIONS

Engine 1A

1. Assemble and review existing documentation.
2. Verify that no Mult-Amp, States Division terminal blocks which were manufactured between 1974 and 1976 are installed.

Engine 1B

1. Assemble and review existing documentation.
2. Visually inspect the three phase voltage regulator to identify the specific components.
3. Visually inspect the voltage regulator bridge rectifier to check the method of bonding the diodes to the heat sinks.
4. Visually inspect the exciter to determine the wiring and construction method used.
5. Verify that no Multi-Amp States Division terminal blocks which were manufactured between 1974 and 1976 are installed.

ATTRIBUTES TO BE VERIFIED

Engine 1A

1. Quality status of Component Document Package
2. Type of terminal blocks installed

ATTRIBUTES TO BE VERIFIED (continued)

Engine 1B

1. Quality status of Component Document Package
2. Specific components of three phase voltage regulator
3. Method by which diodes were bonded to the heat sinks
4. Wiring and construction method used on exciter.
5. Type of terminal blocks installed

ACCEPTANCE CRITERIA

Engine 1A

1. Satisfactory Document Package
2. No Multi-Amp States Division terminal blocks (1974-1976) are installed.

Engine 1B

1. Satisfactory Document Package

2-4. Review of inspection report by the Design Group

5. No Multi-Amp States Division terminal blocks (1974-1976) are installed.

REFERENCES

Engine 1A

1. QCI No.52
2. Approved Site NDE Procedures, TER# 99-037

Engine 1B

1. QCI No.52

2-4. Approved NDE Procedures, TER# 99-014

5. Approved Site NDE Procedures, TER# 99-037

DOCUMENTATION REQUIRED

Engine 1A

1. Document Summary Sheet

2. Inspection Report

Engine 1B

1. Document Summary Sheet

2-5. Inspection Report

GROUP CHAIRPERSON Victor A. Sabato PROGRAM MANAGER J. Wm for file

COMPONENT REVIEW

Engine 1A

1. All EDGCTS site experience documents were assembled and reviewed with satisfactory results.

2. No inspection report has been received which fulfill these requirements.

Engine 1B

1. All EDGCTS site experience douuments were assembled and reviewed with satisfactory results.

2-4. A trip report was received transmitting the results for the required inspections. Results were reported by TER# 06-077.

5. No inspection report has been received which fulfill these requirements.

RESULTS AND CONCLUSION

Engine 1A

The Quality Revalidation effort with respect to this component, as outlined above, is complete. The results have been forwarded to the Design Review Group for their evaluation and conclusions in support of the final report.

RESULTS AND CONCLUSION (continued)

Engine 1B

Same as Engine 1A

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

EDG COMPONENT TRACKING SYSTEM: RIVER BEND SITE, NUCLEAR AND NON-NUCLEAR INDUSTRY EXPERIENCE SUMMARY

COMPONENT NO. 03-6503

Effective Printout Date: 10/15/84

COMPONENT TYPE: Generator Controls

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
RIVER BEND		
Potential problem with HV knife switch connection for sensing PT reported by RTE Switchgear.	10CFR50.55E 12/21/84	Problem has been addressed by GSU/SWEC. Incident does not pose a pattern of concern for River Bend.
NUCLEAR		
Generator tripped because of failure of diode in voltage regulator operated potentiometer.	EPRI Pilgrim 1 073074 DG-1B Alco Engine Div.	This incident is a random failure and does not pose a pattern of concern for River Bend.
Deficiency in test procedure. New procedure developed.	LER North Anna 2 339-82013, 820308 Ser. 62-82, Fairbanks-Morse.	This incident is a result of operator error or a procedural problem and is not related to a design deficiency of the equipment.
Generator failed to to excite or start up because of unused relay target.	Oyster Creek 219-78031, 781130, GM-EMD	Equipment was installed or wired improperly. Not a design related incident.
Problem with residual voltage relaying. New relay installed.	LER North Anna 2 339-82108, 820427 Fairbanks-Morse	This incident has no relationship to the design of the equipment at River Bend.
Faulty lead on generator monitoring instrumentation.	LER North Anna 2 339-80003, 800528 Fairbanks-Morse	This incident is a random failure and does not pose a pattern of concern for River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Generator did not pick up load. Worn brushes on motor-driven potentiometer.	LER Kewaunee 305-74000, 740719 NPRDS-Hit232, GM-EMC	This incident has no relationship to the design of the equipment at River Bend.
Generator failed to excite because of loose fuse holder in exciter.	LER Calvert Cliffs 1 317-7700, 771010 Fairbanks-Morse	This incident is a random failure and does not pose a pattern of concern for River Bend.
Generator tripped because of increase in main generator voltage.	LER Calvert Cliffs 1 318-78000, 780110 EPRI-NP-3933 6/82 Fairbanks-Morse	This incident is a result of operator error or a procedural problem and is not related to a design deficiency of the equipment.
Operator caused mismatch between main generator and diesel generator. Generator tripped.	LER Millstone 2 336-77000, 771109 Fairbanks-Morse	This incident is a result of operator error or a procedure and is not related to a design deficiency of the equipment.
Generator tripped while running. Diodes failed.	LER Big Rock Point. 155-70000, 700806 Caterpillar	Failures in the bridge rectifier circuit are addressed in the report. Maintenance items and design changes are recommended.
Generator voltage could not be adjusted from the control room because of a loose fuse clip.	EPRI Pilgrim 1 032574 DG-1B Alco Engine Div.	This incident is a random failure and does not pose a pattern of concern for River Bend.
Generator voltage dropped while running. SCRs failed in voltage regulator.	Grand Gulf Report Number 83-024, 9/22/83 TDI	Failures in the voltage regulator are addressed in the report. Maintenance items and design changes are recommended.
Generator tripped on start of RHR pump because of design error-1981 modification.	SER Quad Cities 1 78-82 6/22/82 GM-EMD	This incident has no relationship to the design of the equipment at River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Potential logic problem noted during design review.	SER Palisades 59-82 8/17/82 Alco Engine Div.	This incident has no relationship to the design of the equipment at River Bend.
Breaker failed to operate because of uncharged spring.	SER Fort St. Vrain 38-82 05/01/82 Caterpillar	This incident is a result of operator error or a procedural problem and is not related to a design deficiency of the equipment.
Design deficiency found, time delays being installed.	SER North Anna 1 55-80 11/14/80 SOER 81-10 Fairbanks-Morse	This incident has no relationship to the design of the equipment at River Bend.
Offsite power not restored because of design error in breaker circuit. Design change made.	SER Almaraz 1 79-82, 1013/81 SOER 83-6	This incident has no relationship to the design of the equipment at River Bend.
Voltage regulator failed because of water leak.	EPRI Peach Bottom 2 012474-DC-4 Fairbanks-Morse	This incident has no relationship to the design of the equipment at River Bend.
Generator did not excite because of dirty relay contacts in FF circuit.	LER Dresden 2 237-75000, 750319 EPRI-NP-2433, 6/82 NPRDS-Hit 145, GM-EMD	Failures in the field flashing circuit are addressed in the report. Design changes are recommended.
Generator voltage spiked to greater than 5200 V because of bad solder joint on voltage regulator printed circuit board.	LER Zion 1 295-78002, 780103 EPRI-NP-2433, 6/82 Cooper-Bessemer.	Failures in the voltage regulator are addressed in the report. Design changes are recommended.
Diesel tripped because of wrong frequency setting.	NPRDS Dresden 2 7707712 Hit 125 GM-EMD	This incident is a result of operator error or procedural problem and is not related to a design deficiency of the equipment.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Generator voltage dropped to 3000 V and oscillated because of bad amplifier in voltage regulator.	LER Zion 2 304-79017, 790310 EPRI-NP-2433 6/82 Cooper-Bessemer	Failures in the voltage regulator are addressed in the report. Maintenance items and design changes are recommended.
Generator voltage oscillates between 3000-4000 V because of drift of voltage regulator stability circuit.	LER Zion 2 304-78041, 780517 EPRI-NP-2433 6/82 Cooper-Bessemer	Failures in the voltage regulator are addressed in the report. Maintenance items and design changes are recommended.
Generator voltage rose to 4300 volts and could not be lowered during test because of bad K-1 relay.	LER Zion 2 304-78005, 780106 EPRI-NP-2433 6/82 Cooper-Bessemer	This incident is a random failure and does not pose a pattern of concern for River Bend.
Voltage regulator failed because of miswound paralleling transformer.	Grand Gulf Report Number 83-024 9/22/83 TDI	Equipment was installed or wired improperly. Not a design related incident.
Generator failed to excite because of dirt in FF relays.	LER Peach Bottom 2 277-75000, 750428 EPRI-NP-2433 6/82 042818-DG E2 NPRDS-Hit 188 Fairbanks-Morse	Failures in the field flashing circuit are addressed in the report. Design changes are recommended.
No output voltage from generator. Ground short because of chafing of leads.	LER Zion 1, 295 75000, 750118 EPRI-NP2433, 06/82	This incident is a random failure and does not pose a pattern of concern for River Bend.
Generator paralleled out of phase. Diodes in regulator circuit failed.	NPRDS Pilgrim 1 780802, Hit 93 EPRI-08278 DG-1B Alco Engine Div.	This incident is a random failure and does not pose a pattern of concern for River Bend.
Generator tripped. Rectifier assembly failed.	NPRDS Salem-1 771104 Hit 85 Alco Engine Div.	Failures in the bridge rectifier circuit are addressed in the report. Maintenance items and design changes are recommended.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Generator failed because of inverter failure.	LER Cook 1 315-82076, 820823	This incident has no relationship to the design of the equipment at River Bend.
Generator voltage cutout failed because of sticky relay contacts.	NPRDS Trojan 1 830418, Hit 259 GM-EMD	This incident is a random failure and does not pose a pattern of concern for River Bend.
Over-excitation alarm actuated on shutdown because of defective relay.	NPRDS Trojan 1 830268, Hit 260 GM-EMD	This incident has no relationship to the design of the equipment at River Bend.
Following SCRAM, generator could not be put on bus because of failure of loss of excitation relay. Procedure revised.	EPRI Brunswick 2 021378 DG-1 Norberg	This incident is a result of operator error or a procedural problem and is not related to a design deficiency of the equipment.
Instrument inverter failed.	EPRI Zion 1 081179 Inv 114 DG-0	This incident has no relationship to the design of the equipment at River Bend.
Generator tripped. Suspected base potential transformer.	NPRDS Pilgrim 1 800 505 Hit 2 and 92 Alco Engine Div.	This incident is a random failure and does not pose a pattern of concern for River Bend.
Generator failed to to field flash because of burned out rectifier.	NPRDS Quad Cities 1 770425, Hit 158 GM-EMD	Failures in the field flashing circuit are addressed in the report. Design changes are recommended.
Generator overloaded because of operator error.	NPRDS Zion 2 760919, Hit 238 Cooper-Bessemer	This incident is a result of operator error or a procedural problem and is not related to a design deficiency of the equipment.
Generator did not excite because of failed coil.	NPRDS Brunswick 2 810629, Hit 211 Norberg	Failures in the field flashing circuit have been addressed in the report. Design changes are recommended.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Generator field flashing relay failed on startup.	NPRDS Brunswick 1 820726 Hit 205 Norberg	Failures in the field flashing circuit are addressed in the report Design changes are recommended.
Generator started because of false undervoltage condition. Generator failed to energize bus because of broken wire lug.	EPRI Brunswick 2 010976 DG-1 Norberg	Equipment was installed or wired improperly. Not a design related incident.
Generator failed to operate with proper voltage and frequency because of failed fuse.	EPRI Davis Besse 060478, DG-1-1 NPTDS Hit 90 GM-EMD	This incident is a random failure and does not pose a pattern of concern for River Bend.
Rectifier found to be disconnected. Repair made.	I&E Notice 83-51 Clinton NP 05/20/83 Louis-Allis	Equipment was installed or wired improperly. Not a design related incident.
Generator tripped because of shorted resistor in logic circuit.	NPRDS Brunswick 1 810708, Hit 204 Norberg	This incident has no relationship to design of the equipment at River Bend.
Generator field failed to flash because of dirty relay contacts.	NPRDS San Onofre 1 821123, Hit 262 TDI	Failures in the field flashing circuit are addressed in the report. Design changes are recommended.
Voltage regulator did not control generator voltage because of failed source circuit breaker.	NPRDS Arkansas Nuclear 1 830413, Hit 269 GM-EMD	This incident is a random failure and does not pose a pattern of concern for River Bend.
Generator did not respond to manual voltage control because of failed K-1 relay.	EPRI Zion 1 072274 DG 1A, B Cooper-Bessemer	This incident is a random failure and does not pose a pattern of concern for River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Relay burned up in control panel because of coil failure.	NPRDS Kewaunee 750730, Hit 233 GM-END	This incident is a random failure and does not pose a pattern of concern for River Bend.
Diesel generator tripped on overspeed because of SCR failure in inverter.	EPRI Cook 1 120976 DG-CD Worthington	This incident has no relationship to the design of the equipment at River Bend.
Diesel generator failed to start because of faulty switch. Switch repaired.	LER Dresden 1 010-78013, 780304 EPRI-NP-2433	This incident is a random failure and does not pose a pattern of concern for River Bend.
Control circuit breaker tripped because of slow blow fuses.	LER Zion 1 295-80012, 800312 NPRDS Zion 1 800312 Hit 47 Cooper-Bessemer	This incident has no relationship to the design of the equipment at River Bend.
Generator tripped because of shorted resistor in logic.	DPRDS Brunswick 1 810614, Hit 204 Norberg	This incident has no relationship to the design of the equipment at River Bend.
Voltage regulator failed because of burned out SCR. SCR replaced.	LER MP&L; 83-140 GGNS DG Reliability Report 10/26/83	Failures in the voltage regulator are addressed in the report. Maintenance items and design changes are recommended.
Blow PT fuse alarm because of CFVB relay malfunction.	NPRDS Ark Nuc One -1 750423 Hit 264 GM-EMD	This incident is a random failure and does not pose a pattern of concern for River Bend.
Generator tripped lock out relay and loss of excitation relay because of blocking device.	LER Arkansas Nuclear 313-81007-1, 810427 GM-EMD	This incident is a random failure and does not pose a pattern of concern for River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Generator tripped "not available" alarm. High maintenance caused vibrations. The vibrations caused differential relays of Phase A to C to trip.	EPRI Brunswick 2 0220679 DG 1	This incident is a random failure and does not pose a pattern of concern for River Bend.
Potentiometers in NGV relays defective.	Shoreham LER 322 78000 780301 TDI	Vendor defect. Not related to components in review.
Generator did not respond to manual control. Regulator with dirty contact.	EPRI Zion 1, 072874, DG 1A and 1B.	Failures in the voltage regulator are addressed in the report. Maintenance items and design changes are recommended.
Voltage regulator board found defective during inspection.	NPRDS Arkansas Nuclear 1 780130, Hit226, GM-EDM	Failures in the voltage regulator are addressed in the report. Maintenance item and design changes are recommended.
Field breaker would not close. Failed field diode.	NPRDS Quad Cities 1, 771128, Hit 157 GM-EMD.	This incident has no relationship to the design of the equipment River Bend.
Generator field failed to flash. Shorted capacitor in field flashing circuit.	LER Dresden 3, 249-77000, 770322 NPRDS Hit 149 GM-EMD	This equipment is not made by TDI. Failure of a similar capacitor in the River Bend system would not prevent the generator from field flashing.
Malfunction due to a shorted selenium rectifier in the generator field circuit. Short was caused by build up of dirt.	LER Dresden 2 237-76000, 760930 NPRDS Hit 123 EPRI-NP-2433 6/82 EM-EMD.	This incident is a random failure and does not pose a pattern of concern for River Bend.

