

# DIESEL POWER PACKAGE PERMISSIBILITY CHECKLIST

## M168-001-01

REVISION 03  
JANUARY 2004

APPLIES TO SYSTEMS THAT ARE FITTED WITH FLAME-PROOF PORT IN BELLOWS FLANGE ONLY

(Page 1 of 13)

DST MANAGEMENT SYSTEM™ DIESEL POWER PACKAGE  
[MSHA DIESEL POWER PACKAGE APPROVAL No 7F-014-0]

CATERPILLAR 3306 PCTA DIESEL ENGINE  
[190 HP – 2,200 RPM - MSHA DIESEL ENGINE APPROVAL No 7E-A005-0]

## **DST MANAGEMENT SYSTEM™ MODEL M168 DIESEL POWER PACKAGE**

DRY SYSTEMS TECHNOLOGIES®

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REVISION DATE: JANUARY 2004

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## DST MANAGEMENT SYSTEM™ DIESEL POWER PACKAGE FOR 190 HP CATERPILLAR 3306 PCTA DIESEL ENGINE PERMISSIBILITY CHECKLIST [M168-001-01, Page 02, Rev 03]

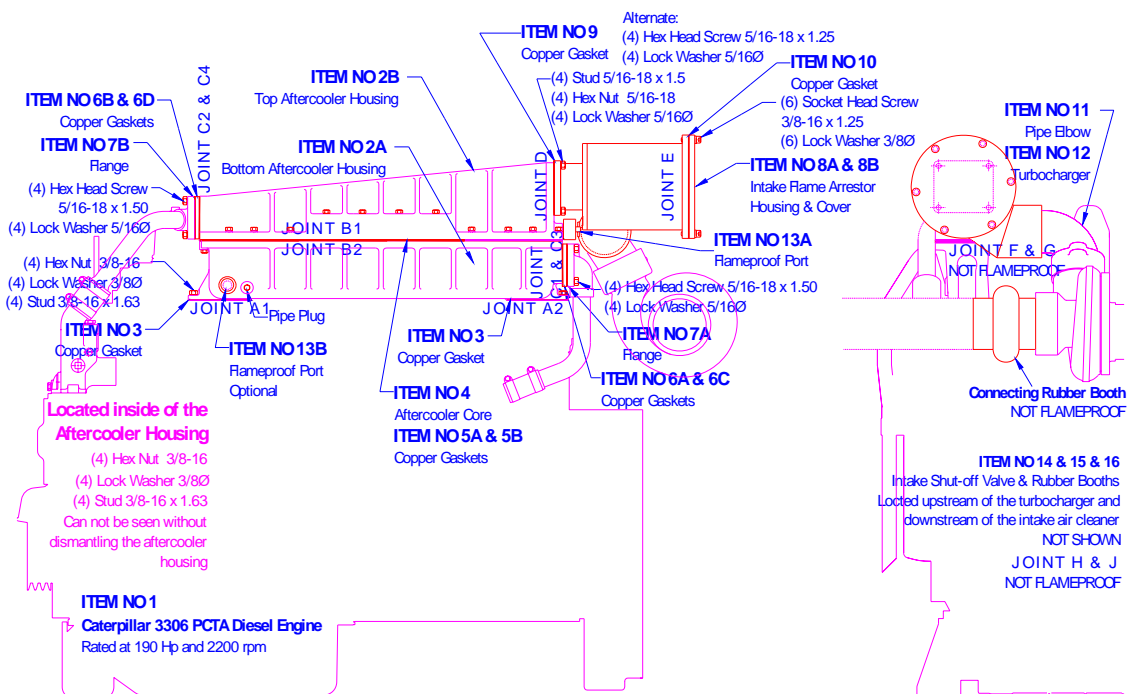
### Diesel Engine

1. [ ] It has been determined that the area, in which tests are to be performed, is in **FRESH AIR**.
2. [ ] The machine is equipped with a **CATERPILLAR Model 3306 PCTA**, MSHA Part 7E, Category A Approved six-cylinder turbocharged diesel engine.

### Intake System

The Intake System of this **DST Model M168 Management System™ Diesel Power Package** includes a Caterpillar intake manifold as integral part of the engine, a Caterpillar aftercooler core contained in Caterpillar aftercooler housing, an intake flame arrestor assembly, a Caterpillar turbocharger compressor, an intake air shut-down valve with an actuating cylinder or cable, and an intake air cleaner. The Intake System of the assembly is shown in Illustration 1.

