



CLARKE

Fire Protection Products, Inc.

CLARKE UK, LTD.

Fire Protection Products

Cincinnati, Ohio USA - Glasgow, Scotland UK

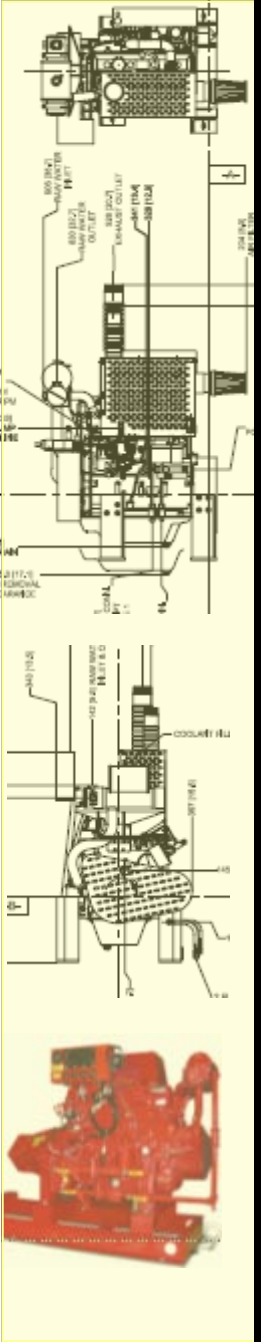
Diesel Engines for Fire Protection Applications

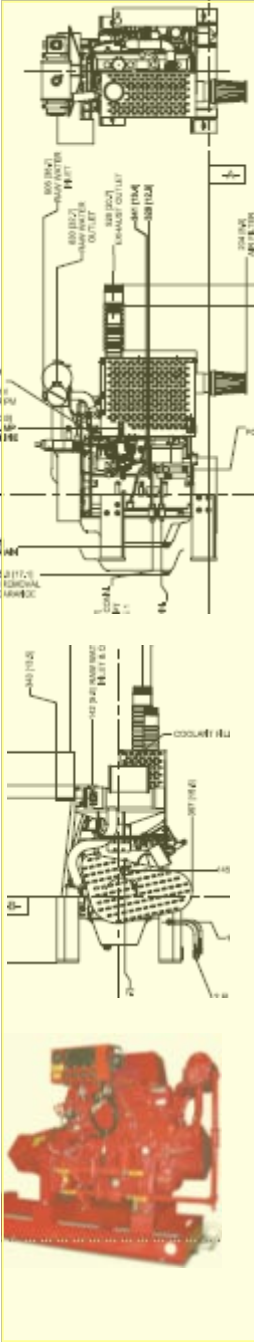
Based on NFPA 20 2010 Edition

www.clarkefire.com

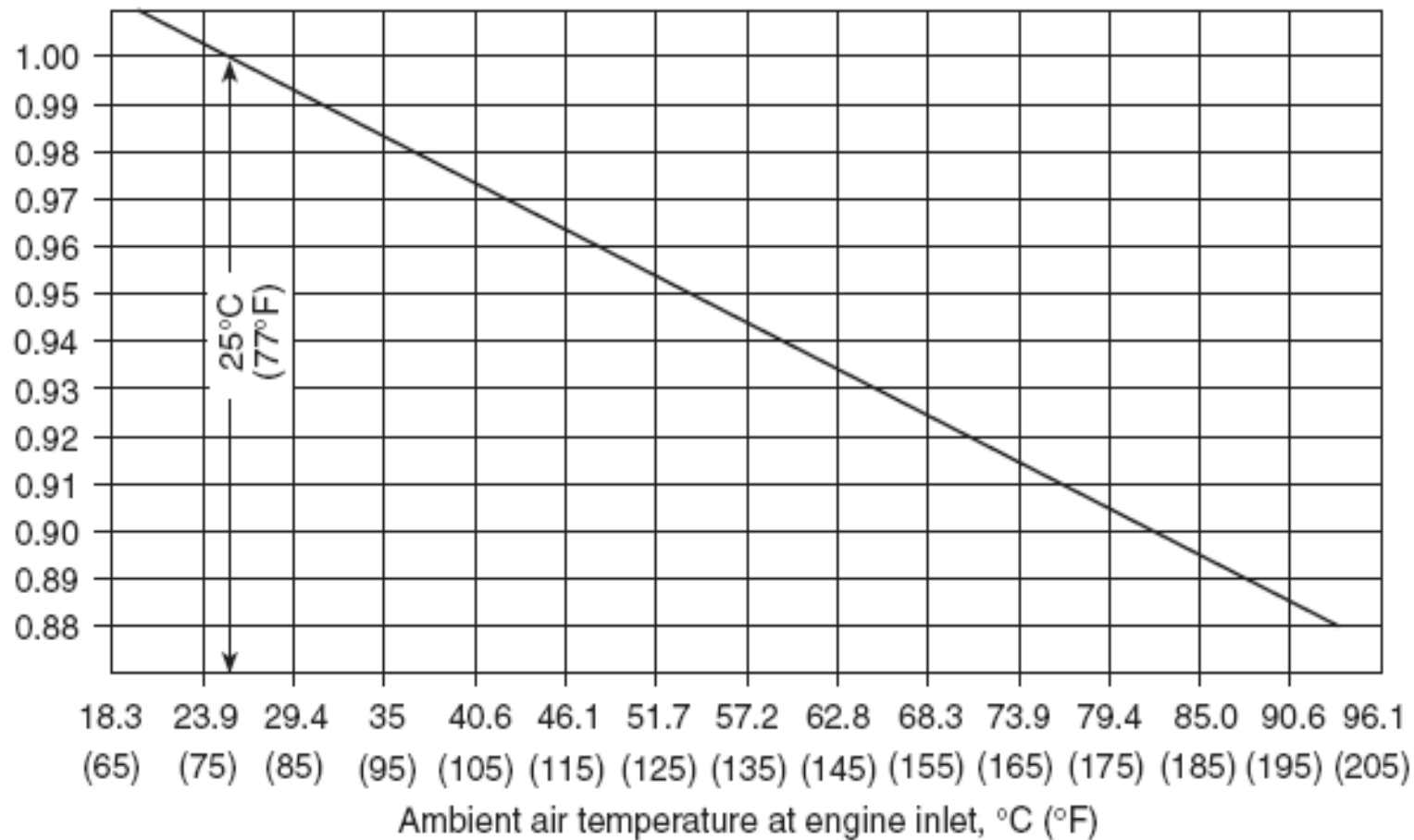
NFPA 20 - Engine Ratings

- Rated at SAE Conditions 25°C (77°F) and 91 m (300 ft) above sea level.
- Engines must have at least a 10% reserve in horsepower and a 4 hour minimum run time. (All UL-FM engine ratings reflect this requirement).
- Engines must be derated for Altitude and Temperature.
 - 3% Derate for every 300 m (1000 ft) above 91 m (300 ft).
 - 1% Derate for every 5.6°C (10°F) above 25°C (77° F).





Derate factor (C_T)



Note: The correction equation is as follows:

$$\text{Corrected engine horsepower} = (C_A + C_T - 1) \times \text{listed engine horsepower}$$

where:

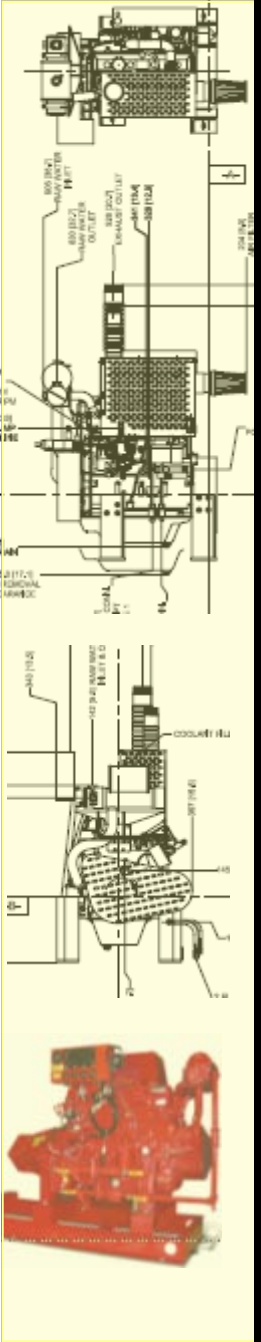
C_A = derate factor for elevation

C_T = derate factor for temperature

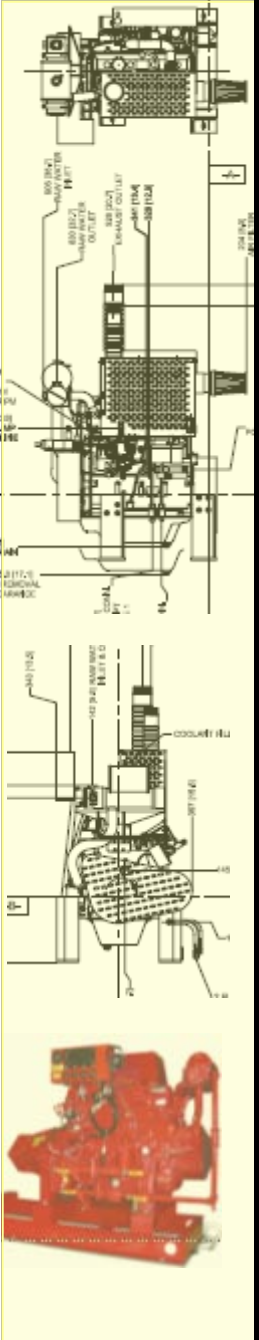
FIGURE A.11.2.2.5 Temperature Derate Curve.

Derate Example

- 150 hp engine
- Altitude 1,524 m (5,000 ft): $C_A = .86$
- Temperature 41°C (105°F): $C_T = .973$
- Formula: $(C_A + C_T - 1) \times \text{hp} = \text{derated hp}$
- $(.86 + .973 - 1) = .833 \times 150 \text{ hp} = 124.95 \text{ hp}$
- Clarke Selection/Derate Calculator program can calculate the exact size engine you need to use.



Engine Selection/De-rate Calculator



Clarke Fire - Windows Internet Explorer

http://www.clarkefire.com/EngineSelctionTools/ENGINESELECTIONDERATECALUSA.aspx

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http://www.standards.org.s... | Clarke Fire

2) PUMP MAX POWER
Max Power:
Power Units: BHP KW
(Allow screen to refresh after selection)

3) ENGINE/PUMP RPM
Interpolated RPM: No Yes
(Allow screen to refresh after selection)

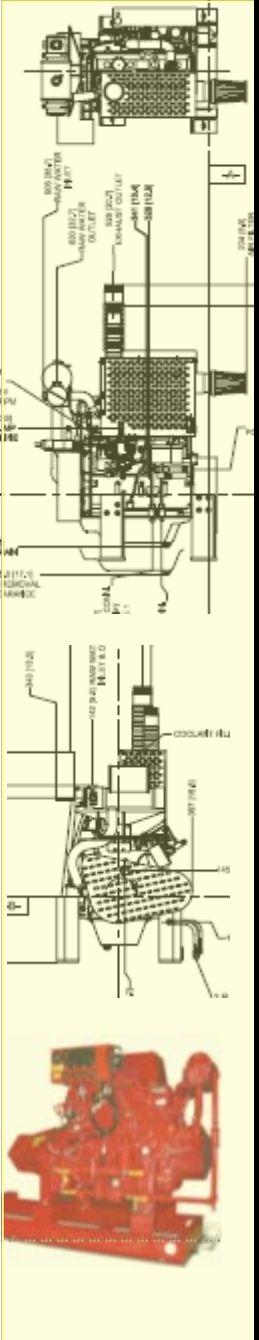
RPM: 1500 1800 1900 2000 2100 2200 2300 2350 2400 2500 2600 2800 3000 3300 3600
Ctrl-Click to select multiple RPM's

4) ENGINE DERATES
Altitude (ft):
Derate 3% per every 1000 ft. above 300 ft.
Ambient Temperature (°F):
Derate 1% for every 10 °F above 77°
Right Angle Gear Loss (%):

5) APPLICATION DATA
Customer:
Job Name:
Job Number:
Input By:

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Engine Selection/De-rate Calculator



Clarke Fire - Windows Internet Explorer

http://www.clarkefire.com/EngineSelctionTools/ENGINESELECTIONDERATECALCUA.aspx

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CLARKE HOME SEARCH

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 **Clarke...the first name in fire protection.**

Engine Selection / Derate / Speed Interpolator - USA

Use the handy calculator below to select your engine. It takes just minutes to complete. Note: If you experience any sort of problems please contact Donna Pentler immediately. Donna can be reached at 513-719-2320 or email her at dpentler@clarkefire.com

Engine Selection / De-rate Calculator / Speed Interpolator

USA Purchased, Export, 2010 Models, UL/FM Approved, Heat Exchanger Cooled

DATE: 8/9/2010

PUMP REQUIREMENTS: **Pump Max Power:** 150 BHP
RPM(s): 1800

DERATE PARAMETERS: **Altitude:** 5000 (feet)
Ambient Temperature: 105 (°F)
Right Angle Gear Loss: 0%
Derate Percent: 16.9

RESULTS:

Model	RPM	Rated HP (KW)	Derate HP (KW)	EPA Emission Tier (Reference)	Interpolation Data (RPM, HP)
JU6H-UFAAQ8	1800	227 (169)	188.6 (140.4)	N-Non-Emissionized	Not used
JU6H-UF50	1800	183 (137)	152.1 (113.8)	T1-Compliant	Not used
JU6H-UF58	1800	183 (137)	152.1 (113.8)	T1-Compliant	Not used

Alternate T3-Certified engine selections:

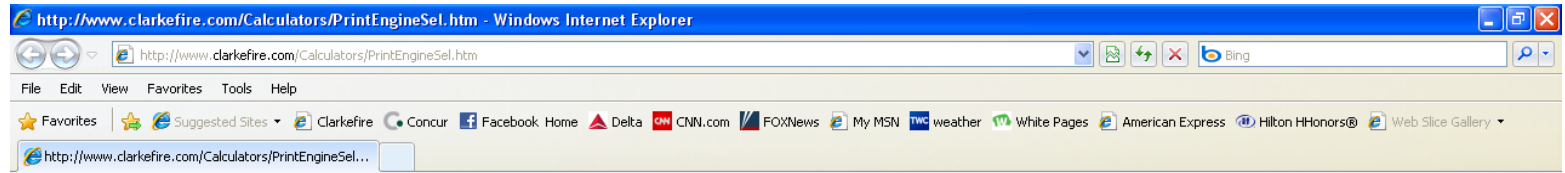
Model	RPM	Rated HP (KW)	Derate HP (KW)	EPA Emission Tier (Reference)	Interpolation Data (RPM, HP)
JU6H-UFAD58	1800	183 (137)	152.1 (113.8)	T3-Certified	Not used

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Engine Selection/De-rate Calculator



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Fire Protection Products, Inc.