EXPERIENCE	REFERENCE DOCUMENTS	RIVER BEND STATUS
Generator field failed to flash. Shorted capacitor in field flashing circuit.	NPRDS Dresden 2 750405 Hit 146 GM-EMD	This equipment is not made by TDI. Failure of a similar capacitor would not prevent the generator from field flashing.
Generator tripped on overspeed. Fuse in clip unsprung causing poor contact.	NPRDS Browns Ferry 3 770919, GM-EMD	This incident is a random failure and does not pose a pattern of concern for River Bend.
Design deficiency in application of Westinghouse ECT. Current transformer operated outside rated temperature.	10CFR50,55E Wash Pub Supply System 12/15/81 TDI	The corresponding CT used in the River Bend static exciter is different from the one reported in the failure.
Diesel generator tripped on loss of field.	LER Indian Point 2 247-74000, 740315 Alco Engineering Div.	Insufficient information in reference documents for evaluation.
DG-E1 tripped on A-phase differential after paralleling with E12 4 kV bus. No problem found.	Peach Bottom 2 121977 EPRI DG-E1 Fairbanks-Morse	This incident is a random failure and does not pose a pattern of concern for River Bend.

NON-NUCLEAR

None

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Generator: Shaft & Bearings UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-650C TASK DESCRIPTION NO. DR-06-03-650C-0

SNPS GPL NO. 03-650C CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- The static lateral and dynamic torsional loadings were computed and used to evaluate both the generator shaft factor of safety, for yielding and fatigue, and the bearing operating characteristics. The resulting bearing operating characteristics are within accepted industry allowables and the factors of safety are comparable to the lead engines at Shoreham and Comanche Peak.

- A review of the EDG Component Tracking System indicates that there have been no design related problems associated with this component. There is no site experience for River Bend listed in the Component Tracking System.

There are no maintenance or modification recommendations for this component other than those specified by the vendor.

Quality Revalidation for this component is not required.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Assembly Cabinet/System

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500A

TASK DESCRIPTION NO. DR-06-03-500A-0

SNPS GPL NO. 03-500A

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Based on a review of the lead DR/QR report (Comanche Peak), a design review of the control panel assembly cabinet/system is not required for River Bend.

The application of the electropneumatic control system used on River Bend to start, stop, operate, protect, and monitor the diesel is essentially identical to Comanche Peak design.

The logic design and controls used on River Bend to bypass all Group I and Group II trips during an emergency condition and to provide maintenance/operational mode control is identical to Comanche Peak design.

River Bend differs from Comanche Peak in the pneumatic logic design to disable the Group II trips on diesel startup and trip on diesel malfunction. The addition of a two-way, quick release pressure actuated valve provides rapid venting action of the pneumatic logic board and corresponding shutdown of the River Bend diesel.

There is no River Bend site experience listed in the EDG Component Tracking System for the control system.

Nuclear and non-nuclear industry experience listed does not show any significant or generic problems associated with the type of electropneumatic system used on River Bend.

There are no maintenance or modification recommendations for the control panel assembly cabinet/system.

Quality Revalidation of the control panel assembly cabinet/system is not deemed necessary.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Assembly Annunciators

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500B

TASK DESCRIPTION NO. DR-06-03-500B-0

SNPS GPL NO. 03-500B

CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Based on a review of the lead DR/QR report (Shoreham), a design review for the annunciator is not required for River Bend.

The application of the annunciators used at River Bend to provide local audiovisual status for diesel generator operation is similar to Shoreham. Ronan annunciators (TDI Part No. 74039-125) used at River Bend are powered independently from the diesel engine control circuitry to assure that loss of the annunciator will not compromise the intended safety function of the diesel and vice versa. A review of the vendor's information for this annunciator shows that it meets design requirements.

There is no site or non-nuclear industry experience identified in the EDG Component Tracking System. Nuclear industry experience listed does not show problems relating to the annunciator design or application used at River Bend.

There are no maintenance or modification recommendations required for the control panel assembly annunciators.

Quality Revalidation of the control panel assembly annunciators is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

COMPONENT DESIGN REVIEW CHECKLIST

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Assembly - Accumulator

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500F

TASK DESCRIPTION NO. DR-06-03-500F-0

SNPS GPL NO. 03-500F

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Based on a review of the lead DR/QR report (Shoreham) a design review for the accumulators is not required for River Bend.

The application of the Bimba accumulators used on River Bend is similar to those used on Shoreham. River Bend differs from Shoreham in that a 10.6 cu. in. accumulator, F-573-323, is used in conjunction with a 19.6 cu. in. accumulator, F-573-326, to increase the Group II lockout timing during engine startup. Shoreham design requires a single 19.6 cu. in. accumulator, F-573-326, for this purpose.

There is no site, nuclear or non-nuclear industry experience listed in the EDG Component Tracking System for this component.

There are no maintenance or modification recommendations required for the accumulators.

Quality Revalidation of the accumulators is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

COMPONENT DESIGN REVIEW CHECKLIST

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Valves

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500G

TASK DESCRIPTION NO. DR-06-03-500G-0

SNPS GPL NO. 03-500G

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Based on a review of the DR/QR report for Grand Gulf, a design review for the control panel valves at River Bend is not required.

The control panel valves used on River Bend are identical to those on Grand Gulf with regard to valve application and manufacturer, with the exception of Whitey test valve F-573-157. This test valve is used at River Bend to provide combustion air indication and is an adequate design for this function.

There is no River Bend site experience listed in the EDG Component Tracking System for the control panel valves. The nuclear and non-nuclear industry experience listed does not show any significant experience relating to the control panel valves.

To minimize fouling of the control panel valves, the valves should be inspected and cleaned (including the fine mesh screen of the check valve) during each refueling outage. This recommended maintenance interval should be reassessed depending upon the degree of system fouling.

Quality Revalidation of the control panel valves is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

COMPONENT DESIGN REVIEW CHECKLIST

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Assembly - Pressure Switches

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500H

TASK DESCRIPTION NO. DR-06-03-500H-0

SNPS GPL NO. 03-500H

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Based on review of the lead DR/QR Report (Comanche Peak), a design review for pressure switches is not required for River Bend.

The pressure switches used at River Bend are identical to those used on Comanche Peak with reguard to manufacturer and application, with the exception of Barksdale pressure switch F-577-080. This pressure switch senses starting air presure, providing a high pressure alarm and is of adequate design for this service.

There is no site or non-nuclear industry experience listed in the EDG Component Tracking System for this component. The nuclear industry experience listed does not show any generic or significant problems with the pressure switches.

There are no maintenance or modification recommendations required for the pressure switches.

Quality Revalidation of the pressure switches is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Assembly - Control Relays

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500J

TASK DESCRIPTION NO. DR-06-03-500J-0

SNPS GPL NO. 03-500J

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Based on review of the lead DR/QR Report (Comanche Peak), a design review for pressure switches is not required for River Bend.

The application of the control relays used on River Bend to start/stop the diesel generator and to monitor its integrity is similar to Grand Gulf except for the use of Artisan Electronics time delay (TDI Part. No. F-590-135). River Bend uses this relay to delay, for a preset time period, the jacket water and lube oil high temperature alarms to prevent spurious alarms caused by voltage spikes in the electrical circuitry. A review of the vendor's information for this relay shows that it meets design requirements.

There is no site or non-nuclear industry experience identified in the EDG Component Tracking System. Nuclear industry experience listed showed that most of the experience items are not applicable to relay type, service condition, or are otherwise unrelated to TDI design, and therefore are not applicable to this component.

There are no maintenance or modification recommendations required for the control panel assembly relays.

Quality Revalidation for the control panel assembly relays is not deemed necessary.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Assembly - Solenoid Valves

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500K

TASK DESCRIPTION NO. DR-06-03-500K-0

SNPS GPL NO. 03-500K

CLASSIFICATION TYPE A

TASK DESCRIPTIONS

Based on review of the DR/QR Lead Report (Comanche Peak), a design review for the solenoid valves is not required for River Bend.

The control panel assembly solenoid valves used at River Bend are similar to those used at Comanche Peak with regard to manufacturer and application. The solenoid valves are identified for both plant sites as Humphrey Products, Model T062E1-3-10-35-125 V DC. T.D.I. part numbers differ on River Bend from those assigned to control panel assembly solenoid valves for Comanche Peak site.

The River Bend site control panel assembly solenoid valves are employed for control of maintenance mode selection, return to operational, shutdown system active, stop, shutdown deactivate, field flash, ready to load, D.C. Power and up to speed functions. At River Bend, the solenoid valves are located on a Humphrey, nine-station, manifold assembly (Part No. 74039-135) and a Humphrey, six-station, manifold assembly (Part No. 74039-136) for the above functions.

The Circle Seal Controls solenoid valves, used as pilot valves for the California Controls Company "Start Air Admission Valves," (TDI Part No. KR-001-000) in the starting air system at River Bend are identical to Comanche Peak design.

There is no site experience or non-nuclear industry experience listed in the EDG Component Tracking System for the component. The nuclear industry experiences have been reviewed with regard to River Bend, and no generic or significant problems are apparent.

There are no maintenance or modification recommendations required for the control panel assembly solenoid valves.

Quality Revalidation for the control panel assembly solenoid valves is not deemed necessary.

COMPONENT DESIGN REVIEW CHECKLIST

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

Not required

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Control Panel Components - Piping, Tubing, and Fittings

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-500M

TASK DESCRIPTION NO. DR-06-03-500M-0

SNPS GPL NO. 03-500M

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review of control panel piping, tubing and fittings is not required for River Bend based on the following:

- Review of the two lead engines (Shoreham and Comanche Peak) has revealed no inherent design flaws in these components.
- Review of the seismic qualification documentation for the engine control panel. Typically, the engine control panel is seismically qualified by shake table tests, and these tests have provided adequate qualification for all service conditions. The control panel used at River Bend was shake table tested at Wyle Labs. Minute leaks were detected after the shake table test, Ref. 1, but these were readily fixed by tightening a swagelock fitting.
- Review of the EDG Component Tracking System. Most industry experience items reported in the Component Tracking System related to minor maintenance problems. One experience item was reported for River Bend in the Component Tracking System. It involved replacement of a broken pneumatic line. One such failure occurred at Shoreham but was not indicative of more extensive deficiencies.

There are no maintenance or modification recommendations for this component.

Quality Revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Seismic Qualification of Transamerica Delaval Diesel Generator Sets, Serial Numbers 74039/40 for Gulf States Utilities River Bend Station, Unit 1, Addendum to Final Report, Volume III, Document number 718, 7/10/81.

2. Stone & Webster Specification number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Lousiana.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT QUALITY REVALIDATION CHECKLIST

COMPONENT Control Panel Assembly Terminal Boards/ Switches, Wiring

UTILITY Gulf States Utilities, River Bend Station

GPL NO. 03-500N

REV. NO. 2

SNPS GPL NO. 03-500N

TASK DESCRIPTIONS

Recommend that the following inspection for component 03-500N be performed:

- Verify that no Multi-Amp, States Division terminal blocks which were manufactured between 1974 and 1976 are installed.

Any terminal blocks failing the above inspection should be replaced.

Upon completion of the above verification, no further review of component 03-500N is required based on the following reason:

There is no site experience or significant industry experience in evidence.

Component was reviewed on the lead engine (Shoreham) with satisfactory results.

GROUP CHAIRPERSON Victor A. Saletta PROGRAM MANAGER J J Power for JCK

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Foundation Bolts - Anchors, Bolts & Miscellaneous Hardware

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-550

TASK DESCRIPTION NO. DR-06-03-550-0

SNPS GPL NO. 03-550

CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated no significant applicable industry experience. River Bend experience indicated that foundation bolts lacked a stamped "4," which signifies the heat treatment. It is recommended that the hardness of the bolts which are missing the stamp be checked to verify the proper heat treatment.

- A review of the Shoreham and Comanche Peak lead engine DR/QR reports indicated no inherent design flaws in TDI supplied foundation bolts. River Bend has the same number of foundation bolts attaching the engine/generator skid and auxiliary skid to concrete as Shoreham. The bolts are the same diameter and have the same preload torque. Shoreham bolts were found acceptable and had ample margin.

- A review of the seismic qualification of the generator indicated an incorrectly calculated required bolt pretension to resist the combined seismic and short circuit torque (Ref. 3). The specified torque of 1400 ft-lbs (Ref. 2) is adequate however. Foundation bolts do not need to be retorqued or checked after a short circuit event.

There are no maintenance recommendations for this component based on the lead engine (Shoreham) report.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone and Webster Specification Number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Louisiana.

2. Transamerica Delaval Instruction Manual Volume I, Model DSR-48 River Bend Station, Unit 1, Appendix IV

3. Addendum to the final report, Volume IV, Part 1, Seismic Qualification of TDI Diesel Generator sets for Gulf States Utilities, River Bend Station, Unit 1, Document No. 74039-719, July 1981. Pages 14a, b, c, d.

4. SWEC Calculation Number 11600.02-NM(B)-437-CZC-029 "Seismic Review of Diesel Generator Foundation Bolts and Sub Base Bolting".

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Sub Base - Sub Base Engine Engine and Generator UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-715A TASK DESCRIPTION NO. DR-06-03-715A-0

SNPS GPL NO. 03-715A CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated no significant adverse applicable industry and site experience relating to the skid. One experience item related to the grout under the skid. It is recommended that it be verified that there are no cracks or voids under the skid framing.
- A review of the lead engine report (Shoreham) indicated no problems with the skid design. The River Bend skid is of a slightly different design, but generally contains the same features as Shoreham's.

There are no maintenance recommendations from the lead engine DR/QR report.

No modifications were recommended in the lead engine review (Shoreham) but a modification to the skid was made prior to the lead engine review to solve a vibration problem at the generator pedestal bearing. Gussets were added to the skid under the pedestal. The generator at River Bend is different from that at Shoreham and the sub-base is different. Thus resonance problems are not expected at the pedestal bearing. The engine vibration survey at River Bend will identify resonance problems around the skid if they exist. Sub base flexibility was considered in the seismic analysis of the generator and pedestal and was found acceptable, ref. 3.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone & Webster Specification No. 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Louisiana.

2. TDI drawing number 10130, "Sub-Base Assy"

3. Addendum to the Final Report, Volume IV, Part 1, Seismic Qualification of TDI Diesel Generator Sets for Gulf States Utilities, River Bend Station, Unit 1. Document No. 74039-719, July 1981.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Sub Base - Bolting

UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-715B

TASK DESCRIPTION NO. DR-06-03-715B-0

SNPS GPL NO. 03-715B

CLASSIFICATION TYPE C

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated no significant applicable industry and site experience.

