

APPENDIX C

Pre-Test Modifications

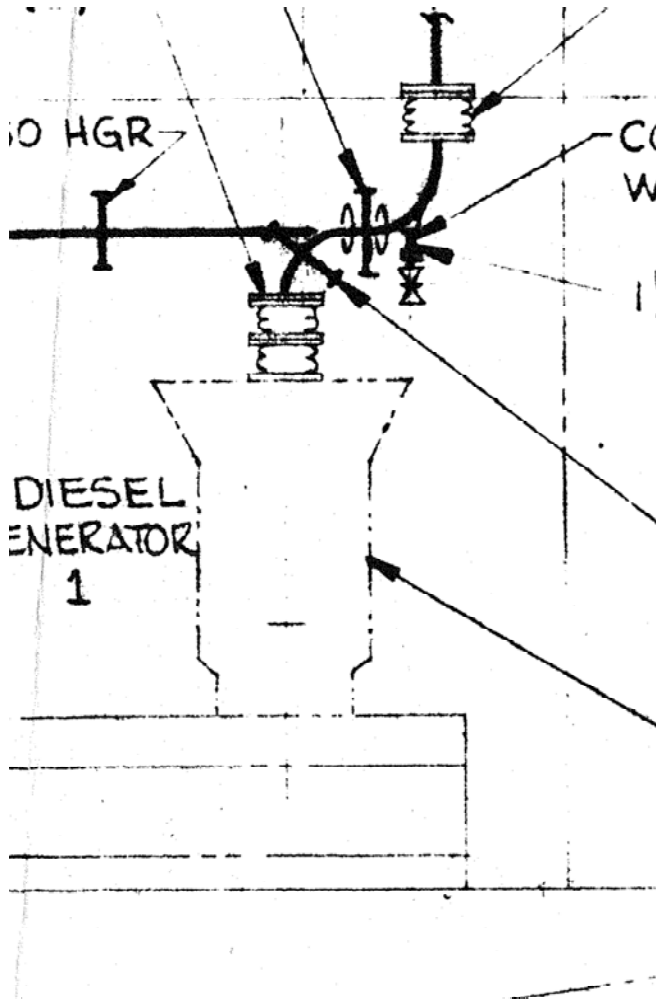
- Stack Modification (Includes ABS Approval Document)
- Engine Instrumentation Modification

STACK MODIFICATION DETAILS

T/S State of Michigan

#4 SSDG Stack Modification

- NOx Code Requirements
- Alteration Plan
- ABS Approval
- Work in Progress Pictures
- Final Completed Modification



Drawing Extract

NOx Technical Code 2008 Extract:

5.9.3.1 The sampling probes for the gaseous emissions shall be fitted at least 10 pipe diameters after the outlet of the engine, turbocharger, or last after-treatment device, whichever is furthest downstream, but also at least 0.5 m or 3 pipe diameters upstream of the exit of the exhaust gas system, whichever is greater. For a short exhaust system that does not have a location that meets both of these specifications an alternative sample probe location shall be subject to approval by the Administration.