Engine Selection / De-rate Calculator / Speed Interpolator

USA Purchased, Export, 2010 Models, UL/FM Approved, Heat Exchanger Cooled

DATE: 8/9/2010

PUMP REQUIREMENTS: Pump Max Power: 150 BHP
RPM(s): 1800

DERATE PARAMETERS: Altitude: 5000 (feet)
Ambient Temperature: 105 (°F)
Right Angle Gear Loss: 0%
Derate Percent: 16.9

APPLICATION INFO: Customer: Test 1
Job Name: Job 1
Job Number: 1
Run By: Justin Strousse

RESULTS:

Model	RPM	Rated HP (KW)	Derate HP (KW)	EPA Emission Tier (Reference)	Interpolation Data (RPM, HP)
JU6H-UFAAQ8	1800	227 (169)	188.6 (140.4)	N-Non-Emissionized	Not used
JU6H-UF50	1800	183 (137)	152.1 (113.8)	T1-Compliant	Not used
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Alternate T3-Certified engine selections:

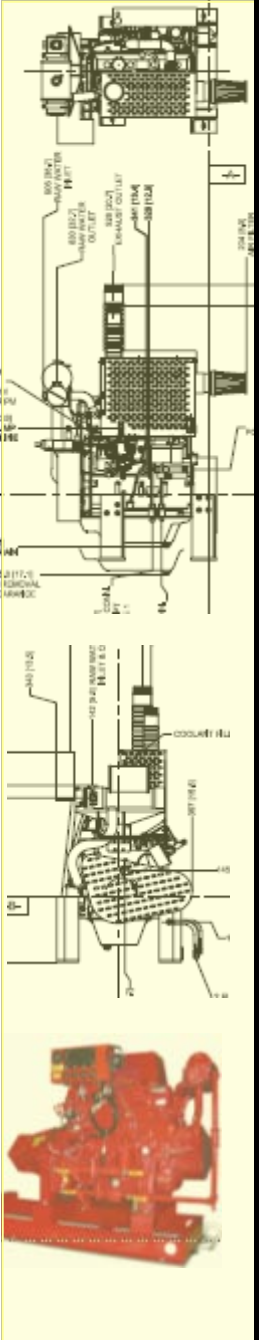
Model	RPM	Rated HP (KW)	Derate HP (KW)	EPA Emission Tier (Reference)	Interpolation Data (RPM, HP)
JU6H-UFAD58	1800	183 (137)	152.1 (113.8)	T3-Certified	Not used

NOTE:

Derated HP takes into account all the input derates for altitude, temperature and Right Angle Gearbox. When no derates are input, this column will be blank and engine selection(s) will be based upon Rated HP. When the Derated HP column is filled in, then the engine selection(s) are based upon this value.

DEFINITIONS:

- UL/FM - Engine that is Underwriters Laboratories Listed and Factory Mutual Approved



Over speed Setting Verification

To verify the engine over speed setting and function without over speeding the engine, follow this procedure:

- Start engine manually from the controller while holding the over speed verification switch in the ‘up’ position. Observe the shutdown RPM.
- Test switch returns to normal position when released.
- Reset the over speed switch on the engine instrument panel and restart the engine from the controller to verify normal operation.
- **EXAMPLE:**

Rated engine speed:

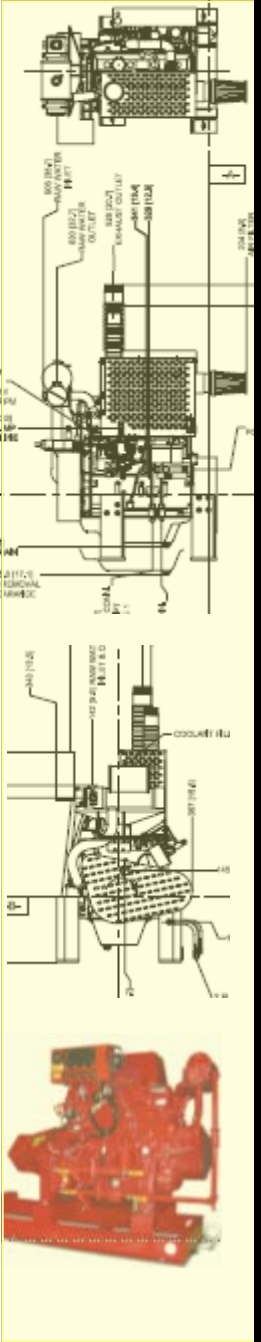
2100 rpm

Over speed setting:

2520 rpm (120% 2100 rpm)

Verification shutdown:

1688 rpm (67% of 2520 rpm)



JU and JW Series Instrument Panel

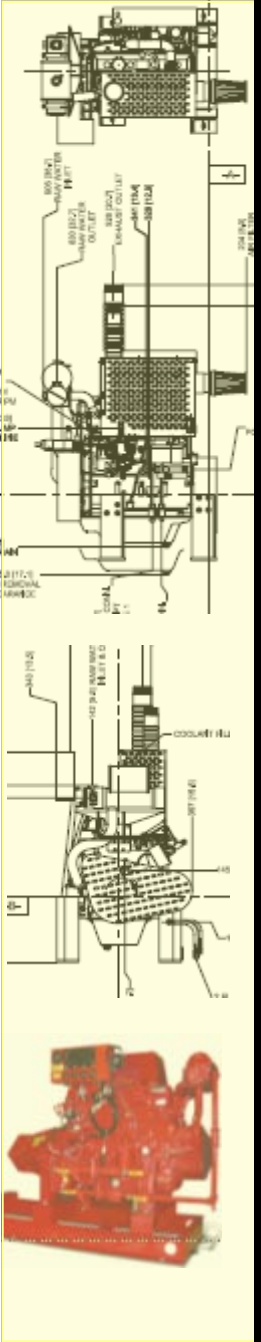


- 1** Tachometer with Hour-meter
- 2** Mode Selector Switch
- 3** Manual Operating Instructions
- 4** 'Red' Warning Light
- 5** Overspeed Reset Switch
- 6** Manual Start Contactor #1

- 7** Manual Start Contactor #2
- 8** Overspeed Verification @ 67%
- 9** Engine Oil Pressure Gauge
- 10** Voltmeter - Battery Set #1
- 11** Voltmeter - Battery Set #2
- 12** Coolant Temperature Gauge

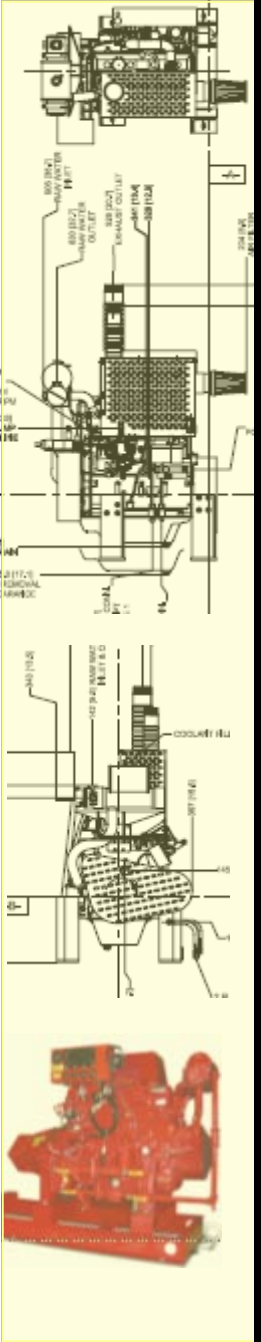
NFPA 20 – Instrumentation & Control

- Required Gauges:
 - Tachometer – indicates rpms
 - Oil Pressure Gauge
 - Coolant Temperature Gauge
 - Hour meter – record engine run time
- Additional Gauges:
 - Two voltmeters – one for each set of batteries



NFPA 20 – Instrumentation & Control

- The engine instrument panel shall not be used as a junction box or conduit for any ac supply.
- Interconnections between the automatic controller and engine junction box shall be made using stranded wire sized on a continuous-duty basis.
- The dc interconnections between the automatic controller and engine junction box and any ac power supply to the engine shall be routed in separate conduit.



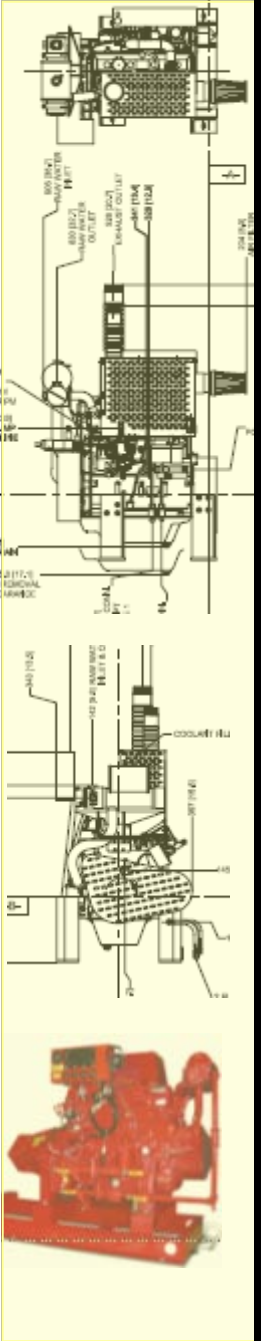
Engine-to-Controller Connections

Terminal	Interconnect Function	
W	Cooling Solenoid	(only on mechanical and JX 12.5L)
1	Signal from Controller	Energize to Run
2	Signal to Controller	Engine Running
3	Signal to Controller	Over Speed Alarm
4	Signal to Controller	Low Oil Pressure Alarm
5	Signal to Controller	High Engine Coolant Temp. Alarm
6	Power Supply and Charging	Set #1
8	Power Supply and Charging	Set #2
9	Cranking Signal from Controller	Start System #1
10	Cranking Signal from Controller	Start System #2
11	Common Ground	
301	Signal to Controller	Alternate ECM Alarm (electronic engines)
302	Signal to Controller	General Fault Alarm(electronic engines)

Typical Wire Size **

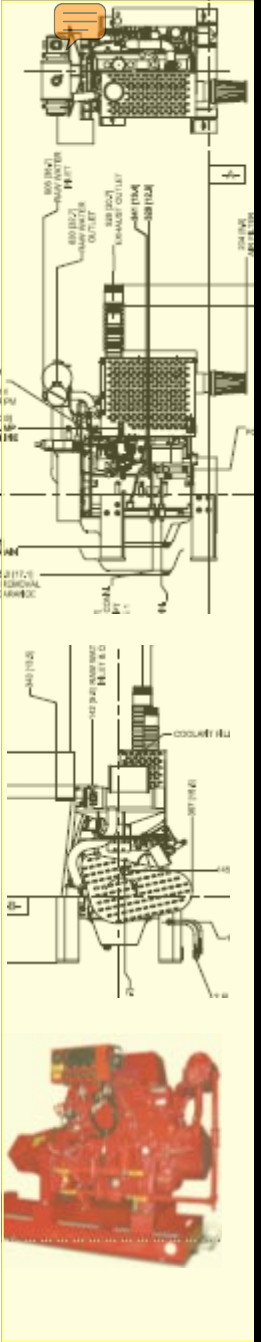
**Refer to Controller Manufacturer's Installation Instructions for minimum size recommendations.

# W, 1-5, 9, 10, 301, 302	14 Gauge (2 mm) Stranded Wire
#6, 8, 11,	10 Gauge (5 mm) Stranded Wire



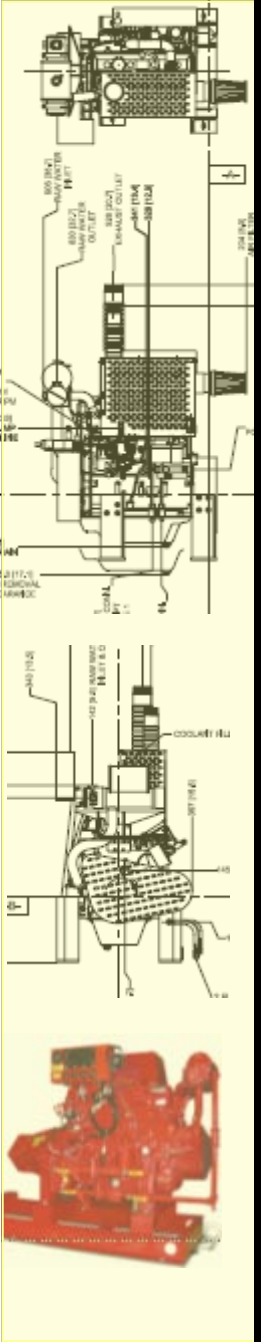
NFPA 20 – Instrumentation & Control

- Engines with only one starting motor shall include a main battery contactor installed between each battery and the cranking motor for battery isolation.
 - The battery contactors shall be listed for the service.
- Engines with two cranking motors shall have one cranking motor dedicated to each battery.
- Clarke electric starting standard;
 - One (1) starter on JW6H, JX6H units.
 - Two (2) starters on JU4H, JU6H units.