- A review of the lead engine report (Shoreham) indicated acceptable bolt behavior, but identified engine thermal expansion as a potential concern. A 20 degree F difference in engine and skid temperature was calculated to be sufficient to plastically deform the bolts, thus relaxing the bolt torque. If this does occur, it would occur at the bolts near the auxiliary skid end, farthest away from the pinned generator end. At Shoreham this relaxation was not observed. At River Bend a sub-base bolt (GB-139-003) is used to anchor the turbocharger support strut. The turbocharger is at the auxiliary skid end of the engine, thus the turbocharger support strut bolt would be susceptible to torque relaxation due to engine expansion. At Shoreham, minor relaxation of bolt torque was considered acceptable for a few bolts near the auxiliary skid end. At River Bend the turbocharger support strut sub-base bolt should not be loose as this could potentially effect the ability of the strut to suppress turbocharger vibration. Maintenance operations in which the engine is cooled to room temperature and subsequent heat-up when the engine is put into standby service or started, cause the greatest temperature difference between the engine and skid. After each such occurrence, it is recommended that the torque of the turbocharger support strut bolt be checked. If the torque has relaxed, the bolt should be replaced and torqued with the engine at standby temperature.

- Generator sub-base bolts have been found to be adequate by analysis, Ref 4.

There are no maintenance or modification recommendations from the lead engine DR/QR report.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone & Webster Specification No. 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Louisiana.

2. SWEC calculation No. 11600.02-NM(B)-437-CZC-029, "Engine Sub-Base Bolting, Foundation Bolts, and Auxiliary Skid Foundation Bolts".

3. TDI drawing number 102445, "Turbocharger Bracket and Brace"

4. Addendum to the Final Report, Volume IV, Part 1, Seismic Qualification of TDI Diesel Generator Sets for Gulf States Utilities, River Bend Station, Unit 1. Document No. 74039-719, July 1981.

DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

COMPONENT DESIGN REVIEW CHECKLIST
RIVER BEND STATION - UNIT 1

COMPONENT Aux Sub Base & Oil & Water Piping - Aux Skid UTILITY Gulf States Utilities

GROUP PARTS LIST NO. 03-717A TASK DESCRIPTION NO. DR-06-03-717A-0

SNPS GPL NO. 03-717A CLASSIFICATION TYPE B

TASK DESCRIPTIONS

Design review for this component is not required based on the following:

- A review of the EDG Component Tracking System indicated no significant adverse industry and site experience.
- The lead engine report (Shoreham) found no problems with auxiliary skid design.
- A detailed dynamic analysis was performed to seismically qualify the skid. The summary report for analysis is contained in Ref. 4.
- The boundary of ASME III applicability is shown in Ref. 2 and those components that are ASME III - NF are analyzed in Ref. 3. There are no ASME III qualification documentation problems.

There are no maintenance recommendations from the lead engine beyond those recommended in the TDI Instruction Manual.

There are no modifications recommended for this component.

Quality revalidation is not required for this component.

PRIMARY FUNCTION

Not required

ATTRIBUTE TO BE VERIFIED

Not required

SPECIFIED STANDARDS

Not required

REFERENCES

1. Stone and Webster Specification number 244.700, Addendum 2, 8/30/82 "Standby Diesel Generator Systems" River Bend Station - Unit 1 Gulf States Utilities Company, West Feliciana Parish, Louisiana.

2. TDI drawing number 102279, "Aux. Sub-Base and NF Supports Assy."

3. Addendum to the final report, Volume II, Seismic Qualification of TDI Diesel Generator sets for Gulf States Utilities, River Bend Station, Unit 1. Document No. 74039-717, June 17, 1981.

4. Final Report, Volume II, Part 1, Seismic Qualification of TDI Diesel Generator Sets for Gulf States Utilities, River Bend Station Unit 1. Document No. 74039-72317, Jan 23, 1982. Section IX Auxiliary Sub-Base.,

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DOCUMENTATION REQUIRED

Not required

GROUP CHAIRPERSON _____ PROGRAM MANAGER _____

TDI OWNERS GROUP

for

RIVER BEND STATION

MAINTENANCE REVIEW
APPENDIX - II

I INTRODUCTION

The purpose of this Appendix is to provide River Bend with a set of maintenance and surveillance recommendations for diesel generator components which have been developed by TDI and/or the Owners Group as a result of the overall Owners Group Program. This Appendix is intended to supplement the existing TDI Instruction Manual, Volume I and Volume III, which will maintain the qualification of the diesel generators for the life of the plant.

II METHODOLOGY

During the implementation of the Owners Group Program Plan, the Owners Group Technical Staff reviewed many sources of information regarding the maintenance and surveillance for the diesel generator components identified in this Appendix. These sources included TDI Instruction Manuals, Service Information Memos (SIMS), and TDI correspondence on specific components. This review along with Technical Staff input regarding the adequacy of the recommendations found in the sources mentioned above, and additional maintenance recommendations identified during the DR/QR review, forms the basis for the content of this matrix.

III RESULTS AND CONCLUSIONS

Proper maintenance is important in ensuring long, reliable and satisfactory service of the emergency diesel generators. Maintenance work, in order to be effective, must be carried out thoroughly and regularly. It is for these reasons that a detailed schedule of maintenance service has been laid out by the Owners Group for the TDI Diesel Generators at River Bend Station. The schedule details specific components requiring maintenance on a regular basis. This schedule separates the maintenance activities into a daily, monthly, outage, alternate outage (every other), 5-year and 10-year frequencies. It should be noted here that the duration time between outages at River Bend is assumed to be 18 months.

Those less significant diesel generator system components with which standard engineering practice and maintenance will ensure continued operation, are not specifically addressed in the matrix. Standard maintenance practices are briefly discussed below.

The engine and generator should be kept clean and dry at all times. Oil and water leakage should be wiped off the unit as quickly as possible in order to assist in locating the source of leakage, prevent potential equipment damage and maintain a safe working environment. Leaking pipes, gaskets and packing glands should be attended to promptly so as not to impair the reliability and/or operation of the system. Flanged gasketed connections may be retightened to stop leaks and any abnormal engine noises or vibrations. Actions required to correct any abnormal conditions should be carried out in a timely manner. Loose bolts and electrical terminals should be attended to in a safe, practical manner.

Specific items to be maintained on a DAILY basis consist of the following:

1. Observe and record lubricating oil and jacket water temperatures (keep warm pump running).

2. Drain all low point water collectors, barring device air filter and air receiver tank float traps in the air start system.

3. Check engine and auxiliary equipment and piping connections for oil, water, and fuel oil leaks.

4. Check level of lubricating oil in the governor and pedestal bearing. Add oil as needed.

5. Check fuel oil pump rack for freedom of movement through full limit of travel. Do not disconnect from governor.

6. Check turbocharger bearing lubricating oil system sight glass for oil flow.

7. Drain water from crankcase vent piping drip legs.

8. Verify all controls in proper position for standby mode.

9. Check all governor knob settings.

Load	Maximum Droop Zero
Speed	To provide mechanical governor control at 450 rpm.

10. Visually inspect lube oil heat exchanger and jacket water heat exchanger for signs of leakage from the lantern ring leakoff ports, indicating leaking packing rings.

The following Preventive Maintenance Recommendation Matrix was designed to assist the Maintenance Department in determining the scope of work required to maintain the intended design function of the diesel generators at River Bend on a planned schedule basis. It should be followed closely and referred to often.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
F-068	Intercoolers	1. Evaluate heat exchanger performance by checking engine operating parameters.	X					
		2. Clean/inspect shell and tube sides every outage or as necessary.		X				Ref: Lead engine DR/QR Report #F-068 (Items 2, 3, 4)
		3. Visually inspect for external leaks.	X					Ref: 7/26/84 IOC from J. Cadogan to M. McGerigle, Ref: 08/14/84 letter to C. Ray from M. Lowrey
		4. Verify intercooler inlet plenum drain connection is open and clean daily.						To be performed daily.
MP-017	Turbocharger	1. Measure vibration and check with base line data.		X				To be accomplished during 24 hour test run.
		2. Clean impeller and diffuser.		X				
		3. Measure rotor end play (axial clearance) to identify trends of increasing clearance, i.e; thrust bearing degradation.		X				Review thrust bearing axial clearances after inspection to determine if a trend exists. Any trend toward increasing axial clearance could signify thrust bearing degradation. Ref: Lead engine DR/QR Report #MP-017

RB2610/4

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		4. Perform visual and blue check inspections of the thrust bearing.				X		NOTE: Thrust bearing inspection should also be performed after 40 non-prelubed (automatic) fast starts. Ref: Lead engine DR/QR Report #MP-017
		5. Disassemble inspect and refurbish.				X		
		6. Perform a spectro-chemical engine oil analysis to assist the bearing monitoring program. To further expand/clarify chemical analysis, ferrographic analysis may be utilized. Particular attention shall be paid to copper level, and particulate size, which could signify thrust bearing degradation.		X				To be performed during the last monthly test run prior to oil change. NOTE: Sample to be drawn up stream of lube oil filter. Ref: Lead engine DR/QR Report #MP-017
00-420	Lube Oil Pressure Regulating Valve	1. Disassemble and clean.		X				If valve sticks repeatedly, more frequent cleaning may be necessary. If valve plugging becomes a problem, the dimensions of the valves' internal parts should be checked to ensure proper clearance.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. During initial startup after a major reassembly of Lube Oil piping, the L.O. regulating valve should be disassembled and cleaned until abnormal L.O. pressure excursions subside.						Ref: Lead engine DR/QR Report #00-420 (Items 1 & 2)
00-700B	Jacket Water Standpipe: Valves	1. Replace elastomeric parts in circle seal valves.				X		Ref: Comanche Peak DR/QR Report #02-717B
03-305A	Base Assembly	1. Perform a visual inspection of the base. The inspection should include the areas adjacent to the nut pockets of each bearing saddle and be conducted after a thorough wipe down of the surfaces, using good lighting.		X				NOTE: Any cracks detected must be investigated further before the engine is allowed to return to to service. The mating surfaces of the base and cap shall be throughly cleaned with solvent before any reassembly. Ref: Lead Engine DR/QR Report #03-305B (Items 1, 2)
		2. The amting surfaces of the base and cap shall be throughly cleaned with solvent before any reassembly.						

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-305C	Main Bearing Caps - Studs and Nuts	1. Upon removal of bearing caps, clean mating surfaces with a solvent prior to reassembly of the caps to the base.						Ref: Lead engine DR/QR Report #03-305C
03-307B	Lube Oil Tubing and Fittings - Internal	1. Check tubing for dents or crimps.		X				Items 1, 2; Ref: TDI Instruction Manual, Vol. I, Maintenance Schedule
		2. Perform gear-train spray check.		X				
03-310A	Crankshaft	1. Measure crankshaft web deflection.		X				Complete TDI Inspection and Maintenance Record Form No. 310-1-1, TDI Instruction Manual, Volume I, Section 6. Ref: TDI Instruction Manual, Vol. I, Maintenance Schedule
		2. Measure diameter of crank journals.						This inspection is to be performed during major engine overhauls. Complete TDI Inspection and Maintenance Record Form No. 310-3-1, TDI Instruction Manual, Volume I, Section 6
03-310B	Main Bearings Shells	1. Inspect and measure main bearing shell thickness. Inspection shall evaluate			X			The first inspection should be performed at the first fuel outage

RB2610/7

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		bearing wear and evidence of harmful crankshaft misalignment. If results show evidence of misalignment, TDI recommendations for crankshaft realignment should be implemented.						and at alternate outages thereafter. Complete TDI Inspection and Maintenance Record Form No. 310-2-1, TDI Instruction Manual, Volume I, Section 6 - one sheet for each main bearing. Use Volume I, Appendix III for clearance values. Ref: TDI Instruction Manual, Vol. 1, Maintenance Schedule, Ref: Lead engine DR/QR Report #03-310B
03-310C	Thrust Bearing Ring	1. Measure thrust bearing ring clearance via "bump check" method to be performed in conjunction with crankshaft web deflection measurements. The following information should be recorded: ° Date of inspection ° Hours of engine operation ° Hours of engine operation since last bearing replacement (Last bearing replaced: ____ forward ____ back) ° Bearing clearance		X				Complete applicable of sections TDI Inspection and Maintenance Record Form No. 310-1-1 TDI Instruction Manual, Volume I, Section 6. NOTE: If the clearance is greater than the maximum allowed in the TDI Instruction Manual, then at least one bearing must be replaced. Bearings should also be replaced if they are cracked or gouged. Ref: Lead engine

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
								DR/QR Report #03-310C Ref: 8/13/84 memo from G. McCarthy to D. Pasquale
		2. Visually inspect thrust bearing ring for signs of cracks, gouges, wear or degradation.			X			To be performed simultaneously with main bearing shell inspection. Ref: Lead engine DR/QR Report #03-310C
03-315A	Cylinder Block	1. Perform an inspection of the cylinder block per DR/QR Report #02-315A.		X				Ref: DR/QR Report #03-315A
03-315C	Cylinder Liners	1. Perform a visual inspection of liners for potential progressive wear.		X				Borescopic inspection is acceptable if heads are not removed. Complete TDI Inspection and Maintenance Record form No. 315-1-1, TDI Instruction Manual, Volume I, Section 6. Ref: Lead engine DR/QR Report #03-341B
03-317A&B	Water Discharge Manifold - Jacket Water Discharge Piping, couplings and seals	1. Visually inspect for leaks.	X					Leaking Dresser couplings should be replaced with a new Dresser Style 90

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
								or 165 coupling. Ref: DR/QR Report #03-317A&B
03-340A/B	Connecting Rods, Bushings and Bearing Shells	1. Inspect and measure connecting rod bearing shells to verify lube oil maintenance which affects wear rate. The visual and dimensional inspection of the bearing shells should be conducted at the fuel outage which precedes 500 hours of operation by at least the sum of hours of operation in a LOOP/LOCA event plus the expected hours of operation between outages.						To be performed in conjunction with piston pin inpsection. Complete TDI Inspection Maintenance Record Form No. 340-1-1, TDI Instruction Manual, Volume I, Section 6, Appendix III for clearnance Values. Ref: Comanche Peak, Lead engine DR/QR Report #02-340B
		2. Inspect and measure the connecting rods.				X		Complete TDI Inspection Maintenance Record Form No. 340-2-1, 2, TDI Instruction Manual, Volume I, Section 6.
		3. Perform an x-ray examination on all replacment bearing shells to acceptance criteria developed by Owners Group Technical Staff.						This is to be performed prior to installation of any replacement bearing shells. Ref: Lead engine DR/QR Report #03-340B

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-341A	Pistons	1. Inspect and measure skirt and piston pin.				X		Complete TDI Inspection and Maintenance Report Form No. 341-1-1, TDI Instruction Manual, Volume I, Section 6. Use Volume 1, Section 8, Appendix III for clearance values. To be performed in conjunction with piston pin inspection.
03-341B	Piston Rings	1. Inspect and measure replacement piston rings.						Complete TDI Inspection and Maintenance Record Form No. 341-2-1, TDI Instruction Manual, Volume I, Section 6. Use Volume I, Section 8, Appendix III for clearance values. To be performed in conjunction with piston pin inspection.
		2. Visually inspect liners for wear. NOTE: Ring replacement and cylinder liner honing should be performed in accordance with TDI maintenance procedures.		X				Borescopic inspection is acceptible if heads are not removed. Complete TDI Inspection and Maintenance Record Form No. 315-1-1, TDI Instruction Manual, Volume I, Section 6. Use Volume

