

MISSISSIPPI POWER & LIGHT COMPANY Helping Build Mississippi

P. O. BOX 1640, JACKSON, MISSISSIPPI 39215-1640

July 18, 1986

O. D. KINGSLEY, JR. VICE PRESIDENT NUCLEAR OPERATIONS

> U. S. Nuclear Regulatory Commission Office of Nuclear Reactor Regulation Washington, D. C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station Unit 1 Docket No. 50-416 License No. NPF-29 Response to Operating License Condition 2.C.(25)(b) and the NRC Generic TDI Safety Evaluation Report AECM-86/0172

Aco

References:

MP&L letter to the NRC, AECM-84/0525 dated November 28, 1984
 MP&L letter to the NRC, AECM-85/0120 dated April 16, 1985
 MP&L letter to the NRC, AECM-85/0301 dated October 1, 1985
 NRC letter to MP&L, MAEC-85/0395 dated November 22, 1985
 MP&L letter to the NRC, AECM-85/0414 dated December 23, 1985
 MP&L letter to the NRC, AECM-86/0070 dated June 7, 1986
 NRC letter to MP&L, MAEC-86/0285 dated June 26, 1986

This submittal provides Mississippi Power & Light's (MP&L) actions in response to the final evaluations and recommendations from the TDI Owners Group Program applicable to Grand Gulf Nuclear Station (GGNS) Unit 1, as required by Operating License Condition 2.C.(25)(b). This information is provided for NRC review and approval prior to startup following the first refueling outage for GGNS.

This submittal also provides MP&L's plans for implementation of the programs identified in the NRC Safety Evaluation Report of the Operability/Reliability of Emergency Diesel Generators Manufactured by Transamerica Delaval, Inc. (Generic TDI SER)(Reference 7).

MP&L provided the TDI Diesel Generator Design Review/Quality Revalidation (DR/QR) Report for GGNS by letter dated November 28, 1984 (Reference 1). MP&L's actions in response to the recommendations of the DR/QR Report for

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GGNS was provided by letter dated October 1, 1985 (Reference 3). In a followup letter to MP&L dated November 22, 1985 (Reference 4), the NRC staff requested that MP&L work with the TDI OG to develop an acceptable means by which members of the OG can make changes to TDI OG recommendations. MP&L stated in a letter to the NRC dated December 23, 1985 (Reference 5) that in an effort to resolve the issue of changes to TDI OG recommendations MP&L would continue to work with the Owners Group to obtain an agreed upon list of acceptable changes for presentation to and review by the NRC in a timely manner. The TDI OG has agreed upon this acceptable listing of changes to the DR/QR report which is contained in Revision 2, Appendix II to the Maintenance and Surveillance portion of the GGNS DR/QR Report.

Attachment 1 contains MP&L's actions regarding the final recommendations contained in the GGNS DR/QR report and MP&L's plans for implementation of programs identified in the NRC Generic TDI SER.

Please find in Attachment 2 the latest revision to Appendix II of the TDI Diesel Generator DR/QR Report for GGNS. This revision, incorporated into the attachment to the MP&L letters dated November 28, 1984 (Reference 1) and April 16, 1985 (Reference 2), constitutes the final evaluations and recommendations from the TDI Owners Group. This information is provided as required by Operating License Condition 2.C (25)(b).

This submittal defines MP&L's TDI Emergency Diesel Generator program and supercedes all previous commitments for the GGNS TDI Emergency Diesel Generators.

MP&L requests NRC review and approval of MP&L's actions in response to the final recommendations of the TDI OG and MP&L's plans for implementation of programs identified in the Generic TDI SER. MP&L requests this review and approval be complete by August 18, 1986 in order to identify final scheduling, manpower and procurement constraints for the upcoming refueling outage. If additional information is required to support your review, please contact this office.

Yours truly,

ODK:vog Attachment

cc: (See Next Page)

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cc: Mr. T. H. Cloninger (w/a)
Mr. R. B. McGehee (w/a)
Mr. N. S. Reynolds (w/a)
Mr. H. L. Thomas (w/o)
Mr. R. C. Butcher (w/a)

Mr. James M. Taylor, Director (w/a) Office of Inspection & Enforcement U. S. Nuclear Regulatory Commission Washington, D. C. 20555

Dr. J. Nelson Grace, Regional Administrator (w/a) U. S. Nuclear Regulatory Commission Region II 101 Marietta St., N. W., Suite 2500 Atlanta, Georgia 30323

#### MP&L Responses to OLC 2.C.(25)(b) and the Generic TDI SER

## I. Response to Operating Licensing Condition 2.C.(25)(b)

MP&L will implement the final recommendations contained in the TDI OG DR/QR Report for GGNS (through Revision 2). As part of the GGNS implementation plan, MP&L requested and received concurrence from the Owners Group for a limited deferral of DR/QR inspections for the Division II Emergency Diesel Generator to the second refueling outage. MP&L submitted the proposed limited deferral of DR/QR inspections for NRC staff review in a letter dated June 7, 1986 (Reference 6).

In the future, MP&L plans to utilize the 10CFR50.59 process to evaluate and implement any changes to the GGNS DR/QR report recommendations, with the exception of Phase 1 recommendations.

## II. Response to the NRC Generic TDI SER

MP&L's plans for implementation of programs identified in the Generic TDI SER are as follows:

1) Implement the Phase I program as identified in Section 2.1 of the Generic TDI SER.

As noted in the Generic SER, the engines at GGNS have connecting rods with 1 7/8 inch bolts. In order to implement the DR/QR Revision 2 Maintenance and Surveillance program and schedule, MP&L will operate with an engine load restriction. This load restriction is currently in the Technical Specifications for GGNS and corresponds to 82% of rated load. However, as presented in a letter from MP&L to the NRC dated December 6, 1985 (AECM-85/0395), EDG post maintenance testing should remain as stated in this letter. MP&L does not consider acceleration of engine overhaul frequency appropriate following limited post maintenance testing over 82% of rated load. Testing over 82% of rated load is a TDI requirement for seating of new piston rings and is of a relatively short duration. As noted in AECM-85/0395, the NRC staff has previously stated that the subject post maintenance testing was acceptable.

 Implement the Phase II program as identified in Section 2.2 of the Generic TDI SER and as discussed in Section I above.

- 3) Implement the maintenance and surveillance recommendations developed by the Owners Group in Appendix II, Revision 2, of the DR/QR report for GGNS.
- 4) MP&L utilized appropriate recommendations from TDI in developing the current maintenance and surveillance program for the TDI EDG's at GGNS. Also TDI was involved in the development of the DR/QR report for GGNS and has recently endorsed Appendix II, Revision 2, to the DR/QR report as the recommended maintenance plan for TDI engines in nuclear service. As noted above MP&L is implementing the Owner's Group Appendix II, Revision 2 of the DR/QR report for GGNS. Future TDI recommendations will be evaluated by MP&L and will be implemented consistent with this evaluation.

ATTACHMENT 2

### TDI DIESEL GENERATOR

## DESIGN REVIEW

## AND QUALITY REVALIDATION

## REPORT

Prepared For

MISSISSIPPI POWER & LIGHT COMPANY

GRAND GULF NUCLEAR STATION - UNIT 1

By

TDI DIESEL GENERATOR OWNERS GROUP

Revision 2 April 1986

A M Segrest Program Manager TDI Diesel Generator Owners Group

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TDI OWNERS GROUP

## APPENDIX - II

GENERIC MAINTENANCE MATRIX

TDI OWNERS GROUP

## GENERIC MAINTENANCE MATRIX

## APPENDIX - II

## OVERVIEW AND DEFINITIONS

## OPERATING AND STANDBY SURVEILLANCE PARAMETERS

PART A

#### TDI OWNERS GROUP

### GENERIC MAINTENANCE AND SURVEILLANCE PROGRAM

#### APPENDIX - II

#### I INTRODUCTION

The purpose of this appendix is to provide the TDI Owners 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 and including subsequent testing and inspections performed following the review conducted by the original program. This appendix is intended to enhance the existing TDI Instruction Manual, Volume I and Volume III, which will maintain the gualification 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. The basis of this matrix is formed by the following:

- Owners Group Technical Staff review of TDI Instruction Manuals, SIMs, and TDI correspondence on specific components.
- Technical Staff input regarding the adequacy of recommendations found in sources mentioned above.
- Additional maintenance recommendations identified during the DR/QR review.
- Results of subsequent testing and surveillance (i.e., Shoreham EDG103 750-hour endurance run and subsequent engine teardown) performed following the review conducted during the original program.
- Additional review by the Owners Group representatives.

It should be noted that this revision in some cases modifies the original program results based on this additional information and review.

#### 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. This schedule should be followed as closely as the operating conditions will permit. This maintenance service as specified supersedes previous general maintenance requirements, but is separate and does not supersede Quality Revalidation and/or modifications previously recommended. The schedule details specific components requiring maintenance on a regular basis. This schedule separates the maintenance activities into frequencies as set forth in the subsequent list of definitions.

Inspections, as outlined in this maintenance schedule, are to be performed and parts refurbished or replaced as required by the program or deemed necessary by the inspection. Any adverse findings shall be investigated and corrective action, including amended inspection frequencies, shall be implemented unless sufficient justification is present to do otherwise.

This generic matrix, Parts A, B, C together with Part D entitled "Site-Specific Maintenance Matrix" and the sources defined in Section II form the TDI Maintenance Program. Note that component numbers used in the generic matrix are for Texas Utilities' Comanche Peak Steam Electric Station - Unit 1. Part E provides a cross reference to identify corresponding components for other engines. Also note that a blank in the cross reference signifies that a component is not on a particular engine and thus that Owner would not perform that maintenance item.

Tables 1 and 2 of Part A provide engine operating and standby surveillance parameters and frequencies. It is recommended that the utility address these tables in its operating and monitoring programs. Table 1 addresses operating parameters and is not duplicated in the maintenance schedules; these parameters are to be recorded and/or checked during the monthly testing and any other period of operation. Table 2 addresses the standby parameters that occur on a daily frequency and are not duplicated in the maintenance schedules.

- IV. DEFINITION OF TERMS
- 1. Overhaul Frequency
  - a) A complete engine teardown and inspection will be performed every 10 years. The utility has the flexibility to inspect one engine/reactor unit at the EOC prior to 10 years and the other engine at the EOC following 10 years. Alternately for PWR units, the inspection may be performed coincident with the 10-year reactor vessel inservice inspection. This will permit both engines for each unit to be disassembled in parallel since one engine will not have to remain in service with the reactor vessel off loaded. (For reactor units having three engines, the inspections are to be carried out as above with the third engine to be inspected at the second EOC following 10 years). The 10-year interval will typically be taken from issuance of the Low Power Operating license or from subsequent teardown and inspection for plants already in operation.

- b) A one time inspection will be performed at the EOC closest to 5 years. For a unit, one engine may be inspected at the EOC prior to 5 years and the other at the EOC after 5 years to minimize plant outage length. (For reactor units having three engines, the inspections are to be carried out as above with the third engine to be inspected at the second EOC following 5 years). This inspection will generally involve the same components as the 10-year teardown; however, only a sample of items for some components will be inspected as set forth in the maintenance schedule. During this 5-year inspection any significant adverse findings of a particular component will result in an inspection of all such components of that engine to determine any adverse trends. Favorable findings will result in reassembly of the engine for service.
- 2. Daily Frequency To be performed once per day.
- Monthly Frequency To be performed once in a month; normally during, before, or after test run per plant Technical Specifications.
- 4. EOC (End of Cycle) To be performed once during outage for refueling.
- 5. Alternate EOC To be performed once every other outage for refueling.
- Five Years To be performed once at the EOC occuring nearest to the end of a recurring 5-year period.
- As Required To be performed as often as good maintenance, site procedures, manufacturer's recommendations, or experience dictate as determined by site personnel.
- Maintenance Monitoring and/or surveillance on a periodic frequency to assure the component will perform its intended function in a safe reliable manner.
- Accessible Any item on which the required function can be performed without disassembly of an engine component. Removal of defined access cover is <u>not</u> considered disassembly.
- 10. Appropriate NDE Nondestructive examination selected by site personnel that is most suitable to obtain the information sought by an individual inspection item; choice of NDE shall be made to assure that the technique will detect indications consistent with the acceptance criteria.