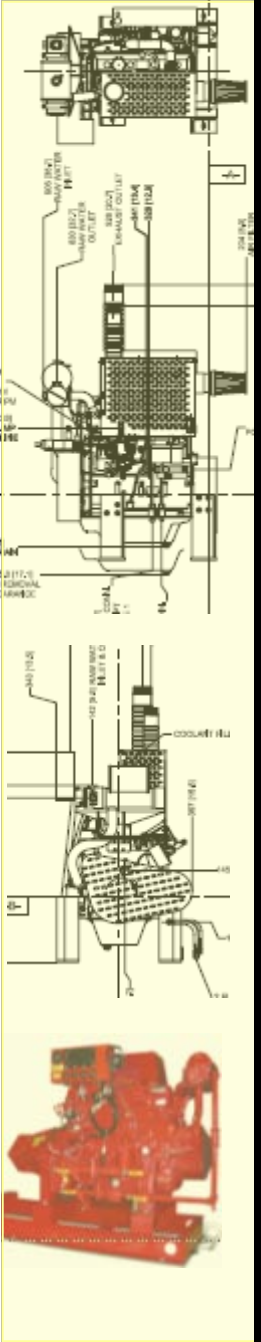


NFPA 20 – Instrumentation & Control Electronic Engines

- Engines with an electronic control module (ECM) shall have an alternate ECM wired to produce full power in the event of primary ECM failure.
- There shall be a single ECM Selector Switch, with no off position, to transition from the primary ECM to the alternate ECM.
- A visual indicator shall show when the engine is running with the alternate ECM. (On both the engine panel and on the diesel controller)



JX Series Instrument Panel



VOLTMETER
BATTERY #2



BATTERY #1

MODE
SELECTOR

MANUAL RUN



AUTOMATIC



WARNING
MODE SELECTOR NOT
IN AUTOMATIC
ENGINE WILL
NOT STOP

CLARKE

FIRE PUMP ENGINE - MANUAL OPERATING INSTRUCTIONS

TO START ENGINE

1. Position MODE SELECTOR switch to MANUAL RUN.
2. Lift and hold MANUAL CRANK #1 until engine starts, or release after 15 seconds. If unit fails to start, wait for 15 seconds, use MANUAL CRANK #2 and repeat step.
3. If COOLING WATER is not flowing or engine TEMPERATURE is too HIGH, open cooling system manual by-pass valve.

TO STOP ENGINE

1. Lift and hold MANUAL STOP until Engine Stops.
2. Return MODE SELECTOR switch to AUTOMATIC position.
3. Close cooling system manual by-pass valve, if opened.

IMPORTANT

DO NOT leave the MODE SELECTOR switch in the MANUAL RUN position during AUTOMATIC operation.

OVERSPEED RESET

1. After problem has been corrected, reset the speed sensing device by lifting the OVERSPEED RESET and hold for 30 seconds.

MANUAL
STOP



MANUAL CRANK
#1



MANUAL CRANK
#2



OVERSPEED
RESET

ECM
SELECTOR

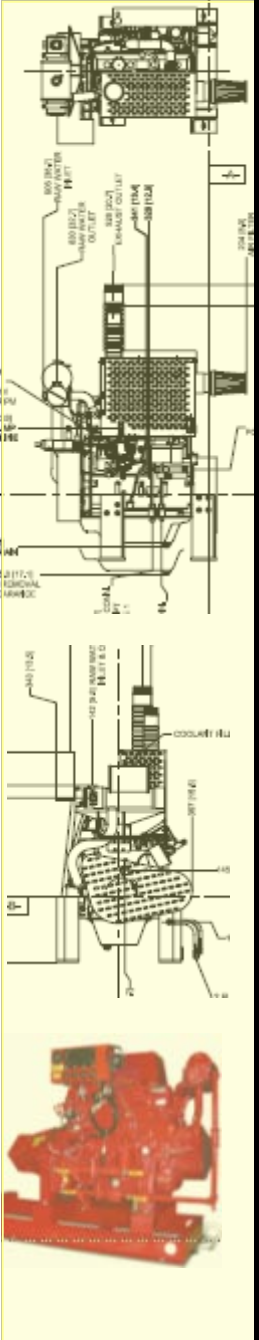
ALTERNATE ECM



PRIME ECM



WARNING
OPERATING ON
ALTERNATE ECM





**MODE
SELECTOR**
MANUAL RUN



AUTOMATIC

WARNING
MODE SELECTOR
NOT IN
AUTOMATIC







VOLTMETER

BATTERY #2



BATTERY #1

FIRE PUMP ENGINE - MANUAL OPERATING INSTRUCTIONS

TO START ENGINE

1. Position **MODE SELECTOR** switch to **MANUAL RUN**.
2. Lift and hold **MANUAL CRANK #1** until engine starts, or release after 15 seconds. If unit fails to start, wait for 15 seconds, use **MANUAL CRANK #2** and repeat step.
3. If **COOLING WATER** is not flowing or engine **TEMPERATURE** is too high open cooling system manual by-pass valve.

TO STOP ENGINE

1. Lift and hold **MANUAL STOP** until Engine Stops.
2. Return **MODE SELECTOR** switch to **AUTOMATIC** position.
3. Close cooling system manual by-pass valve, if opened.

IMPORTANT

DO NOT leave the **MODE SELECTOR** switch in the **MANUAL RUN** position during **AUTOMATIC** operation.

EMERGENCY FAILED TO START INSTRUCTIONS

SELECT ALTERNATE ECU

If a failed to start condition has occurred, move the **ECM selector** switch to the **ALTERNATE ECM** position, then follow manual operating instructions above.

**MANUAL
STOP**



**MANUAL CRANK
#1**



**MANUAL CRANK
#2**



WARNING
OPERATING ON
ALTERNATE ECM

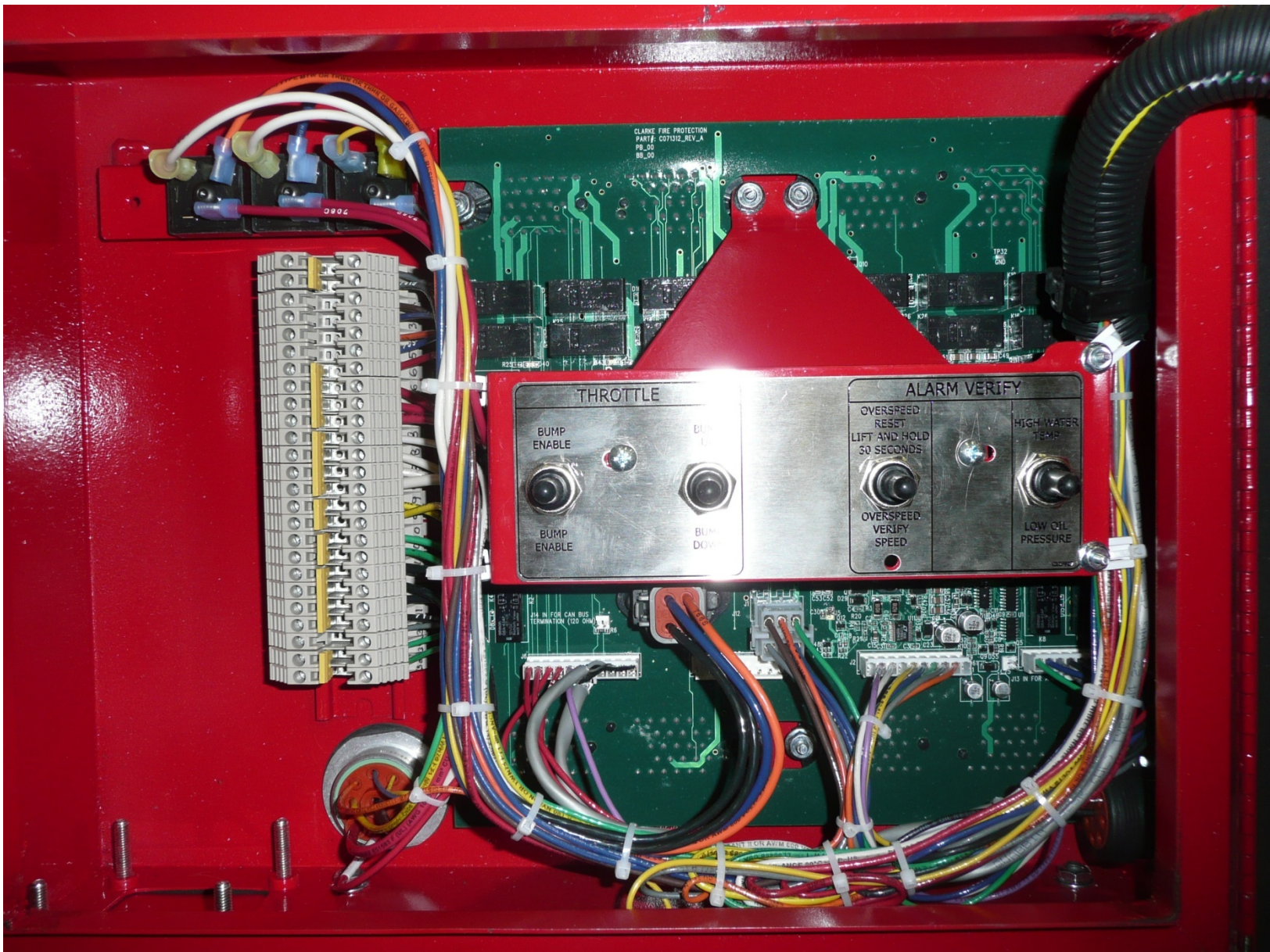
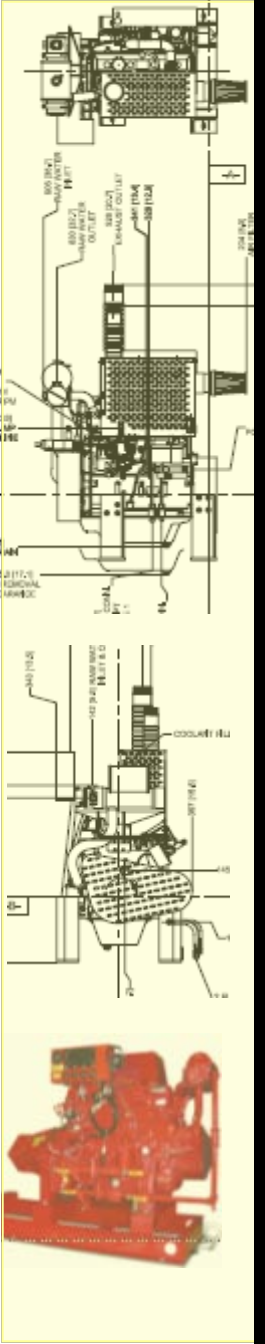


**ALTERNATE ECM
WARNING:
DO NOT SWITCH WHILE
THE ENGINE IS RUNNING**



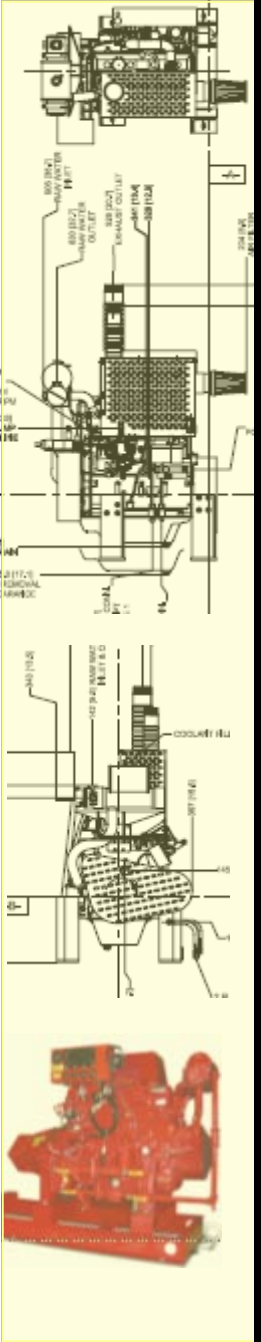
**PRIMARY ECM
ECM
SELECTOR**

C125782



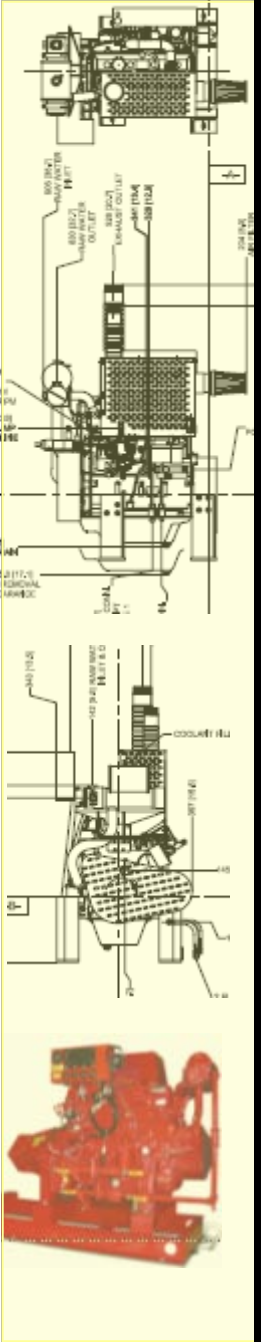
NFPA 20 – Instrumentation & Control Electronic Engines

- Any sensor necessary for the function of the ECM shall have a redundant sensor that shall operate automatically in case of failure.
- A signal shall be provided to the diesel controller for fuel injector failure, low fuel pressure and any primary sensor failure.
- **New for 2010** - The transition from the primary ECM to the alternate ECM shall be accomplished automatically upon failure of the primary ECM



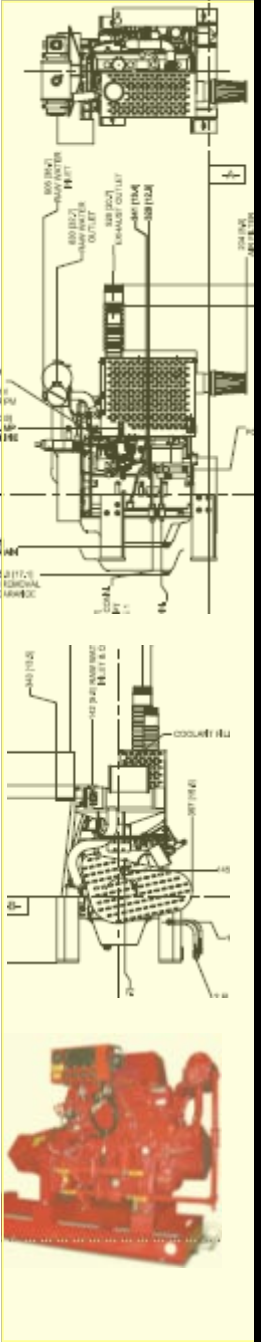
NFPA 20 – Instrumentation & Control

- Each engine shall be provided with two storage battery units.
- Electrolyte shall be added a minimum of 24 hours prior to the time the engine has to be started.
- At 4.5°C (40°F) each battery shall have twice the capacity sufficient to maintain 3 minute attempt-to-start cycle (15 seconds of cranking and 15 seconds of rest in six consecutive cycles).
- **New for 2010** - Batteries shall be sized on a calculated capacity of 72 hours of stand by power with out AC power being available



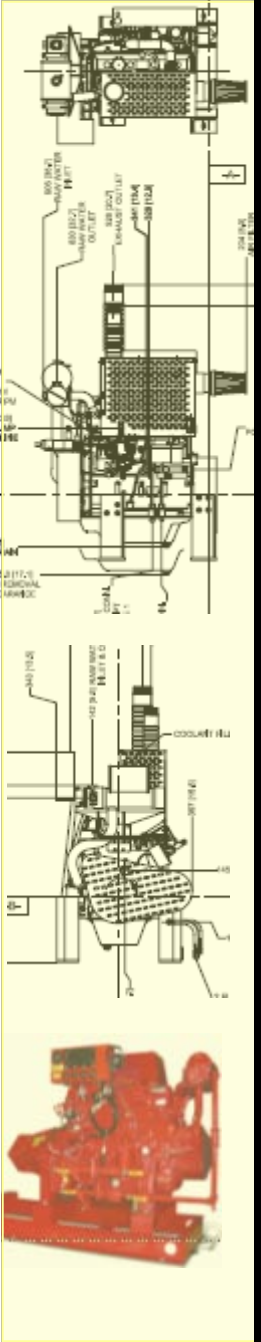
NFPA 20 – Instrumentation & Control

- Storage batteries shall be rack supported above the floor to prevent water damage.
- Storage batteries shall be readily accessible for servicing.
- Storage batteries shall not be located in front of the engine mounted instruments and controls.