3. [ ] All components appear to be the same as shown on the Illustration No 1.  
[WEEKLY]



**Illustration 1: Air Intake System**

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4. [ ] The bottom half of the Aftercooler Housing, Item No 2 A, is securely attached to the Diesel Engine, Item No 1. Some of the fasteners are located inside of the Aftercooler Housing and are not accessible for this inspection. There are two Copper Gaskets, Item No 3, between the two Engine intake ports and the Aftercooler Housing, labeled Joint No A1 & A2.  
*[WEEKLY]*
5. [ ] There is no visible damage, cracks or dents on the Aftercooler Housing.  
*[WEEKLY]*
6. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joints No A1 and No A2.  
*[WEEKLY]*
7. [ ] The Aftercooler Core, Item No 4 is mounted inside the Aftercooler Housing. The flange of the Aftercooler Core must be visible, sandwiched between the upper and the lower half of the Aftercooler Housing and is not accessible for this inspection. The Caterpillar supplied fasteners for holding the upper and lower Aftercooler Housing together are all in place and tight. There are two Copper Gaskets, Item No 5 A and 5 B used on the two joints, labeled Joints No B1 & B2.  
*[WEEKLY]*
8. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joints No B1 & B2.  
*[WEEKLY]*
9. [ ] A Flange, Item No 7 A, is bolted to the water connection of the Aftercooler Core and the lower Aftercooler Housing. A second Flange, Item No 7 B, is bolted to the water connection of the Aftercooler Core and the upper Aftercooler Housing. The flanges are tightly secured to the Aftercooler Housings with Fasteners and Lockwashers. There are Copper Gaskets, Items No 6 A & 6 B, used between the Flanges and the Aftercooler Housing halves, labeled Joint No C1 & C2. There are Copper Gaskets, Items No 6 C & 6 D, used between the Flanges and the water connections, labeled Joint No C3 & C4.  
*[WEEKLY]*
10. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joint No C1, C2, C3 & C4.  
*[WEEKLY]*
11. [ ] The Intake Flame Arrestor, Item No 8, is bolted to air inlet connection of the upper Aftercooler Housing. The flange is tightly secured to the Aftercooler Housings with Fasteners and Lockwashers. There is a Copper Gasket, Items No 9, used between the Flame Arrestor Housing and the Aftercooler Housing, labeled Joint No D.  
*[WEEKLY]*
12. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joint No D.  
*[WEEKLY]*
13. [ ] The Intake Flame Arrestor, Item No 8 A, has a Cover, Item No 8 B, bolted to the end. The Cover is tightly secured to the Flame Arrestor Housings with Fasteners and Lockwashers. There is a Copper Gasket, Item No 10, used between the Cover and the Flame Arrestor Housing, labeled Joint No E.  
*[WEEKLY]*

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14. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joint No E.  
*[WEEKLY]*
15. [ ] The inlet of the Intake Flame Arrestor is attached with a slip fit to a Pipe, Item No 11, that is attached with a slip fit to the Compressor outlet of the Turbocharger, Item No 12. These two joints, labeled Joint No F & G, are not considered flameproof and do not have to be inspected.  
*[WEEKLY]*
16. [ ] Item No 13 A is a Flameproof Port to measure the boost pressure. It is installed at the end of the top Aftercooler Housing under the Intake Flame Arrestor and is connected to the Governor of the Fuel Injection Pump. A hose is connected to the side of the Flameproof Port and a plug is securely installed at the end with a retaining ring. Item No 13B is an optional Flameproof Port installed at the side of the bottom Aftercooler Housing to measure the boost pressure. If not used, a pipe plug must be installed.  
*[WEEKLY]*
17. [ ] The intake Air shut-off Valve, Item No 14, is securely attached between two flanges, Items No 15 & 16 with Fasteners and Lockwashers. These two joints, labeled Joint No H, are not considered flameproof and do not have to be inspected.  
*[WEEKLY]*
18. [ ] The air compressor supply connection (if used) must be located out-by (upstream) of the Flame Arrestor and in-by of the intake air cleaner, unless it is fitted with its own air intake system.  
*[WEEKLY]*

### **Exhaust System**

The exhaust system of this [DST Model M168 Management System™ Diesel Power Package](#) includes a Caterpillar water-cooled exhaust manifold, a Caterpillar turbocharger, a water cooled bellows assembly, a water-cooled catalyst, a water-cooled elbow, a water-cooled inlet/outlet box, a water-cooled heat exchanger, an exhaust connecting pipe, a flame arrestor, and a DPM filter housing with a disposable paper element DPM filter.

Illustration 2 depicts the components between the engine outlet and the turbocharger inlet, Illustration 3 depicts the components between the turbocharger outlet and the inlet at the inlet/outlet box, and Illustration No 4 depicts the components from the inlet/outlet box to the final exhaust.