# TABLE 1

# Diesel Engine Operating Surveillance Parameters and Frequency

	Component	Frequency
1)	Lube Oil Inlet Pressure to Engine	Log hourly
2)	Lube Oil Filter Differential Pressure	Log hourly
3)	Lube Oil Temperature (engine inlet and outlet)	Log hourly
4)	Lube Oil Sump Level	Log hourly
5)	Turbocharger Oil Pressure	Log hourly
6)	Fuel Oil Filter Differential Pressure	Log hourly
7)	Fuel Oil to Engine Pressure	Log hourly
8)	Fuel Oil Day Tank Level	Check hourly
9)	Jacket Water Pressure (engine inlet)	Log hourly
10)	Jacket Water Temperature (in, out)	Log hourly
11)	Engine Cylinder Temperature Exhaust - All (If temperature in any one cylinder exceeds 1050°, refer to MP-022/023 Item 7.)	Log hourly
12)	Manifold Air Temperature (RB, LB for DSRV Engines)	Log hourly
13)	Manifold Air Pressure (RB, LB for DSRV Engines)	Log hourly
14)	Starting Air Pressure (RB, LB for DSRV Engines)	Check hourly
15)	Crankcase Vacuum	Log hourly
16)	Engine Speed	Log hourly
17)	Hour Meter	Log hourly

# TABLE 1 (Cont'd)

# Diesel Engine Operating Surveillance Parameters and Frequency

	Component 18) Kilowatt Load				
18)	Kilowatt	Load			

Log hourly

Check hourly

Frequency

19) Visual Inspection for Leaks, etc.

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# TABLE 2

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Diesel Engine Standby Surveillance Parameters and Frequency

	Component	Frequency
1)	Lube Oil Temperature (in, out)	Log daily
2)	Lube Oil Sump Level	Log daily
3)	Check Operation of Lube Oil Keep-Warm Pump Motor	Daily
4)	Monitor Lube Oil Keep-Warm Strainer and/or Filter Differential Pressure	Daily
5)	Perform a visual inspection for leakage of the Lube Oil Heat Exchanger. Verify that no leakage through the leak-off ports of the lantern ring is present.	Daily
6)	Fuel Oil Day Tank Level	Log daily
7)	Jacket Water Temperature (in, out)	Log daily
8)	Perform a visual inspection for leakage at packing for Jacket Water Heat Exchanger whenever the engine is in the emergency STANDBY mode. Verify that no leakage through the leak-off ports of the lantern ring is present.	Daily
9)	Governor Oil Level	Daily
10)	Verify proper oil level of generator pedestal bearing	Daily
11)	Starting Air Pressure	Log daily
12)	Drain air receiver float traps and/or drain Starting Air Storage Tank and monitor the quantity of moisture produced. If quantity of moisture is excessive, correct immediately.	Daily

# TABLE 2 (Cont'd)

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Diesel Engine Standby Surveillance Parameters and Frequency

	Component	Frequency
13)	Check Operation of Compressor Air Traps	Daily
14)	Test Annunciators	Before Engine Operation
15)	Check Alarm Clear	Before Engine Operation
16)	Inspect for Leaks	Daily
17)	Visually inspect intercooler for external leaks including intake manifold drain connection.	Daily

TDI OWNERS GROUP

APPENDIX - II

## GENERIC MAINTENANCE MATRIX

PART B

PHASE I COMPONENTS

Component Number	Component Identification	PM Recommendation . Monthly	EOC	Alt. EOC 5 Year	Overhaul Comments
MP-022/23	Turbocharger	<ol> <li>Measure vibration and check with baseline data.</li> </ol>	x		To be accomplished during 24-hour test run.
		<ol> <li>Inspect impeller/diffuser and clean if necessary.</li> </ol>		x	
		<ol> <li>Measure rotor end play (axial clearance) to identify trends of increasing clearance i.e., thrust bearing degradation.</li> </ol>	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.
		<ol> <li>Perform visual and blue check inspections of the thrust bearing.</li> </ol>		X	Note: Thrust bearing inspection should also be performed after experiencing each 40 non-prelubed (automatic) fast starts. In addi- tion, a one time inspec- tion should be completed after the first 100 engine starts.
		5. Disassemble, inspect, and refurbish.		X	Note: During reassembly ensure that capscrews are properly installed with the recommended torque. If QR inspection was performed prior to accu- mulating significant hours (ig., the number of hours accumulated during plant preopera- tional testing, approxi- mately 100 hours), the turbochargers should be reinspected at the next EOC.

Monthly

Component Number

Component Identification

PM Recommendation

The nozzle ring com-6. ponents and inlet guide vanes should be visually inspected for missing parts or parts showing distress. If such conditions are noted, the entire ring assembly should be replaced.

7. Monitor inlet temperature to ensure gas temperature does not exceed manufacturer's recommendation of 1200°F if exhaust temperature for any cylinder exceeds 1050°F (Refr: Table 1).

Base Assembly

Perform a visual inspec-1. tion 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.

EOC

Alt.

EOC

5 Year

X

Overhaul Comments

x

Also perform a visual inspection on one turbocharger per nuclear unit at each EOC.

Note: Discontinue inspection with appropriate redesign.

Monitoring may be performed using permanent in-line thermocouple, strap-on thermocouple, heat gun, or other suitable means that has been appropriately tested and calibrated per plant procedures.

Note: Also perform monitoring any time the engine operates in an unbalanced condition.

Note: Any cracks detected must be investigated further before the engine is allowed to return to service. The mating surfaces of the base and cap shall be thoroughly cleaned with solvent before any reassembly. Perform on EOC basis for 3 cycles, then overhaul provided there are satisfactory results.

Note: 3 EOC inspections may be eliminated by performing a metal analysis to confirm consistent to class 40 grey iron requirements; performing analysis does not eliminate need for overhaul inspections.

02-305A

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	<u>Overhaul</u>	Comments
02-305C	Main Bearing Caps - Studs and Nuts	<ol> <li>The mating surfaces a the bearing cap/saddl interface should be inspected when dis- assembled to ensure the absence of sur- face imperfections that might prevent tight boltup.</li> </ol>	at le					
		Note: Upon removal of bearing caps, clean m surfaces with a solve prior to reassembly of the caps to the base.	of mating ent of					
02-310A	Crankshaft	See site specific recommendations						
02-315A	Cylinder Block	See site specific recommendations						
02-315C	Cylinder Liners	<ol> <li>Perform a visual insp of liners for progres wear.</li> </ol>	pection ssive					To be performed for first 2 EOCs following piston removal; then discon- tinue until next piston removal. Boroscopic irspection is acceptable if heads are not removed. Complete TDI Inspection and Maintenance Record Form No. 315-1-1 as applicable, TDI In- struction Manual, Volume I, Section 6.
02-340A/B	Connecting Rods, Bushings and Bearing Shells (Generic)	<ol> <li>Inspect and measure a connecting rod bearin shells to verify lubu maintenance, which a wear rate.</li> </ol>	all ng e oil ffects				X	Complete TDI Inspection and Maintenance Record Form No. 340-1-1 as applicable, TDI In- struction Manual, Vol- ume I, Section 6, Appendix III for clearance values. Perform inspection at 5 years, on items acces- sible, consistent with Item 2 of this compo- nent.

Component Number	Component Identification	PM Recommendation Monthly EOC	Alt.	5 Year	Overhaul	Comments
		<ol> <li>Inspect and measure the connecting rods.</li> <li>Note: Perform inspection and measure four connecting rods for DSRVs and two for DSRs at random at one time 5-year inspection.</li> </ol>			*	Complete TDI Inspection Maintenance Record Form No. 340-2-1, -2 as applicable, TDI In- struction Manual, Volume I, Section 6.
		<ol> <li>Perform an x-ray examin- ation on all replacement bearing shells to acceptance criteria developed by Owners Group Technical Staff.</li> </ol>				This is to be performed prior to installation of any replacement bearing shells as require
		4. All connecting rod bolts, nuts, and washers should be visually inspected, and damaged parts should be replaced. The bolts should be MT inspected to verify the continued absence of cracking. No detectable cracks should be allowed at the root of the threads.	•		X	Perform inspection at 5 years, on items acces- sible, consistent with Item 2 of this component.
		5. During any disassembly that exposes the inside diameter of a rod-eye (piston pin) bushing, the surface of the bushing should be LP inspected to verify the continued absence of linear indications in the heavily-loaded zone width ±15 degrees of the bottom dead-center position.				Perform inspection, as required and on items accessible, consistent with Item 2 of this component.
02-340 A/B DSRV's only	Connecting Rods, Bushings and Bearing Shells	<ol> <li>Measure the clearance between the link pin and link rod. This clearance should be zero i.e., no measurable clearance when the specified bolt torque of 1,050 ft-lbs is applied.</li> </ol>				To be performed once for each connecting rod.

Component Number

Component Identification

PM Recommendation

available.

7.

8.

9.

At the overhaul, visually

inspect the rack teeth surfaces for signs of fretting and at one time 5-year inspection for rods disassembled.

Inspect mating surfaces

to verify that the minimum

manufacturers' recommended

percent contact surface is

If connecting rod bolt stretch

was measured ultrasonically

during reassembly following

the lengths of the two pairs

of bolts above the connecting

link rod box is disassembled. If ultrasonic measurement was not previously used. begin use at next inspection that accesses the connecting rods. Measure bolt stretch

should be visually inspected

and the two pairs of connect-

crankpin should be MI inspec-

ted to verify the absence of cracking. All washers used

be performed of all external

surfaces of the link rod box to verify the absence

of any signs of service-

included distress.

for thread damage (galling)

ing rod bolts above the

with the bolts should be examined visually for signs of galling or cracking and replaced if damaged.

11. A visual inspection should

the preservice inspection,

rod should be remeasured

ultrasonically before the

before disassembly. 10. All connecting rod bolts Monthly EOC Alt. EOC

5 Year Overhaul Comments X

X

X

To be performed once for new and/or replacement parts.

Also to be performed at any time the connecting rod is disassembled. Perform inspection at 5 years, on items accessible, consistent with Item 2 of this component.

- X Also to be performed at any time the connecting rod is disassembled. Perform inspection at 5 years, on items accessible, consistent with Item 2 of this component.
  - Also to be performed at any time the connecting rod is disassembled. Perform inspection at 5 years, on items accessible, consistent with Item 2 of this component.

Component Number	Component Identification	PM R	ecommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
		12.	All of the bolt hold the link rod box sh be inspected for th damage (galling) or signs of abnormalit Bolt holes subject highest stresses (t pair immediately ab crankpin) should be with an appropriate destructive method verify the absence cracking. Any indi should be recorded evaluation and corr action.	es in ould read other ies. to the he ove the examined non- to of cations for ective				X	Also to be performed at any time the connect- ing rod is disassembled. Perform inspection at 5 years, on items accessible, consistent with Item 2 of this component.
02-341A	Pistons	1.	Inspect and measure and piston pin. Th item assumes that A are installed. For types, see site-spe recommendations.	skirt is E skirts other cific				X	Complete TDI In: pection and Maintenance Report Form No. 341-1-1 as applicable, TDI Instruction Manual, Volume I, Section 6. Use Volume 1, Section 8, Appendix III for clear- ance values. To be performed at 5-year interval on sampling basis consistent with Component 02-340A/B- Connecting Rods.
02-360A	Cylinder Head	1.	Visually inspect cy heads (all cylinder Note: Inspection b boroscope is accept	linder s). y able.				X	Complete TDI Inspection and Maintenance Record Form No. 360-1-1 as applicable, TDI Instruction Manual, Volume I, Section 6 - one sheet for each head. To be performed at 5- year interval on sam- pling basis consistent with Component 02-340 A/B - Connecting Rods.
		2.	Record cold compres pressures and maxim firing pressures.	sion num	x				If so indicated - remove cylinder heads, grind valves, and reseat. Refr: TDI Instruction Manual, Volume I, Section 6.