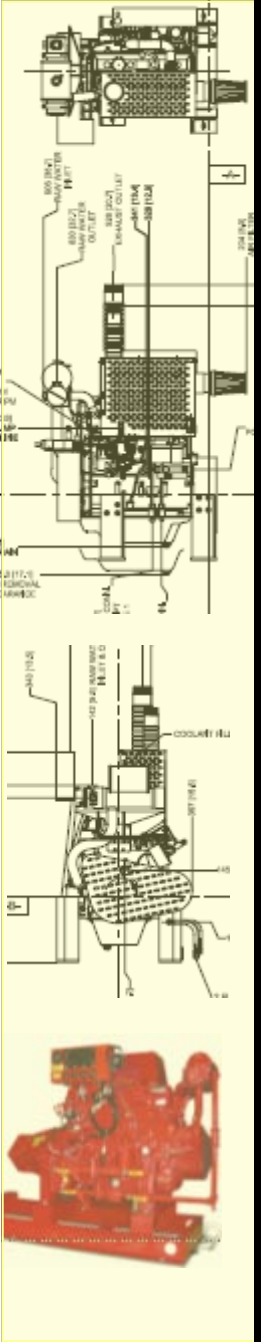
NFPA 20 – Instrumentation & Control

- There should be two means for recharging the storage batteries.
 - The battery chargers in the diesel controller is the primary source.
 - The alternator on the engine is the secondary source.



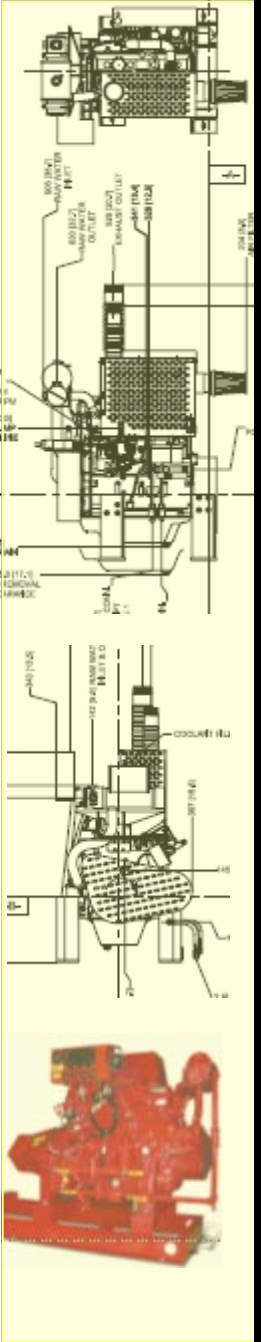
NFPA 20 – Connecting to Pump

- Engines shall be connected to horizontal shaft pumps by means of a flexible coupling or flexible connecting shaft (drive shaft) **listed** for this service.
- The flexible coupling shall be directly attached to the engine flywheel adapter or stub shaft.



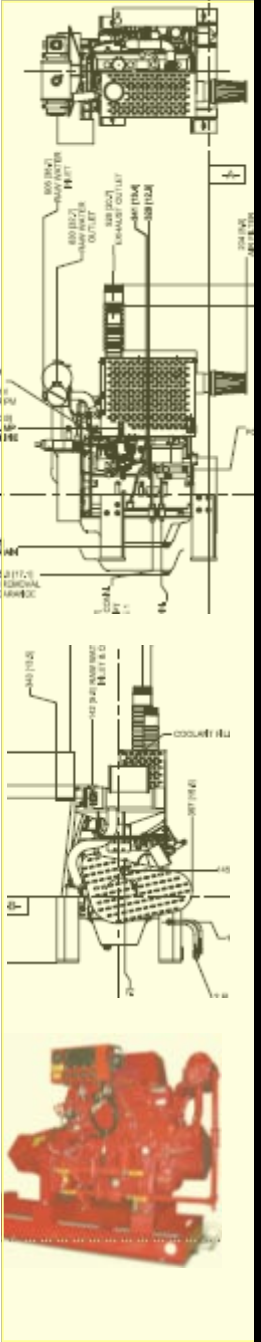
NFPA 20 – Engine Cooling

- The engine cooling system shall be of the closed-circuit type.
 - Heat exchanger type
 - Radiator type



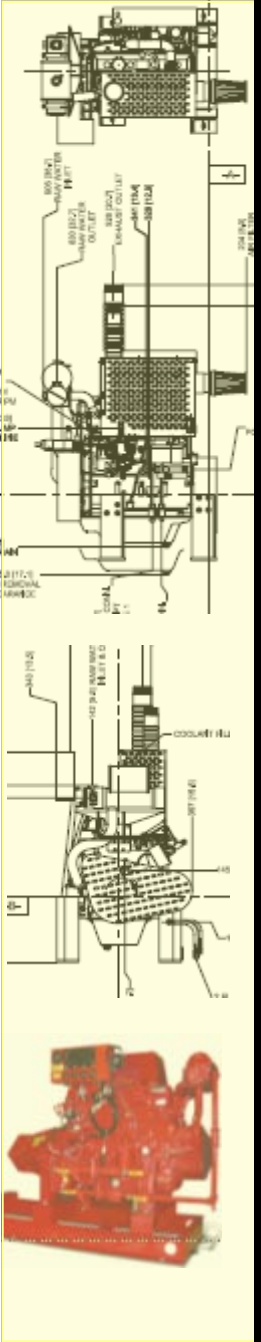
NFPA 20 – Engine Cooling

- Cooling water shall be piped through a threaded rigid pipe from the discharge of the pump to the inlet of the heat exchanger.
- It is not permitted to use flexible tubing attached to the cooling loop.



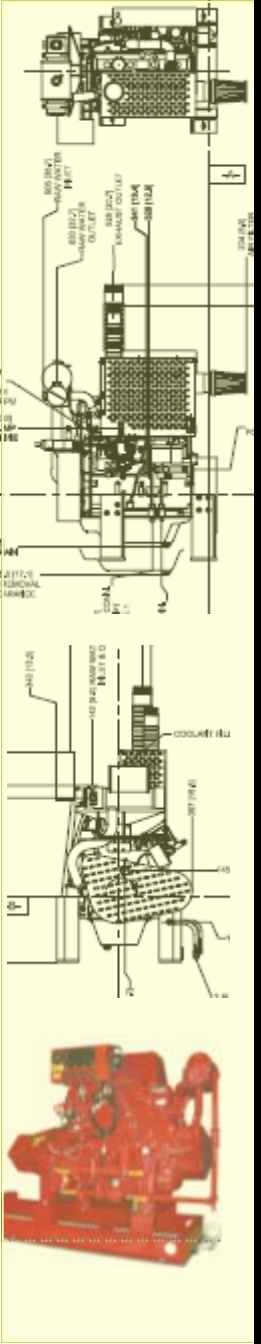
NFPA 20 – Engine Cooling

- The outlet for the wastewater coming from the heat exchanger shall be one size larger than the inlet.
- The wastewater shall be discharged into a visible open waste cone.
- Discharge can be piped to a suction reservoir provided a visual flow indicator and temperature indicators are installed.

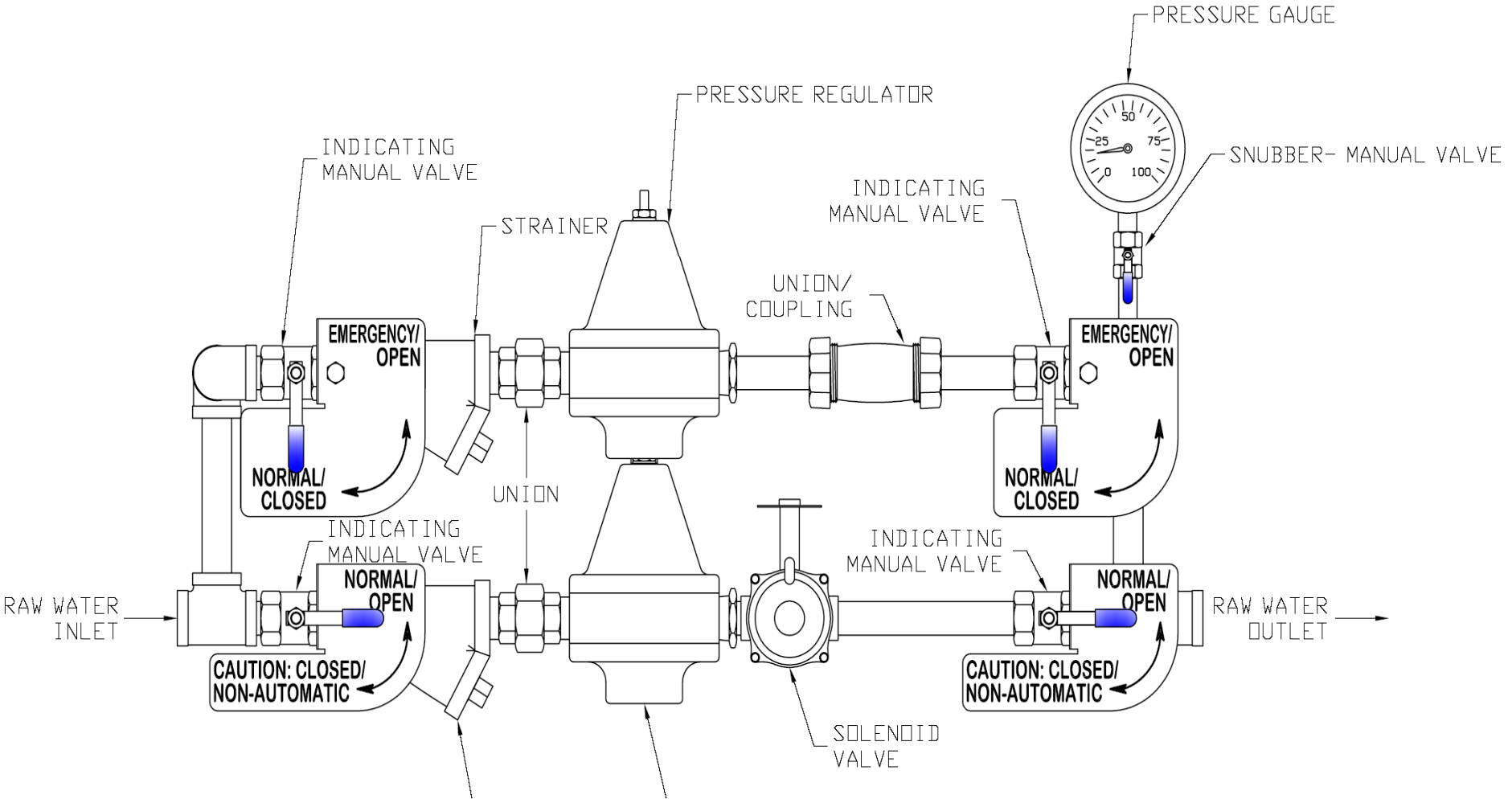


NFPA 20 – Engine Cooling

- Heat exchanger standard equipment.
- Sea water or fresh water; sacrificial anode optional.
- Engines are shipped without coolant.
- Cooling water line (cooling loop) shall have a manual by-pass.
- Cooling water line and by-pass shall include:
 - indicating manual shutoff valve
 - approved flushing-type strainer
 - pressure regulator
 - automatic valve
 - second indicating manual valve or check valve
 - pressure gauge

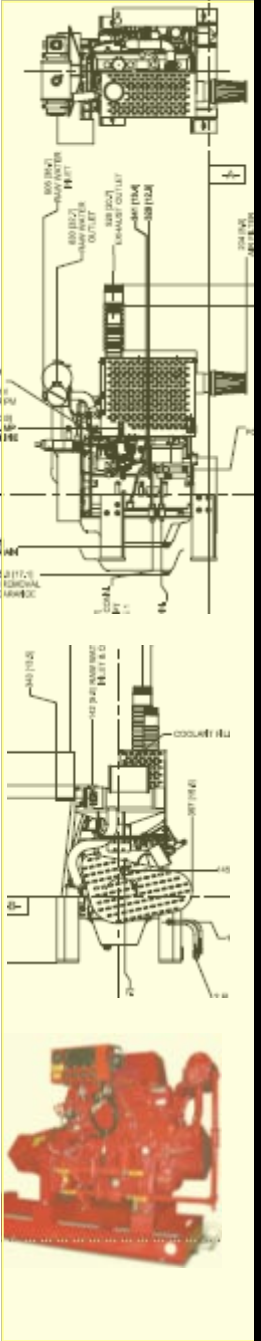


Cooling Water Line



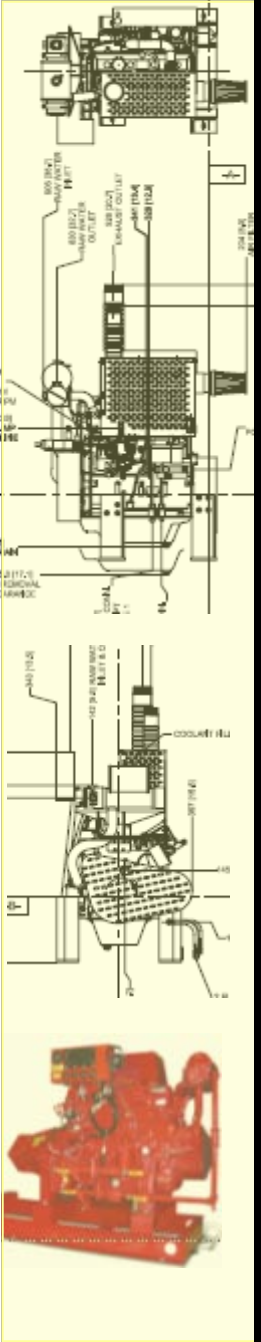
Engine Coolant

- Coolant is now included with the engine.
- Water, ethylene glycol, inhibitor coolant mixture. 50% water 50% coolant.
- Coolant to conform to ASTM D6210 or D4985 with SCA's.
 - Heat transfer
 - Corrosion resistance
 - Prevents cavitation
 - Prevents scale and sludge build up
 - Provides freeze and boil over protection
- Pre-mix before installing in engine to prevent premature engine heater failure.