19. [ ] All components appear to be the same as shown on Illustrations No 2, No 3 and No 4. There appears to be no visible damage.  
*[WEEKLY]*
20. [ ] Illustration No 2 depicts the Exhaust System components between the outlet of the Diesel Engine and the inlet of the Turbocharger. There appears to be no external damage.  
*[WEEKLY]*

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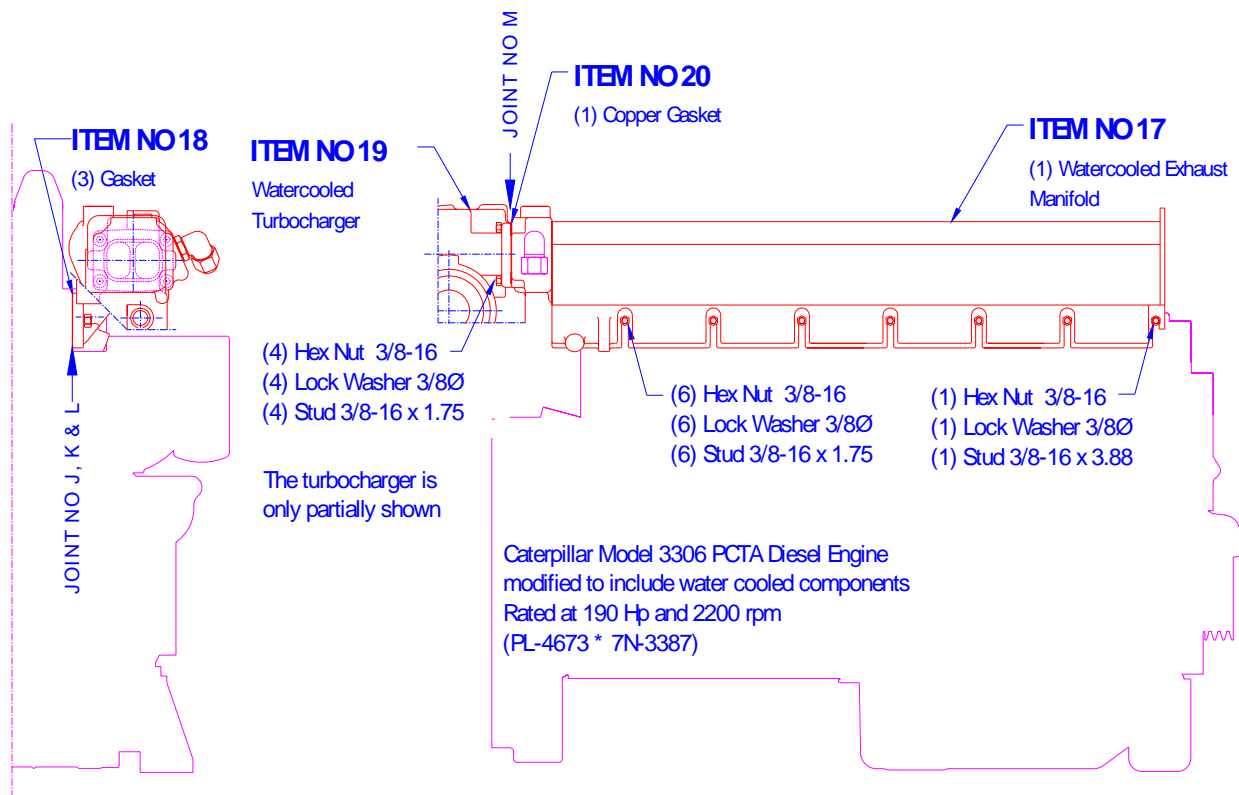


Illustration No 2: Water-cooled Exhaust Manifold and Turbocharger Components

21. [ ] A water cooled Exhaust Manifold, Item No 17, is securely attached to the exhaust ports of the Diesel Engine and all Fasteners and Lockwashers or hardened Washers are in place and tight. There are three Copper Gaskets or Caterpillar Metal Gaskets, Item No 18, installed between the Exhaust Manifold and the Diesel Engine, labeled Joints No J, K & L.  
 [WEEKLY]
22. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joints No J, K & L.  
 [WEEKLY]
23. [ ] The water cooled Turbocharger, Item No 19, is securely attached to the outlet of the Exhaust Manifold and all Fasteners and Lockwashers are in place and tight. There is a Copper Gasket, Item No 20, installed between the Exhaust Manifold and the Turbocharger, labeled Joint No M.  
 [WEEKLY]
24. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joint No M.  
 [WEEKLY]