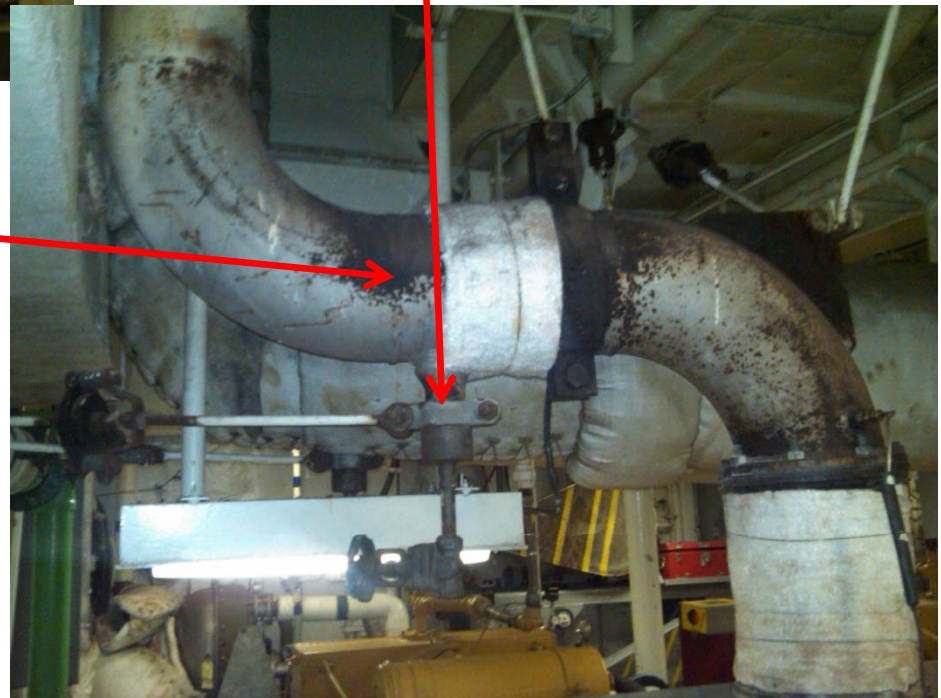


DG #4 Exhaust Trunk with blanket

Drain and Drain Valve

Location of test penetration

DG #4 Exhaust Trunk without blanket





Flex Expansion Joint

Flex Expansion Joint Coupling

Exhaust Temperature Probe

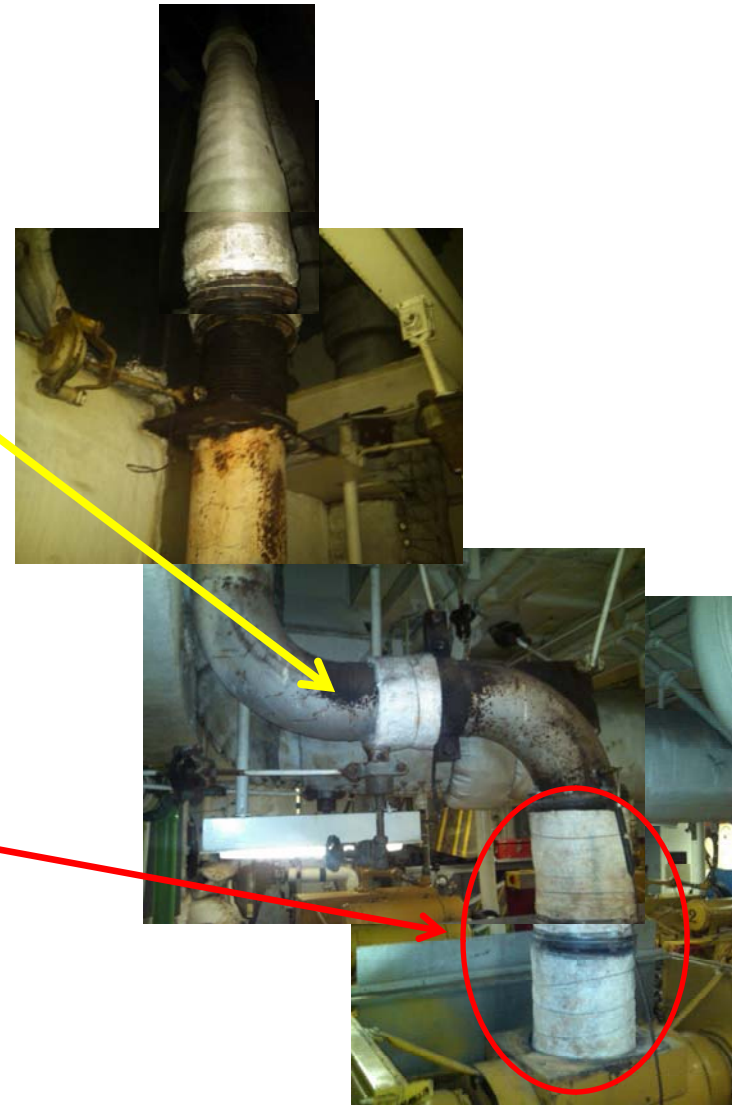




Flex Expansion Joint

Location per conversation on 8/31/11 with Tom Risley (LCE), Bill Welch (UC-R) and Roger Schwartz (Schwartz Boiler). Locate 90 degrees from drain line on either inboard or outboard side of pipe – spot to be marked by Bill Welch during ship visit on 9/2/11.

Schwartz Boiler will remove exhaust expansion joint coupling, cover area to ensure no debris gets in engine turbochargers and then proceed with penetration, welding, testing, and cleanup per procedure on 9/6/11 after gas free certificate issued by Current Marine Services, Inc.



Compiled Photo of DG#4 Exhaust Trunk

T/S State of Michigan Stack Modification Details



Before



After

ABS Approval

Electronically published by ABS Washington.
Reference 800996, dated 02-SEP-2011.