Component Number	Component Identification	PM Recomme	ndation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
		<ol> <li>Blow- least more engin cylin be op of we the o air n perfo manne 24 ho shuto the o air n befon start</li> <li>Visue arous</li> </ol>	over the engine at t 4 hours but not than 8 hours after ne shutdown. The nder cocks should ben for detection ater leakage into cylinders. A second roll should be bormed in the same er approximately burs after engine down. In addition, engine should be rolled shortly re any planned t. ally inspect the area and the fuel injection	X					In the event water is detected, the cylinder head should be replaced or returned to the vendor for repair. Delete post- run air roll requirements for engines with Group III heads after one cycle with positive inspection results.
		port durin run b	on each cylinder hea ng the normal monthly for signs of leakage.	id /					should be replaced.
02-365C	Fuel Injection Tubing	1. Check at co	k tubing for leaks ompression fittings.	x					All fuel oil leak in- spections to be per- formed while the engine is running or whenever the compression fittings have been disturbed.
		2. Visua lengt or cr unshi fuel detec port: which this	ally inspect tubing ths for fuel oil leak racks if tubing is rouded. If shrouded, oil leakage can be cted at the leak-off s in the base nuts, h are provided for purpose.	X					Fitting inspection for leaks to be performed at engine operation following shutdown. Subsequent inspections to be performed period- ically as indicated. Unshrouded tubing, used as replacement, should be fully inspected con- sistent with FaAA NDE Procedure 11.10 prior to bending.

Monthly

Component Component Number Identification 02-390C **Push Rods** 

Each push rod of the 1. forged-head design should be inspected by liquid penetrant prior to installation or, if installed, at each overhaul. This should be repeated, until it has been determined by 750 hours of operation at the load level used for surveillance testing that the push rod will not develop service-induced cracks. Push rods confirmed in this way need be examined only visually at subsequent overhauls. Push rods of the forged-head design exhibiting cracks larger than 0.25 inch should be replaced, preferably with push rods of the frictionwelded design. Each forged-head rod should also be visually inspected one time to confirm that the head was fully inserted in the tube prior to welding.

**PM** Recommendation

Each push rod of the fric-2. tion-welded design should be inspected initially by liquid penetrant. If this initial inspection was not performed prior to placing the push rods in service. it should be performed at the first overhaul. If the friction-welded push rod has been previously inspected by liquid penetrant, then visual examination will suffice for future inspections. All friction-welded push works with cracks should be replaced, preferably with push rods of the same design.

EOC

Alt. EOC

5 Year Overhaul Comments

X Refr: PNL-5600

Refr: PNL-5600.

If initial inspection was not performed, perform on sampling basis at 5-year inspection consistent with Component 340A/B -Connecting Rods.

Component Number	Component Identification	PM Recommendation	Monthly	EOC	EOC	5 Year	Overhaul	Comments
02-390G	Rocker Arm Capscrews, Drive Studs (Pop Rivets)	<ol> <li>Verify capscrew torque values during QR inspec- tion. If not performed at QR, verify at next EOC, then as required at reassembly.</li> </ol>						Use TDI Instruction Manual, Volume I, Section 8, Appendix IV for proper torque values.
		<ol> <li>Verify that rocker arm drive studs are intact and tight during QR inspection or EOC1, then as required at reassembly</li> </ol>	<i>ı</i> .					
02-425A	Jacket Water Pump - Gear	<ol> <li>Visually inspect jacket water pump gear for chipped or broken teeth, excessive wear, pitting or other abnormal conditions.</li> </ol>				x		Any abnormal situations or indications of pro- gressive pitting should be reported for an engineering evaluation. For engines with less than 750 hours, also inspect by EOC2.
		<ol> <li>Check the key to keyway interface for a tight fit on both the pump shaft to impeller and the spline to pump shaft during pump reassembly.</li> </ol>					x	This along with the driv fit of the impeller onto the shaft will preclude past problems where relative motion between shaft and impeller cause fretting and upset of the keyway sides.
		At next teardown, verify impeller is one piece, (i.e., without a bore insert). If it is not a one piece impeller, replace.						
		<ol> <li>It is recommended that the castle nut that drives the external spline on its taper have minimum and max- imum torque values of 120 ft-lbs and 660 ft-lbs respectively for DSRVs and a maximum torque value of 77 ft-lbs for DSRs.</li> </ol>						

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TDI OWNERS GROUP

## AFPENDIX - II

## GENERIC MAINTENANCE MATRIX

PART C

PHASE II COMPONENTS

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
F-068	Intercoolers	<ol> <li>Record the following temperatures during the monthly surveillance to of the engine: exhausi from cylinders and jack cooling water supply. Compare these results a similar data from prev month to establish whe the trend is sufficient warrant further action</li> </ol>	X est t ket with ious ther t to					
		<ol> <li>Inspect shell and tube sides, and clean as required.</li> </ol>						Inspect at EOC1 and EOC3 to verify Item 1 results are valid.
		<ol> <li>Verify intake manifold drain connection is open and clean.</li> </ol>	×					Note: Refer to TDI SIM to be issued subsequent to March 1986.
		<ol> <li>Perform leakage test o water side boundary fo gross degradation.</li> </ol>	ŕ			x		
CP-101A	Emergency Generator	<ol> <li>Check operation of brushes and slip rings by visual examination during operation.</li> </ol>	x					
		<ol> <li>Inspect all accessible parts of the generator and clean as required.</li> </ol>		×				
		3. Megger rotor and state	ır.	x				
		<ol> <li>Verify that space heat are on with engine shu</li> </ol>	ers X Itdown.					
		<ol> <li>Measure vibration and check against baseline data.</li> </ol>		×				
CP-1018	Emergency Generator Pedestal Bearing	<ol> <li>Drain, flush, refill bearing housing.</li> </ol>		×				
		2. Measure bearing house insulation resistance.	'Y	Х				

Component Number	Component Identification	PM	Recommendation	Monthly	EOC	Alt.	5 Year	<u>Overhaul</u>	Comments
		3.	Disassemble and inspect bearing and check clearances.					x	
CP-102	Emergency Generator Control Panel	1.	Inspect panel for cleanliness and clean as required.		x				
		2.	Check terminal boards for loose wiring.		x				
		3.	Visually check condition of wire insulation for degradation.		×				
		4.	Clean and inspect relay contacts.		x				
		5.	Check meter calibrations						To be performed per appropriate site intervals for similar equipment.
		6.	Bridge rectifier assembly	у.					Note: Inspections may be deleted after modifications as prescribed in DR/QR Report.
			a. Inspect the temperat sensitive label plac on the most visible face of the hexagona body of the diodes. The label shall be inspected before and after each running of the engine.	ure X ed 1					If the label permanently blackens, the maximum temperature of the diode has been exceeded, requiring an electrical inspection of the diode and an inspection of the aounting threads of the heat sink and diode.
									Replace the diode and the heat sink as needed and assure that proper mounting tightness of 300 in-lbs and proper thread condition is maintained.

Component Number	Component Identification	PM Recommendation	Monthly	EOC	EOC	5 Year	Overhaul	Comments
		b. Inspect glyptol to the side of and mounting be the lugs which to the bottom of diode and SCR h for signs of re motion.	applied the lugs olt for attach of the meatsinks clative	X				Retighten any loose connections, remove old glyptol, and reapply if connections are retightened.
		7. Adustment potention inspect glyptol app to the the side and adjustment screws. It of the five adjustment potentiometers on the printed circuit boo the voltage regular signs of relative to	eters - olied the for each ent the ard of tor for wotion.	×				If adjustments are needed, remove glyptol, and reapply when the adjustment procedure is complete.
		<ol> <li>Printed circuit boo check for cleaning and proper mounting components.</li> </ol>	ards - ess g of	x				Report soy abnormal conditions to engineer- ing for evaluation.
		<ol> <li>Implement a procedure monitor generator at start. A manuareset of the excitate performed in the of a failed start.</li> </ol>	ure to vuitage l er must e event					This recommendation is required entil such time that modifications are made to the time delay relay latching logic in the generator control.
00- 120	Lube Oil Pressure Regulating Valve	1. Disassemble and cl	ean.				X	If valve sticks repeat- edly, more frequent cleaning may be necessary. If valve plugging becomes a prob- lem, the dimensions of the valves internal parts should be checked to ensure proper clearance.
		2. During faitial sta a major reassembly lube oil piping, a lube oil pressure should be investig remedial action ta until excursions s	rtup after of bnormal excursions ated and ken ubside.					

11-0-3

Component Number	Component Identification	PM Recommendation	Monthly	EOC	ATL.	5 Year	Overhaul	Comments
00-442A	Starting Air Distributor Assembly	<ol> <li>Visually inspect the poppet valve spool ends and timing cam of the starting air distributor.</li> </ol>					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.
		<ol> <li>Ensure that the starting air manifold vent is open and unobstructed by noting the escape of eir during engine startu</li> </ol>	x p.					Note: Inspect at EOC1 for sites that did not perform QR Inspection after plant pre-opera- tional testing.
02-3078	Lube Oil Tubing and Fittings - Internal	<ol> <li>Check accessible tubing for dents or crimps after performing main- tenance in that area.</li> </ol>			•			To be performed as required.
02-3108	Main Bearings Shells	<ol> <li>Inspect and measure thic of all main bearing shell Inspection shall evaluat bearing wear and evidence of harmful crankshaft misalignment. If result show evidence of mis- alignment, ID1 recom- mendations for crankshaf realignment should be implemented.</li> </ol>	kness 1s. e s t				×	Note: Perform inspec- tion on bearings 5 & 7 for DSRVs and mains between 5 & 6, and 6 & 7 for DSRs on one engine/station at EOC2. At one time 5-year in- spection, inspect bearings 3 through 8 inclusive. Complete TDI Inspection and Maintenance Record Form No. 310-2-1 as applicable, TDI Instruction Manual, Volume I, Section 6 - one sheet for each main bearing. Use Volume I, Appendix III for clearance values. Also inspect when removed consistent with inspections required for Component 02-310A.