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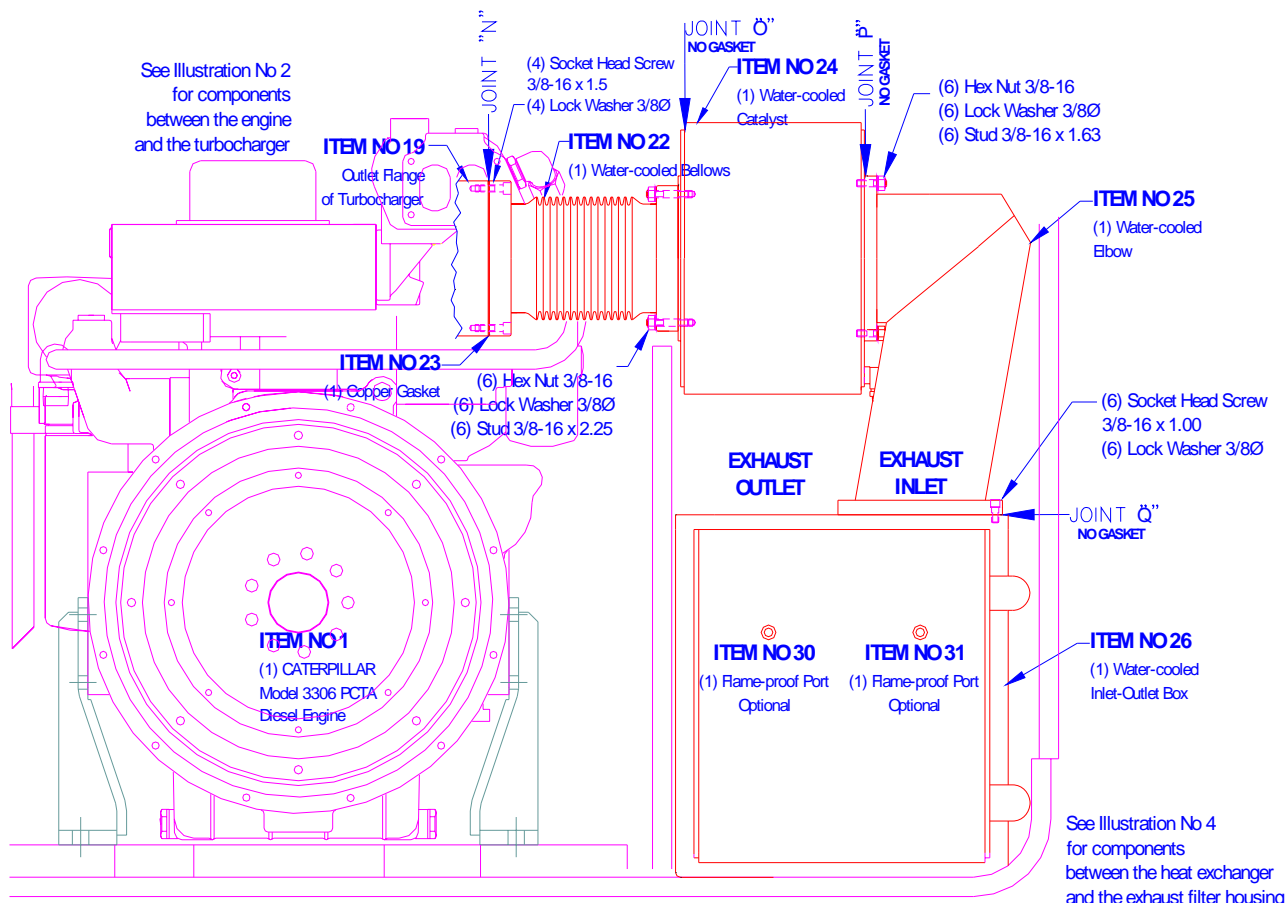


Illustration No 3: Exhaust System Components between the Heat Exchanger and the Inlet/Outlet Box

25. [ ] Illustration No 3 depicts the Exhaust System components between the outlet of the Turbocharger and the Inlet/outlet Box. There appears to be no external damage.  
[WEEKLY]
26. [ ] The water-cooled Bellows assembly, Item No 22, is securely attached to the outlet flange of the water-cooled Turbocharger and all Fasteners and Lockwashers are in place and tight. The Bellows are not cracked or damaged and there is no indication of coolant leaks. There is a Copper gasket, Item No 23, installed between the Turbocharger outlet and the Bellows Inlet Flange, labeled Joint No N.  
[WEEKLY]
27. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the joint No N.  
[WEEKLY]