TJI / MJR

Project No.: 2639516
Refer to Task: 800996

2 September 2011

**Department of Transportation
Maritime Administration**
1200 New Jersey Ave., SE
Washington, DC 20590

**Attention: Mr. Sujit Ghosh, Mechanical Engineer
MAR- 410 (202-366-1839)**

**Subject: T/S State of Michigan ABS ID 8502561
Modification to Exhaust System**

Gentlemen:

We have your email of 1 September 2011 submitting the following drawing for the subject vessel:

**1) Dwg. No. S2-MET-MA155b-S48-10-1 Rev C "Exhaust Trunk Modification for
Insertion of Probe"**

This drawing has been reviewed for compliance with ABS Rules for Building and Classing Steel Vessels 2011. The arrangements and details as indicated are satisfactory and provided the workmanship is to the Surveyor's satisfaction and the Rules in all other respects are complied with, the drawing is approved.

Accordingly, one approved print of the drawing is being returned electronically; hardcopies will be provided only upon request.

Should you have any questions, please feel free to contact Mr. Thomas J. Ingram, 703.519.9974 or the undersigned at 703.519.9240.

Very truly yours,
ABS AMERICAS

Michael J. Roa
Senior Managing Principal Engineer

cc: ABS Cleveland with Surveyor's Copy of the drawing

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Government Operations Office, 1421 Prince Street, Suite 100, Alexandria, VA, 22314, USA
TEL: 703-519-9230 (Main) / FAX: 703-519-9895

83-MET-MA1988-848-10-1

MATERIAL SCHEDULE FOR EXISTING SYSTEM										
SERVICE	PIPE		SCHED/THICKNESS	FASTENERS		GASKETS	VALVES		FITTINGS	REMARKS
	MATERIAL	SPECIFICATION		BOLTS	NUTS		BODY	TRM		
MAIN DIESEL EXHAUST	STEEL	ASTM-A234 STEEL	0.250"	ASTM A193 GR B16	ASTM A194 GR 7	UNKNOWN	N/A	N/A	CARBON STEEL ASTM A234 BUTTWELD ANSI B16.0	

- GENERAL NOTES**
- THIS DRAWING MODIFIES REFERENCE 3.
 - ALL PIPE SIZES ARE IN INCHES AND NOMINAL PIPE SIZES UNLESS OTHERWISE NOTED.
 - ALL WELDING SHALL BE DONE BY ABS QUALIFIED WELDERS. THE WELDING SHALL BE IN ACCORDANCE WITH ABS STEEL VESSEL RULES PART 2 CHAPTER 4 SECTION 4.
 - MODIFIED PIPING SHALL BE CLEANED SO THAT THERE ARE NO LOOSE PARTICLES LEFT IN THE MODIFIED PIPING.
 - MODIFIED PIPING SHALL BE DYE PENETRANT TESTED IN ACCORDANCE WITH ABS STEEL VESSEL RULES PART 2 CHAPTER 4 SECTION 4 PARAGRAPH 11.5. THE MODIFIED PIPING SHALL BE PNEUMATICALLY TESTED TO A PRESSURE OF 12.5 PSIG.
 - EXHAUST PIPING SHALL BE INSULATED IN ACCORDANCE WITH THE THERMAL INSULATION SCHEDULE. REFERENCE 1. THE INSULATION SHALL BE PROVIDED WITH A SMALL CUT-OUT WITH A MATCHING INSULATION PLUG. THE INSULATION PLUG WILL BE REMOVED WHEN THE GAS PROBE IS INSERTED, AND REPLACED WHEN THE PROBE IS REMOVED. (SEE DETAIL 11-A).
 - THE NEW PROBE INSTRUMENT LOCATION AND ANGLE SHALL BE DETERMINED IN THE FIELD.
 - THE CENTER LINE OF THE PROBE TAP OPENING SHALL BE DIRECTED TO THE CENTER LINE OF THE EXHAUST PIPE.

PIPE DESIGN DATA									
SERVICE	NOMINAL PIPE SIZE	ID PIPE	FLOW (CFM)	DELT PSI - LINE	WORKING PRESSURE	WORKING TEMPERATURE	TEST PRESSURE	TEST FLUID	REMARKS
MAIN DIESEL EXHAUST	8"	8.128"	5000	0.83	1 PSI	840 ± 50 DEG. F	12.5 PSIG	AIR	

MATERIAL LIST							
ITEM	QTY	DESCRIPTION	SERVICE	CONNECTION	MATERIAL	SPEC.	REMARKS
1	1 EA.	3/4" PIPE THREAD X 8" PIPE WEDDLET OUTLET FITTING	DIESEL EXHAUST	FILLET WELD	STEEL	ASME B31.1	BONNEY FORGE 3/4" THREAD/OUTLET CLASS 3000 OR EQUAL
2	1 EA.	3/4" PIPE THREAD PIPE PLUG	DIESEL EXHAUST	THREADED	STEEL	ASME B31.1	BONNEY FORGE 3/4" NPT SQUARE HEAD PLUG OR EQUAL
3	2 EA.	8" GASKETS	DIESEL EXHAUST	N/A	VARIOUS		FLEXITALL IC COG THERMOCLATE 888 OR EQUAL