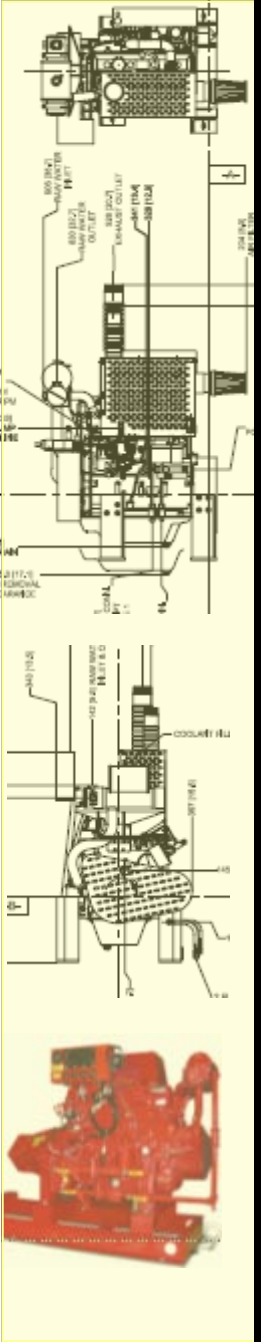
NFPA 20 – Engine Cooling

- Coolant heater is the only AC power on engine; Separate AC junction box required. Do not use controller AC for power supply.
- Add coolant mixture *before* applying AC power.
- All heaters single voltage; Optional AC voltages available - location specific.
- Engine coolant maintained at 49°C (120°F).



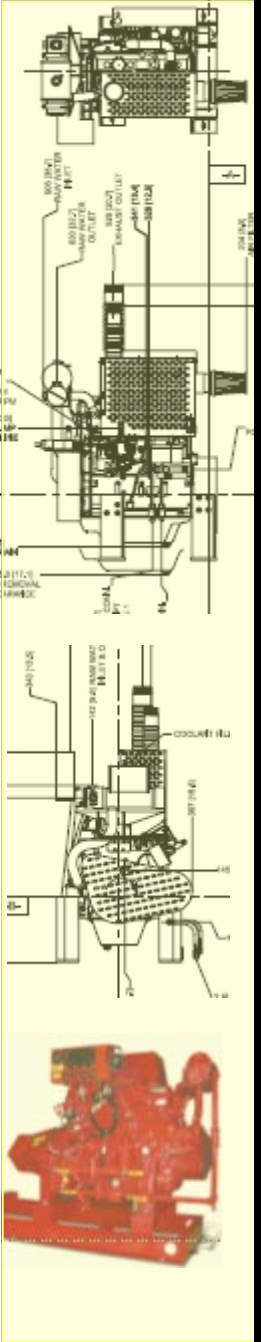
NFPA 20 – Engine Protection

- The engine shall be protected against possible interruption of service through explosion, fire, flood, earthquake, rodents, insects, windstorm, freezing, vandalism and other adverse conditions.
- Application: The engine must be installed inside or protected from the weather and low temperature.



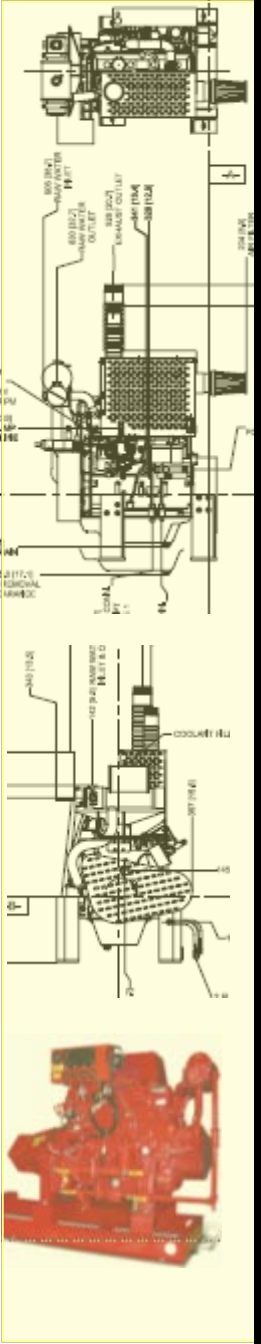
NFPA 20 – Room Requirements

- Floors shall be pitched for adequate drainage of escaping water from critical equipment.
- The pump room shall be provided with a floor drain that will discharge to a frost free location.
- Fire pump rooms enclosing a diesel engine pump driver and day tank shall be protected with an automatic sprinkler system installed in accordance with NFPA 13.
- Emergency lighting shall be provided in accordance with NFPA 101. Emergency lights shall not be connected to an engine starting battery



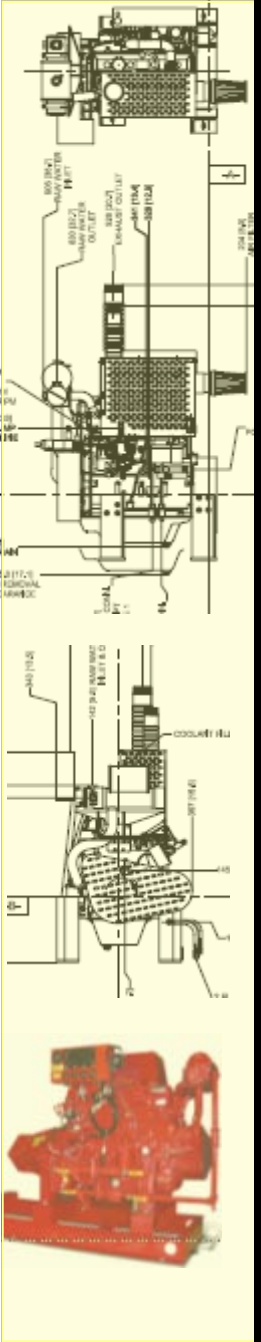
NFPA 20 – Room Requirements

- Rooms containing fire pumps shall be free from storage & penetrations not essential to the operation of the pump.
- **New for 2010** - Equipment related to domestic water distribution shall be permitted to be located within the same room as fire pump equipment.
- **New for 2010** - Room needs to be protected from surrounding occupancies by a minimum of 2 hour fire rated construction or physically separated from the building by 50 ft (15.3m) away from any buildings and other fire exposures exposing the building.



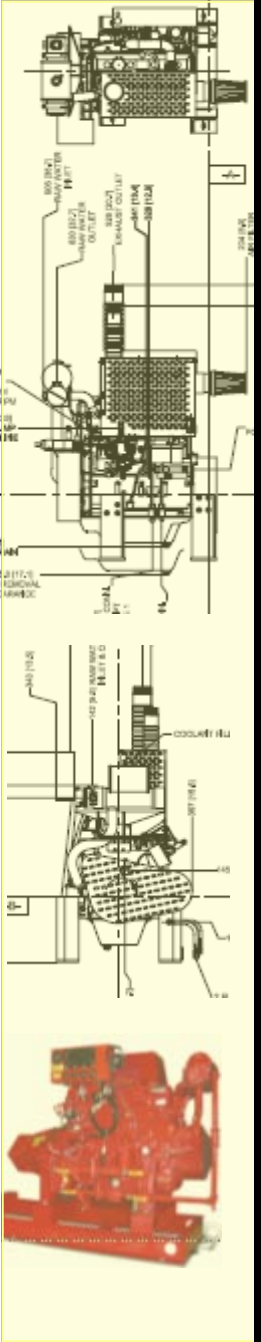
NFPA 20 – Room Requirements

- **New for 2010** – Access to the fire pump room shall be pre-planned with the fire department
- **New for 2010** - Fire pump rooms not directly accessible from the outside shall be accessible through an enclosed passageway from an enclosed stairway or exterior exit. The enclosed passageway shall have a minimum 2 hour fire resistance rating.



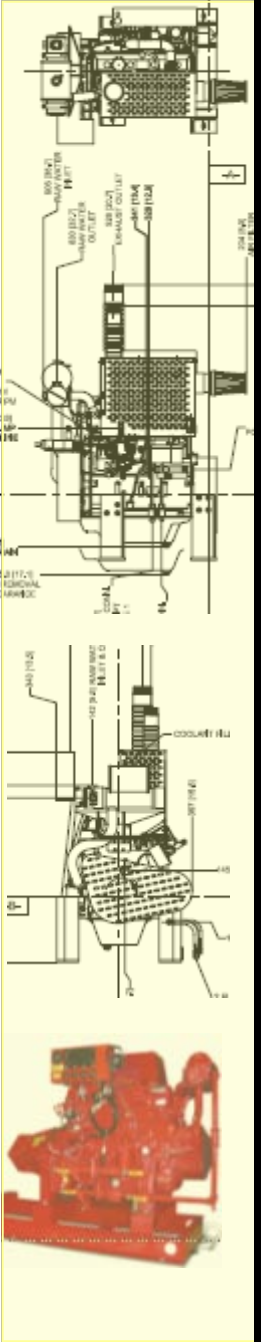
NFPA 20 – Air Requirements

- The minimum ambient temperature for the pump room is 4.5°C (40°F).
 - An approved or listed source of heat shall be provided for maintaining the temperature of a pump room or pump house.
- The maximum temperature for the pump room is 49°C (120°F) at the air cleaner inlet with the engine running at rated load.



NFPA 20 – Air Requirements

- Inlet louver and ventilating system must:
- Maintain 49°C (120°F) in the room
- Supply adequate air for engine combustion
- Adequate air for ventilating radiated heat; both engine & exhaust system.
- (Radiator Cooled Units shall be ducted outdoors in a manner that will prevent recirculation and requires more air for combustion and radiated heat removal.)



Installation and Operation Data

CLARKE

Fire Protection Products

JU6H-UF60 & JU6H-UF62 INSTALLATION & OPERATION DATA USA Production

Basic Engine Descriptor

Engine Manufacturer.....	John Deere Co.
Ignition Type	Compression (Diesel)
Number of Cylinders.....	6
Bore and Stroke - in.(mm).....	4.19(106) x 5.00(127)
Displacement - in. ³ (L).....	415(6.8)
Compression Ratio.....	17.0:1
Valves per cylinder - Intake.....	1
Exhaust.....	1
Combustion System.....	Direct Injection
Engine Type.....	In-Line, 4 Stroke Cycle
Aspiration.....	Turbocharged
Firing Order (CW Rotation).....	1-5-3-6-2-4
Charge Air Cooling Type.....	Raw Water
Rotation (Viewed from Front) - Clockwise.....	Standard
Counter-Clockwise.....	Not Available
Engine Crankcase Vent System.....	Open
Installation Drawing.....	D-536

Cooling System

	1760	2100	2350	2600
Engine H ₂ O Heat -Btu/sec.(kW).....	78 (82)	93 (98)	101 (106)	118 (12)
Engine Radiated Heat - Btu/sec.(kW).....	46 (48)	54 (57)	54 (57)	54 (57)
Heat Exchanger Minimum Flow				
60°F (15°C) Raw H ₂ O - gal/min. (L/min.).....	17 (64)	20 (76)	23 (87)	25 (95)
95°F (35°C) Raw H ₂ O - gal/min. (L/min.).....	18 (68)	21 (79)	25 (97)	26 (98)
Heat Exchanger Maximum Cooling H ₂ O				
Inlet Pressure - bar (lb./in. ²) (kPa).....	4 (60) (400)			
Flow - gal./min (L/min.).....	40 (151)			
Thermostat, Start to Open - °F (°C).....	187 (86)			
Fully Opened - °F (°C).....	196 (91)			
Engine Coolant Capacity - qt. (L).....	20 (19)			
Coolant Pressure Cap - lb./in. ² (kPa).....	10 (69)			
Maximum Engine H ₂ O Temperature - °F (°C).....	200 (93)			
Minimum Engine H ₂ O Temperature - °F (°C).....	160 (71)			