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28. [ ] Check the Bellows for damage. If damage to the convolutes or leaks to the water-cooled Bellows are detected, replace the complete Bellows assembly. Every 24 month, or 5,000 operating hours, remove and inspect the Bellows assembly regardless of its apparent external condition. If damage to the inside convolutes or inside leaks to the water-cooled Bellows are detected, replace the complete Bellows assembly. When re-installing the original or a replacement Bellows assembly, make sure the Copper Gasket, Item No 23, is installed in the joint between the Turbocharger outlet and the Bellows inlet flange, and all Fasteners and Lockwashers are in place and tight on both flanges. Check the flame gap on Joints N and O as described under No 27 and No 31.  
*[SEE NOTE]*
29. [ ] Item No 21 is Flameproof Port for the total backpressure measurement and untreated CO sampling. It is tightly installed into the outlet flange of the bellows assembly. A hose is connected to the side of the Flameproof Port and a plug is securely installed at the end with a retaining ring.  
*[WEEKLY]*
30. [ ] Item No 24 is the water-cooled Catalyst assembly. It is securely attached to the outlet flange of the water-cooled Bellows, and all Fasteners and Lockwashers are in place and tight. There is no gasket installed between both components, labeled Joint No O.  
*[WEEKLY]*
31. [ ] A 0.004" feeler gage cannot be inserted into the Joint No O.  
*[WEEKLY]*
32. [ ] Item No 25 is the water-cooled Elbow. It is securely attached to outlet of the Catalyst and the Inlet-Outlet Box. All Fasteners and Lockwashers are in place and tight. No gaskets are between Elbow and the Catalyst, labeled Joint No P and the Elbow and the Inlet-Outlet Box, labeled Joint No Q. Item No 26 is the Inlet-Outlet Box connected to the Heat Exchanger  
*[WEEKLY]*
33. [ ] A 0.004" feeler gage cannot be inserted into the Joints No P & Q.  
*[WEEKLY]*
34. [ ] Illustration No 4 depicts the Exhaust System components between the inlet of the Inlet-Outlet Box and the Exhaust Filter Housing. There appears to be no external damage.  
*[WEEKLY]*
35. [ ] Item No 26 is the Inlet-Outlet Box connected to the Heat Exchanger. Item No 27 is the Core section of the Heat Exchanger. It is sandwiched between the Inlet-Outlet Box flange, and the Shell flange of the Heat Exchanger, Item No 28 and all Fasteners and Lockwashers are in place and tight to hold the flanges of the three components securely. A Copper Gasket, Item No 29, is installed between the Inlet-Outlet Box and the flange of the Heat Exchanger Core Section, labeled as Joint No R. The flange between the Heat Exchanger Core section and the Shell flange, labeled Joint S has liquid gasket material installed and is not considered flameproof and does not have to be inspected.  
*[WEEKLY]*

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39. [ ] A 0.004" feeler gage cannot be inserted into the Joint No T.  
*[WEEKLY]*
40. [ ] Item No 33 is the Exhaust Flame Arrestor. It is securely attached to the Exhaust Elbow, and all Fasteners and Lockwashers are in place and tight. A Copper Gasket, Item No 34 is installed between the Exhaust Elbow and the Flame Arrestor, labeled Joint U.  
*[WEEKLY]*
41. [ ] A 0.0015" feeler gage cannot be inserted greater than 1/8" into the Joint No U.  
*[WEEKLY]*
42. [ ] Item No 35 is the Exhaust Filter Housing. It is securely attached to the Exhaust Flame Arrestor, and all Fasteners and Lockwashers are in place and tight. No gasket between the Flame Arrestor and the Filter Housing, labeled Joint V. No check is necessary on this joint.  
*[WEEKLY]*
43. [ ] Once every twelve-month, remove the Exhaust Flame arrestor. The core of the Flame Arrestor consists of a 4" wide stainless steel crimped ribbon element. There is no apparent damage and a 0.038" Plug Gage will not pass through any of the triangular openings. The proper procedure is outlined on Illustration 6. Reinstall the Exhaust Flame arrestor, and make sure all Fasteners and Lockwashers are in place and tight. A copper gasket is installed between the Flame Arrestor and the Exhaust Elbow and no gasket is used between the Flame Arrestor and the Exhaust Filter Housing.  
*[12 MONTH]*
44. [ ] Item No 35 is the 16" DPM Filter Housing and Item No 36 is the 16" M30 Exhaust DPM Filter.  
*[WEEKLY]*
45. [ ] The 16" filter element, Item No 36, must be marked "DST M30" or "PAAS M30" or "M30-411-01" on its end and must have a plug installed at the center of the inlet flange, if the flange has a center hole.  
*[WEEKLY]*
46. [ ] Remove the Exhaust DPM Filter element from the DPM Filter Housing. Wear gloves and avoid direct contact with diesel soot. Visually inspect the outlet side of the Flame Arrestor. There is no apparent damage to the crimped ribbon core of the Flame Arrestor. Visually inspect the Exhaust DPM Filter for damage and leaks. Reinstall the Exhaust DPM Filter element into the Filter Housing, or replace with a new element if necessary.  
*[WEEKLY]*
47. [ ] Item No 37 is a Water Injector for the On-board Cleaning System. The Water Injector is tightly installed into the pipe thread on top of the Inlet-Outlet Box. A hose is connected to the side of the Water Injector.  
*[WEEKLY]*
48. [ ] Item No 38 is the high exhaust gas temperature Shutdown Valve. The Shutdown Valve is tightly installed into the pipe thread on the Exhaust Elbow.  
*[WEEKLY]*