REVISIONS			
REV	DATE	DESCRIPTION	BY
ALL		INITIAL ISSUE	ELB
C 14.9		1. CHANGED LOCATION OF PROBE INSTALLATION POINT FROM VERTICAL RUN OF EXHAUST PIPE TO HORIZONTAL RUN OF EXHAUST PIPE.	B+11
5.0		2. CHANGED FITTING FROM LATROUET TO WEDDLET.	
7.0			

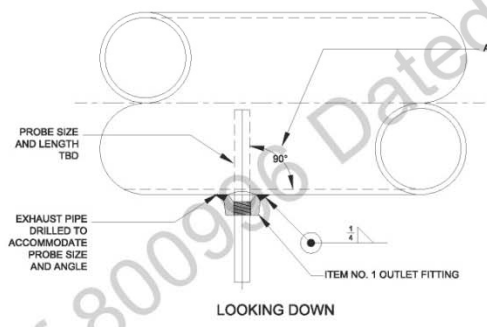
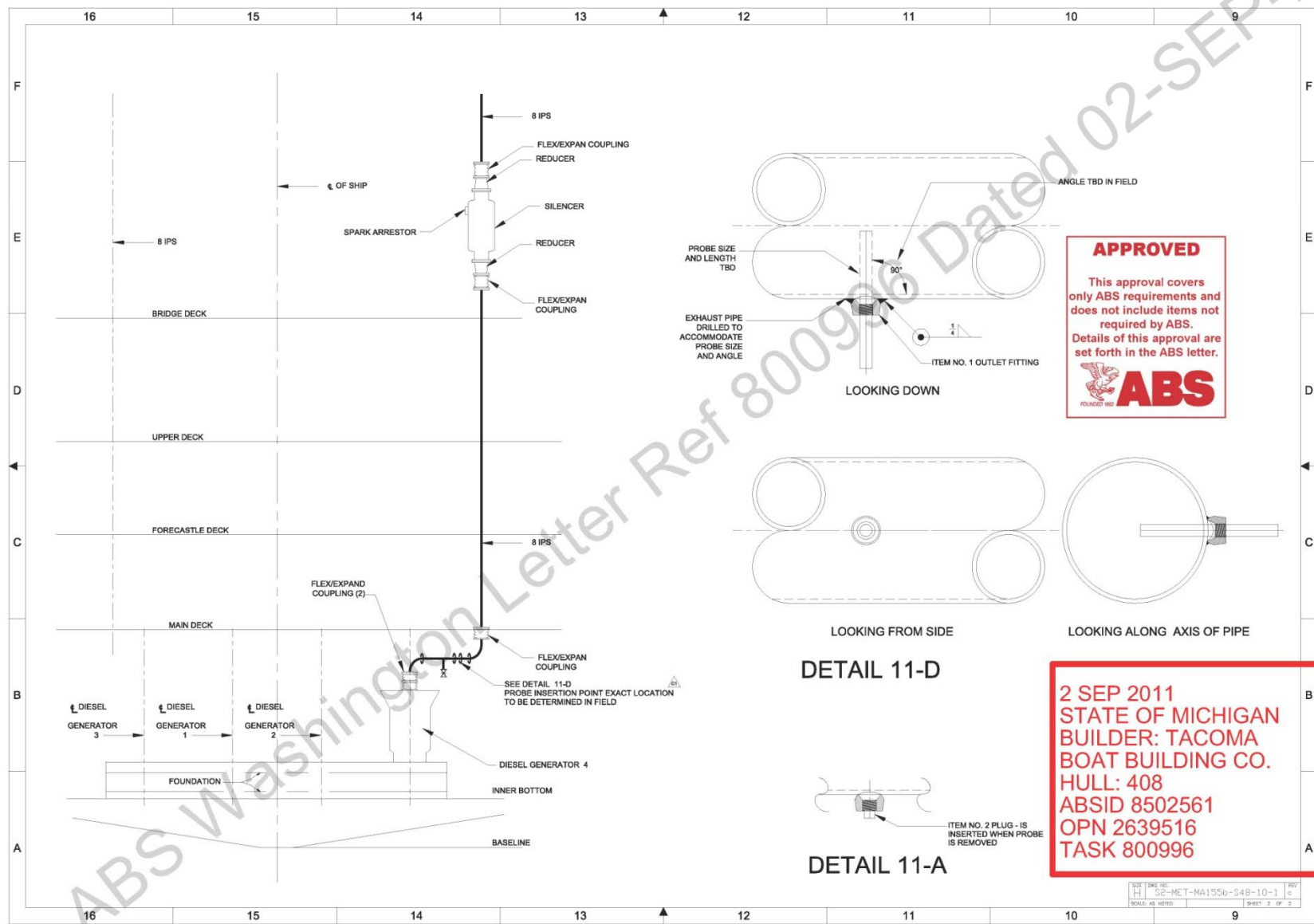