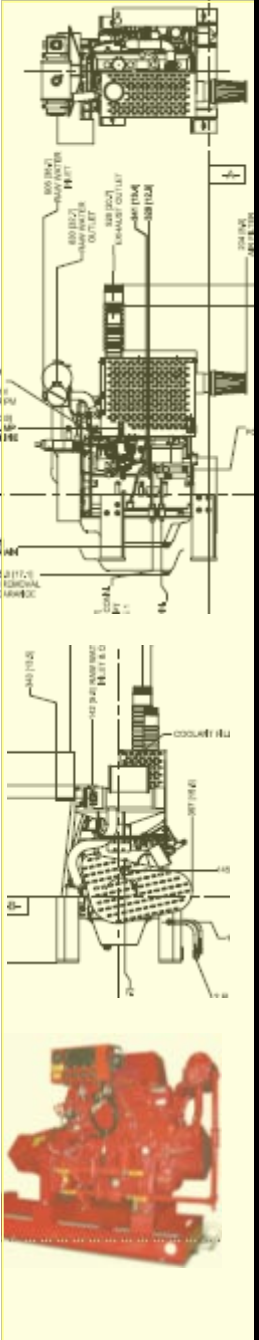
Electric System - DC

System Voltage (Nominal).....	12
Battery Capacity for Ambients Above 32°F (0°C)	
Voltage (Nominal).....	12
Qty. per Battery Bank.....	1
SAE size per J537.....	4D-640
CCA @ 0°F (-18°C).....	640
Reserve Capacity - Minutes.....	285
Battery Cable Circuit*, Max Resistance - ohm.....	0.0012
Battery Cable Minimum Size	
0 -120 in. Circuit* Length.....	00
121 - 160 in. Circuit* Length.....	000
161 - 200 in. Circuit* Length.....	0000
Charging Alternator Output - Amp.....	40
Starter Cranking Amps - @ 60°F (15°C).....	440

*Positive and Negative Cables Combined Length

*Positive and Negative Cables Combined Length

NOTE: This engine is Intended For Indoor Installatin Or In A Weatherproof Enclosure. (Continued)



Installation and Operation Data

CLARKE

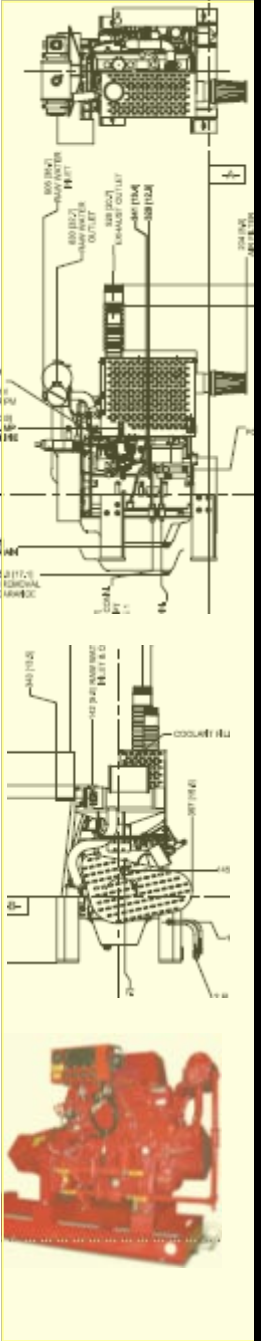
Fire Protection Products

JU6H-UF60 & JU6H-UF62 INSTALLATION & OPERATION DATA (Continued) USA Production

	1760	2100	2350	2600
Exhaust System				
Exhaust Flow - ft. ³ /min. (m ³ /min.).....	952 (27)	1227 (35)	1345 (38)	1484 (42)
Exhaust Temperature - °F (°C).....	988 (531)	909 (487)	883 (473)	898 (481)
Maximum Allowable Back Pressure - in. H ₂ O (kPa).....	30 (7.4)			
Minimum Exhaust Pipe Dia. - in. (mm)**.....	5 (127)			
Fuel System				
Fuel Consumption - gal./hr. (L/hr.).....	10 (38)	10.3 (39)	11.2 (42)	12.7 (48)
Fuel Return - gal./hr. (L/hr.).....				
Total Supply Fuel Flow - gal./hr (L/hr.).....				
Fuel Pressure - lb./in. ² (kPa).....	4-6 (28-41)			
Minimum Line Size - Supply - in. (mm).....	50 (12.7) Sch. 40 - Black Iron			
Minimum Line Size - Return - in. (mm).....	375 (9.5) Sch. 40 - Black Iron			
Maximum Allowable Fuel Pump Suction				
With Clean Filter - in. H ₂ O (mH ₂ O).....	31 (0.8)			
Maximum Allowable Fuel Head above Fuel pump, Supply or Return - m(ft)...	1.4 (4.5)			
Fuel Filter Micron Size.....	8			
Heater System				
Jacket Water Heater				
Wattage (Nominal).....	1500			
Voltage - AC, 1P.....	115 (+5%, -10%)			
Optional Voltage - AC, 1P.....	230 (+5%, -10%)			
Induction Air System				
Air Cleaner Type.....	Indoors Service Only - Washable			
Air Intake Restriction Maximum Limit				
Dirty Air Cleaner - in. H ₂ O (kPa).....	12.1 (3.0)	13.4 (3.3)	14.2 (3.5)	14.8 (3.7)
Clean Air Cleaner - in. H ₂ O (kPa).....	2.1 (0.5)	3.4 (0.8)	4.2 (1.0)	4.8 (1.2)
→ Engine Air Flow - ft. ³ /min. (m ³ /min.).....	354 (10.0)	494 (14.0)	538 (15.2)	587 (16.6)
Maximum Allowable Temperature (Air To Engine Inlet) - °F (°C)***.....	130 (54)			
Lubrication System				
Oil Pressure - normal - lb./in. ² (kPa).....	40-60 (276-414)			
In Pan Oil Temperature - °F (°C).....	220-245 (104-118)			
Oil Pan Capacity - High - qt. (L).....	20 (19)			
Low - qt. (L).....	18 (17)			
Total Oil Capacity with Filter - qt. (L).....	21 (19.5)			
Performance				
BMEP - lb./in. ² (kPa).....	217 (1496)	218 (1503)	195 (1344)	176 (1213)
Piston Speed - ft./min. (m/min.).....	1467 (447)	1750 (533)	1958 (597)	2167 (661)
Mechanical Noise - dB(A) @ 1m.....	C13916 (UF60)			
Power Curve.....	C13481(UF60) & C13496(UF62)			

** Based On Nominal System. Flow Analysis Must Be Done To Assure Adherence To System Limitations.
(Minimum Exhaust pipe Diameter is based on 15 feet of pipe, one elbow, and a silencer pressure drop no greater than one half the max. allowable back pressure.)

*** Review For Power Deration If Air Entering Engine Exceeds 77 °F (25°C)



Heat Exchanger Ventilation

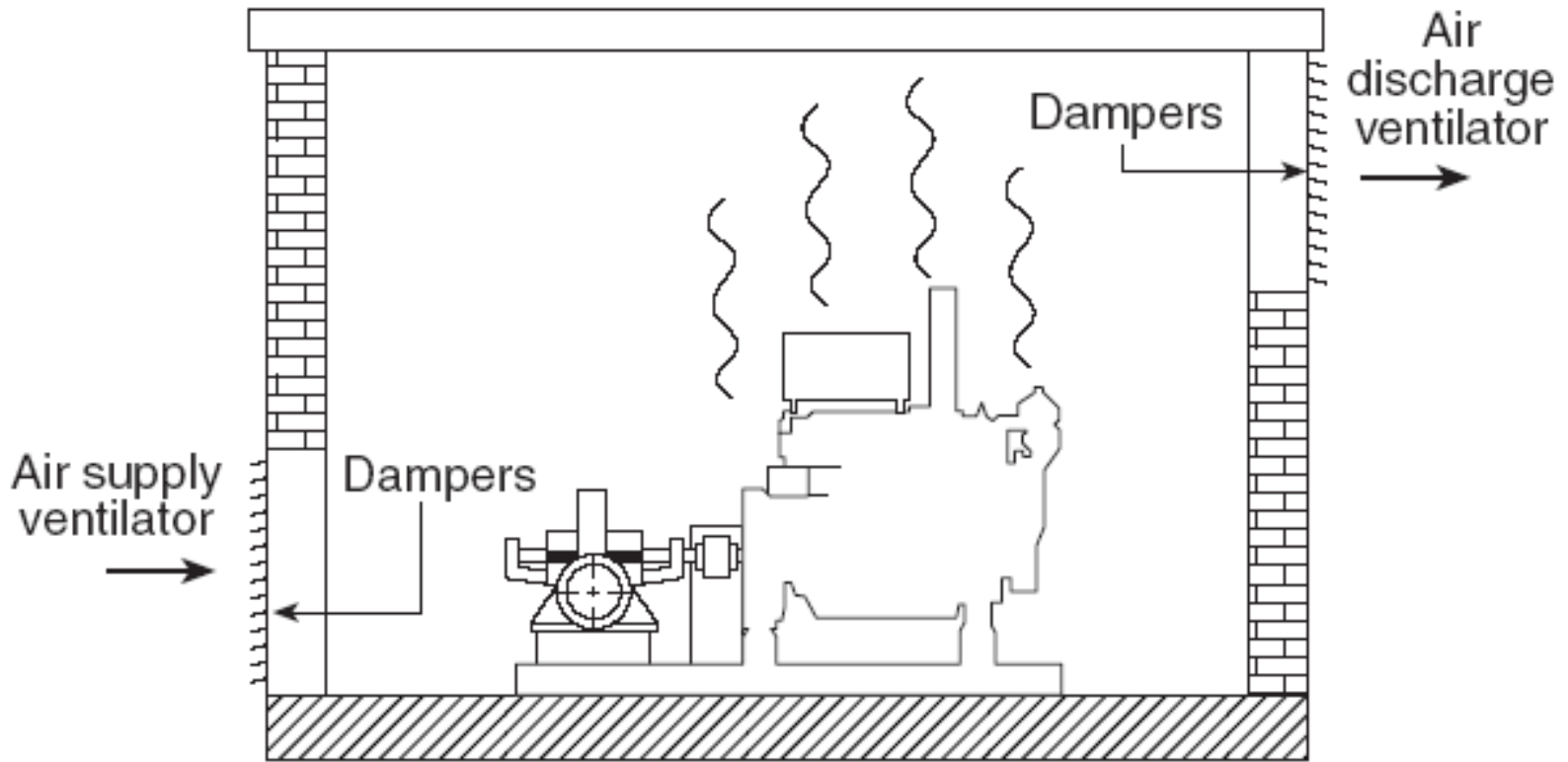
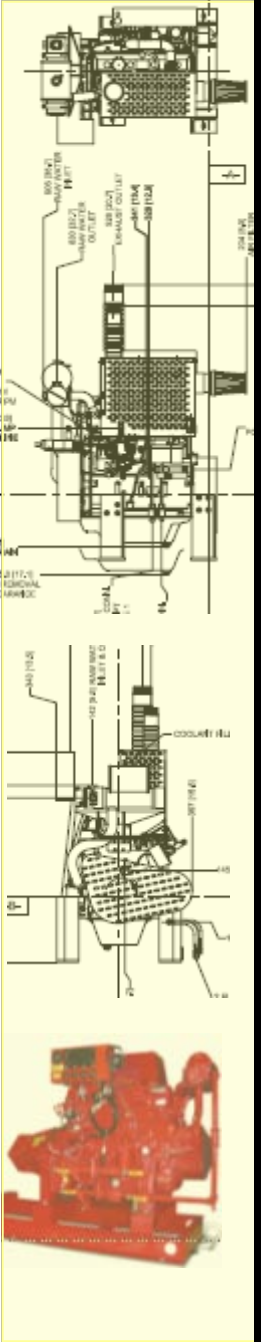


FIGURE A.11.3.2(a) Typical Ventilation System for a Heat Exchanger-Cooled Diesel-Driven Pump.