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49. [ ] Item No 39, is the exhaust gas temperature Sensor. The Sensor is tightly installed into the pipe  
*[WEEKLY]* thread on the Exhaust Elbow.

50. [ ] Item No 40 is the high coolant temperature Shutdown Valve. The Valve is tightly installed near  
*[WEEKLY]* the Diesel Engine's thermostat housing.

### Shut Down Devices

51. [ ] There are two high temperature Shutdown Valves, one for the high coolant temperature and  
*[WEEKLY]* one for the high exhaust gas temperature. Each valve will shut down the diesel engine when a pre-set temperature is exceeded. Both valves are installed.

52. [ ] Test both high temperature shutdown Valves are to be tested every 6 month as described  
*[EVERY 6 MONTH]* below:

a. ( ) Remove the high water temperature Shutdown Valve. Plug the opening in the thermostat with  
a pipe plug. Place high coolant temperature Shutdown Valve into a water & ethylene glycol mixture and heat the mixture. The high coolant temperature Shutdown Valve must open at 205° F and shut the engine down.

b. ( ) Remove the high gas temperature Shutdown Valve with the integral Well. Do not separate the  
Valve and the Well. Close the port in the Exhaust Elbow with a pipe plug. Place high exhaust temperature Shutdown Valve and Well into a non-flammable liquid, such as non-flammable transmission or hydraulic fluid, and heat. The high exhaust gas temperature Shutdown Valve must open at 285° F and the engine must shut down.

c. [ ] Reinstall both temperature Shutdown Valves into their proper locations.

53. [ ] With the throttle pedal fully depressed and the transmission in neutral and all accessories  
*[WEEKLY]* dis-engaged, the engine speed indicated on the gauge in the operators cab does not exceed 2,350 RPM

54. [ ] Run engine at high idle speed of 2,250-2,350 RPM. The total intake vacuum shown on the  
*[WEEKLY]* gauge in the operator's cab must not exceed 25 inches H<sub>2</sub>O.

55. [ ] With the engine running at intermediate speed, engage the Engine Stop Switch, which is the  
*[WEEKLY]* normal method to shut-down the engine. The engine must shut down IMMEDIATELY.

56. [ ] With the engine at idle speed of 650-950 RPM, activate the Emergency Shutdown Switch.  
*[WEEKLY]* The engine must shut down IMMEDIATELY.

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57. [ ] With the engine warmed up and at idle speed, attach a CO sampling device to the port labeled "Engine-out CO". Apply full load to the engine by means of torque stall and start sampling for engine-out CO according to the mandatory weekly check in Part 75.1914(g). For additional details, see more detailed instructions for this procedure in the DST manual. CAUTION: Do not allow the torque converter to overheat during the test.  
*[WEEKLY]*
58. [ ] At full load and 1,800-1,850 rpm engine speed, the total exhaust backpressure should not exceed 25 inches H<sub>2</sub>O indicated on the gauge in the operator's cab. (Applies only to systems with the sampling port installed in the bellows flange DOWNSTREAM of the turbocharger).  
*[WEEKLY]*
59. [ ] OPTIONAL: Next, attach the CO sampling device to the port labeled "Catalyzed CO". Apply full load to the engine by means of torque stall and start sampling for the treated CO from the system. See more detailed instructions for this procedure in the DST manual. CAUTION: Do not overheat the torque converter. If the catalyst would develop a problem, the treated CO levels will increase significantly. Any "treated CO" reading greater than 50% of the "engine-out CO" reading requires that the catalyst be checked for possible internal plugging.  
*[OPTIONAL]*