Component Number	Component Identification	PM Recommendation	Monthly	EOC	EOC	5 Year	Overhaul	Comments
02-310C	Thrust Bearing Ring	<ol> <li>Measure thrust ring clearance "bump check" me performed in co with crankshaft deflection meas The following should be recommended</li> </ol>	bearing by ethod to be onjunction t web surements. information rded:	X				Complete applicable sections of TDI Inspection and Main- tenance Record Form No. 310-1-1 TDI Instruc- tion Manual, Volume I, Section 6. Note: If the clearance is greater than the maximum
		<ul> <li>Date of insponse</li> <li>Hours of eng</li> <li>Hours of eng since last be placement</li> <li>Bearing clear</li> </ul>	ection ine operation ine operation earing re- rance					allowed in the IDI Instruction Manual, at least one bearing must be replaced. Bearings should also be replaced if they are cracked or gouged.
		<ol> <li>Visually inspe bearing ring f of wear or deg</li> </ol>	ct thrust or signs radation.				x	To be performed al. 10-year interval only (i.e., not at one time 5-year inspection).
02-311A	Crankcase Assembly	<ol> <li>Perform a visu of the vertica the crankcase the nut pocket indications of</li> </ol>	al inspection l portion of arch wall to area for cracking.				X	The first inspection after 185 hours of at or near full load opera- tion may be used to justify the discontinua- tion of such inspection until an overhaul. For engines with less than 185 hours operation at or near full load, inspect at each EOC until exceeds 185 hours.
		<ol> <li>Remove alterna side doors and examine the in of the engine abnormal condi Check with a g light for evid babbit flakes.</li> </ol>	te left side for any tions. pod lence of	X				If excessive water, sludge or any indication of bearing failure is present drain crankcase, deter- mine cause, and take necessary corrective action.
		<ol> <li>Check internal block and base leaks.</li> </ol>	s of for	x				

Component Number	Component Identification	PM Recommendation	Monthly EOC	Alt. EOC 5 Year	Overhaul	Comments
02-317 <b>A&amp;B</b>	Water Discharge Manifold - Jacket Water Discharge Piping, Couplings and Seals	<ol> <li>Visually inspect for leaks.</li> </ol>	r X			
02-341B	Piston Rings	<ol> <li>Inspect and measure replacement rings.</li> </ol>	piston			Complete TDI Inspection and Maintenance Record Form No. 341-2-1 as applicable, TDI Instruc- tion Manual, Volume I, Section 6. Use Volume I, Section 8, Appendix III for clearance values. To be performed as required.
02-341C	Piston Pin Assembly	<ol> <li>Visually inspect fo chrome plate damage Replace pins which chipped or blistere chrome.</li> </ol>	r show d			Also to be performed one time at the 5-year inspection on sampling basis consistent with Component 340A/B - Connecting Rods.
		Note: All new or r placement pins shou LP or MP inspected before installation Owners Group engine	e- ld be in s.			Note: MT may cause FE particulate accumulation.
		<ol> <li>Inspect end plugs a reroll or replace a that are loose.</li> </ol>	ind iny		x	Note: This inspection is also to be performed one time at 5-year interval on sampling basis consistent with Component 340A/B - Connecting Rods.
02-345A	Intake and Exhaust Tappet Assembly	<ol> <li>Visually inspect in exhaust tappet asse condition, and veri cam rollers are fre rotate and that the no noticeable clean tween the cam rolle the roller pins. D by manually checkin excessive motion an visually observing abnormalities on th ing surfaces.</li> </ol>	atake and mbly fy that ee to ere is rance be- ers and this ng for nd for ne mat-		X	Complete TDI Inspection and Maintenance Report Form No. 345-1-1 as applicable, TDI Instruc- tion Manual, Volume I, Section 6. Refr: TDI Instruction Manual, Volume 1, Maintenance Schedule. Perform an additional inspection by EOC2 on exposed or accessible assemblies. Also perform one time at 5 years consistent with Component 02-340 A/B Item 2.

Component Number	Component Identification	PM Recommendation	Monthly EOC	Alt. EOC 5 Year	Overhaul	Comments
02-3458	Fuel Tappet Assembly	<ol> <li>Visually inspect fuel assembly condition, a verify that cam rolle are free to rotate an that there is no noti able clearance betwee the cam rollers and t roller pins. Do this by manually checking excessive motion and visually observing fo abnormalities on the mating surfaces.</li> </ol>	tappet nd rs d ce- n he for r		X	Complete TDI Inspection and Maintenance Report Form No. 345-1-1 as applicable, TDI Instruc- tion Manual, Volume 1, Section 6. Also perform ona time at 5 years consistent with Component 02-340 A/B Item 2. Per- form an additional in- spection by EOC2 on exposed or accessible assemblies.
02-350A	Cam Shaft Assembly	<ol> <li>Perform a visual insp of all cam lobe surfa for signs of cracking pitting, or spalling.</li> </ol>	ection ces ,		8	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. Any corrective measures shall be implemented as indicated by this analysis.Signs of spalling shall result in immediate replacement of the cam. Perform an additional inspection by EOC2 on exposed or accessible assemblies. Refr: TDI Instruction Manual, Volume I, Maintenance Schedule. Also to be performed one time at 5 years consistent with Com- ponent 02-340 A/B.
0#-350B	Cam Shaft Bearings	<ol> <li>Inspect and measure of shaft bearing shells.</li> </ol>			X	Complete TD1 Inspection and Maintenance Record form No. 350-1-1 as applicable, TD1 Instruc- tion Manual, Volume I, Section 6. Use Volume I, Section 8, Appendix 111 for clearance values.

Component Number	Component Identification	PM Recommendation	Monthly EOC	Alt. EOC 5 Year	Overhaul Comments
					Also at one time 5-year inspection for Component 02-340A/B measure clear- ances per TDI on one bearing housing/camshaft.
02-350C	Cam Gear	<ol> <li>Visually inspect cam for chipped or broken teeth, pitting, excen- wear, or other abnom conditions. At this spection, the gear is immediate proximity the spray nozzie white should also be visual inspected.</li> </ol>	gear n ssive mal in- s in to ch lly	X	For engines with less than 750 hours, also inspect at EOC2.
		<ol> <li>Measure gear backlass</li> <li>Note: If cam gear h is removed, it is recommended that the be relocked at the position correspondi to the torque of 70± ft-lbs. Insertion o cotter pin must be accomplished at a to &gt; 50 ft lbs and ≤ 90 ft -lbs. If this is not possible, anothe bolt, nut or washer should be used.</li> </ol>	h. ub nut 20 if the prque	X	Complete applicable sections of TD1 Inspec- tion and Maintenance Record Form No. 355-1-1, TD1 Instruction Manual, Volume I, Section 8, Appendix III-1 for clearance values. Note: Refer to TD1 SIM to be issued sub- sequent to March 1986. Also to be performed one time at 5 years consistent with Com- ponent 02-340 A/8.
02-355A	Crank to Lube Oil Pump Gear	<ol> <li>Visually inspect cra shaft to lube oil pu gear for chipped or broken teeth, excess wear, or progressive pitting or other abn conditions.</li> </ol>	ink- imp ive normal	X	Any abnormal situations or indications of progressive pitting should be reported for an engineering evaluation. For engines with less than 750 hours, also inspect by EOC2.

Component Number	Component Identification	PM Recommendation Mont	hly EOC	Alt. EOC 5 Year	Overhaul	Comments
		2. Measure year backlash.			X	Complete applicable sections of IDI Inspection and Main- tenance Record Form No. 355-1-1, IDI Instruction Manual, Volume I, Section 6. Use Volume 1, Section 8, Appendix III-1 for clearance values.
02-355B	Idler Gear Assembly	<ol> <li>Visually inspect idler gears for chipped or broken teeth, excessive wear pitting, or other abnormal conditions.</li> </ol>		x		Any abnormal indications should be reported for an engineering evaluation. For engines with less than 750 hours, also inspect at EOC2.
		2. Measure gear backlash. Note: If idler gear hub is removed, it is recom- mended 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-lbs and ≤ 90 ft-lbs. If this is not possible, another bolt, nut, or washer should be used.			X	Complete applicable sections of IDI Inspec- tion and Maintenance Record Form No. 355-1-1, IDI Manual, Volume I, Section 6. Use Volume I, Section 8, Appendix 111-1 for clearance values.
02-359	Air Start Valves	<ol> <li>Remove, clean, and inspect air start valves. (Re- place copper valve-to- head gasket).</li> </ol>		x		Ensure valve installation includes retorque re- quirements. Refr.: TDI SIM 360.
		<ol> <li>Inspect the piston, cap, guide, and housing sliding surfaces to evaluate wear or corrosion.</li> </ol>		x		
02-3608	Cylinder Head - Intake and Exhaust Valves	<ol> <li>Visually inspect intake and exhaust valves, keepers, stems and seats for vire drawing, pitting, distor- tion, concentricity, and any abnormal condition.</li> </ol>			<b>X</b> .	Also to be performed one time at 5 years on sam- pling basis consistent with Component 340A/B.

Component Number	Component Identification	PM Recommendation	Monthly EOC	Alt. EOC 5 Year	Overhaul	Comments
		<ol> <li>Visually inspect sub- for evidence of value guide blowby (soot).</li> </ol>	covers e			This is a one-time-only inspection, to be performed after 500 or 600 hours of operation after rebuild of a cylinder head.
		<ol> <li>Measure intake and end and haust valves head thickness.</li> </ol>	K-		X	Complete applicable sections of TDI Inspection and Main- tenance Records Form 360-2-1, TDI Instruc- tion Manual, Volume I, Section 6-one sheet for each cylinder. Use Section 8, Appendix III for clearance values. (Items 2 & 3). Also to be perfomed one time at 5 years on sampling basis consis- tent with Component 340A/B.
		<ol> <li>Measure intake and e valves - valve-to-gu clearances.</li> </ol>	xhaust ide		x	Complete applicable sections of ID1 Inspection and Main- tenance Record form 360-2-1, TDI Instruction Manual, Volume I, Section 5-one sheet for each cylinder. Use ID1 SIM 336, Rev. 1 for clear- ance values (acceptance criteria). Also to be performed one time at 5 years on sampling basis consistent with Component 340A/B.
02-362A	Cylinder Head Covers - Subcover Assembly	<ol> <li>Perform a liquid pen examination of the r arm pedestals top an vertical machined su faces (connector pus rod side only).</li> </ol>	netrant rocker nd nr- .h-		x	Also to be performed one time at 5 years on a sampling basis con- sistent with Component 340A/B. Subcovers with pedestal cracks that extend through the counter bore web down to the threads should be replaced. Refr: DR/QR Report #02-362A.

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Component Number	Component Identification	PM Recommendation	Monthly EOC	Alt. EOC 5 Year	Overhaul	Comments
02-365A	Fuel Injection Pumps	<ol> <li>Tear down one pump for inspection.</li> </ol>		x		Use representative pump to determine need to overhaul other pumps.
						Complete fuel injection pump inspection in accordance with TDI Instruction and Main- tenance Manual, Volume I, Section 6. Based on inspection results and operating parameters. Complete TDI Instruction and Maintenance Record Form No. 365-1-1 as applicable, for the pump disassembled.
		<ol> <li>Visually check pressure bleed screw for erosion on disassembled pump.</li> </ol>		X		
02-365B	Fuel Injection Nozzles	<ol> <li>Remove, inspect, and cle tips.</li> </ol>	ean X			Ensure that a new copper gasket is used upon reinstallation of nozzle into head. Perform retorque requirement per IDI. Complete IDI Inspec- tion and Maintenance Record Form 365-2-1 as applicable, Instruction Manual, Volume I, Section 6.
						Note: 135° fuel oil tips may be used if inspection results indicate a need for additional action to improve lubrication and reduce coke huildup.
		2. Check nozzle pop pressu	re. X			
		3. Check spray pattern.	x			

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt. EOC	5 Year	Overhaul	Comments
02-3650	Fuel Oil Injection Lines: Supports	<ol> <li>Visually inspect support elastomer inserts for deterioration or degrada tion.</li> </ol>		X				Any inserts found to be unsatisfactory shall be replaced with new inserts prior to reassembly of fuel oil lines. This inspection can be per- formed prior to reassembly of the fuel oil lines in conjunction with the cylinder liner inspection.
02-371A	Fuel Pump Control Shaft	<ol> <li>Check and lubricate as required.</li> </ol>						
02-3718	Fuel Pump Linkage Assembly and Bearings	<ol> <li>Grease swivel link or otherwise lubricate all fuel oil pump assemblies.</li> </ol>		x				
02-380A	Exhaust Manifold	<ol> <li>Perform a visual examination of accessible pipe welds and corresponding heat- affected zones.</li> </ol>	ation s		x			To be performed at EOC1 and alternate EOCs thereafter.
02-385A	Crankcase Relief Valve	1. Clean flame arrestors.			x			
		2. Inspect seat and disc.			x			
02-387A	Crankcase Vacuum Fan	<ol> <li>Inspect fan and clean as necessary.</li> </ol>			X			
		2. Check bearing for roughness.			×			
02-390E	Rocker Arm Bushings	<ol> <li>Visually inspect and measure intake rocker an bushings.</li> </ol>	•				x	Also to be performed one time at 5 years on sampling basis con- sistent with Component 340A/B.
		<ol> <li>Visually inspect and measure exhaust rocker arm bushings.</li> </ol>					x	Also to be performed one time at 5 years on sampling basis con- sistent with Component 340A/B.
		<ol> <li>Visually inspect and measure intermediate rocker arm bushings.</li> </ol>					x	Also to be performed one time at 5 years on sampling basis consist- ent with Component 340A/B.