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
								I, Section 8, Appendix III for clearance values. Ref: Lead engine DR/QR Report #03-341B (Items 2, 3, 4)
		3. 135° fuel oil spray tips may be used if inspection results indicate a need for additional action to improve lubrication and reduce coke buildup.						Ref: 07/31/84 memo from L. Swanger to D. Pasquale
		4. When replacing engine oil use H.D. oil that exceeds series 3 standards. The base stock should be more resistant to thermal degradation and coke formation. The additive package should provide high detergent dispersant properties with high alkalinity and a high level of antiwear additive such as zinc dithiophosphate. Total Base Number (TBN) should be 12 to 15 for use with #2 fuel oil and a						NOTE: Do not mix L.O. brands or types. When changing L.O. replace the entire L.O. charge. Ref: 08/14/84 letter to C. Ray from M. Lowrey

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		sulfated ash content of 1.5% to 2.0% is preferred. An engine oil with such properties, Mobilguard 412 or equivalent product may be used to ensure improved lubrication.						
03-341C	Piston Pin Assembly	1. Visually inspect for chrome plate damage. Replace pins which show chipped or blistered chrome. NOTE: All new or replacement pins will be L.P. or M.P. inspected before installation in Owners Group engines.				X		Also to be performed whenever pistons are removed and disassembled to an extent that such inspection is possible. Ref: Lead engine DR/QR Report #03-341C (Items 1&2), for details on acceptance criteria, Ref: 08/22/84 memo from W. Littmann to D. Pasquale
		2. Inspect end plugs and reroll or replace any that are loose.						Note: This inspection is to be performed whenever the engine is sufficiently dismantled to allow this inspection. Ref: Comanche Peak DR/QR Report #02-341C

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-345A	Intake and Exhaust Tappet Assembly	1. Inspect intake and exhaust tappet assembly condition.		X				Complete TDI Inspection and Maintenance Report Form No. 345-1-1, TDI Instruction Manual, Volume I, Section 6. Ref: Lead engine DR/QR Report #03-345A
		2. Verify that cam rollers are free to rotate, and that there is no measurable clearance between the cam rollers and the roller pins.		X				Complete TDI Inspection and Maintenance Record Form No. 345-1-1 TDI Instruction Manual, Vol. I, Section 6. Ref: Lead engine DR/QR Report #03-345A
03-345B	Fuel Tappet Assembly	1. Inspect fuel assembly condition		X				Complete TDI Inspection and Maintenance Report Form No. 345-1-1, TDI Instruction Manual, Volume I, Section 6. Ref: Lead engine DR/QR Report #03-345B
		2. Verify that cam rollers are free to rotate, and that there is no measurable clearance between the cam rollers and the roller pins.		X				Complete TDI Inspection and Maintenance Record Form No. 345-1-1 TDI Manual, Vol. I, Section 6. Ref: Lead engine DR/QR Report #03-345B

RIVER BEND MATRIX

Component Number	Component Identification	TDI Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-350A	Cam Shaft Assembly	1. Perform a visual inspection of all cam lobe surfaces for signs of cracking, pitting or spalling.		X				Any signs of cracking, pitting or spalling shall be followed by a detailed analysis to evaluate the expected life based on the size and extent of surface distress and any corrective measures shall be implemented as indicated by this analysis. Signs of spalling shall result in immediate replacement of the cam. Ref: Lead engine DR/QR Report #03-350A
03-350B	Cam Shaft Bearings	1. Inspect and measure cam shaft bearing shells.				X		Complete TDI Inspection and Maintenance Record Form No. 350-1-1, TDI Instruction Manual, Volume I, Section 6. Use Volume I, Section 8, Appendix III for clearance values.
03-350C	Cam Gear	1. Visually inspect cam gear for chipped or broken teeth, pitting, excessive wear, or other abnormal conditions.		X				Ref: Memo from B. Bickford to E. Montgomery dated 6/23/84, Ref: Lead engine DR/QR Report #03-350C

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Measure gear back lash. NOTE - if cam gear hub is removed, it is ESSENTIAL that the nut be relocked at the position corresponding to the prescribed torque range of 70±20 ft-lbs. Insertion of the cotter pin must be accomplished at a torque > 50 ft-lbs force and ≤ 90 ft-lbs force. If this is not possible another bolt, nut or washer should be used.			X			Complete applicable sections of TDI Inspection and Maintenance Record, Form No. 355-1-1, TDI Instruction Manual, Volume I, Section 8, Appendix III-1 for clearance values. Ref: Lead engine DR/QR Report #03-350C
03-355A	Crank to Pump Gear	1. Visually inspect crankshaft to lube oil pump gear for chipped or broken teeth, excessive wear, or progressive pitting or other abnormal conditions.		X				Any abnormal situations or indications of progressive pitting should be reported for an engineering evaluation. Ref: Lead engine DR/QR Report #03-355A

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Measure gear backlash.			X			Complete applicable sections of TDI Inspection and Maintenance Record Form No. 355-1-1 TDI Instruction Manual, Volume I, Section 6. Use Volume 1, Section 8, Appendix III-1 from clearance values. Ref: TDI Instruction Manual, Vol. I, Maintenance Schedule
03-355B	Idler Gear Assembly	1. Visually inspect idler gears for chipped or broken teeth, excessive wear pitting, or other abnormal conditions.		X				Any abnormal indications should be reported for an engineering evaluation. Ref: Lead engine DR/QR Report #03-355B
		2. Measure gear backlash NOTE: If idler gear hub is removed, it is recommended that the nut be relocked at the position corresponding to the torque of 70 ±20 ft-lbs. Insertion of the cotter pin must be accomplished at a torque ≥ 50 ft-lb and ≤ 90 ft-lb. If this is not possible, another bolt nut, or washer should be used.			X			Complete applicable sections of TDI Inspection and Maintenance Record Form No. 355-1-1, TDI Instruction Manual, Volume I, Sections 6, Use Vol. I, Section 8, Appendix III-1 for values. Ref: TDI Instruction Manual, Vol. I, Maintenance Schedule, Ref: Lead engine DR/QR Report #03-355B

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-359	Air Start Valves	1. Remove, clean and inspect air start valves. (Replace copper valve-to-head gasket)		X				Ensure valve installation includes retorque requirements. Ref: DR/QR Report #03-359 (Items 1, 2, 3)
		2. Inspect the piston, cap, guide and housing sliding surfaces to evaluate wear or corrosion.		X				
		3. Ensure that the dryer between the air compressor after cooler and the air receivers is working properly by blowing down the air receivers daily and monitoring the moisture content.						To be performed daily. Ref: DR/QR Report #03-359
03-360A	Cylinder Head	1. Visually inspect cylinder heads (all cylinders).				X		Complete TDI Inspection and Maintenance Record Form No. 360-1-1, TDI Instruction Manual, Volume I, Section 6. One sheet for each head.
		2. Record cold compression pressures and maximum firing pressures.		X				If so indicated remove cylinder heads, grind valves and reseat. Ref: TDI Instruction Manual, Volume I, Section 6

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		3. Blow-over the engine per TDI maintenance requirements, Volume I or at appropriate intervals after shutdown of the engine to ensure against harmful effects of water leaks.						In the event water is detected, the cylinder head should be replaced or returned to the vendor for repair. Ref: Lead engine DR/QR Report #03-360A
		4. Visually inspect the fuel injection port on each cylinder head "during" the normal monthly engine run for water leaks.	X					If water leakage is detected, the head(s) should be replaced. Ref: Lead engine DR/QR Report #03-360A
03-360B	Cylinder Head - Intake and Exhaust Valves	1. Visually inspect intake and exhaust valve, discs, stems and seats for wire drawing, pitting, distortion, concentricity, or any abnormal condition.				X		Complete the applicable sections of TDI Inspection and Maintenance Record Form 360-2-1.
		2. Visually inspect subcovers for evidence of valve guide blowby (Soot).						This is a one time only inspection to be performed after 500-600 hrs. of engine operation after rebuild of the cylinder head. Ref: Lead engine DR/QR Report #03-360B

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		3. Measure intake and exhaust valves head thickness.				X		Complete applicable sections of TDI Inspection and Maintenance Records Form 360-2-1, TDI Instruction Manual, Volume I, Section 6. One sheet for each cylinder. Use Section 8, Appendix III for clearance values. (Items 3, 4)
		4. Measure intake and exhaust valves - valve-to-guide clearances.				X		Complete applicable sections of TDI Inspection and Maintenance Record Form 360-2-1, TDI Instruction Manual, Volume I, Section 5. One sheet for each cylinder. Use Section 8, Appendix III for clearance values.
03-362A	Cylinder Head Covers - Subcover Assembly	1. Perform a liquid penetrant examination of the rocker arm pedestals top and vertical machined surfaces (connector pushrod side only).						This inspection is to be performed in conjunction with the rocker arm bushing inspections when the rocker arm shafts are removed from the subcovers (Ref: Lead engine DR/QR Report #03-390E) or when the rocker arm shaft assembly is

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
								removed. Subcovers with pedestal cracks that extend through the counter bore web down to the threads should be replaced. Ref: Lead engine DR/QR Report #03-362A
03-365A	Fuel Injection Pumps	1. Visually check pressure bleed screws for erosion.		X				To be performed on all eight pumps.
		2. Tear down one pump for inspection.			X			Use representative pump to determine need to overhaul other pumps.
		3. Complete fuel injection pump inspection in accordance with TDI Instruction and Maintenance Manual, Volume I.			X			Based on inspection results and operating parameters. NOTE - Disassembly of fuel injection pumps should be performed by a Bendix Corp. representative. Complete TDI Instruction and Maintenance Record Form No. 365-1-1, Section 6 (Items 1, 2). Ref: TDI Instruction Manual, Volume I Maintenance Schedule for Item 3, Ref: Lead engine DR/QR Report #03-365A (Items 2 & 3)

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-365B	Fuel Injection Nozzles	1. Remove, inspect and clean tips.		X				Ensure that a new copper gasket is used upon reinstallation of nozzle into head. Complete TDI Inspection and Maintenance Record Form 365-2-1 Instruction Manual, Volume I, Section 6. Ref: TDI Instruction Manual, Vol. I, Section 5 Maintenance Schedule Ref: Lead engine DR/QR Report #03-365B (Items 1-4)
		2. Check nozzle pop pressure.		X				
		3. Check spray pattern.		X				
		4. Check assembly for leakage.	X					To be performed with the running during the mounthly test run.
03-365C	Fuel Injection Tubing	1. Check tubing for leaks at compression fittings.	X					All fuel oil leak inspections to be performed while the engine is running or whenever the compression fittings have been disturbed. Ref: Lead engine DR/QR Report #03-365C

RB2610/22

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Visually inspect tubing lengths for F.O. leaks or cracks.	X					Fitting inspection for leaks to be performed at first engine operation following the installation of tubing. Subsequent inspections to be performed periodically as indicated. Fuel oil leakage from shrouded fuel oil lines can be detected at the leakoff ports in the base nuts, which are provided for this purpose. Ref: Letter from C. A. Malourh to V. A. Saleta dated 8/30/84.
03-365D	Fuel Oil Injection Lines: Supports	1. Visually inspect support elastomer inserts for deterioration or degredation.		X				Any inserts found to be unsatisfactory shall be replaced with new inserts prior to reassembly of F.O. lines. This inspection can be performed prior to reassembly of the F.O. lines in conjunction with the cylinder liner inspection. Ref: Lead engine DR/QR Report #03-315C Cylinder Liners, Ref: San Onofre DR/QR Report #02-365D Task Description.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-371A	Fuel Pump Control Shaft	1. Check lube oil cups and fill as necessary.	X					Ref: Lead engine DR/QR Report #03-371A
03-371B	Fuel Pump Linkage Assembly and Bearings	1. Grease swivel link on, F.O. pump assemblies all cylinders.		X				
03-371C	Fuel Pump Linkage: Automatic Shutdown Cylinder	1 Check cylinder for extension and return.		X				To be accomplished during control system check.
		2. Check tailrod vent for air leakage.	X					To be accomplished during control system check. Items 1, 2; Ref: IOC dated 3/26/84 from M. Wehmeyer to R. Kaklec.
03-375	Intake Manifold	1. Care should be exercised in assembly of cylinders heads on to the engine, to avoid cracking of the intake manifold elbows.						If required, other castings may be tried to achieve an acceptable fit, or bolt hole diameters may be increased to 1/8" oversize. Component should under no circumstances be jacked to fit. Ref: Lead engine DR/QR Report #03-375
03-380A	Exhaust Manifold	1. Visually and MT examine a sampling of circumferential pipe welds and corresponding heat affected zones. This examination is to be performed in accordance with Impell			X			To be performed during the first refueling outage and alternate outages thereafter. However, diesel operation should not exceed 200 hours between inspections.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		memo from G. Shears to J. Kammeyer dated 08/13/84.						Ref: Lead engine DR/QR Report #03-380A
03-385A	Crankcase Relief Valve	1. Clean flame arrestors.		X				Ref: 3/26/84 IOC from M. Wehmeyer to J. Kammeyer
		2. Inspect seat and disc.		X				
03-390E	Rocker Arm Bushings	1. Visually inspect and measure intake rocker arm bushings.						The visual and dimensional inspection of the rocker arm bushings should be conducted at the fuel outage which precedes 2300 hours of operation by at least the sum of expected hours of operation in a LOOP/LOCA event plus the expected hours of operation between outages. Ref: Lead engine DR/QR Report #03-390E (Items 1, 2, 3)
		2. Visually inspect and measure exhaust rocker arm bushings.						Not to exceed 1300 maximum hours of engine operation between inspections as described above.
		3. Visually inspect and measure intermediate rocker arm bushings.						Not to exceed 730 maximum hours of engine operation between inspection as described above.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-390G	Rocker Arm Capscrews, Drive Studs (Pop Rivets)	1. Verify capscrew torque values.		X				Use TDI Instruction Manual, Volume I, Section 8, Appendix IV for proper torque values.
		2. Verify that rocker arm drive studs are intact and tight.		X				Ref: Lead engine DR/QR Report #03-390G (Items 1, 2)
03-402A	Governor Drive - Governor and Tachometer Drive Gear and Shaft	1. Visually inspect drive gear and shaft for signs of wear.		X				Ref: TDI Instruction Manual, Vol. I, Section 5, Maintenance Schedule.
03-402B	Governor Drive - Couplings, Pins and Keys	1. Check that coupling is tight on shaft.		X				If the coupling is found to be loose, it should be removed, all mating surfaces cleaned, and the unit reassembled using Loctite 609 on the mating surfaces. Ref: Lead engine DR/QR Report #03-402B (Items 1, 2)
		2. Replace the elastomeric insert in the Koppers coupling.		X				

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-410A	Overspeed Trip Governor	1. Check trip set point - adjust as required.		X				Modify the surveillance testing procedure to include verification that the overspeed trip is correctly set to an overspeed trip setting of 518 rpm ±1 % every outage. Ensure that the electric governor and the mechanical backup governor setting are properly returned to their normal settings following the overspeed test. The test is to be performed with no load on the engine by increasing the normal governor speed setting(s) until a trip occurs. After several inspection periods, the history of the required adjustments should be reviewed to evaluate and possibly modify the testing interval. Ref: Lead engine DR/QR Report #03-410A
		Note: After setting the overspeed governor, the adjustment screw settings should be marked with Torque Seal to reveal any unintended changes in the set positions.						