Radiator Ventilation

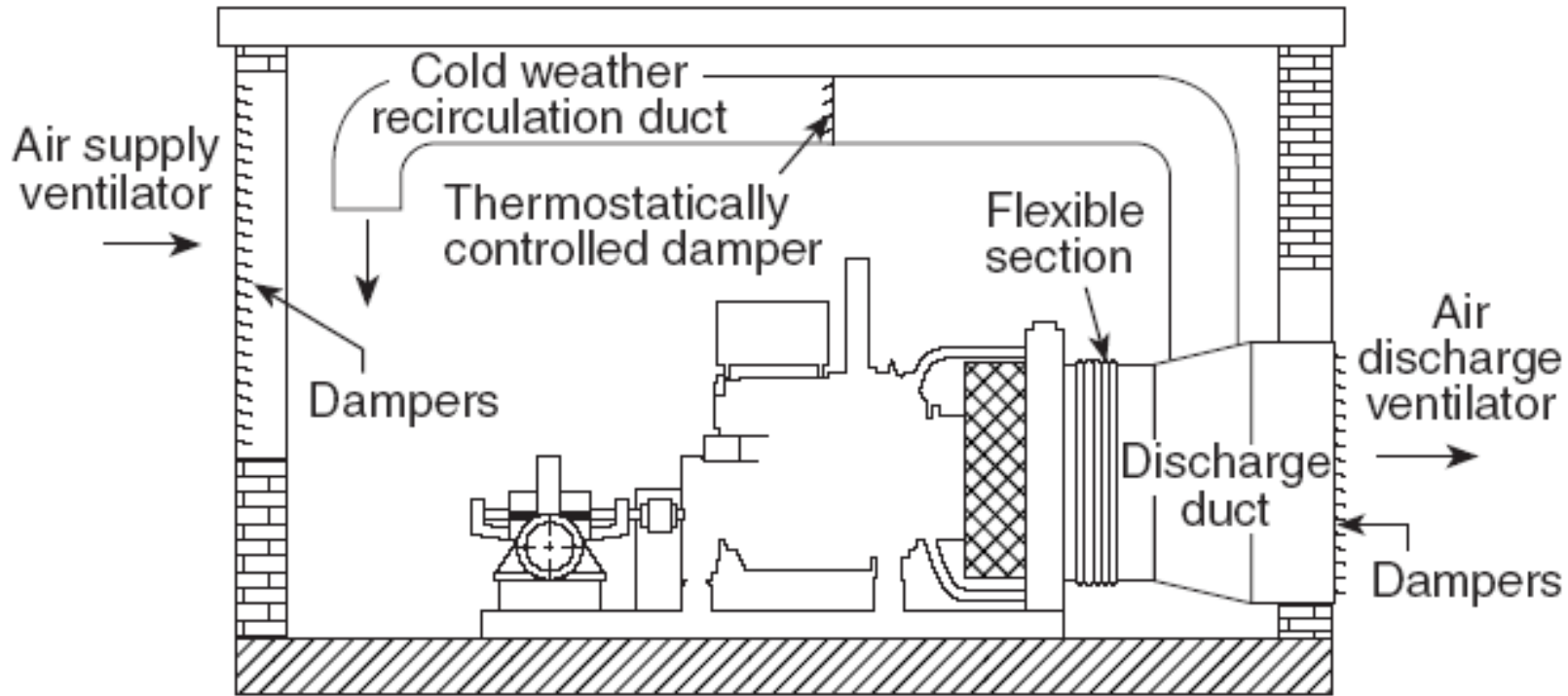
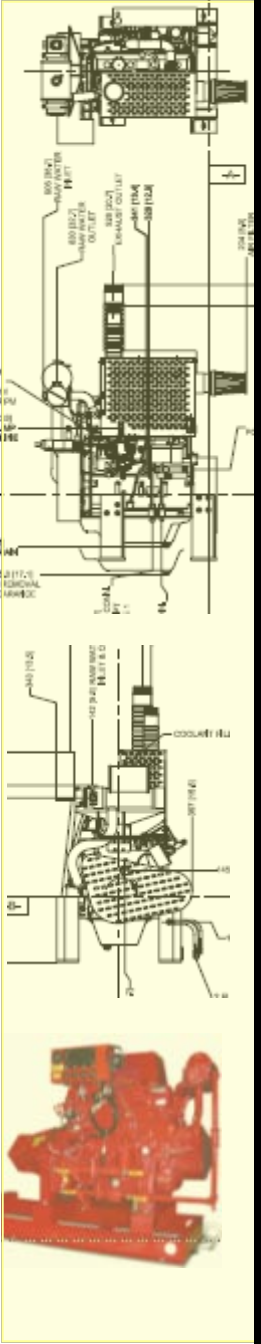
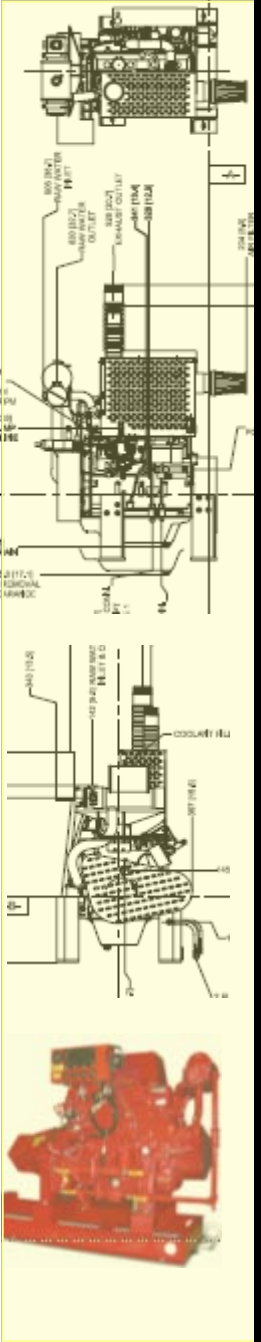


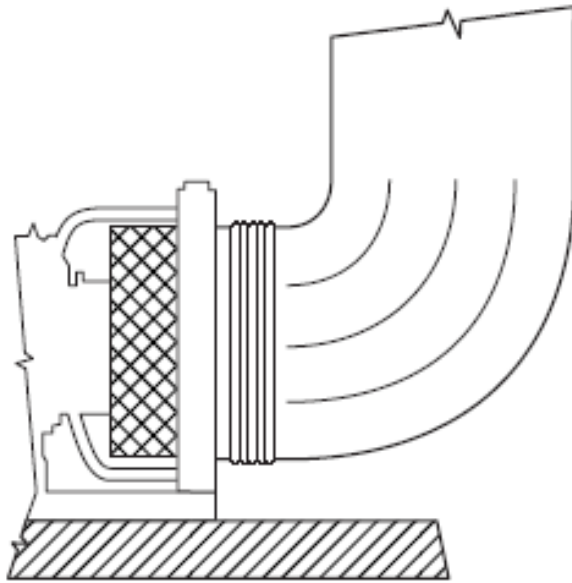
FIGURE A.11.3.2(b) Typical Ventilation System for a Radiator-Cooled Diesel-Driven Pump.



Radiator Ventilation

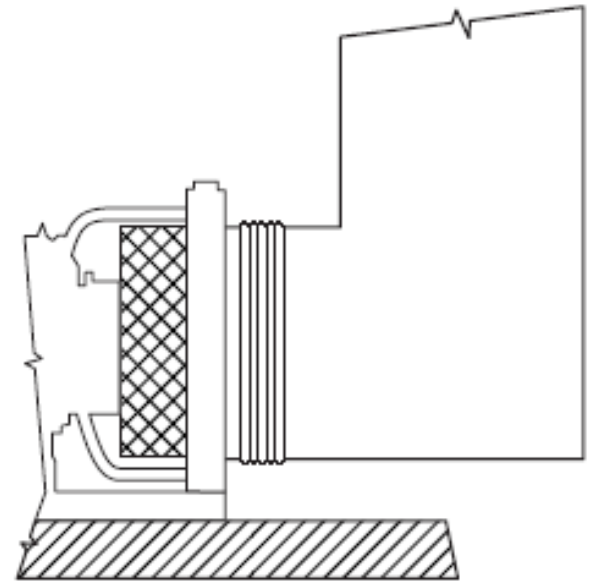


Right



If a bend in the ducting cannot be avoided, it should be radiused and should include turning vanes to prevent turbulence and flow restriction.

Wrong



This configuration should not be used; turbulence will not allow adequate air flow.

Radiator Ventilation

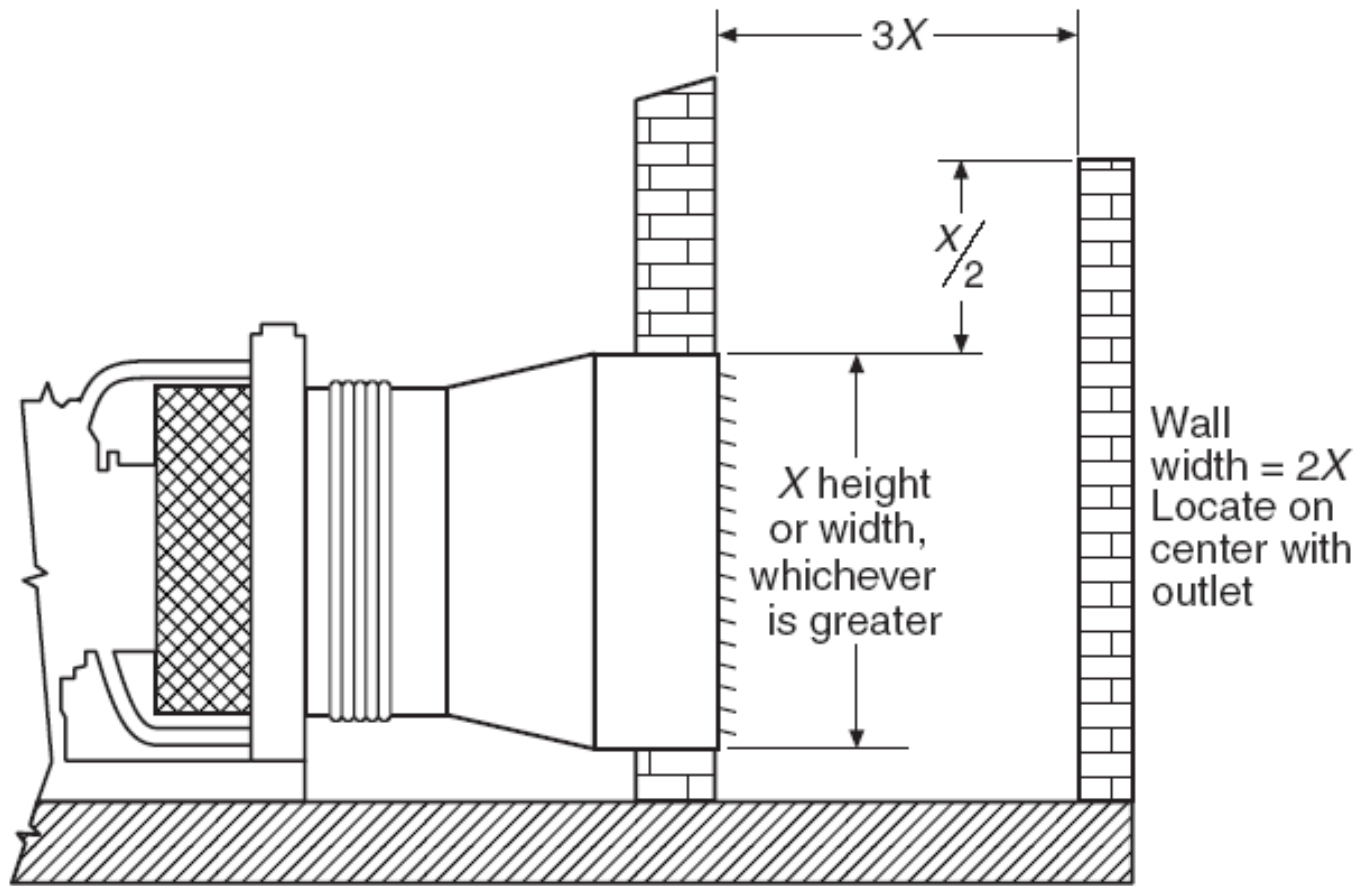
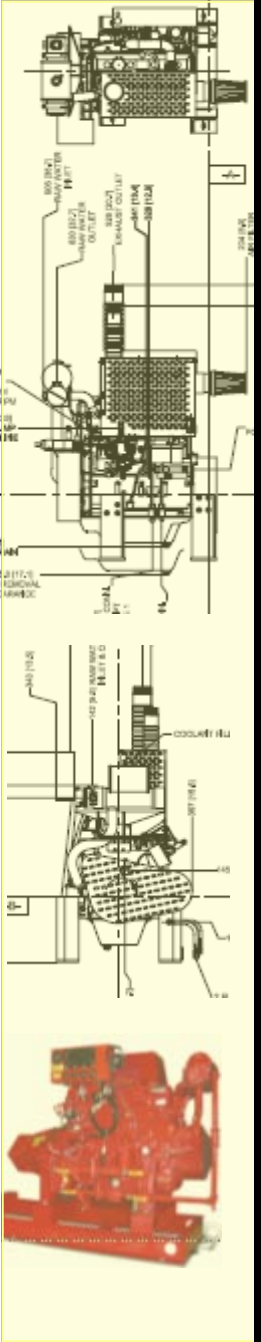


FIGURE A.11.3.2.4 Typical Wind Wall.

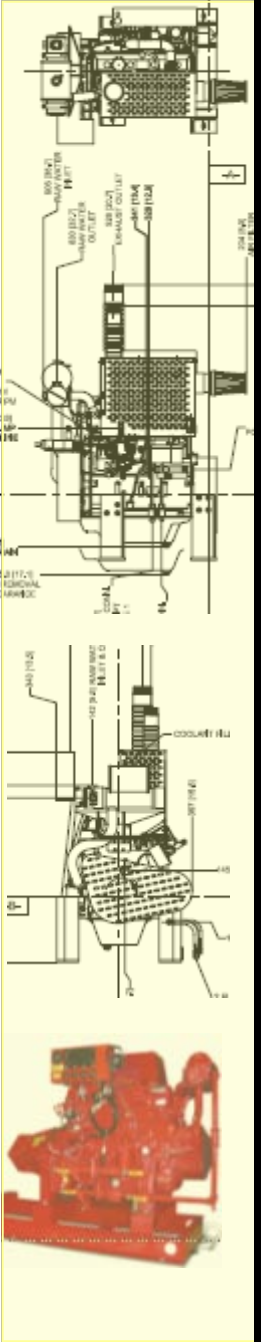
NFPA 20 – Fuel Tank Arrangement

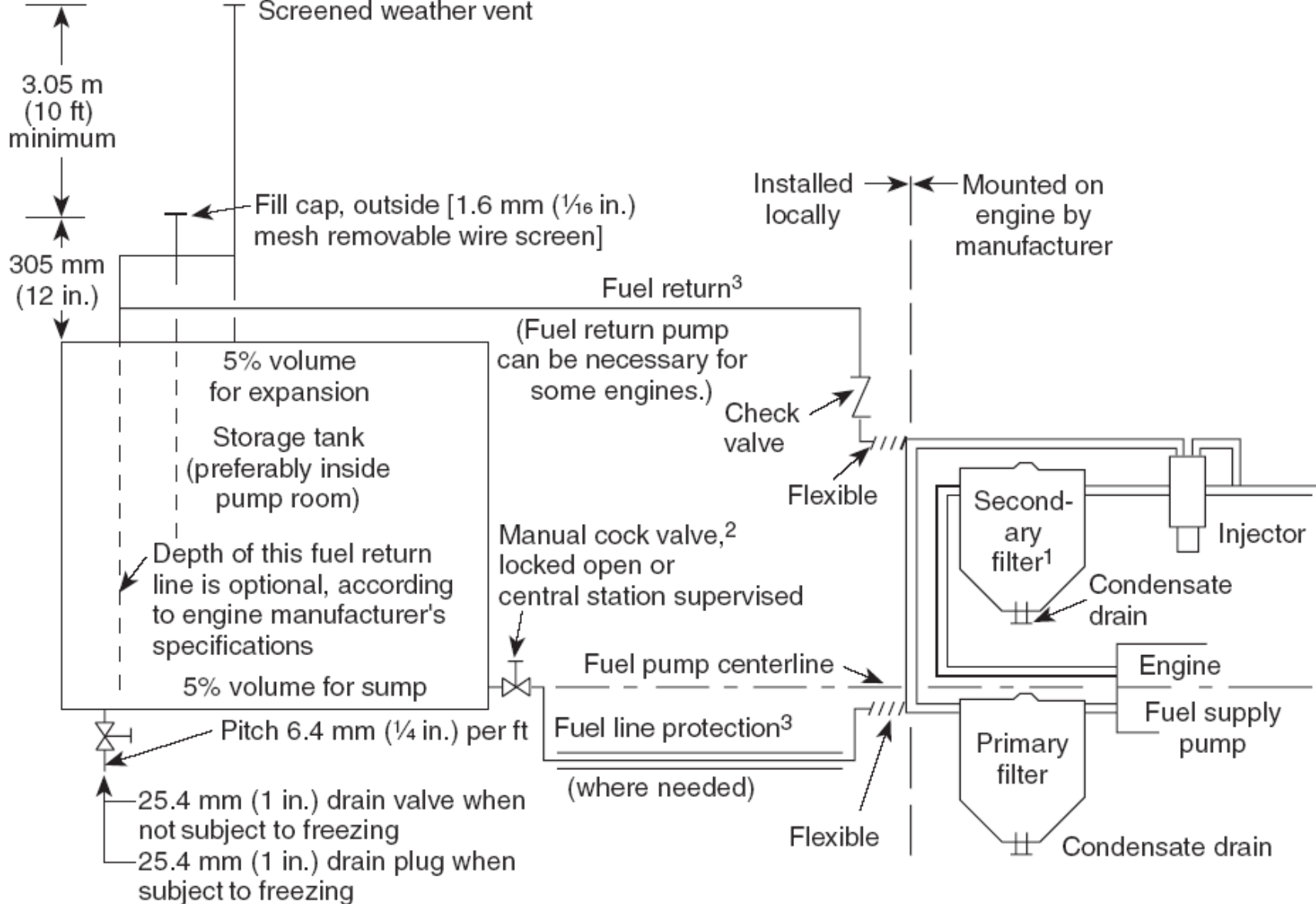
- The fuel tank is sized for 5.07 liter/kW (1 gal/HP) plus 10% (5% for expansion and 5% for sump).
- The fuel tank shall be reserved exclusively for the fire pump diesel engine.
- There shall be one fuel tank per engine.