2 SEP 2011
STATE OF MICHIGAN
BUILDER: TACOMA
BOAT BUILDING CO.
HULL: 408
ABSID 8502561
OPN 2639516
TASK 800996

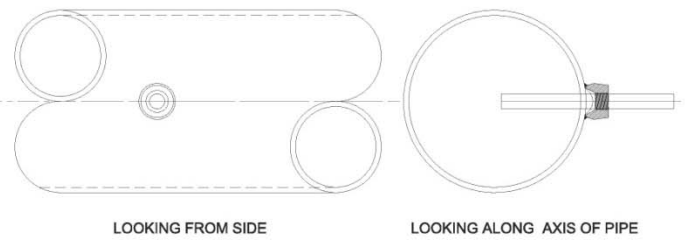
ABS STEEL VESSEL RULES	ABS STEEL VESSEL RULES
2011 (REVISED)	2011 FT LANCE CLASS VESSEL EXHAUST DISCHARGE APPROVEMENT
1. USE (SEE HULL 800-001001)	THERMAL INSULATION SCHEDULE
NO.	PLAN NO.
REFERENCES	
APPROVALS ABS <input type="checkbox"/> USCG <input type="checkbox"/> USPH <input type="checkbox"/> MARAD <input type="checkbox"/> REVIEWED <input type="checkbox"/> APPROVED <input type="checkbox"/>	
U.S. DEPARTMENT OF TRANSPORTATION MARITIME ADMINISTRATION T/S STATE OF MICHIGAN GREAT LAKES MARITIME ACADEMY MARAD DESIGN S2-MET-MA155b	
EXHAUST TRUNK MODIFICATION FOR INSERTION OF PROBE	
DRAWN	DATE
CHECKED	DATE
APPROVED	DATE
SIZE: DWG NO.:	S2-MET-MA1988-848-10-1
SCALE: AS NOTED	SHEET 1 OF 2

See ABS Washington Letter Ref 800996 Dated 02-SEP-2011

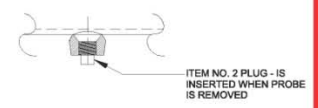
83-MEL-WA-88-948-10-1 5 C



APPROVED
 This approval covers only ABS requirements and does not include items not required by ABS. Details of this approval are set forth in the ABS letter.
ABS
 FOUNDED 1842