RB2610/27

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-410B	Overspeed Trip Governor and Accessory Drive	1. Remove plugs from housing and check for magnetic particles.		X				1. Ref: IOC dated 03/27/84 from M. Weymeyer to N. Cooperrider.
		2. Check shafts for excessive radial and axial movement.		X				2. Same as above
		3. Visually inspect accessory drive gear for excessive wear.		X				3. Same as above
03-410C	Overspeed Trip Drive Couplings	1. Replace the Lovejoy coupling spiders or test coupling elastomer for hardness.		X				Replace elastomer if hardness is greater than 90 Shore A. Ref: Lead engine DR/QR Report #03-410C (Items 1, 2, 3)
		2. Verify that coupling is tight on shaft.		X				Ref: 6/24/84 memo from D. Limbert to E. Montgomery
		3. Remove the present L-110 Lovejoy couplings and replace them with new units in accordance						To be completed at the first refueling outage.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		with SIM 363 and DR/QR Report recommendations.						
03-410D	Overspeed Trip Vent Valve	1. Disassemble and replace "O" rings.				X		Ref: Lead engine DR/QR Report #03-410D
03-413	Governor Linkage	1. Inspect for loose parts on the linkage assembly.	X					
		2. Install positive locking hardware to the lever arm clamp bolt heads and shaft roll pins. NOTE: To be performed as necessary after tightening governor linkage hardware to design torque specifications.						
03-415A	Woodward Governor	1. Drain, flush, refill and vent actuator oil system with new oil from a clean container ensuring the appropriate cleanliness procedures are followed.				X		NOTE: Venting the hydraulic actuator shall be performed per the Woodward manual if more than a half quart of oil is added. Ref: Lead engine DR/QR Report #03-415A
		2. Disassemble, clean and refurbish the actuator.				X		Items 1, 2, 3; Ref: 03/27/84 IOC from M. Wehmeyer to N. Cooperrider, Ref: TDI Instruction Manual, Volume I, Section 5, Maintenance Schedule

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		3. Replace flex element for governor drive coupling.		X				Ref: Lead engine DR/QR Report #03-402B Governor Drive Couplings
		4. Verify all governor control knob settings are in appropriate positions: LOAD - Maximum DROOP - Zero Speed - To provide mechanical governor control at 460 rpm.	X					All knob settings should be secured with a commercially available product such as Torque-Seal.
		5. Modify the surveillance testing procedures to include an evaluation of the governor settings by means of the two tests below: (a) Perform a test of the governor settings while under mechanical/electrical governor control, with the diesel generator off the grid in the isochronous mode. (b) Perform a test of the governor settings while under mechanical (Only) governor control, with the diesel generator off the grid in the isochronous mode.						Note: These tests shall include examinations of the engine speed transient loading conditions. Included as part of the above tests is the verification that the engine set speed of 45- rpm is not exceeded by more than 11.2 percent (500 rpm max.) either during an engine start or during the largest single load reduction. Ref: Lead engine DR/QR Report #03-415A

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		6. Augment the setting adjustment procedures as described in the Woodward manuals, to include a test of the governor response, during an engine start to ensure agreement with the specification as detailed in Item #5 above.						Ref: Lead engine DR/QR Report #03-415A
03-415B	Governor Booster Servomotor	1. Clean, inspect, and replace "O" rings and gaskets.				X		Ref: 3/27/84 IOC from M. Wehmeyer to J. Kammeyer
03-415C	Governor Heat Exchanger	1. Clean and inspect.				X		
03-425A	Jacket Water Pump - Gear	1. Visually inspect jacket water pump gear for chipped or broken teeth, excessive wear, or potential/progressive pitting or other abnormal conditions.		X				Any abnormal situations or indications of progressive pitting should be reported for an engineering evaluation. Ref: Lead engine DR/QR Report #03-355B
		2. Check the key to keyway interface for a tight fit on both the pump shaft to impeller and the spline to pump						This along with the drive fit of the impeller on to the shaft will preclude past problems where relative motion between

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		shaft during pump reassembly.						shaft and impeller caused fretting and upset of the keyway sides. Ref: DR/QR Report #03-425A
		3. It is recommended that the castle nut that drives the external spline on its taper, have a maximum torque value of 77 ft-lbs.						Ref: DR/QR Report #03-425A
03-441A	Starting Air Manifold: Air Vent	1. Ensure that the starting air manifold vent is open and effective.	X					Ref: 08/27/84 Memo from W. Littmann to J. Cadogan, Ref: Lead engine DR/QR Report #03-442A (STAD)
03-441B	Air Filter to Starting Air Distrib.	1. Inspect filter elements.	X					Ref: TDI Instruction Manual, Vol. I, Maintenance Schedule
		2. Replace filter elements.		X				It is also recommended that the filter be changed whenever the manufacturers recommended maximum differential pressure is achieved. Ref: Lead engine DR/QR Report #03-441B (Items 1&2)

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
	Strainer - Starting Air System	3. Blow down strainer DAILY.						Ref: Lead engine DR/QR Report #03-441B (Items 3&4)
		4. Clean and inspect strainer monthly.	X					If the strainer is excessively dirty, the frequency of cleaning and inspecting should be increased.
	Air Start Block Valves	5. Clean, refurbish valves -replace "O" rings and clean the screened fitting. Ensure leak tightness after reassembly.		X				Ref: Lead engine DR/QR Report #03-441B (Items 5, 6, 7)
		6. Inspect for tightness of fittings and bolts and apply locking compound, as required during reassembly of components.		X				
03-442A	Starting Air Distributor Assembly	1. Visually inspect the poppet valve spool ends and timing cam of the starting air distributor.		X				Evaluate the degree of wear to determine whether existing condition would have an adverse effect on timing and the specified ability to start the engine.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Ensure that the starting air manifold vent is open and unobstructed.	X					Ref: Lead engine DR/QR Report #03-442A (STAD), Items 1 & 2
03-455A	Fuel Oil Filter	1. Record filter d/p.	X					Change filter elements at or before the filter d/p reaches the manufacturers recommended maximum differential pressure. Purge entrapped air from the filter canister using the vent valve provided, and divert some fuel oil into the newly replaced cartridge. After air has been purged close vent valve and return handle to previous operating position. Ref: Lead engine DR/QR Report #03-455A
		2. Inspect canister gaskets and replace as necessary.						To be performed during change out of filter elements. Ref: 3/27/84 IOC from M. Wehmeyer to J. DiMare
		3. Inspect tubing and mechanical connections for tightness and/or leaks.	X					Ref: TDI Instruction Manual, Volume I

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-455B	Fuel Oil Strainers	1. Record strainer d/p.	X					Shift/clean element if manufacturers recommended maximum differential pressure is achieved. Bolt torques of 120-150 in-lbs should be utilized during reassembly. Ref: Lead engine DR/QR Report #03-455B (Items 1, 2)
		2. Purge air from stand-by strainers						As required.
03-460A	Full Pressure Lube Oil Strainer	1. Record strainer d/p.	X					Use for trend data
		2. Inspect and clean elements.						To be performed when strainer differential pressure rises significantly. Ref: Lead engine DR/QR Report #04-000, Ref: TDI Instruction Manual, Volume I, Maintenance Schedule
		3. Lube oil strainer pressure gauge - calibration check.		X				

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-465A	Lube Oil Lines External: Tubing, Fittings and Couplings	1. Ensure that a minimum installation gap of 0.132 inches is maintained between pipe ends at the 8-inch Dresser coupling.						To be performed whenever piping is installed or reinstalled. Ref: DR/QR Report #03-465A
03-475B	Air Butterfly Valve	1. Lube valve shaft via grease fittings.		X				Ref: IOC dated 3/28/84 from M. Wehmeyer to J. DiMare. If oil cups are used, this should be completed monthly.
		2. Check valve disc for freedom of movement.	X					Check by visually observing valve/actuator operation. Ref: 04/16/84 from R. Jaquinto to R. Johnson
		3. Verify that associated locking devices (jam nuts and lock washers) are tight.	X					Ref: DR/QR Report #03-475B
03-500A	Engine Control Cabinet	1. Inspect interior of cabinet for cleanliness and clean as required.		X				Ref: 3/29/84 IOC from M. Wehmeyer to T. Jacobs for Items 1-5, Ref: 07/30/84 IOC from J. Cadogan to K. Horelik for Items 1-6

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Visually check wiring for insulation degradation.		X				
		3. Visually check instrument tubing for leaks.		X				
		4. Functionally check cabinet heater and calibration of thermostat.		X				
		5. Test pneumatic S/D board logic.		X				
		6. Replace "O" rings, gaskets and filter in pressure regulator.		X				
03-500C	Circuit Breakers and Contact Blocks	1. Check all terminals clean/tighten.		X				To be accomplished during panel clean/inspection.
		2. Visually check wiring insulation for degradation.		X				To be accomplished during panel clean/inspection.
		3. Trip check circuit breakers.		X				

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-500G	Control Panel Valves	1. Inspect and clean control panel valves.		X				This recommendation interval should be reassessed depending on the degree of system fouling. Ref: Lead engine DR/QR Report #03-500G
		2. Inspect and clean the 200 mesh screen in the check valve.		X				Ref: Lead engine DR/QR Report #03-500G
03-500J	Control Panel Assembly: Relays	1. Inspect contacts and clean as required.		X				Ref: 08/10/84 IOC from K. Horelik to J. Cadogan
		2. Visually check condition of wiring and tightness of terminations.		X				
03-500N	Control Panel Switches Terminal Boards and Wiring	1. Clean terminal boards and switch contacts.		X				Ref: IOC dated 3/29/84 to J. Kammeyer from M. Wehmeyer for Items 1, 2, 3.
		2. Visually check wire insulation and terminals for tightness and degradation.		X				
		3. Inspect for arcing and overheating.		X				
03-515	Thermostatic Valves	1. Replace thermal power elements.				X		Ref: Lead engine DR/QR Report #03-515 (Items 1, 2)

RB2610/38

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Visually inspect valve body for evidence of leakage.	X					To be accomplished during monthly test run. Ensure that any replacement valves have cast steel valve bodies.
03-550	Foundation Bolts	1. Visually inspect foundation for breaks in the bond between the sole plates and grout.		X				Ref: TDI Instruction Manual, Section 5, Maintenance Schedule
		2. Check foundation bolts for correct torque. Retorque as necessary then recheck crankshaft web deflections.		X				Use TDI Instruction Manual, Volume I, Section 8, Appendix IV for proper torque values.
03-630D	Thermocouples	1. Check that thermocouple indicates ambient engine temperature when the engine is cold.		X				An inconsistant reading traced to thermocouple trouble should result in replacement of the thermocouple.
		2. Clean and inspect thermocouples and thermocouple shields.			X			Indications of fatigue should result in replacement of the thermocouple and/or thermocouple shield. Ref: 7/31/84 Memo from S. Riess to W. Littmann

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		3. Pyrometer wiring-check that terminations are tight.						To be accomplished during control panel check-out and initial operation inspection. Items 1, 2, 3; Ref: 07-30-84 IOC from J. Cadogan to S. Riess
03-650A	Emergency Generator	1. Check operation of brushes and slip rings.	X					Ref. IOC dated 03/30/84 M. Wehmeyer to D. Mercald (Items 1-5)
		2. Clean/inspect all accessible parts of the generator.		X				
		3. Megger rotor and stator.		X				
		4. Verify operation of space heaters.	X					
		5. Measure vibration and check against base line data.		X				
03-650B	Emergency Generator Control Panel	1. Inspect panel for cleanliness and clean as required.		X				Items 1-5; Ref: 3/30/84 IOC from M. Wehmeyer to D. Mercaldi
		2. Check terminal boards for loose wiring.		X				
		3. Visually check condition of wire insulation for degradation.		X				

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		4. Clean and inspect relay contacts.		X				
		5. Check meter calibrations.		X				
		6. Bridge rectifier assembly and SCR mounting.						Ref: DR/QR Report #03-650B, Attach. 1
		a. Inspect the temperature sensitive label placed on the most visible face of the hexagonal body of the diodes and the SCR. These labels shall be inspected before and after each running of the engine.	X					If either of the labels permanently blacken the maximum temperature of the diode and/or SCR has been exceeded requiring an electrical inspection and an inspection of the mounting threads of the heat sinks and diode and/or SCR. Replace the diode and/or SCR and the heat sinks as needed and assure that proper mounting tightness of 300 in-lbs (diode) and 275 in-lbs (SCR) and proper thread conditions are maintained.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		b. Inspect glyptol applied to the side of the lugs and mounting bolt for the lugs which attach to the bottom of the diode and the SCR heatsinks for signs of relative motion.	X					To be performed after each monthly test run. Retighten any loose connections, remove old glyptol and reapply if connections are retightened.
		7. Adjustment potentiometers - inspect glyptol applied to the the side of the adjustment screws for each of the five adjustment potentiometers on the printed circuit board of the voltage regulator for signs of relative motion.	X					To be performed after each monthly test run. If adjustments are needed, remove glyptol and reapply when the adjustment procedure is complete.
		8. Printed circuit boards - check for cleanliness and proper mounting of components.	X					To be performed after each monthly test run. Report any abnormal conditions to engineering for evaluation.
03-650C	Emergency Generator Pedestal Bearing	1 Check ring oilers for proper operation and verify oil level.	X					To be accomplished during every test run of the engine. Ref: 3/30/84 IOC from M. Wehmeyer to N. Cooperrider (Items 1-4)

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Drain flush refill bearing housing.		X				
		3. Measure bearing housing insulation resistance.		X				
		4. Disassemble and inspect bearing and check clearances.				X		
03-695B	Engine Control Air Pressure Regulator	1. Inspect and clean engine shutdown equipment.		X				NOTE: This recommendation should be assessed depending on the degree of system fouling Ref: Lead engine DR/QR Report #03-695B (Items 1 & 2)
		2. Replace elastomeric parts and gaskets in the pressure regulator.		X				
03-695C	Engine Control Pneumatic Trip Switches	1. Check switch set points.		X				Pressure switches. Ref: 3/30/84 IOC from M. Wehmeyer to J. DiMare
		2. Replace elastomeric parts.				X		
03-717B	Auxiliary Sub-base & Oil & Water Piping - Jacket Water: Valves	1. Inspect the valves for packing leakage.	X					Replace as necessary. Ref: Lead engine DR/QR Report #03-717B