Component Number	Component Identification	PM	Recommendation	Monthly	EOC	AIL.	5 Year	Overhaul	Comments
02-390F	Hydraulic Valve Lifters	1.	Check and adjust valve lash.		×				
		2.	Reinstall and adjust lifters.					x	Also to be performed one time at EOC2 and at 5 years on a sampling basis consistent with Component 340A/B.
									Note: Ensure lifters are installed with the fill holes up. Verify condi- tion of lifters by com- parison of lifter leak- down rate (actual) to specifications noted on IDI Maintenance Manual. Refr: TDI Maintenance Manual, Section 6-B-5.
02-410A	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 517 ± 5 rpm. Ensure that the electric governor setting is properly re- turned to 450 rpm and the mechanical backup governor returned to the manu- facturer's specified interval 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 in- terval. Also perform at EOC2.

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt. EOC	5 Year	<u>Overhaul</u>	Comments
								Note: After setting the overspeed governor, the adjustment screw settings should be marked with Torque Seal or other positive means to reveal any unintended changes in the set positions.
02-410B	Overspeed Trip Governor and Accessory Drive	<ol> <li>Remove plugs from and check for magi particles.</li> </ol>	housing netic		x			
		2. Check shafts for radial and axial	excessive movement.		x			
		<ol> <li>Visually inspect of drive gear for existence wear.</li> </ol>	accessory cessive		x			
02-410C	Overspeed Trip Drive Couplings	<ol> <li>Remove the presen Lovejoy couplings compliance with S</li> </ol>	t L-110 in IM 363.					To be completed by the first refueling outage.
		<ol> <li>Verify that coupl tight on shaft.</li> </ol>	ing is		x			
		<ol> <li>Replace the Lovej ling spiders or t ling elastomer fo</li> </ol>	oy coup- est coup- r hardness.		x			Replace elastomer if hardness is greater than 90 Shore A.
02-410D	Overspeed Trip Vent Valve	<ol> <li>Disassemble and r "O" rings or repl</li> </ol>	eplace ace valve.		x			
02-411A	Governor Drive - Governor and Tachometer Drive Gear and Shaft	<ol> <li>Visually inspect gear and shaft fo of wear.</li> </ol>	drive r signs				x	Also inspect one time at EOC nearest 5 years. For engine with less than 750 hours, also inspect at EOC2.
02-411B (excluding San Onofre - See Site Specific for San Onofre)	Governor Drive - Couplings, Pins and Keys	<ol> <li>Check that coupli tight on shaft.</li> </ol>	ing is	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.

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
		<ol> <li>Replace the elasto insert in the Kopp coupling.</li> </ol>	meric ers	×				
02-413A	Governor Linkage	<ol> <li>Install positive 1 hardware to the le arm clamp bolt hea shaft roll pins.</li> </ol>	ocking wer ds and					Note: To be performed as necessary after tightening governor linkage hardware to design torque specifications.
		2. Inspect for loose on the linkage ass	parts X embly.					
02-413A	Governor Linkage (DSRVs only)	<ol> <li>Lubricate cross st bearings as require</li> </ol>	naft red.					
		<ol> <li>Grease the rod end fittings, or lubri oil wicks, especia those at the ends the cross shaft.</li> </ol>	d icate ally of	x				
02-413B	Fuel Pump Linkage: Automatic Shutdown Cylinder	1. Check cylinder for extension and ret	r X urn.					To be accomplished when placing unit in main- tenance modes.
		<ol> <li>Check tailrod ven for air leakage.</li> </ol>	ı	x				To be accomplished during controls system check.
02-415A	Woodward Governor	<ol> <li>Drain, flush, ref vent actuator oil with new oil from clean container e the appropriate c procedures are fo If contaminated o noted, increase f</li> </ol>	ill, and system a nsuring leanliness llowed. il is requency.		x			Note: Ensure the hy- draulic actuator is pro- perly vented.
		<ol> <li>Disassemble, clear refurbish the act</li> </ol>	n, and uator.				x	
		<ol> <li>Verify all govern control knob sett are in appropriat positions.</li> </ol>	nor X Lings Le					Note: Mechanical governor setting to be 470 rpm.

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt. EOC	5 Year	Overhaul	Comments
		<ol> <li>Evaluate electric governor settings to verify overshoot of the 450 rpm set speed is within plant-specific guidelines and to avoid critical speeds during start or when unloaded.</li> </ol>		x				An evaluation of the governor settings is to be performed during surveillance testing once under joint mechanical and electrical governor control.
02-4158	Governor Booster Servomotor	<ol> <li>Clean, inspect, and replace "O" rings and gaskets.</li> </ol>					x	
02-415C	Governor Heat Exchanger	1. Clean and inspect.					x	
02-435A	Jacket Water Fittings - Pipe and Fittings (Small Bore Scope Only)	<ol> <li>Visually inspect for leaks.</li> </ol>	X					
02-437	Turbo Water Piping-Pipe and Fittings	<ol> <li>Visually inspect for leaks.</li> </ol>	x					
02-4418	Air Filter to Starting Air Distributor	<ol> <li>Replace filter elements. If filter in a metal screen, cleaning with solvent is acceptable in lieu of replacement.</li> </ol>		x				This can be modified so that the filter is to be changed at a maximum pressure drop of 25 psi for cagines equipped with pressure monitoring devices.
	Air Start Admission Valve Strainer	2. Clean and inspect straine	er.	X				If the strainer is excessively dirty, the frequency of cleaning and inspecting should be increased.
	Air Start Block Valves	<ol> <li>Clean and refurbish valve replace "O" rings and clean the screened fittin Ensure leak tightness after reassembly.</li> </ol>	es - ng.				x	
		<ol> <li>Imspect for tightness of fittings and bolts and apply locking com- pound as required during reassembly of components.</li> </ol>						
		<ol> <li>Replace "O" rings of the shuttle valve.</li> </ol>					×	

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Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt. EOC	5 Year	Overhaul	Comments
02-455A	Fuel Oil Filter	<ol> <li>Record filter differ- ential pressure.</li> </ol>	X					Change filter elements when filter differential pressure reaches 20 psid rise above the clean 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 pre- vious operating position.
		<ol> <li>Inspect canister gaskets and replace as required.</li> </ol>						To be performed during change out of filter elements.
		<ol> <li>Inspect tubing and me- chanical connections for tightness and/or leaks.</li> </ol>	x					Refr: TDI Instruction Manual, Volume I.
02-4558	Fuel Oil Strainers	<ol> <li>Record strainer differ- ential pressure or monit supervisory alarm as applicable.</li> </ol>	X .or					If greater than 5 psid- shift, clean element. Bolt torques of 120-150 in-lbs should be uti- lized during reassembly.
		<ol> <li>Purge air from stand-by strainers.</li> </ol>						As required.
02-467A	Turbocharger Lube Oil Fitting: Pipe, Tubing, Fittings, and Flexible Coupling (Small Bore Scope Only)	1. Visually inspect for lea	iks. X					
02-475A,C	Turbocharger: Bracket Bolting and Gaskets	<ol> <li>At each engine shutdown the first three engine s downs of operation after turbo installation, the screws should be visual inspected to assure that screw has loosened becau of engine operating load If during these inspect none of the screws are loosened or damaged, fur</li> </ol>	for shut- r se ly t no use ds. ions found ture					

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	<u>Overhaul</u>	Comments
		inspections are to b ducted on a yearly b (or during plant shu But if any time duri inspection any scree loosened or damaged, then be replaced (if and all screws retor follows: 125 ft-1b: bracket-to-engine so 75 ft-1bs for the bi turbo base screws. Note: To avoid dama bracket to engine, a bracket to turbo, th per torques as delin above should be uti for each respective bolting application	be con- basis utdown). ing w is found , it must f damaged) rqued as s for the crews and racket-to- age to and/or he pro- neated lized bracket					
02-4758	Air Butterfly Valve	<ol> <li>Lubricate valve sha via grease fittings</li> </ol>	ft	x				If oil cups are used, lubricate shaft monthly.
		<ol> <li>Check valve disc for freedom of movement</li> </ol>	r	X				Check by visually observ- ing valve/actuator oper- ation. If oil cups are used, this should be completed monthly.
		<ol> <li>Verify that associa locking devices (ja nuts and lock washe are tight.</li> </ol>	ted m rs)	x				
02-500A	Engine Control Cabinet	<ol> <li>Inspect interior of for cleanliness, an as required.</li> </ol>	cabinet d clean	x				
		<ol> <li>Visually check wiri insulation degradat</li> </ol>	ng for ion.	x				
		<ol> <li>Visually check inst tubing for leaks.</li> </ol>	rument	x				
		<ol> <li>Functionally check heater and calibrat thermostat.</li> </ol>	cabinet tion of	x				

Component Number	Component Identification	PM	Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
		5.	Replace "O" rings, gasket and filter in pressure regulator as required.	\$,					
		6.	Inspect filter surface fo matter to determine if problems may exist down- stream.	r	x				
		7.	Monitor control system ai pressure or supervisory alarm as applicable.	r X					
02-500C	Circuit Breakers and Contact Blocks	1.	Check all terminals - clean and tighten.		x				Accomplished during panel cleaning and inspection.
		2.	Visually check wiring insulation for degradation	in.	x				Accomplished during panel cleaning and inspection.
		3.	Trip check circuit breakers.						To be performed at appropriate site intervals for similar equipment.
02-500G	Control Panel Valves	1.	Inspect control panel valves for leaks.		x				
		2.	Replace or refurbish pneumatic logic board.				×		
02-500J	Control Panel Assembly: Relays	1.	Inspect contacts and clea as required.	n	x				
		2.	Visually check condition of wiring and tightness of terminations.	of	x				
02-500N	Control Panel Switches Terminal Boards and Wiring	1.	Clean terminal boards and switch contacts.	1	×				
		2.	Visually check wire insu- lation and terminals for tightness and degradation	n.	x			e	
		3.	Inspect for arcing and overheating.		x				

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
02-5258	Barring Device Control Valve and Press Regulator	<ol> <li>Replace control valve "O" rings and lube shaft.</li> </ol>						As required.
		<ol> <li>Replace press regulator elastomeric parts.</li> </ol>						As required.
02-525C	Barring Device Air Filter	1. Replace filter element.						As required.
		<ol> <li>Drain barring device air filter.</li> </ol>						As required.
02-5250	Barring Device - Mounting Bracket/Supports	<ol> <li>Replace old cotter pin with new cotter pin after each reassembly.</li> </ol>						To be performed after each reassembly.
02-540A	Lube 011 Sump Tank	<ol> <li>Check lubricating oil with a viscosi- meter for fuel oil dilution. Send a sample of oil to laboratory for analysis.</li> </ol>	X					Refr: TDI Instruction Manual, Volume I, Maintenance Schedule, Items 1, 2.
		2. Drain lubricating oil system and clean sump tank. Refill with new oil. To be performed based on sample analysis.						Note: When replacing eng- ine oil use HD 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 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 equiv- alant product may be used to insure improved lubri-

cation. Do not mix lube oil brands or types. When changing lube oil replace the entire charge. Replace as required.