DETAIL 11-D



DETAIL 11-A

2 SEP 2011
 STATE OF MICHIGAN
 BUILDER: TACOMA
 BOAT BUILDING CO.
 HULL: 408
 ABSID 8502561
 OPN 2639516
 TASK 800996

SIZE	8 1/2	NO.	1	REV	
HULL NO.	S2-MET-MA155b-548-10-1		DATE		
SCALE	AS NOTED	SHEET	2	OF	2

83-MEL-WA-88-948-10-1 5 C

See ABS Washington Letter Ref 800996 Dated 02-SEP-2011



With Drilled hole

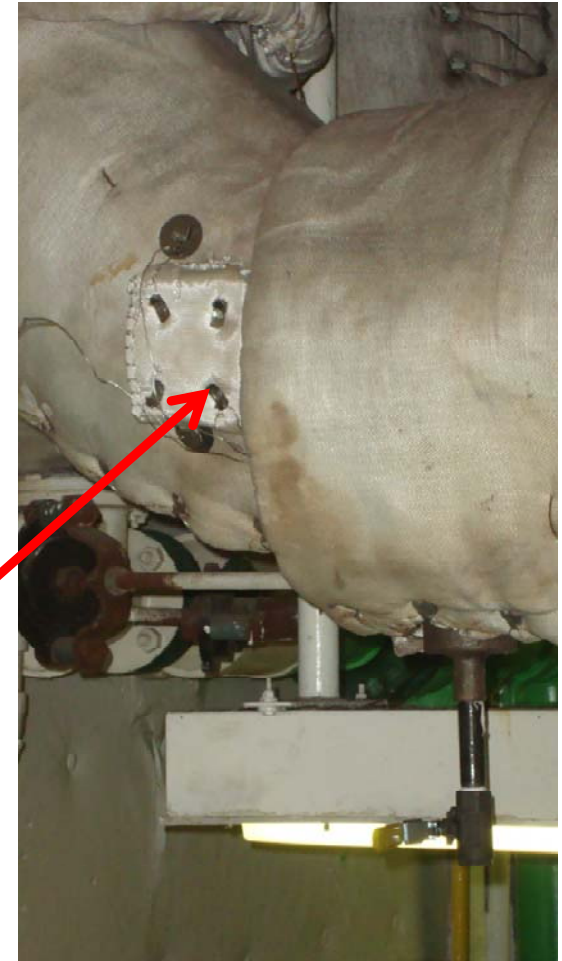
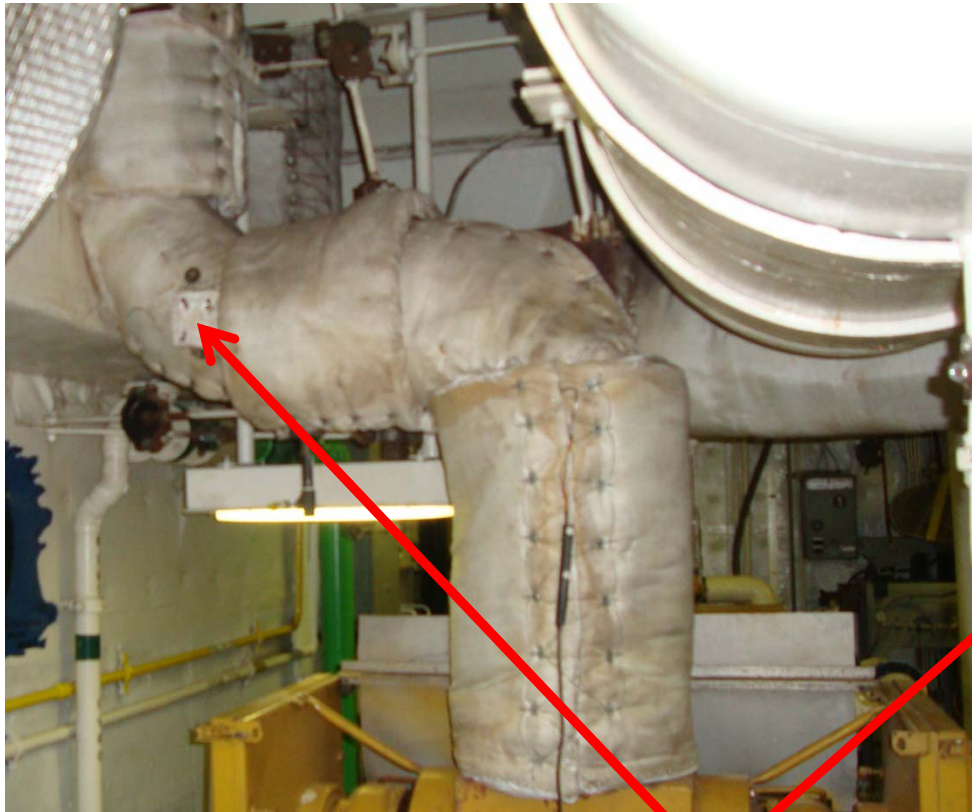