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-717H	Auxiliary Sub-Base Lube Oil Pipe and Fittings	1. Visually inspect pipe and joints for leakage.	X					Ref: 4/2/84 IOC from M. Wehmeyer to J. Freeman
		2. Clean and inspect L.O. keep-warm pump suction strainer.		X				Complete when L.O. tank is drained. Ref: 04/16/84 letter from R. Jaquinto to R. Johnson
03-717I/N	Auxiliary Sub-Base Lube Oil and Fuel Oil Valves	1. Disassemble, lubricate, inspect and refurbish.		X				Ref: IOC dated 4/6/84 from M. Wehmeyer to J. DiMare. Ref: Lead engine DR/QR Reports #03-717I/N
		2. Dissassemble, clean and check relief valve lift pressure.				X		Ref: 07/31/84 IOC to M. McGerigle from J. Cadogan, Ref: 08/16/84 IOC from M. McGerigle to J. Cadogan, Ref: Lead engine DR/QR Report #03-717I/N (Items 1 & 2)
03-800A	Jacket Water Heaters	1. Measure heater insulation resistance.		X				Replace heater if degradation of insulation resistance is noted. Ref: 5/10/84 IOC from M. McGerigle to W. Brown for Items 1, 2, 3
		2. Clean and inspect heater elements.		X				
		3. Check calibration and inspect thermostat.		X				

RB2610/44

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-800B	Lube Oil Sump Tank Heaters	1. Measure heater insulation resistance.		X				Replace heater if degradation of insulation resistance is noted.
		2. Inspect and clean heater elements.		X				To be accomplished during tank inspection.
		3. Check calibration and inspect condition of thermostat.		X				Ref: 05/10/84 IOC from M. McGerigle to W. Brown for Items 1, 2, 3
03-805B	Intake Air Filters	1. Inspect air intake filters every 3 to 6 months.						Replace if necessary. Ref: Lead engine DR/QR Report #10-114
03-805D	Flex Connection	1. Visually inspect for evidence of cuts, holes, or dents.			X			
03-810A	Jacket Water Heat Exchanger	1. Jacket water heat exchanger and associated service water piping must be flushed periodically to prevent fouling and corrosion.						Ref: Lead engine DR/QR Report #10-103, Ref: 04/20/84 IOC from M. Wehmeyer to R. Kadlec

RB2610/45

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Perform a daily visual inspection for leakage at packing whenever the engine is in the emergency STANDBY mode. Verify that no leakage is present through the leak-off ports of the lantern ring.						To be performed daily. Ref: 07/19/84 Telecon D. Pasquale and R. Chili
		3. Record heat exchanger performance by checking engine operating parameters.	X					Use for trend data
		4. Evaluate heat exchanger performance data.		X				
		5. Inspect tubes and tube sheet for fouling and errosion - remove entrance and exit channel covers.		X				Ref: TDI Instruction Manual, Volume I, Maintenance Schedule
		Replace packing rings at floating tube sheet after tube inspection.						Ref: Lead engine DR/QR Report #10-103

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		6. Inspect and clean lantern ring. Verify leak-off holes are not plugged.		X				Replace/rework lantern ring as necessary to ensure concentricity prior to reinstallation.
		7. Replace packing rings.						Replace packing when packing becomes hard or leakage at the packing is noted and cannot be stopped by tightening. Ref: Lead engine DR/QR Report #02-810C
03-820A	Lube Oil Heat Exchanger	1. Perform a daily visual inspection for leakage at packing. Verify that no leakage is present through the leak-off ports of the lantern ring.						Ref: Lead engine DR/QR Report #10-104, Ref: 06/12/84 IOC from R. Chii to P. Martia Ref: 04/02/84 IOC from M. Wehmeyer to R. Kadlec
		2. Record heat exchanger performance by checking engine operating parameters.	X					Use for trend data
		3. Evaluate heat exchanger performance data.		X				

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		4. Inspect tubes and tube sheet for erosion and fouling - remove entrance and exit channel covers.		X				Ref: TDI Instruction Manual, Volume I, Maintenance Schedule, Ref: 07/19/84 Telecon D. Pasquale and R. Chii
		5. Inspect and clean lantern ring. Verify leak-off holes are not plugged.		X				Replace/rework lantern ring as necessary to ensure concentricity.
		6. Replace packing rings at the floating tube sheet during reassembly after each inspection.		X				When packing becomes hard or leakage at the packing is noted and cannot be stopped by tightening.
		7. Perform a spectro chemical analysis of the lube oil. Particular attention shall be given to percent moisture content.						To be performed at approximate quarterly intervals. Ref: Lead engine DR/QR Report #10-104
03-820B	Full Flow Lube Oil Filters	1. Record filter d/p.	X					Use for trend data, Ref: 04/02/84 IOC from M. Wehmeyer to J. DiMare, Ref: TDI Instruction Manual, Volume I, Maintenance Schedule

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Drain water and/or sludge from lubricating oil full flow filter.	X					
		3. Replace filter cartridges and perform a visual inspection to determine the nature of the material caught in the filter.						To be performed before the filter d/p reaches the manufacturers recommended maximum differential pressure. Ref: 05/30/84 IOC from M. McGerigle to B. Brown, Ref: Lead engine DR/QR Report #10-106, Ref: 07/31/84 IOC from J. Cadogan to M. McGerigle
		4. Lube oil filter gauge - calibration check.		X				
03-820C	Lube Oil Keep-Warm Pump	1. Check operation of pump/motor bearings.	X					Items 1-5; Ref: 04/05/84 IOC from M. Wehmeyer to T. Fritsch
		2. Check mechanical seal leakage.	X					
		3. Record pump discharge pressure.	X					Use for trend data
		4. Measure unit vibration (pump/motor)		X				

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
03-820D	Lube Oil Keep-Warm Filter	1. Record filter d/p.	X					Ref: 04/05/84 IOC from M. Wehmeyer to J. DiMare
		2. Change filter elements.		X				To be performed before the filter d/p reaches the manufacturers recommended maximum differential pressure. Ref: Lead engine DR/QR Report #10-117
03-825C	Fuel Oil Filters & Strainers: Strainers	1. Change over, strainer element at 15 psid.						Ref: River Bend DR/QR Report #03-825C Task Description.
03-835A	Starting Air Storage Tank	1. Drain air receiver float traps DAILY and monitor the quantity of moisture produced at the float traps.						If quantity of moisture is excessive correct immediately. Check air dryer operation. Ref: Lead engine DR/QR Report #10-111
		2. Disassemble and clean the float trap.			X			Ref: IOC dated 05/08/84 from P. Titus to P. Martin (Items 2 & 3)
		3. Starting air tank pressure gauges - calibration check.		X				

RB2610/50

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		4. Starting air tank pressure switches - calibration check.		X				
03-835D	Diesel Starting Air Compressors	1. Check lubicating oil level.	X					All items; Ref: 04/02/84 IOC with attached Maintenance Chart from M. Wehmeyer to J. Kammeyer.
		2. Overall visual inspection.	X					
		3. Clean fins on inter and after coolers.		X				
		4. Replace intake filter element.		X				
		5. Change compressor oil.		X				
		6. Check belt tension.		X				
		7. Check pulley clamp bolts/set screws tight.		X				
		8. Inspect filter felts on unloader system.		X				Replace as necessary.
03-835I	Air Dryers and Moisture Traps	1. Blow down trap sediment bowls.	X					Ref: 04/05/84 IOC from M. Wehmeyer to J. Kammeyer, Ref: TDI Instruction Manual, Volume I, Maintenance Schedule

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
		2. Inspect and service moisture traps.		X				
		3. Check proper operation of desiccant dryer.	X					Replace desiccant charge as required. Ref: 04/16/84 letter from R. Jaquinto to R. Johnson
	Jacket Water System	1. Check pH. factor of jacket water and correct as recommended by chemical supplier.	X					Ref: TDI Instruction Manual, Volume I, Maintenance Schedule
		2. Replace elastomeric parts in jacket water valves.				X		
	Lube Oil System	1. Check lubricating oil with a viscosimeter for fuel oil dilution. Send a sample of oil to laboratory for analysis.	X					Ref: TDI Instruction Manual, Volume I, Maintenance Schedule, Items 1, 2
		2. Drain lubricating oil system and clean sump tank. Depending on the results of lube oil analysis, refill with new oil.		X				When replacing engine oil use H.D. oil that meets or exceeds series 3 standards. The base stock should be more resistant to thermal degradation and coke formation. The additive package should provide high detergent

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
								dispersant properties with high alkalinity and a high level of antiwear additive such as zinc dithiophosphate. Total Base Number (TBN) should be 12 to 15 for use with #2 fuel oil and a sulfated ash content of 1.5% to 2.0% is preferred. An engine oil with such properties, Mobilguard 412 or equivalent product may be used to insure improved lubrication.
		3. Visually inspect lube oil sump tank level switch floats. Check switch set points.		X				To be performed after lube oil has been drained from sump.
		4. Perform a spectro-chemical analysis of the lube oil.						To be performed at approximately quarterly intervals. Ref: TDI Instruction Manual, Volume I, Maintenance Schedule
	System Operation	1. Record all operating parameters. Compare with base line data to ensure engine is operating properly.	X					To be performed during monthly engine test run.

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
	Piping System	1. Conduct a detailed visual and audible inspection of all fuel, air, oil, and water piping and valves for leakage.	X					Tighten, repair or replace as required. Ref: TDI Instruction Manual, Volume I, Maintenance Schedule
		2. Inspect, clean and as applicable, lubricate manual valves on skid.		X				
	Engine Internals	1. Remove alternate left side doors and examine the inside of the engine for any abnormal conditions. Check with a good light for evidence of babbit flakes.		X				If excessive water, sludge or any indication of bearing failure is present, drain crankcase, determine cause, and take necessary corrective actions.
Miscell-anceous	Engine Mounted Pressure Switches	1. Replace elastomeric parts.				X		
	Gear Train	1. Inspect gears for general condition.		X				
		2. Measure gear back lash on all gears.			X			Replace worn gears exceeding maximum clearance. Complete TDI Inspection and Maintenance Form No. 355-1-1 TDI Instruction Manual,

RIVER BEND MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	Outage	Alt. Outage	5 Year	10 Year	Comments
								Vol. I, Section 5. Use Vol. I, Section 8 Appendix III-I for clearance values. Ref: 04/16/84 letter from R. Jaquinto to R. Johnston

ENGINEERING REVIEW CRITERIA DOCUMENT

FOR

THE DESIGN REVIEW OF THE TDI DIESEL

SMALL BORE PIPING, TUBING AND SUPPORTS

FOR THE TDI OWNERS GROUP

Report No. 11600.60-DC-02
Revision 0

Prepared
by

Stone & Webster Engineering Corporation
Boston, Massachusetts

August 1984

TABLE OF CONTENTS

TDI OWNERS GROUP

ENGINEERING REVIEW CRITERIA DOCUMENT FOR THE DESIGN REVIEW OF THE TDI DIESEL SMALL BORE PIPING, TUBING AND SUPPORTS FOR THE TDI OWNERS GROUP

1.0 INTRODUCTION

The TDI Emergency Diesel Generator Owners Group Program requires Design and Quality Revalidation reviews to independently verify the structural adequacy of the small bore piping, tubing and associated supports to withstand the effects of normal operating and earthquake loadings. This report provides the criteria to be used to perform the review.

2.0 APPLICABILITY

The requirements of the review contained in this report are applicable to all TDI supplied small bore piping and tubing systems including associated supports contained in the diesel engine and its skid, unless specifically excluded by an approved Task Description in accordance with TDI Diesel Generator Owners Group Procedure DG-3.

3.0 OBJECTIVE

The objective of this report is to provide the criteria to be utilized to verify that the small bore piping, tubing and supports will perform their intended function under all normal and earthquake loadings.

4.0 REVIEW METHODS

4.1 Review of Existing TDI Documentation

The initial method to be utilized in determining a component's acceptability is to perform a review of all existing small bore pipe stress and support documentation provided by TDI.

The documentation will be reviewed to determine if it provides an adequate design basis in accordance with the appropriate codes as delineated by the individual utilities design specification for the diesel engine, The review shall also compare the as built piping and support condition to the existing design basis to determine compatability.

If, after completing the review, the engineer determines that the component is acceptable, based on the existing documentation, the Component Design Report will be issued stating the conclusion of acceptability.

If TDI documentation is not available, or if it is determined that the available documentation does not readily lead to a conclusion of accpetability the engineer will alternatively continue the review as outlined in the following paragraphs.

4.2 Review of Small Bore Piping for Acceptability

In cases where the review of TDI documentation does not lead to component acceptability, the engineer will judge if the component will perform its intended function under all normal and earthquake loadings. This judgment will be based on a review of the following information:

Quality approved as built piping isometrics

System operating parameters

Physical piping data

Site specific amplified response spectra

System function

In addition to reviewing the above information, a physical walkdown of the engine and skid piping may be required. The walkdown would include a review of the piping to determine pipe support type and function, as well as a review for the following:

Thermal flexibility: The engineer will determine if sufficient flexibility exists for each between support section of small bore piping. The thermal movement imparted by the supports onto the piping will also be considered.

Deadweight spans: The deadweight spans between supports will be reviewed by the engineer and acceptability will be based on judgment.

Seismic spans: The seismic spans between supports will be reviewed by the engineer and acceptability will be based on judgment. The engineer's judgment will consider the site specific amplified response spectra and all components, fittings and branch connections. Engine induced vibration will also be considered in determining acceptability of seismic spans and is further discussed in paragraph 4.5.

The engineer will document the reviews of the individual component by a written trip report. The report will address each component and record the thought process for acceptance or rejection of each.

In cases where the engineer judges that the component will perform its intended design function the Component Design Report will be issued stating the conclusion of acceptability.

In cases where the engineer judges that a modification may be required to assure functional capability, a recommendation for the modification will be stated in the conclusions of the Component Design Review. The analyst may perform calculations to support the judgment in cases where it is not apparent that a modification is required. The object of these calculations is not to provide code compliance, but specific codes may be referenced for guidance.

4.3 Review of Tubing for Acceptability

A field walkdown of all critical tubing components will be required. The same methods as outline in paragraph 4.2 for small bore piping review will be employed for tubing.

4.4 Review of Small Bore Piping and Tubing Support

In cases where the review of TDI documentation, as outlined in paragraph 4.1, does not lead to component acceptability the engineer must continue the review based on the following:

1) Quality approved as built support sketches, if available.

2) Physical support data

3) Anticipated support loads

In addition to, or in conjunction with, reviewing the above information, a physical walkdown of the engine and skid supports may be required. The walkdown would consist of a review of the following support components so that the engineer may judge if the support will perform its intended function:

1) Structural members

2) Structural bolts and base plates

3) Welds

The engineer will document the review and recommend modifications as outlined in paragraph 4.2.

4.5 Engine Induced Vibration

The effects of engine induced vibration will be considered in determing the adequacy of the piping spans for dynamic loading. Specifically, the engineer

will determine if the existing piping spans may cause the piping to respond at the resonant frequency of the engine. This determination may be based on calculation or review of the vibration test results obtained at Shoreham and Comanche Peak. Another acceptable method of considering engine induced vibration is to compare the specific engine small bore piping or tubing with proven acceptable design experience.

The documentation of acceptability or recommendation of modifications will be in accordance with paragraph 4.2.

5.0 SPECIAL COMPONENTS

5.1 Dresser Compression Coupling

Based on review of the small bore Dresser couplings at Shoreham, it is not required to perform qualifying calculations for the coupling on the remaining engines. The couplings are inherently qualified based on acceptability of the attached piping.

5.2 Pipe Flanges

Based on review of the small bore pipe flanges at Shoreham, it is not required to perform qualifying calculations for the flanges on the remaining engines. The flanges are inherently qualified based on acceptability of the attached piping.