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt. EOC	5 Year	Overhaul	Comments
		<ol> <li>Visually inspect lube oil sump tank level switch floats. Check switch set points.</li> </ol>						To be performed per appropriate site intervals for similar equipment.
		4. Perform a spectro- chemical engine oil analysis to assist the bearing monitoring program. To further expand or clarify chemic. analysis, ferrographic analysis may be utilized Particular attention shall be paid to copper level and particulate size, which could signify thrust bearing degradation. Particular attention shall be given to percent mois- ture content.	X al					Note: Sample to be drawn upstream of lube oil filter. Items 1 and 4 can be performed using the same sample.
02-550	Foundation Bolts	<ol> <li>Visually inspect founda- tion for breaks in the bond between the sole plates and grout.</li> </ol>		×				
		<ol> <li>Check foundation bolts for correct torque. Retorque as necessary, then recheck crankshaft web deflections.</li> </ol>					×	Use TDI Instruction Manual, Volume I, Section 8, Appendix IV for proper torque values.
		<ol> <li>Generator foundation bol are to be retorqued after a generator short circuit if the bolts were initially torqued to 480 ft-lbs. If initial bolt torque was 600 ft-lbs, no retorque is required.</li> </ol>	ts					
02-6300	Thermocouples	<ol> <li>Check that thermocouple indicates ambient engine temperature when the engine is cold.</li> </ol>		x				An inconsistent reading traced to thermocouple trouble should result in replacement of the thermocouple.

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Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
		<ol> <li>Clean and inspect thermocouples and thermocouple shields as required.</li> </ol>						Indications of fatigue should result in re- placement of the thermo- couple and/or thermo- couple shield.
		<ol> <li>Pyrometer wiring - check that terminations are tight.</li> </ol>						To be accomplished dur- ing control panel check- out and initial operation inspections.
02-6958	Engine Control Air Pressure Regulator	<ol> <li>Inspect and clean engine control air pressure regulator when pressure gauge indicates abnormal pressure reduction during normal engine shutdown.</li> </ol>						Note: This recommenda- tion should be reassessed depending on the degree of system fouling.
		<ol> <li>Replace elastomeric parts and gaskets in the pressur regulator.</li> </ol>	re					As required.
02-6950	Engine Control Pneumatic Trip Switches	<ol> <li>Check switch set points per appropriate site interval.</li> </ol>						Pressure switches and temperature switches.
		2. Replace elastomeric parts						As required.
02-7008	Jacket Water Standpipe: Valves	<ol> <li>Replace elastomeric parts in valves.</li> </ol>						As required.
02-7C0F	Jacket Water Standpipe and Miscellanenous Bolting	<ol> <li>Visually check jacket water standpipe, pump suction and engine return nozzle welds during each routine engine run and every 100 hours during extended engine runs.</li> </ol>						Any visible cracking or minor jacket water leakage should result in rework of cracked nozzle welds.
		<ol> <li>Check treatment (ph, etc. as applicable) of jacket water and correct as recommended by chem- ical supplier.</li> </ol>	x					Also to be performed after adding makeup water.
02-7178	Auxiliary Sub-Base and Oil & Water Piping - Jacket Water: Valves	<ol> <li>Inspect the valves for packing leakage.</li> </ol>	x					Replace packing as necessary.

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Component Number	Component Identification	PM R	ecommendation	Monthly	EOC	Alt. EOC	5 Year	Overhaul	Comments
02-717C	Auxiliary Sub-Base and Oil & Water Piping - Jacket Water: Pipe, Couplings, Fittings Orifices, Y-Strainers (Small Bore Scope Only)	1.	Visually inspect for leaks	. X <sup>.</sup>					
02-717F	Auxiliary Sub-Base Lube Oil Pipe and Fittings	1.	Visually inspect pipe and joints for leakage.	x					
		2.	Clean and inspect lube oil keep-warm pump suction strainer as required.						Complete when lube oil tank is drained.
02-717G/K	Auxiliary Sub-Base Lube Oil/ Fuel Oil Valves	1.	Disassemble, inspect, and refurbish off engine lube oil and fuel oil valves as required.						
		2.	Check relief valve lift pressure. Dis- assemble and clean if necessary.					x	
02-8058	Intake Air Filters	1.	Inspect air intake/oil bath filters every 3 to 6 months.		•				Replace with change oil if necessary. If samp- ling is utilized, change based on analysis re- sults.
02-8050	Flex Connection (Exhaust)	1.	Visually inspect for evidence of cuts, holes, or dents.					x	
		2.	Visually check for evidence of exhaust leakage.	x					
02-810C	Jacket Water Heat Exchanger	1.	To avoid corrosion and fouling, jacket water heat exchanger and associated service water piping should be flushed on a periodic basis (continuous service flow is sufficient). Alternatively, servic, water chemistry control c be used to maintain heat exchanger performance and integrity.	an					

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
		<ol> <li>Record heat exchanger parameters.</li> </ol>	x					Use for trend data.
		<ol> <li>Evaluate heat exchanger performance data.</li> </ol>		x				
		<ol> <li>Inspect tubes and tube sheet for fouling and erosion - remove en- trance and exic channel covers as required by trend data or at over- haul. Also review consistent with in- spections of other plant heat exchangers utilizing similar water chemistry.</li> </ol>					X	Refr: TDI Instruction Manual, Volume I, Maintenance Schedule.
		<ol> <li>Inspect and clean lantern ring as require Verify leak-off holes are not plugged.</li> </ol>	d.					Replace or rework lantern ring as necessary to ensure concentricity prior to reinstalla- tion.
		<ol> <li>Replace packing rings as required.</li> </ol>						Replace packing when packing becomes hard or leakage at the packing is noted and cannot be stopped by tightening.
02-8100	Thermostatic Valves	<ol> <li>Replace thermal power elements as required.</li> </ol>						
		<ol> <li>Visually inspect valve bonnet for evidence of leakage.</li> </ol>	x					To be accomplished during monthly test run. Ensure that any replacement valves have cast steel valve bodies.
02-810E	Jacket Water Heaters	<ol> <li>Check calibration and inspect thermostat.</li> </ol>						To be performed at appropriate plant interval for similar equipment. Replace heater if degradation of insulation resistance is noted.

Component Number	Lomponent Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
02-820A	Lube Oil Sump Tank Heaters	<ol> <li>Inspect and cl heater element required by tr</li> </ol>	ean s as end data.					Replace heater if de- gradation of insulation resistance is noted.
		<ol> <li>Check calibrat inspect condit thermostat.</li> </ol>	ion and ion of					To be performed at appropriate site intervals for similar equipment.
02-820C	Lube Oil Keep-Warm Pump	<ol> <li>Check mechanic and piping con for leakage.</li> </ol>	al seal X mection				•	
		<ol> <li>Verify pump di pressure is wi manufacturer's cation.</li> </ol>	scharge thin specifi-	x				Use for trend data.
02-820D	Lube Oil Keep-Warm Strainer	<ol> <li>Clean or replated element when the pressure changed of the pressure changed of the pressure changed of the pressure of the pressure of the filter is 20 prior the pressure of the</li></ol>	the differential ge at the lube strainer is those ting this lean or re- fferential tep warm osid.					
02-820E	Lube Oil Keep-Warm Filter	1. Record filter pressure.	differential X					
		2. Change filter elements as re	equired.					To be performed when the filter differential pressure reaches 20 psid. For sites not equipped with differ- ential pressure gauge, inspect monthly and clean as necessary.
02-820F	Full flow Lube Oil Filters	<ol> <li>Record filter pressure.</li> </ol>	differential X					Use for trend data. Refr: TDI Instruction Manual, Volume I, Maintenance Schedule.
		<ol> <li>Replace filter and perform a inspection to nature of the caught in the</li> </ol>	r cartridges visual determine material filter.					To be performed when the filter differential pressure reaches 20 psid.

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Component Number	Component Identification	PM R	Recommendation	Monthly	EOC	Alt.	5 Year	Overhau]	Comments
		3.	Lube oil filter gauge - calibration check.						To be performed at appropriate site intervals for similar equipment.
02-820G	Lube Oil Heat Exchanger	1.	Record heat exchanger parameters.	x					Use for trend data.
		2.	Evaluate heat exchanger performance data.		×				
		3.	Inspect tubes and tube sheet.					x	Refr: TDI Instruction Manual, Volume I, Maintenance Schedule.
		4.	Inspect and clean lantern ring as required. Verify leak-off holes are not plugged.	Ç					Replace or rework lantern ring as necessary to ensure concentricity.
		5.	Replace packing rings at the floating tube sheet during reassembly.						When packing becomes hard or leakage at the packing is noted and cannot be stopped by tightening.
02-820H	Full Pressure Lube Oil Strainer	1.	Monitor differential pressure of strainer and/or filter.	x					Use for trend data.
		2.	Clean or replace strainer element when the differ- ential pressure change at the lube oil strainer is 20 psid. For those p not having this capabili clean or replace when differential pressure of full pressure filter is 20 psid.	r lants ty,					To be performed when the differential pressure across the strainer is 20 psid. Refr. TDI Instruction Manual, Volume I, Maintenance Schedule.
		3.	Lube oil strainer pressure gauge - calibration check.						To be performed per appropriate site intervals for similar equipment.

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Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
02-8358	Diesel Starting Air Compressors	<ol> <li>Check oil pressure and nil level if compressor is so equipped.</li> </ol>	x					
		2. Overall visual inspection.	x					
		<ol> <li>Clean fins on intercooler and aftercoolers.</li> </ol>	5	x				
		<ol> <li>Inspect intake filter element if equipped and replace as neces- sary.</li> </ol>		x				
		<ol> <li>Change compressor oil at each EOC, or if monthl sampling is performed change as required based on results.</li> </ol>	у	x				
		6. Check belt tension.		x				
		<ol> <li>Check pulley clamp bolts and set screws tight.</li> </ol>		X				
		<ol> <li>Inspect filter felts on unloader system.</li> </ol>		x				Replace as required, if so equipped.
02-8351	Air Dryers and Moisture Traps	<ol> <li>Inspect and service moisture traps.</li> </ol>		x				
		<ol> <li>Check proper operation (f dryer.</li> </ol>	x					Replace desiccant charge or refrigerant as re- quired.
02-835J	Starting Air Storage Tank	<ol> <li>Disassemble and clean the float trap if installed</li> </ol>		x				

Component Number	Component Identification	PM	Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
		2.	Starting air tank pressu gauges - calibration check.	re					To be performed per appropriate site intervals for similar equipment.
		3.	Starting air tank pressu switches - calibration check.	ire					To be performed per appropriate site intervals for similar equipment.
	Piping System (For items not previously covered)	1.	Conduct a detailed vis- ual and audible inspec- tion of all fuel, air, oil, and water piping and valves for leakage.	x					Tighten, repair, or replace as required. Refr: TDI Instruction Manual, Volume 1, Maintenance Schedule.