Welded Latrolet and New Drain Valve



Final Dye Penetrant Inspected Latrolet and Drain Line Renewal

Exhaust Pipe Cover/Blanket Reworked and Reinstalled



Cover for newly inserted test probe location

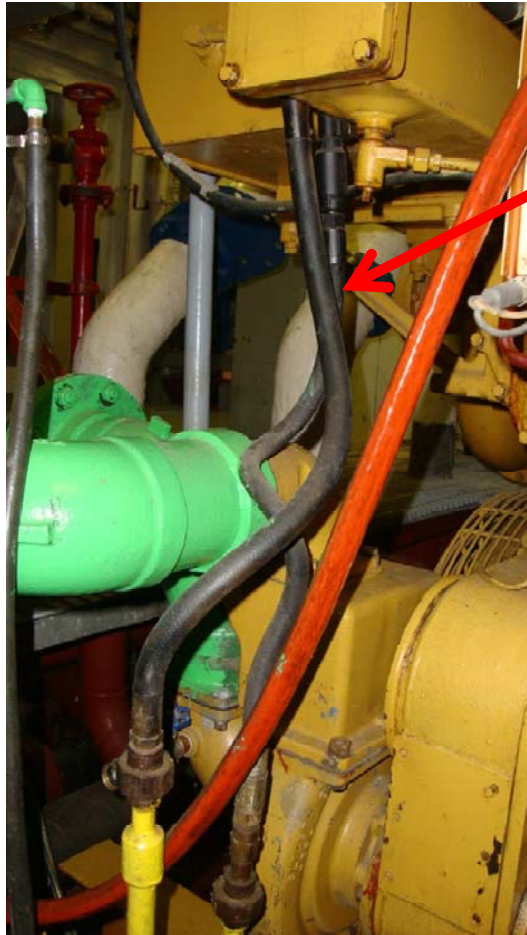
ENGINE INSTRUMENTATION MODIFICATIONS

Temporary Engine Modifications

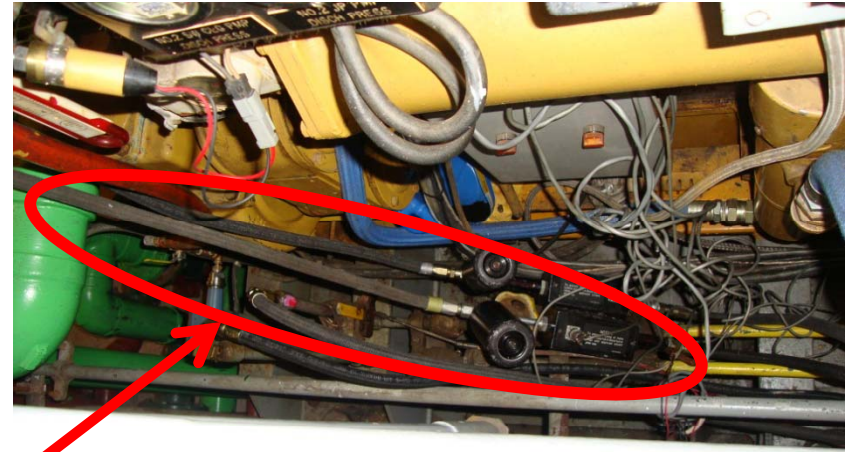
Caterpillar Temporary Modifications

- Installed Fuel meters installed
- Inserted temperature and pressure taps in Intake air manifold ports

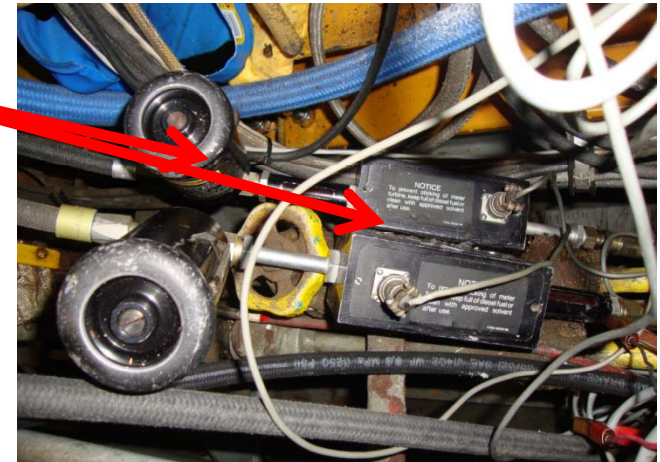
Fuel Meter Installation



Original Engine
fuel oil supply
and return
flexible hose



Cat installed fuel
oil supply and
return meters



Two temporary fuel meters were installed by removing two flex hoses and inserting flex hoses and meters – upon test completion original flex hose to be re-installed