DESIGN CRITERIA FOR
DIESEL GENERATOR
LARGE DIAMETER PIPING FOR RIVER BEND

Submitted to
TDI Owners Group
Charlotte, North Carolina

Prepared by
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RB2864

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

1.0 PURPOSE

The purpose of this document is to provide structural acceptance criteria for evaluation of the Transamerica Delaval, Inc. (TDI), large diameter, diesel generator skid mounted piping at the River Bend Station Unit No. 1, (RBS). This criteria was based primarily upon the philosophy embodied in industry accepted Codes and Standards for design of nuclear power station piping.

2.0 APPLICABLE CODES

2.1 Diesel Generator Specification Requirements

The RBS Diesel Generator Specification, Ref. 1, invokes ASME III - Class 3 (Ref. 2) for the subject piping.

2.2 Code Requirements

2.2.1 Diesel Engine Manufacturers Association (DEMA) Standards

The DEMA Standard (Ref. 3) extensively covers the detailed performance requirements of systems and subsystems for diesel engine driven electric power generating units, but does not cover analytical requirements or allowable stresses for piping systems. It relies on other codes for these requirements but does not specifically reference any.

2.2.2 American Bureau of Ships Building Code

Section 36 of the American Bureau of Ships Building Code (Ref.4) discusses requirements for pumps and piping systems. This code presents very few design requirements, providing specific analytical formulas only for pipe wall thickness versus piping design pressure. The code makes no specific provisions for analysis for deadweight, thermal expansion, or dynamic effects. Piping materials and allowable membrane stresses are addressed in this code. For example, ASTM A53 Grade B and A106 Grade B are approved materials. It is noted that this code provides tabulated membrane stress allowables which are the same as for B31.1 (Ref. 5) and ASME III Class 3 and 2 (Refs. 2 and 6).

2.2.3 ANSI B31.1 and B31.3

The general philosophy of ANSI B31.1 (Ref. 5) and B31.3 (Ref. 7) is to parallel those provisions of Section I "Power Boilers" of the ASME Boiler and Pressure Vessel Code, as they can be applied to piping systems functioning at elevated pressures and temperatures. These codes are conservative, reflecting the general need for long service life and maximum reliability in power, chemical, and petroleum refinery installations.

B31.1 and B31.3 are quite similar, except that B31.3 allowable stresses are somewhat more permissive than B31.1 values. Both are all inclusive codes which set forth engineering requirements for design and construction of piping systems. These codes contain basic reference data and formulas deemed necessary for design, including the following:

(1) Material specifications and component standards which have been accepted for code usage;

(2) The designation of proper dimensional standards for the elements comprising piping systems;

(3) Requirements for the design of component parts and assembled units, including necessary pipe supporting elements;

(4) Requirements for the evaluation and limitation of stresses, reactions, and movements associated with pressure, temperature, and external forces;

(5) Requirements for the fabrication, assembly, and erection of piping systems.

(6) Requirements for testing and inspection of elements before assembly or erection and of the completed systems after erection.

2.2.4 ANSI B31.7

ANSI B31.7 "Nuclear Power Piping" (Ref. 8) was the precursor of ASME III-Class 1 Subarticle NB-3600, which covers ASME Code Class 1 piping design, and embraces the same design philosophy as ASME III-Class 1 (Ref. 9).

2.2.5 ASME Code, Section III

The ASME Boiler and Pressure Vessel Code provides rules for the construction of boilers, pressure vessels, and nuclear components. Section III of this Code addresses nuclear power plant components, and consists of two (2) divisions. Division 2 covers concrete reactor vessels and containments and is not pertinent here. Division 1 consists of the following subsections:

NCA	General Requirements
NB	Class 1 Components
NC	Class 2 Components
ND	Class 3 Components
NE	Class MC Components
NF	Components Supports
NG	Core Support Structures
Appendices	

Each subsection is divided into articles as follows:

Article 1000	Introduction and Scope
Article 2000	Material
Article 3000	Design
Article 4000	Fabrication and Installation
Article 5000	Examination
Article 6000	Testing
Article 7000	Overpressure Protection
Article 8000	Nameplates, Stamping and Reports

The code recognizes that various components have different levels of importance associated with the components' function, as related to the safe operation of the nuclear power plant. The code classes thus permit a choice of rules that provide assurance of structural integrity and quality commensurate with the relative importance assigned to the individual items. Class 1 components are assigned the highest level of importance. Reactor coolant pressure boundary components are examples of what is normally assigned as ASME III-Class 1. Class 2 components are assigned the next lower level of importance. Nuclear safety related components other than reactor coolant pressure boundary components are examples of what is normally assigned to ASME III-Class 2. Class 3 components are usually of the same level of importance as Class 2 components, but are assigned to ASME III-Class 3 by virtue of their moderate normal operating temperatures and pressures.

ASME Code Section III does not provide guidance in the selection of component classification and places the responsibility of such component classification on the owner of the nuclear power plant.

2.3 Applicable Code Acceptance Criteria

Those portions of the applicable building codes and standards which refer to structural integrity of the subject piping are addressed herein. The portions of these codes which provide requirements for documentation and other quality assurance related requirements, as well as adequacy of system design requirements such as overpressure protection adequacy, are not part of this scope.

The RBS Diesel Generator Specification, Ref. 1, invokes ASME III - Class 3 (1974 edition, including addendums through Summer 1974). This classification is consistent with the moderate service temperatures and pressures associated with the subject piping. ASME III - Class 3 applies specifically to nuclear safety related piping, having rigorous analytical requirements that are acceptable to the nuclear industry and the U.S. Nuclear Regulatory Commission. ANSI B31.1 and ANSI B31.3, by virtue of their similarity to ASME III - Class 3, are also applicable.

Since ASME III-Class 3 permits qualification to a more stringent code subsection, it is permissible to provide ASME III-Class 2 (Ref. 6) or ASME III-Class 1 (Ref.9) analysis for this purpose. ANSI B31.7 (Ref. 8) is the predecessor to ASME III-Class 1 and is, therefore, similarly applicable.

ASME III-Class 1 has considerably higher allowable stresses for material such as ASTM A106 Grade B. However, this is applicable only if ASME III-Class 1 stress analysis is performed. Note that ASME III-Class 1 analysis provides design rules for rigorous evaluation of fatigue life and must be used if the piping is justified on that basis.

2.4 Conclusion

It was concluded that the RBS diesel generator piping design utilizes the philosophy and intent of ASME III - Class 3 design (Ref. 2) to provide analytical justification of piping design acceptability. The other above referenced codes (References 5, 6, 7, 8 & 9) were also judiciously considered where applicable, as described in Section 3.0.

3.0 ACCEPTANCE PHILOSOPHY

The intent and philosophy of ASME III - Subsection ND design rules for Class 3 components (Ref. 2) was utilized as the basis of acceptance. The requirements of other codes and standards (Refs. 5, 6, 7, 8 and 9) were also considered for applicability. The analysis was performed in steps, as follows:

1. Pipe stress analysis was first performed in accordance with the design rules of ASME III - Class 3 (Ref. 2), using conservative assumptions for modeling and stress intensification described in detail in 5.0 (below).

2. If this analysis indicated excessive stresses, then the results were evaluated to determine if relaxing some of the conservatisms could be justified for the particular piping systems being considered.

   For example, it was, at times beneficial to consider the more rigorous, ASME III-Class 1 analysis in an attempt to justify thermal expansion stresses on the basis of adequate thermal fatigue life.

3. If pipe stress was still excessive after relaxing conservatisms, support removal and/or modification was then considered.

4. The applicable piping system was then reanalyzed to reflect the above referenced analytical modification. Or, as an alternative, hand calculations were performed to account for a highly localized effect.

3.1 Considerations for the Exhaust Manifold

The Exhaust Manifold (EM) piping has operting temperatures above those classified as moderate. In view of the elevated temperature, ASME III - Class 2 would normally be used. However, since the design rules for ASME III -Class 2 and 3 are identical, either may be utilized for the design evaluation.

There are additional concerns associated with the EM elevated temperature service; specifically, the effect of graphitization and creep on the structural integrity of the piping. However, based upon data contained in Reference 10 the diesel is predicted to operate approximately 2000 hours during the 40 year plant life, for an average of approximately only 50 hours each year. Thus, the effects of graphitization and creep are considered negligible since the high temperature exposure is for a very short duration, permitting steel rehabilitation by creep recovery and preventing the formation of embrittling graphic modules in chain-like arrays.

Allowable stresses were developed based upon the criteria set forth in the ASME Codes for negligible creep and graphitization. The criteria specifies that the allowable stress is based upon a fraction of the minimum yield and ultimate strength of the subject material at the elevated temperature.

Consistent with the intent and philosophy of the ASME Code, the adoption of an inspection program, which provides a means for identifying the possible degradation of the EM components, particularly the welded joints, was recommended, Ref. 11.

4.0 LOADING CONSIDERATIONS

The pipe stress analysis accounts for all loads due to deadweight, thermal expansion, and earthquake.

The effects of earthquake were determined by dynamic pipe stress analysis utilizing appropriate seismic response spectrum envelopes. As noted in the Diesel Generator Seismic Criteria (Ref. 1), Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE or DBE) were considered. Consistent with Reference 1, a three-directional earthquake was assumed. The effects of each of the vertical and two horizontal earthquakes was first determined by combining across modes by square root sum of squares (SRSS) with closely spaced modes considered by the ten percent method. The three directions of earthquake were then combined by SRSS to determine the seismic results. Seismic spectra was based on Reference 10.

Damping values were based on Reference 13, per Reference 14. Also, based upon data provided in Reference 15, the diesel, its supporting skid and the auxiliary skid have all first mode natural frequencies in the rigid range of the applicable response spectrum. Therefore, consideration of the dynamic amplification of those components was not necessary and the floor spectra was used for all analyses.

The analytical piping model for both thermal and seismic analyses included the pipe supports, which were modeled as springs whose spring constants were based on the as-built pipe support configuration of the Lead Diesel (Shoreham), where applicable. When the River Bend supports could not utilize spring constants from Shoreham, either spring constants were developed upon available information, or computer program default spring constants were used.

In addition, to more accurately represent both the flexibility of equipment and its dynamic effect on the piping, the equipment was included in the analytical piping model using cross-sectional properties and component weights derived from the applicable equipment details. However, if a particular piece of equipment was apparently rigid, based on engineering judgement, then that equipment was not included in the analytical model.

5.0 SPECIAL COMPONENT CONSIDERATIONS

This section provides discussions relating the analytical considerations of special configurations and components. These include specialty items such as Dresser and Compression Couplings, flexible hose and pipe flanges, and also includes special configurations such as mitered joints, unreinforced branches, including unreinforced lateral connections, and circumferential buttwelds.

5.1 Mitered Joints

Mitered joints are permitted by ASME III-Class 1, 2 and 3 (Refs. 2, 6, and 9), as well as B31.1 (Ref. 5) and B31.3 (Ref. 7). Flexibility characteristic (h), flexibility factor (k), and stress intensification factor (i), as tabulated in Figure NC-3673.2(b)-1 and Figure ND-3673-2(b)-1 in Ref. 2 and 6, were utilized for ASME III-Class 2 and 3 analyses, respectively.

Furthermore, to assure that the miter joint induced discontinuity stresses were acceptably low, equation 4(c), paragraph 304.2.3 of B31.3 (Ref 7) was evaluated to determine the pressure capacity of the joint as compared with the normal operating pressure of the pipe in question.

5.2 Unreinforced Branches

The use of unreinforced branch connections, including unreinforced lateral connections as used in the RBS diesel generator skid mounted piping, is permitted by ASME III-Class 1, 2 and 3, as well as by B31.1 and B31.3.

Flexibility characteristic (h), flexibility factor (k) and stress intensification factor (i), as tabulated in Figure NC-3673.2(b)-1 and Figure ND-3673.2(b)-1 were utilized for ASME III-Class 2 and 3 respectively.

Additional analysis was performed to confirm that the pipe is "self-reinforcing" and that the rules for metal reinforcement requirements set forth in the codes (e.g., ASME III-NC-3643.3, et. al.) were satisfied. It is noted that since the design pressure was small in relation to the actually furnished pipe wall thickness, there was considerable excess wall thickness available for self-reinforcing of the branch penetrations.

5.3 Pressure Retaining Buttwelds

5.3.1 Weld Penetration Considerations

For the seamless on-engine piping, weld only in the bevel region was assumed. No weld penetration in the land region (assumed as 1/16 inch) was assumed.

5.3.2 Weld Joint Capacity

Minimum wall thickness requirements dictated by design pressure (e.g. ASME III-NC-3641.1, Equation (3), et. al.) must be maintained at the circumferential buttwelds, which join adjacent spool pieces.

For the RBS diesel generator piping, it was conservatively assumed that the material available for design pressure requirements was equal to the pipe wall thickness minus 3/32 inch, to account for the worst possible minimum weld thickness. Minimum weld thickness to minimum required pipe wall thickness ratios were determined for all of the subject pipe sections. The smallest ratio of (tw/tmin) was found to be 2.0 (or 200 percent of minimum required wall thickness). Thus, these welds always met minimum Code requirements for pressure dependent pipe wall thickness. This excess wall provides adequate generic margin against corrosion. More specific data regarding corrosion is provided in the specific component reports where applicable.

All pipe stress calculations, other than design pressure vs. wall thickness calculations, utilized the nominal pipe wall thickness, since a local thinning of the pipe affects its pressure capacity but has a negligible effect on gross bending stresses. This is consistent with the philosophy of ASME III and ANSI codes.

Applying this philosophy to the circumferential welds, it was thus assumed that for deadweight, thermal expansion and seismic loading stress analysis, the available wall thickness was the nominal wall thickness minus the nominal flat landing of 1/16 inch. The evaluation of stresses at the circumferential buttwelds considered this reduction in section.

If the stresses thus derived were adequately low, then strength capacity of the circumferential weld joints furnished for the subject piping was considered to be adequate.

5.3.3 Stress Intensification Factor

The initial analysis utilized a stress intensification factor (SIF) of 1.8, which was the upper limit specified in ASME III-ND (1974 version including addenda through Summer 1974) Figure ND-3673.2(b)-1 for a mismatch of an as welded buttweld (which is in excess of 0.1., i.e, having a ratio of mismatch to pipe wall thickness [delta/t_n]).

This approach was a conservative necessity. If it could easily be determined that the ratio (delta/t_n) is 0.1 or less, then the code permits an SIF of 1.0 for as welded or flush buttweld. However, since the pipe had independent I.D.,O.D., and out of round tolerances, it was not possible to determine the actual pipe wall mismatch (delta) between two adjacent spools by visual inspection of the outside of the piping. Thus the conservative value of 1.8 was utilized.

5.4 Dresser and Compression Couplings

Dresser Couplings (see Figure 1) and Compression Couplings (see Figure 2) were utilized throughout the RBS diesel generator skid mounted piping. These couplings provide a flexible, leak proof seal at the pipe spool piece interface, without pipe threading, or welding, and do not require precise spool piece end preparation or precise piping alignment.

These couplings have an 80 year record of successful service on all kinds of piping such as water mains, sewage treatment, and water filtration piping, and in all branches of the oil industry, and have been used extensively by TDI for other diesel generator installations.