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## OWNERS GROUP

## APPENDIX-II

## SITE SPECIFIC MAINTENANCE MATRIX

PART D

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### SITE-SPECIFIC MAINTENANCE MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt.	5 Year	Overhaul	Comments
02-310A (Grand Gulf)	Crankshaft	<ol> <li>Measure and record crank shaft web deflections (hot and cold).</li> </ol>		x				Complete TDI Inspection and Maintenance Record Form No. 310-1-1 as applicable, TDI Instruc- tion Manual, Volume I, Section 6. Refr: TDI Instruction Manual, Volume 1, Maintenance Schedule.
		<ol> <li>Examine the fillets and oil holes of three main bearing journals (4,6,&amp; using LP. If indication are evident, a more thor ough examination should be made using appropriat NDE methods.</li> </ol>	8 5 -					Also to be performed once at 5 years. Refr: PNL-5600.
		<ol> <li>Examine the fillets and oil holes in three of th crankpin journals (choos 3 from Nos. 3 through 8 inclusive) using LP. If indications are avident, a more thorough examina- tion should be made usin appropriate NDE methods.</li> </ol>	e e ng					Also to be performed once at 5 years. Refr: PNL-5600.
		<ol> <li>Measure diameter of cran pin journals.</li> </ol>	ık-				x	Complete TDI Inspection and Maintenance Record Form No. 310-3-1 as applicable, TDI Instruc- tion Manual, Volume 1, Section 6.
								Also perform inspection at 5 years, on items accesssible, consistent with this component and Component 02-340A/B.

#### SITE-SPECIFIC MAINTENANCE MATRIX

#### Component Number

Component Identification

#### PM Recommendation

#### Monthly

EOC

X

 Analyze the trends of cylinder pressure and temperature measurements to detect imbalances. Alt. EOC

5 Year

#### Overhaul Comments

If an engine operates in a <u>severely</u> unbalanced condition, reisspect the oil holes for faligue cracks within a timeframe determined by the utility considering the particular circumstances of the abnormal aperation. Refr: PNL-5500.

Refr: PNL-5600.

Note: To avoid the effects of the 4th order resonance, steady normal-loaded operation at speeds more than a few rpm below the rated speed of 450 rpm should be avoided. Appropriate precautions should be taken to prevent seetained engine operation with significant cylinder imbalance. Lower speeds for testing and break-in are permissible. Avoid resonance frequencies.

### STIE-SPECIFIC MAINTENANCE MATRIX

Component Number	Component Identification	PM Recommendation	Monthly	EOC	Alt. EOC	5 Year	Overhaul	Comments
02-315A (Grand Gulf)	Cylinder Block	<ol> <li>Perform inspect DR/QR Report (</li> <li>Perform visual for cracks.</li> <li>Note: Visual not required in</li> </ol>	tion per 02-315A. I inspection inspection if an appro-				x	

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### OWNERS GROUP

## APPENDIX-II

## CROSS REFERENCE INDEX

## BY COMPONENT

### PART E

#### Legend

- 1. Index sorted by component name.
- Component number listed or "nonum" indicates that the utility engine should perform the maintenance as described.
- Blank indicates that utility is not required to perform maintenance indicated.
- Maintenance or surveillance requirements for a subcomponent should be disregarded for those engines not equipped with the subcomponent.

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COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	SECO/ SAN ONOFRE	PERRY/ VOGTLE	BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ SHEARON HARRIS
Air Butterfly Valve	02-475B/	03-475B/	02-475B/	03-4758/	02-475B/	02-475B/
	03-475B	02-475B	02-475B	02-4758	02-475B	02-475B
Air Dryers and Moisture Traps	02-8351/	03-835H/	02-835A/	03-8351/	02-835A/	02-835G/
	03-835H	02-835F	02-835G	GG-115	02-835C	02-835C
Air Filter to Starting Air	02-441B/	03-441B/	02-441B/	03-441B/	02-441B/	02-441B/
Distributor	03-441B	02-441B	02-441B	02-441B	02-441B	02-441B
Air Start Block Valves	NONUM/	NONUM/	NONUM/	NONUM/	NONUM/	NONUM/
	03-441B	NONUM	NONUM	NONUM	NONUM	NONUM
Air Start Valves	02-359/	03-359/	02-359/	03-359/	02-359/	02-359/
	03-359	02-359	02-359	02-359	02-359	02-359
Auxiliary Sub-Base & Oil & Water Piping - Jacket Water: Pipe, Couplings, Fit- tings, Orifices, Y-Strainers (Smail Bore Scope Only)	02-717C/ 03-717C	03-717D/ 02-717C	02-717C/ 02-717C	03-717D/ 02-717C	<u> </u> /	02-717C/ 02-717D
Auxiliary Sub-Base & Oil & Water Piping - Jacket Water: Valves	02-717B/ 03-717B	03-717B/ 02-717B	02-717B/ 02-717B	03-717B/ 02-717B	02-717B/ 02-717B	02-717B/ 02-717B
Auxiliary Sub-Base Lube Oil	02-717F/	03-717H/	02-717F/	03-717H/	NONUM/	02-717F/
Pipe and Fittings	03-717H	02-717F	02-717F	02-717F	02-717F	02-717H
Auxiliary Sub-Base Lube Oil/	02-717G/K/	03-7171/N/	02-717G/K/	03-717H/N/	NONUM/	02-717G/K/
Fuel Oil Valwes	03-7171/N	02-717G/K	02-717G	02-717G/K	02-717G/K	02-7171

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ SHEARON HARRIS
Barring Device Air Filter	02-5250	03-5250	/	/	′	′
Barring Device Control Valve and Press Regulator	02-525B/ 03-525B	03-525B/	02-5258/	03-5258/ 02-5258	02-5258	02-525B/
Base Assembly	02-305A/	03-30'5A/	02-305A/	03-305A/	02-305A/	02-305A/
	03-305A	02-305A	02-305A	02-305A	02-305A	02-305A
Cam Gear	02-350C/	03-350C/	02-350C/	03-350C/	02-350C/	02-350C/
	03-350C	02-350C	02-350C	02-350C	02-350C	02-350C
Camshaft Assembly	02-350A/	03-350A/	02-350A/	03-350A/	02-350A/	02-350A/
	03-350A	02-350A	02-350A	02-350A	02-350A	02-350A
Camshaft Bearings	02-350B/	03-350B/	02-350B/	03-350B/	02-350B/	02-350B/
	03-350B	02-350B	02-350B	02-350B	02-350B	02-350B
Circuit Breakers and Contact	02-500C/	03-500C/	02-500C/	03-500C/	02-500C/	02-500C/
Blocks	03-500C	02-500C	02-500C	02-500C	02-500C	02-500C
Connecting Rods, Bushings	02-340A/B/	03-340A/B/	02-340A/B/	03-340A/B/	02-340A/B/	02-340A/B/
and Bearing Shells	03-340A/B	02-340A/B	02-340A/B	02-340A/B	02-340A/B	02-340A/B
Control Panel Assembly:	02-500J/	03-500J/	02-5001/	03-500J/	02-500J/	02-500J/
Relays	03-500J	02-500J	02-500J	02-500J	02-500J	02-500J
Control Panel Switches	02-500N/	03-500N/	02-500M/	03-500N/	02-500N/	02-500N/
Terminal Boards and Wiring	03-500N	02-500N	02-500N	02-500N	02-500N	02-500N

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ SHEARON HARRIS
Control Panel Valves	02-500G/	03-500G/	02-500G/	03-500G/	02-500G/	02-500G/
	03-500G	02-500G	02-500G	02-500G	02-500G	02-500G
Crank to Lube Oil Pump Gear	02-355A/	03-355A/	02-355A/	03-355A/	02-355A/	02-355A/
	03-355A	02-355A	02-355A	02-355A	02-355A	02-355A
Crankcase Assembly	02-311A/	02-311A	02-311A/ 02-311A	02-311A	02-311A/ 02-311A	02-311A/ 02-311A
Crankcase Relief Valve (and covers)	02-385A/	03-385A/	02-385A/	03-385A/	02-385A/	02-385A/
	03-385A	02-385A	02-385A	02-385A	02-385A	02-386A
Crankcase Vacuum Fan	02-387A/	NONUM /	′	02-387A	′	
Crankshaft	02-310A/	03-310A/	02-310A/	03-310A/	02-310A	02-310A/
	03-310A	02-310A	02-310A	02-310A	02-310A	02-310A
Cylinder Block	02-315A/	03-315A/	02-315A/	03-315A/	02-315A/	02-315A/
	03-315A	02-315A	02-315A	02-315A	02-315A	02-315A
Cylinder Head	02-360A/	03-360A/	02-360A/	03-360A/	02-360A/	02-360A/
	03-360A	02-360A	02-360A	02-360A	02-360A	02-360A
Cylinder Head - Intake	02-360B/	03-360B/	02-360B/	03-360B/	02-360B/	02-360B/
and Exhaust Valves	03-360B	02-360B	02-360B	02-360B	02-360B	02-360B
Cylinder Head Covers -	02-362A/	03-362A/	02-362A/	03-362A/	02-362A/	02-362A/
Subcover Assembly	03-362A	02-362A	02-362A	02-362A	02-362A	02-362A

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ Shearon Harris
Cylinder Liners	02-315C/	03-315C/	02-315C/	03-315C/	02-315C	02-315C/
	03-315C	02-315C	02-315C	02-315C	02-315C	02-315C
Diesel Starting Air	02-835B/	03-835G/	02-835D/	03-835D/	NONUM/	02-835E/
Compressors	10-112	02-835A	02-835A	GG-113/14	02-835B	
Emergency Generator	CP-101A/ 03-650A	03-650A/ S0-101	02-650A	03-650A/ GG-101A	CN-119/ BL-101A	84-101A/ 02-650A
Emergency Generator Control Panel	CP-102/ 03-650B	03-650B/	02-650B	03-650B/ GG-119	BL-1018	84-121/ 02-650B
Emergency Generator Pedestal	CP-1018/	03-650C/	02-650C/	03-650C/	CN-119A	84-101B/
Bearing (and shaft)	03-650C	S0-103	02-650C	GG-101B	BL-101C	02-650C
Engine Control Air Pressure Regulator (Valves, Orifices)	02-695B/ 03-695B	03-695B/ 02-695B	02-695B/ 02-695B	03-695B/ 02-695B	02-6958/ 02-6958	02-6958/ 02-6958
Engine Control Cabinet	02-500A/	03-500A/	02-500A/	03-500A/	02-500A/	02-500A/
	03-500A	02-500A	02-500A	02-500A	02-500A	02-500A
Engine Control Pneumatic	02-695C/	03-695C	02-695C/	03-695C/	02-695C/	02-695C/
Switches	03-695C	02-695C	02-695C	02-695C	02-695C	02-695C
Exhaust Manifold	02-380A/	03-380A/	02-380A/	03-380A/	02-380A/	02-380A/
	03-380A	02-380A	02-380A	02-380A	02-380A	02-380A

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ Bellefonte	WNP-1/ SHEARON HARRIS
Flex Connection	02-805D/	15-110/	02-805D/	03-805D/	CN-121/	84-114/
	10-109	02-805C	02-805D	GG-111	02-805A	02-805D
Foundation Bolts	02-550/	03-550/	02-500/	03-500/	02-500/	02-500/
	03-550	02-550	02-550	02-550	02-550	02-550
Fuel Injection Nozzles	02-3658/	03-365B/	02-365B/	03-365B/	02-365B/	02-365B/
	03-3658	02-365B	02-365B	02-365B	02-365B	02-365B
Fuel Injection Pumps	02-365A/	03-365A/	02-365A/	03-365A/	02-365A/	02-365A/
	03-365A	02-365A	02-365A	02-365A	02-365A	02-365A
Fuel Injection Tubing	02-365C/	03-365C/	02-365C/	03-365C/	02-365C/	02-365C/
	03-365C	02-365C	02-365C	02-365C	02-365C	02-365C
Fuel Oil Filter	02-455A/	SC-014A	02-455A/	03-455A/	02-455A/	02-455A/
	03-455A	02-455A	02-455A	02-455A	02-455A	02-455A
Fuel Oil Injection Lines:	02-365D/	03-365D/	02-365D/	03-365D/	02-365D/	02-365D/
Supports	03-365D	02-365D	02-365D	02-365D	02-365D	02-365D
Fuel Oil Strainers	02-455B/	SC-042B/	02-455B/	03-455B/	02-4558/	02-4558/
	03-455B	02-455B	02-455B	02-455B	02-4558	02-4558
Fuel Pump Control Shaft	02-371A/	03-371A/	02-371A/	03-371A/	02-371A	02-371A/
	03-371A	02-371A	02-371A	02-371A	02-371A	02-371A