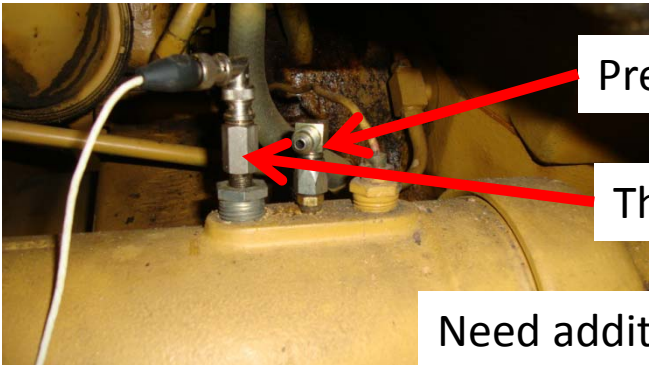
Intake Manifold Instrumentation Ports



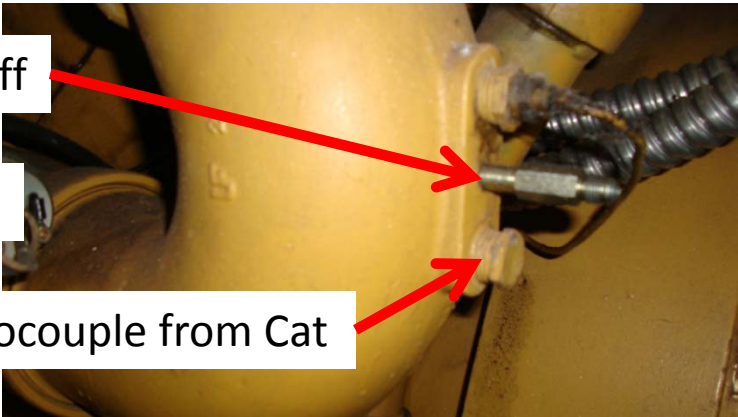
Original Inboard Configuration



Original Outboard Configuration (front view)



Instrumented Inboard Configuration

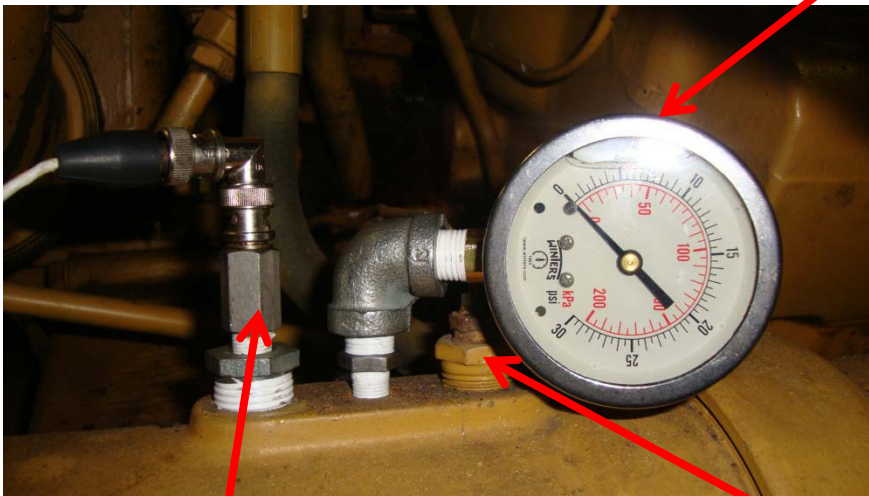


Instrumented Outboard Configuration

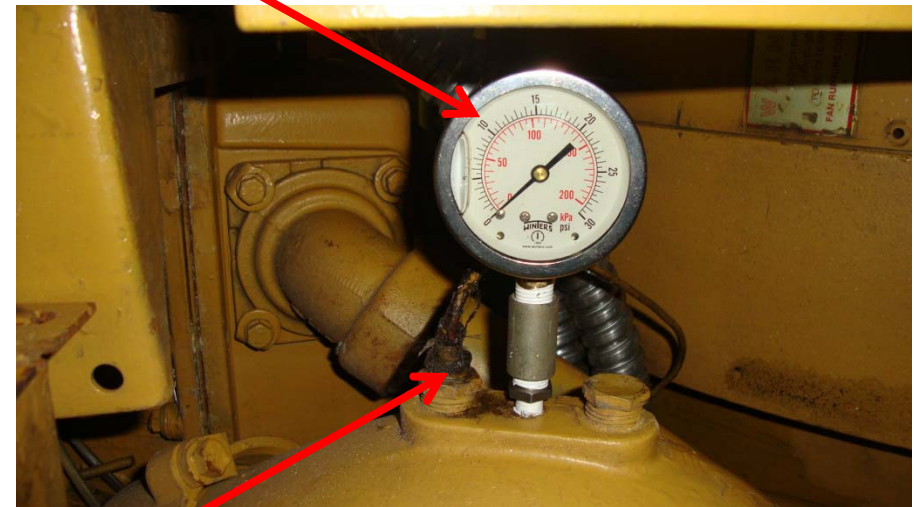
Note: Pipe plugs removed and thermocouple and tubing installed for temperature and pressure measurement – pipe plugs will be re-installed upon test completion

Intake Manifold Taps

Installed Pressure Gauge



Inboard Manifold



Outboard Manifold

Existing Air Inlet Manifold Temperature Probe

Caterpillar Installed Temperature Probe

Caterpillar Provided Test Meters



Digital Thermometer

Digital Fuel Meter