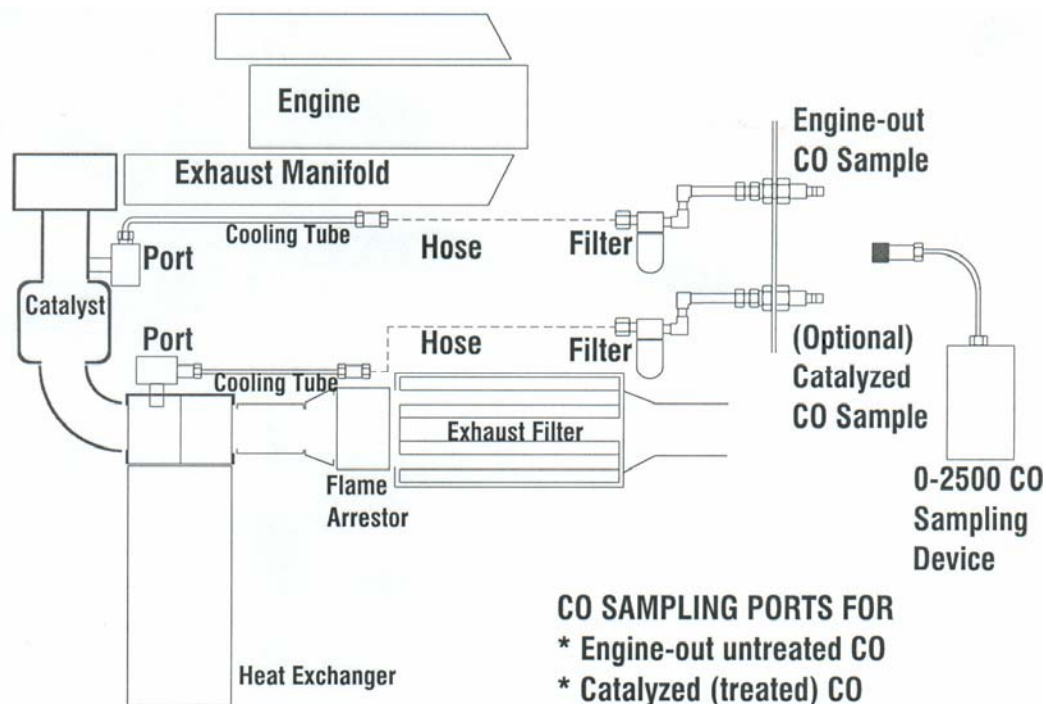


Illustration No 5: CO Sampling Procedure

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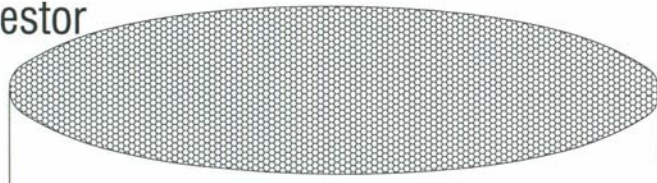
### (MSHA) FLAME ARRESTOR INSPECTION PROCEDURE



Wire Gage Holder  
M30-591-01

0.038" Ø Wire Gage

### Crimped Ribbon Flame Arrestor Exhaust: 0.038"



1. Remove the Flame Arrestor Assembly
2. Place the Flame Arrestor Assembly on a flat surface with a contrasting background under the flame arrestor, such as brattice cloth or clean white cloth.
3. Adequate lighting is required. Cap lamp lighting is not sufficient.
4. Visually inspect each side of the Flame Arrestor for openings or spaces obviously greater than the triangular openings of the core. These kinds of openings may have been caused by prying a screwdriver or another such object against or through the Flame Arrestor core during manufacturing or mine maintenance.
5. Visually inspect each side of the core for places where the windings of the flame arrestor core appear to be separated such that gaps can be seen. If such gaps exist, they must be checked as following:
  - a.) The only measuring tool considered acceptable for performing this evaluation is a 0.038 inch diameter calibrated plug gauge, sometimes called wire gauge. The Plug Gauge is to be mounted in
    - a Gauge Holder weighing 1.0 to 1.5 ounces and projecting at least 1.0 inch out of the end.
    - b.) Grasp the gauge holder lightly between the index finger and the thumb. Place the wire tip at the point in question, making sure the plug gauge is vertical. Using only the weight of the gauge and holder see if it will enter the apparent gap. Do not attempt to wiggle the gauge through the opening.
    - c.) If the plug gauge enters the opening, the flame arrestor core must not be used on permissible equipment.
  6. Visually inspect the triangles in the flame arrestor core (both sides) for triangles that appear to be larger than the rest. If such conditions exist, these openings must be checked as previously described in section 5 a, b and c.
  7. Finally, if the flame arrestor core passes all the above evaluations, a final check should be performed on at least 5 triangles on each side of the core with the procedure described in section 5 a, b and c. In performing this check, the tip of the plug gauge must be placed against a specific triangular opening. If this special care is not taken, the evaluation will be invalid.