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ SHEARON HARRIS
Fuel Pump Linkage Assembly	02-371B/	03-371B/	02-3718/	03-3718/	02/371B	02-371B/
and Bearings	03-371B	02-371B	02-3718	02-3718	02-371B	02-371B
Fuel Pump Linkage:	02-413B/	03-371C/	02-413B/	03-371C/	02-413B/	02-413B/
Automatic Shutdown Cylinder	03-371C	02-413B	02-413B	02-413B	02-413B	02-413B
Fuel Tappet Assembly	02-345B/	03-345B/	02-345B/	03-345B/	02-345B/	02-345B/
	03-345B	J2-345B	02-345B	02-345B	02-345B	02-345B
Full Flow Lube Oil Filter(s)	02-820F/	03-820E/	02-820F/	03-820B/	CN-110/	84-115/
	10-106	02-820C	02-7175	GG-820B	02-820D	02-820E
Full Pressure Lube Oil	02-820H	03-820C/	02-820C/	03-460A/	SE-025/	SE-025/
Strainer	03-820C	SE-014	SE-025	SE-025	02-820C	02-820A
Flywheel Bolting	03-330B	/ 02-330B	′	′	′	′
Gear Train	′	NONUM /	′	′	′	
Governor Booster Servomotor	02-415B/	03-4158/	02-415B/	03-415B/	02-4158/	02-415B/
	03-415B	02-4158	02-415B	02-415B	02-4158	02-415B
Governor Drive - Couplings,	02-411B/	03-402B/	02-411B/	03-402B/	02-411B/	02-4118/
Pins and Keys	03-402B	02-411B	02-411B	02-411B	02-411B	02-4118
Governor Drive - Governor and Tachometer Drive Gear and Shaft	02-411A/ 03-402A	03-402A/ 02-411A	02-411A/ 02-411A	03-402A/ 02-411A	02-411A/ 02-411A	02-411A/ 02-411A

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ SHEARON HARRIS
Governor Heat Exchanger	02-415C/	03-415C/	02-415C/	03-415C/	02-415C/	02-415C/
	03-415C	NONUM	02-415C	02-415C	02-415C	02-415C
Governor Linkage	02-413A/	03-413/	02-413A/	03-413/	02-413A/	02-413A/
	03-413	02-413A	02-413A	02-413A	02-413A	02-413A
Hydraulic Valve Lifters	02-390F/ 03-390F	02-390F	02-390F/	02-390F	02-35)F	02-390F/
Idler Gear Assembly	02-355B/	03-355B/	02-355B/	03-355B/	02-355B/	02-355B/
	03-355B	02-355B	02-355B	02-355B	02-355B	02-355B
Intake Air Filters	02-805B/	03-805B/	02-805B/	03-8058/	CN-106/	84-111/
	10-114	02-805B	02-805A	GG-118	02-805C	02-805B
Intake and Exhaust Tappet	02-345A/	03-345A/	02-345A/	03-345A/	02-345A/	02-345A/
Assembly	03-345A	02-345A	02-345A	02-345A	02-345A	02-345A
Intercoolers	F-068/	NB-002/	F-068/	F-068/	F-068/	F-068/
	F-068	41-127A	F-068	F-068	F-068	F-068
Jacket Water Fittings - Pipe and Fittings (Small Bore Scope Only)	02-435A/ 03-435A	03-435A/ 02-435A	02-435A/ 02-435A	03-435A/	/ 02-435A	02-435A/ 02-435A
Jacket Water Heat Exchanger	02-810C/ 10-103	/	02-810B/ 02-717Q	03-810A/ GG-103	CN-120/ 02-810A	02-717N/ 02-810C
Jacket Water Heaters	02-810E/	03-810C/	02-810D/	03-800A/	CN-128/	02-810B/
	03-800A	02-810	02-717N	02-810A	02-810D	02-810A

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ Bellefonte	WNP-1/ SHEARON HARRIS
Jacket Water Pump - Gear	02-425A/	03-425A/	02-425A/	03-425A/	02-425A/	02-425A/
	03-425A	02-425A	02-425	02-425A	02-425A	02-425A
Jacket Water Standpipe and Miscellaneous Bolting	02-700F/	03-700F/ 02-700F	02-700F	00-700F	02-700F	02-700E/ 02-700F
Jacket Water Standpipe:	02-700B/	03-717B/	02-700B/	00-700B/	02-700B/	02-700B/
Valves	00-700B	02-700B	02-700B	00-700B	02-700B	02-700B
Lube Oil Heat Exchanger	02-820G/	03-820D/	02-820G/	03-820A/	CN-111/	02-717D/
	10-104	J2-820B	02-717R	GG-104	02-820A	02-820B
Lube Oil Keep-Warm Filter	02-820E/	03-820G/	02-820E/	03-8200/	CN-122/	02-7175/
	10-117	02-820E	02-717V	GG-121	02-820E	02-820G
Lube Oil Keep-Warm Pump	02-820C/	03-820F/	02-820B/	03-820C/	CN-109/	02-717R/
	03-820C	02-820D	02-717U	GG-109	02-820G	02-820F
Lube Oil Keep-Warm Strainer	02-820D/	03-820%/	02-820D/	′	′	02-717V/ 02-465D
Lube Oil Pressure Regulating	00-420/	00-420/	00-420/	00-420/	00-420/	00-420/
Valve	00-420	00-420	00-420	00-420	00-420	00-420
Lube Oil Sump Tank Heaters	02-820A/ 03-800B	03-820B/ 02-820	02-820A/ 02-717P	03-800B/ 02-820A	02-540D/	02-820A/ 02-820C
Lube Oil Sump Tank	02-540A/	03-540A/	02-540A/	03-5408/	02-540A/	02-540A/
	03-540A	02-540A	02-540A	02-540A	02-540A	02-540A

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ Bellefonte	WNP-1/ SHEARON HARRIS
Lube Oil Tubing and	02-307B/	03-307B/	02-307B/	03-307B/	02-307B/	02-307B/
Fittings - Internal	03-307B	02-307B	02-307B	02-307B	02-307B	02-307B
Main Bearing Caps - Studs	02-305C/	03-305C/	02-305C/	03-305C/	02-305C/	02-305C/
and Nuts	03-305C	02-305C	02-305C	02-305C	02-305C	02-305C
Main Bearings Shells	02-310B/	03-310B/	02-310B/	03-310B/	02-310B/	02-310B/
	03-310B	02-310B	02-310B	02-310B	02-310B	02-310B
Overspeed Trip Drive Couplings	02-410C/	03-410C/	02-410C/	03-410C/	02-410C/	02-410C/
	03-410C	02-410C	02-410C	02-410C	02-410C	02-410C
Overspeed Trip Governor	02-410A/	03-410A/	02-410A/	03-410A/	02-410A/	02-410A/
	03-410A	02-410A	02-410A	02-410A	02-410A	02-410A
Overspeed Trip Governor	02-410B/	03-410B/	02-410B/	03-410B/	02-410B/	02-410B/
and Accessory Drive	03-410B	02-410B	02-410B	02-410B	02-410B	02-410B
Overspeed Trip Vent Valve	02-410D/	03-410D/	02-410D/	03-410D/	02-410D/	02-410D/
	03-410D	02-410D	02-410D	02-410D	02-410D	02-410D
Piping System	NONUM/	NONUM/	NONUM/	NONUM/	NONUM/	NONUM/
	NONUM	NONUM	NONUM	NONUM	NONUM	NONUM
Piston Pin Assembly	02-341C/	03-341C/	02-341C/	03-341C/	02-341C/	02-341C/
	03-341C	02-341C	02-341C	02-340E	02-341C	02-341C
Piston Rings	02-341B/	03-341B/	02-341B/	03-341B/	02-340D/	02-341B/
	03-341B	02-341B	02-341B	02-340D	02-341B	02-341B

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ SHEARON HARRIS
Pistons	02-341A/	03-341A/	02-341A/	03-341A/	02-340C/	02-341A/
	03-341A	02-341A	02-341A	02-340C	02-341A	02-341A
Push Rods	02-390C/	03-390C/D/	02-390C/	03-390C/	02-390C/	02-390C/
	03-390C	02-390C	02-390C	02-390C	02-390C	02-390C
Rocker Arm Bushings	02-390E/	03-390E/	02-390E/	03-390E/	02-390E/	02-390E/
	03-390E	02-390E	02-390E	02-390E	02-390E	02-390E
Rocker Arm Capscrews,	02-390G/	03-390G/	02-390G/	03-390G/	02-390G/	02-390G/
Drive Studs (Pop Rivets)	03-390G	02-390G	02-390G	02-360G	02-390G	02-390F
Starting Air Distributor	00-442A/	03-442A/	00-442A/	03-442A/	02-442A/	00-442A/
Assembly	03-442A	02-442A	02-442A	02-442A	00-442A	02-442A
Starting Air Storage Tank	02-835J/ 10-111	03-835F/ 02-835E	02-835B/ 02-835D	03-835A/	CN-112 02-835A	02-835F/ 02-835D
Thermocouples	02-630D/	03-630D/	02-630D/	03-630D/	02-630D	02-630D/
	03-630D	02-630D	02-630D	02-630D	02-630D	02-630D
Thermostatic Valves	02-810D/	03-799A/	02-810C/	03-515/	C136/40/	02-810A/
	03-515	02-515	02-717W	02-515	02-810C	02-810E
Thrust Bearing Ring	02-310C/	03-310C/	02-310C/	03-310C/	02-310C/	02-310C/
	03-310C	02-310C	02-310C	02-310C	02-310C	02-310C
Turbo/water Piping -	02-437/	03-437A/	02-437/	03-437A/	02-437/	02-437/
Pipe and Fittings	03-437A	02-437A	02-437A	02-437	02-437	02-437

COMPONENT DESCRIPTION	COMANCHE PEAK/ SHOREHAM	RANCHO SECO/ SAN ONOFRE	PERRY/ VOGTLE	RIVER BEND/ GRAND GULF	CATAWBA/ BELLEFONTE	WNP-1/ SHEARON HARRIS
Turbocharger	MP-022/23/	MP-020/	MP-022/3/	MP-017/	MP-022/3/	MP-022/3/
	MP-017	MM-19/20	MP-022/3	MP-022/3	MP-022/3	MP-022/3
Turbocharger Lube Oil Fit- tings: Pipe, Tubing, Fittings and Flexible Coupling (Small Bore Scope Only)	02-467A/ 03-467A	03-467A/ 02-467A	02-467A/ 02-467A	03-467A/ 02-167A	02-467A/ 02-467A	02-467A/ 02-467A
Turbocharger: Bracket	02-475A,C/	03-475A,C/	02-475A,C/	02-475A,C/	02-475A,C/	02-475A,C/
Bolting and Gaskets	02-475A,D	02-475A,C	02-475A,C	02-475A,C	02-475A,C	02-475A,C
Water Discharge Manifold - Jacket Water Discharge Piping, Couplings and Seals	02-317A&B/ 03-317A&B	03-317A&B/ 02-317A&B	02-317A&B/ 02-317A&B	03-317A&B/ 02-317A&B	02-317A&B/ 02-317A&B	02-317A&B/ 02-317A&B
Woodward Governor	02-415A/	03-415A/	02-415A/	03-415A/	02-415A/	02-415A/
	03-415A	02-415A	02-415A	02-415A	02-415A	02-415A