5.4.1 Code Acceptability of Dresser and Compression Couplings

ASME III-NC-3649 (for Class 2 components) and ASME III-ND-3649 (for Class 3 components) permit the use of pressure retaining products not specifically covered in the code, which are shaped, proportioned, and sized similar to components that have been proven satisfactory by successful performance under comparable service conditions.

By virtue of their long record of satisfactory service for moderate pressure/temperature systems of this type of application, the Dresser Couplings and the Compression Couplings meet the intent of ASME-III Class 2 and Class 3 (Refs. 2 and 6) and were therefore acceptable components.

5.4.2 Coupling Validation

1. Selection

The Dresser catalog specifies limiting pressures and temperatures for the various couplings. The subject service conditions were evaluated against these requirements and some couplings, because of the gaskets supplied, were slightly marginal with respect to the temperature requirements. For these couplings, replacement with an upgraded model was specified if leaks developed.

2. Displacement Verification

When acceptable piping/pipe support results are obtained, the relative translations and rotations of the joined pipes were compared to the vendor allowables for the coupling to validate the analysis.

5.4.3 Effects of Couplings on Pipe Stress Analysis

1. Pressure Effects

Pressure integrity of the piping is achieved by wedging the coupling gasket against the outside of the pipe and into the mating fitting (Reference Figures 1 and 2). However, this configuration permits axial pipe movements of the adjacent pipe spool pieces. Thus, when the pipe is pressurized, it would tend

to slip out of the coupling and separate, if some external axial anchorage were not also furnished. Pipe supports and terminal end connections were relied upon to prevent slipping. The pipe stress analysis included the effects of these resulting unbalanced pressure forces.

2. Constraint of Thermal Expansion

As shown in Figures 1 and 2, a gap is intended to be maintained between the two pipe spool pieces during installation. This would accommodate a modest amount of thermal pipe expansion. However, if this gap is not maintained during the installation of the piping, then the thermal expansion relief is partially negated.

Pipes joined by couplings have only the gasket and its frictional capacity to provide any mutual stiffening across the joint. Since this is very low, the coupling connection was analyzed as completely free to rotate and translate relatively.

3. Seismic Interaction at the Couplings

Examination of Figures 1 and 2 indicates that modest translations and rotations between the two adjacent piping spool pieces are possible, by virtue of the soft gaskets, and the gaps within the couplings. For seismic analysis, it is not conservative to neglect this flexibility.

In order to account for this, seismic pipe stress analysis first conservatively assumed the piping systems to be completely separated at the coupling, thus taking no credit for any mutual stiffening across the coupling. If the seismic stresses were acceptable, then no further evaluation was performed.

5.5 Pipe and Equipment Supports

Pipe and equipment supports were qualified on the basis of plant specific operating history as well as Impell's experience with the Shoreham and Comanche Peak Diesel Generators. Engineering judgement was used in the qualification of supports. Since as-built details for supports were not provided, it was assumed that supports were installed as originally designed by TDI. Where previous support problems existed, either on the River Bend engine or on similar engines, generic-type recommendations for modifications were made. Where piping analysis deemed support modifications (e.g., addition or removal of supports) necessary, recommendations to incorporate such changes were included in the final reports. Where there was no history of problems with a support nor any analytical basis for modification, that support was judged adequate for its intended purpose.

5.6 Pipe Flanges

5.6.1 Standard Flanges

Flanges fabricated to standards listed in ASME III-NC-3132-1 (for Class 2) and ND-3132-1 (for Class 3) are acceptable for ASME III Class 2 and 3. For these flanges the established pressure/temperature rating was first compared with operating pressure/temperature to evaluate the flange selection.

Since the operating pressures for the subject piping systems were modest, the flange had excess capacity to carry mechanical loads imposed on the flange. This was confirmed by conservative hand calculations using techniques outlined in ASME III - Subsection ND 3658.

5.6.2 Non-Standard Flanges

At a number of locations within the RBS Diesel Generator skid mounted piping, square or rectangular, flat plate flanges were utilized. These flanges were analyzed as flat plates, using conservative assumptions.

5.6.3 Flange Bolt Pipe Support Attachments

At a number of locations pipe support straps were connected to piping at pipe flanges by means of two (2) flange bolts. Since these bolts have the multiple duty of providing pressure closure and flange continuity, as well as serving as a pipe support attachment, they required special evaluation for adequacy. These flange bolts were evaluated on the following basis:

If the flange bolts are properly torqued, providing ample precompression at the flange/pipe support strap, then there is frictional resistance to transmit load. If this frictional resistance capacity is greater than the actual applied force, then the bolt is loaded only in tension. It does not therefore realize any of the transverse load, or accompanying bending which is transmitted to the flange assembly by the pipe support strap plate.

The bolt frictional capacity, based on Transamerica Delaval bolt torque recommendations, (Ref. 16), was compared to the strap load, and the connection was adequate to transfer shear without bolt bending provided the frictional capacity is at least 1.5 times the support load. If this criteria was not met, then higher strength bolts were specified, such that an increased bolt torque could be applied, yielding higher pretension and thus ensuring a greater frictional capacity.

6.0 REFERENCES

1. Stone & Webster Specification No. 244.700 (J.O. No. 12210) "Standby Diesel Generator Systems - River Bend Station - Unit 1" Rev. 2, May 5, 1980 and Addendums 1 and 2 dated 10/30/81 and 08/30/82, respectively.

2. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, "Rules for Construction of Nuclear Power Plant Components" (ASME III) Subsection ND Class 3 Components (ASME III-Class 3).

3. Diesel Engine Manufacturers Association (DEMA), "Standards and Practices for Low and Medium Speed Stationary Diesel and Gas Engines," 1972.

4. American Bureau of Ships, "Rules for Buiding and Classing Steel Vessels," 1976.

5. American National Standards Institute (ANSI) Document ANSI/ASME B31.1, "Power Piping" (B31.1).

6. ASME III, Subsection NC, Class 2 Components (ASME III-Class 2).

7. ANSI document ANSI/ASME B31.3, "Chemical Plant and Petroleum Refinery Piping" (B31.3).

8. ANSI B31.7, "Nuclear Power Piping" (B31.7).

9. ASME III, Subsection NB, Class 1 Components (ASME III-Class 1).

10. Record of Conversation between A. J. Palumbo and V. Klo, October 26, 1984.

11. Impell Letter No. 0630-037-NY-046, dated October 26, 1984. River Bend Task Description for Component 03-380A - Exhaust Manifold.

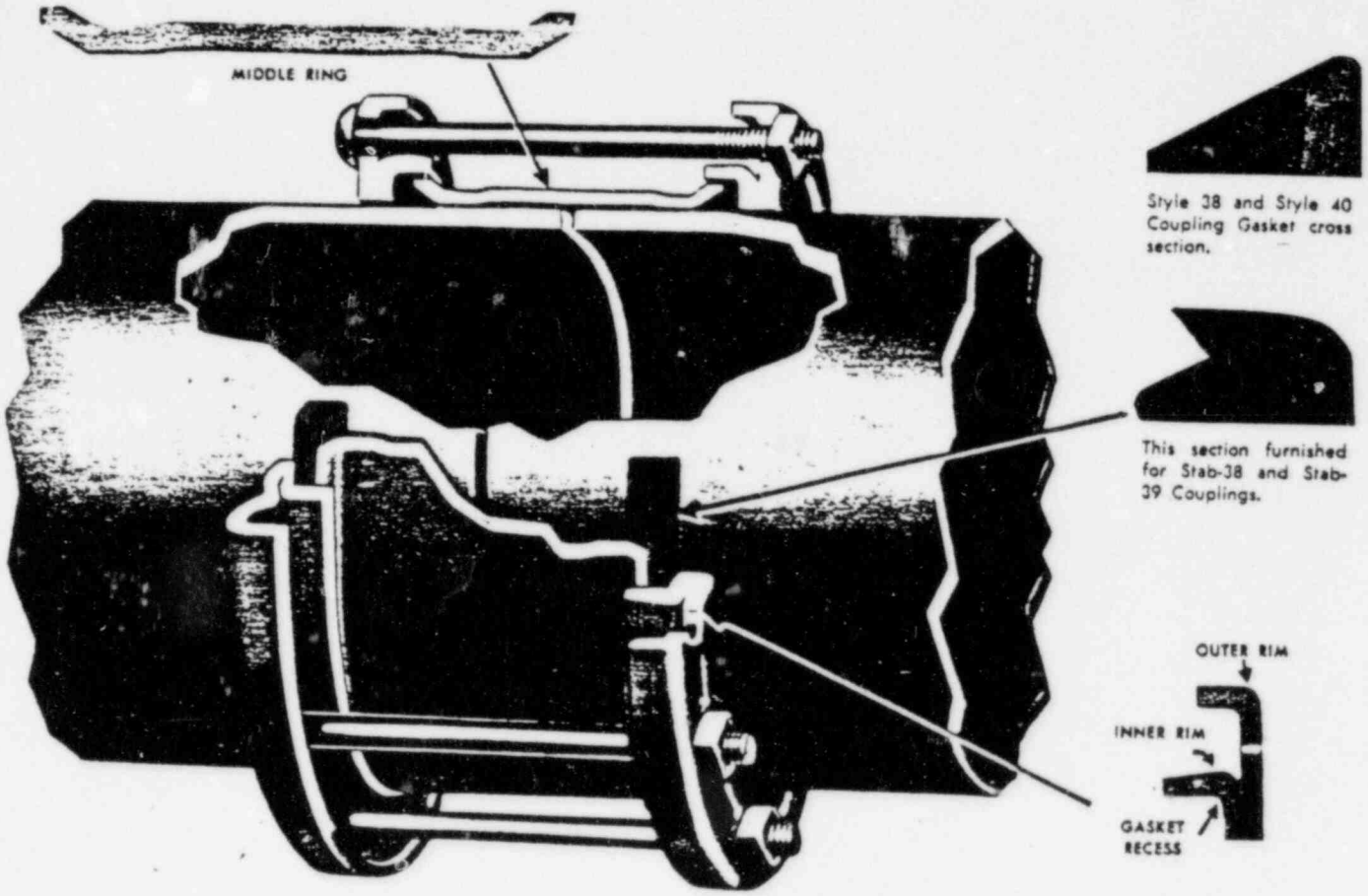
12. Stone & Webster Letter No. RBS-T-14926, dated October 24, 1984.

13. NRC Regulatory Guide 1.61, October, 1973.

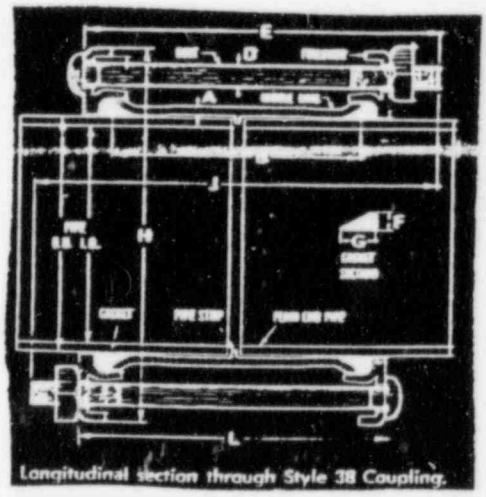
14. Record of Conversation between C. Fonseca and A. Palumbo, October 23, 1984.

15. TDI Final Report Volume 1 - Seismic Qualification of Transamerica Delaval DSR-48 Diesel Generator Unit. Prepared for GSU River Bend Station. Revision 2, May 5, 1980.

16. TDI Instruction Manual, Volume I, Appendix IV "Model DSR-48 Diesel Engine/Generator".



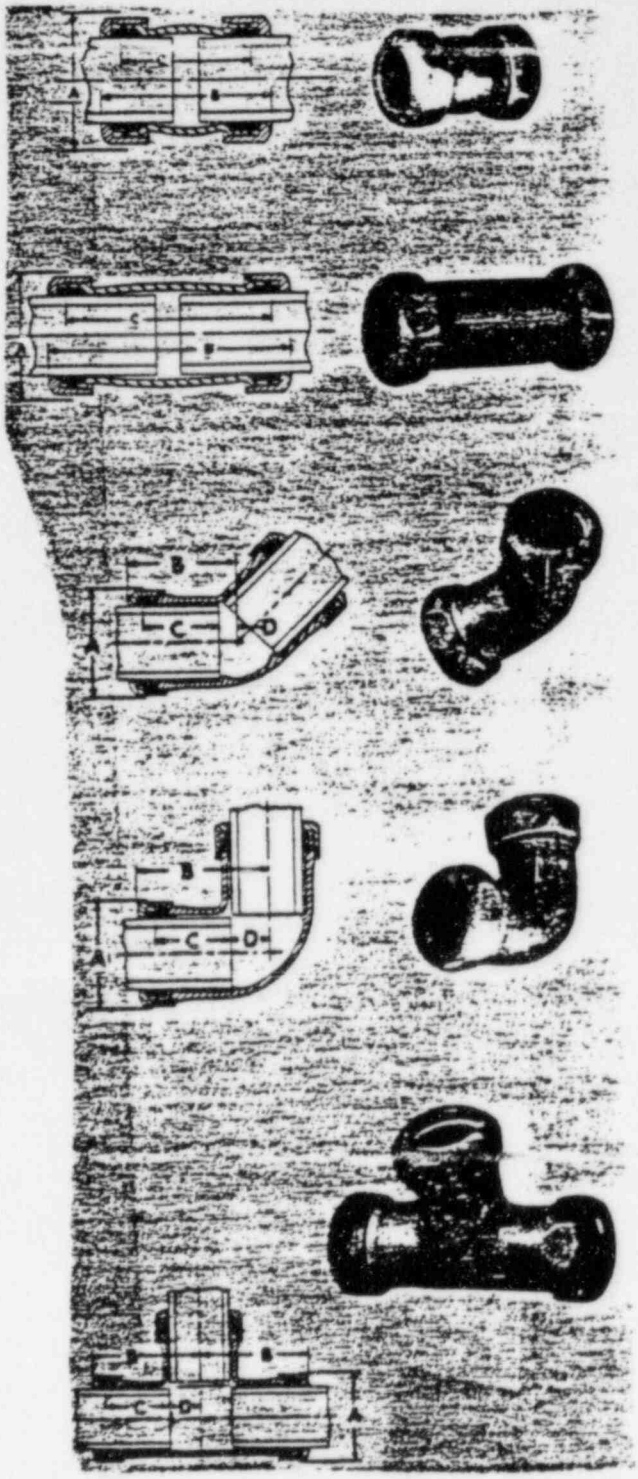
Cutaway view of Dresser Coupling, showing working principle and illustrating shape and relative position of component parts. Insets show details of parts.



Longitudinal section through Style 38 Coupling.

FIGURE 1

DRESSER COUPLING



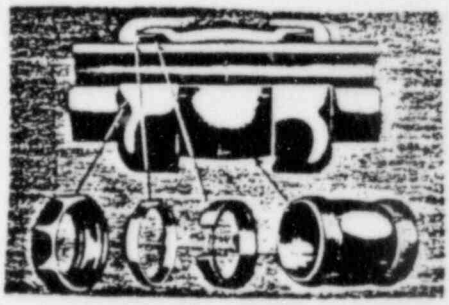


FIGURE 2

COMPRESSION COUPLING