Illustration No 6: Flame Arrestor Checking Procedure

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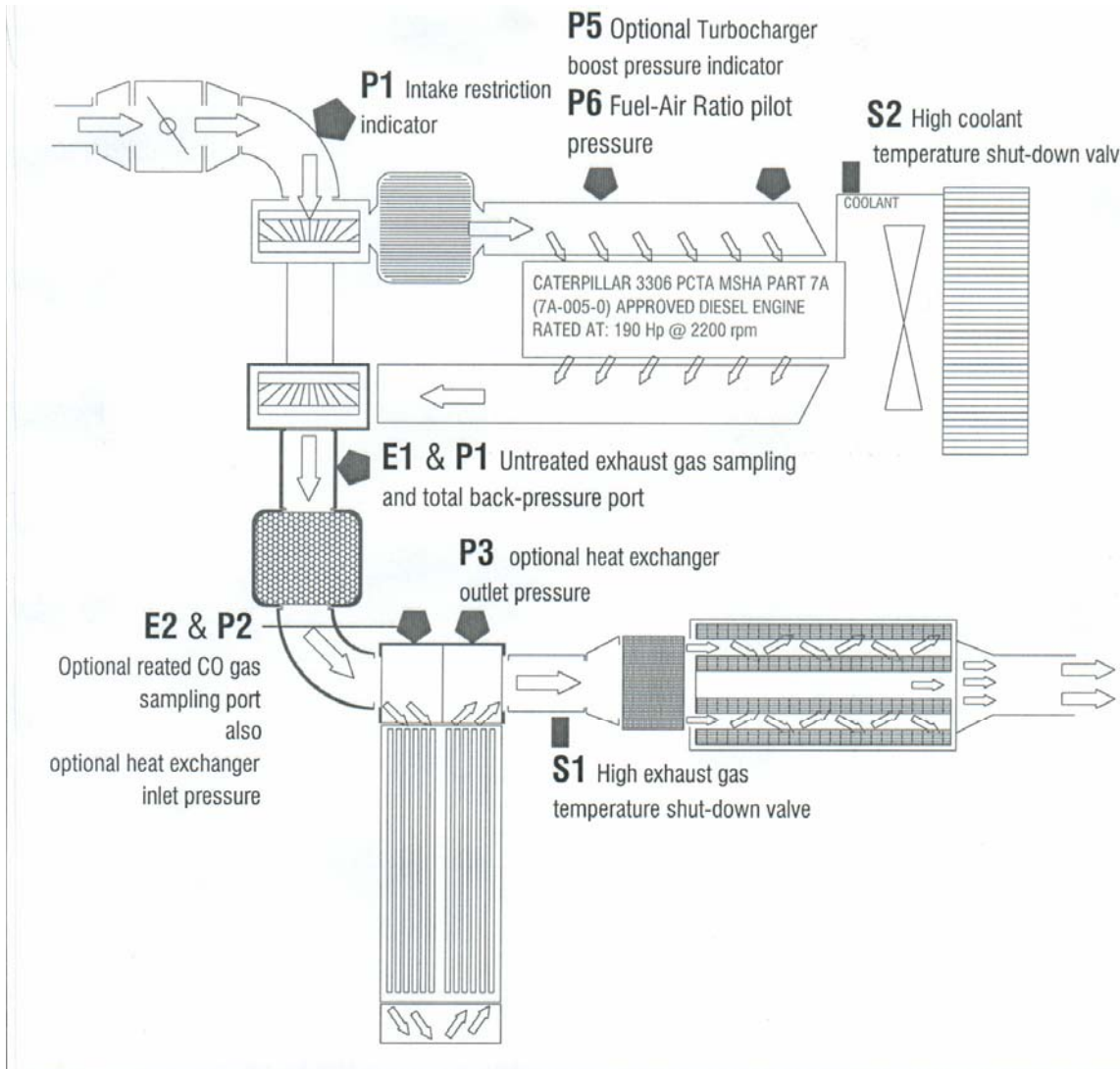


Illustration No 7: Location of Pressure and Temperature Probes

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This permissibility checklist contains 59 items on 13 pages with 7 illustrations.