NFPA 20 – Fuel Tank Arrangement

- The fuel tank shall be located above ground.
- The fuel tank outlet shall be located so that its opening is no lower than the level of the engine's fuel transfer pump.
- The static head pressure limits shall not be exceeded when the level of fuel in the tank is at a maximum.
- In sites where temperatures below 0°C (32°F) could be encountered, the fuel tank shall be located in the pump room.





¹Secondary filter behind or before engine fuel pump, according to engine manufacturer's specifications.

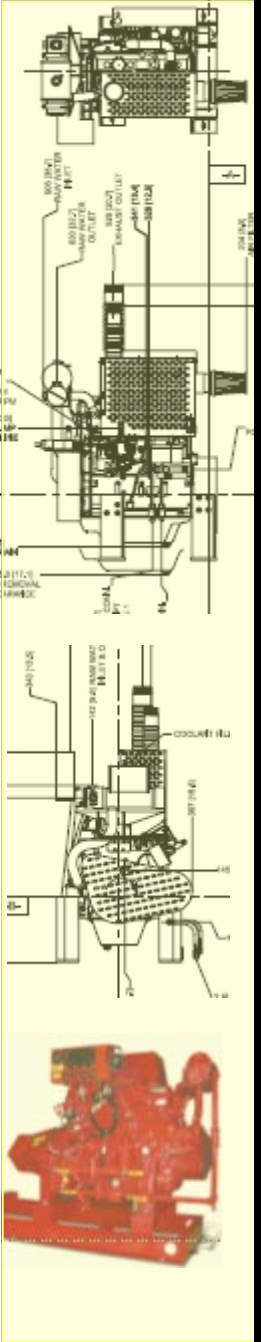
²Excess fuel can be returned to fuel supply pump suction, if recommended by engine manufacturer.

³Size fuel piping according to engine manufacturer's specifications.

FIGURE A.11.4.6 Fuel System for Diesel Engine–Driven Fire Pump.

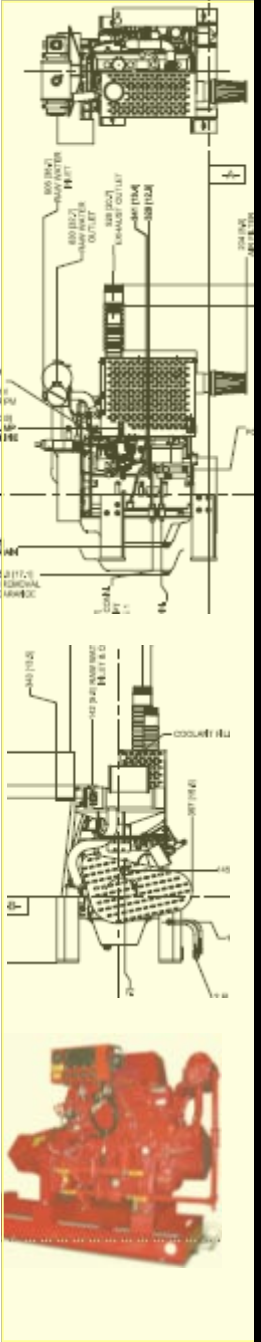
NFPA 20 – Fuel Arrangement

- Flame-resistant reinforced flexible hose shall be provided at the engine for connection to the fuel system piping.
- Fuel piping shall not be galvanized steel or copper.
- There shall be no shut-off in the fuel return line to the tank.
- The grade of fuel oil shall be indicated on the fuel tank by letters that are a minimum of 152mm (6 in) in height and in contrasting color to the tank.



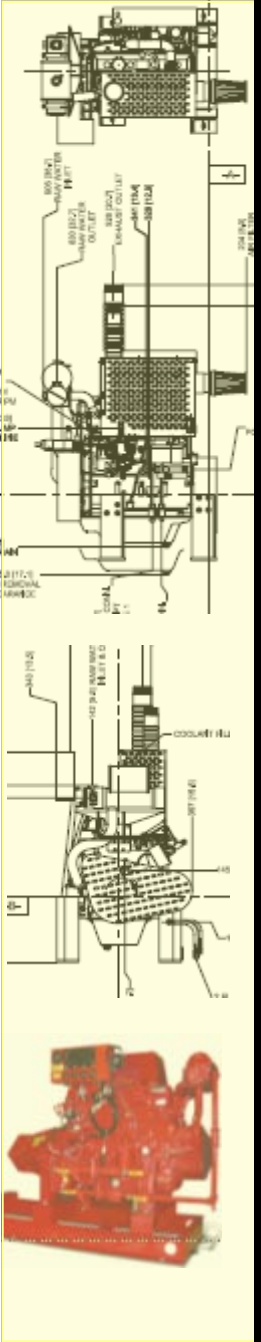
NFPA 20 – Engine Exhaust

- Each engine shall have an independent exhaust system.
- A flex connector shall be used between the engine and the exhaust pipe.
- The flex connector shall not be used for misalignment. (The purpose of the flex is to allow for thermal expansion and for isolating engine vibration from the rest of the exhaust system.)



NFPA 20 – Engine Exhaust

- Back pressure in the exhaust system shall not exceed the engine's limit.
 - The exhaust sizing program on the Clarke website can calculate the back pressure)
- Building supported; *not* engine supported
- Insulation wrap the exhaust systems in-room components.
- Rain cap on outlet if necessary; tight connections.
- Exhaust system shall terminate outside where hot gases and sparks are discharged to a safe location.



Exhaust Sizing

Clarke Fire - Windows Internet Explorer

http://www.clarkefire.com/EngineSelectionTools/EXHAUSTSIZINGUSA.aspx

File Edit View Favorites Tools Help

Clarke Fire

LPCB
 Non-Listed
 APSAD

VMFP

UF84
UFAAQ8
UFAARG
UFAB54 *
UFAB76
UFAB84 *

* denotes obsolete model

SILENCER TYPE:

Critical
 Hospital
 Industrial
 Residential
 No silencer

SILENCER CONFIG:

End in, End out
 Side in, End out

EXHAUST PIPING DATA:

Pipe Size: 5"

Number 90° elbow or Y: 4

Number 45° elbows:

Number Tees:

Straight Pipe (Feet): 150

APPLICATION DATA

Customer: Test #1

Job Name: Job #1

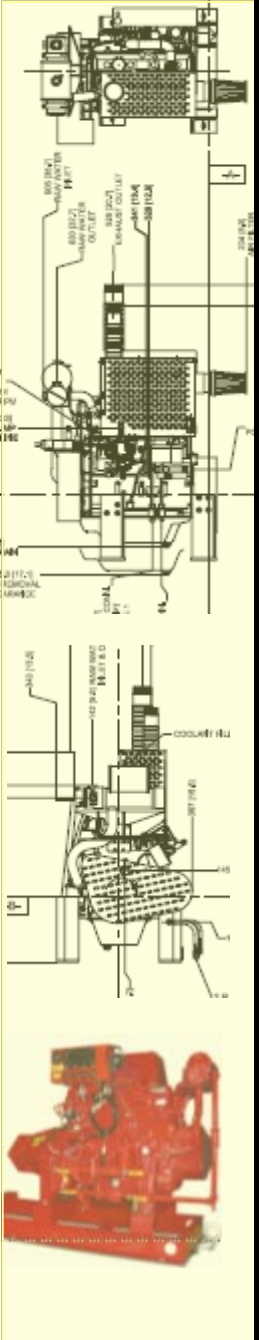
Job Number:

Input By: Justin Strousse

See Results Clear Results

Note: If you experience any sort of problems please contact Donna Pentler immediately. Donna can be reached at 513-719-2320 or email her at dpentler@clarkefire.com

© 2008 Clarke - All rights reserved.



Exhaust Sizing

http://www.clarkefire.com/Calculators/PrintExhaust.htm - Windows Internet Explorer

http://www.clarkefire.com/Calculators/PrintExhaust.htm

File Edit View Favorites Tools Help

Favorites Suggested Sites Clarkefire Concur Facebook Home Delta CNN.com FOXNews My MSN TWC weather White Pages American Express Hilton HHonors Web Slice Gallery

http://www.clarkefire.com/Calculators/PrintExhaust.htm

CLARKE

Fire Protection Products, Inc.

Exhaust Backpressure Calculator - Results
Calculations made 8/18/2010

Data input by: Justin Strousse

Input Data:

Customer: Test #1

Job Name: Job #1

Job Number:

Engine Data:

Manufacturer: Clarke
Model: JU6H-UF30
RPM: 2100
HP: 160

Piping Data:

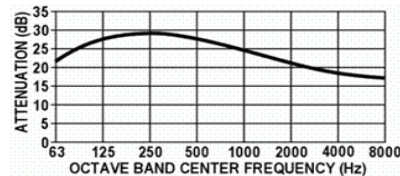
Pipe Size: 5"
#90° elbow or Y: 4
Number 45° elbows:
Number Tees:
Straight Pipe (Feet): 150

Silencer Data:

Manufacturer: Clarke USA
Pipe Size (in): 5
Model: C06533
Application: Residential
Connection: 150# Flange

Output Data:

Exh Flow (CFM): 953
Temperature (° F): 959
Max Backpressure (inches water):
30
Min Backpressure (inches water): 0
Std. Exhaust Dia (in): 5



Exhaust Pipe Recommendation:

BACKPRESSURE
CALCULATIONS
(inches water)

14.1 Pipe
+ Silencer (see
note 1)
4.8

18.9 Total
30.0 Maximum
Allowable
Backpressure

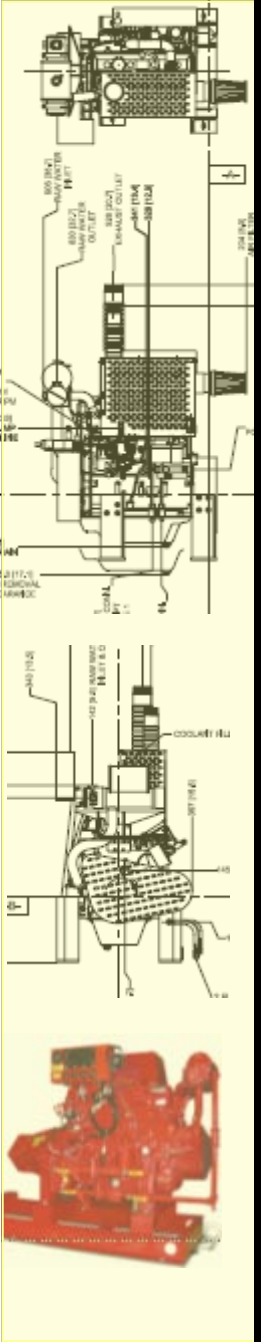
Result: Total
Backpressure is within
limits

Done

start 2 Mic... 2 Win... 2 Mic... 2 Inte... Docume... Search Desktop Internet 75% 8:45 AM

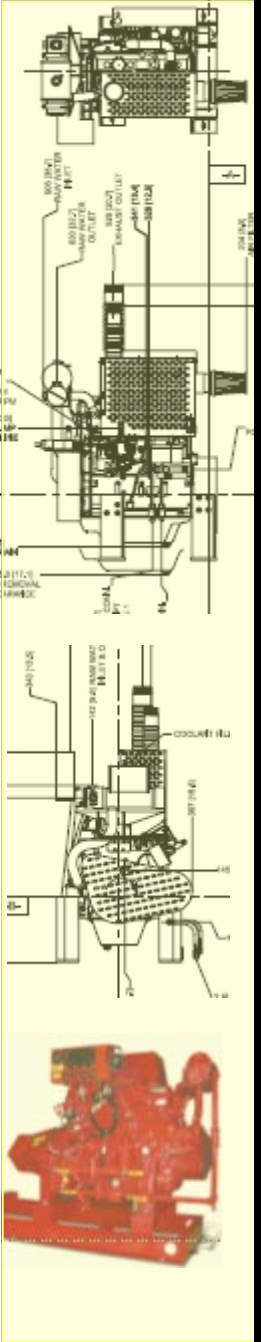
NFPA 20 – System Operation

- Engines shall be started no less than once a week and run for no less than 30 minutes.
- The fire pump shall be started and brought up to rated speed without interruption within 20 seconds.



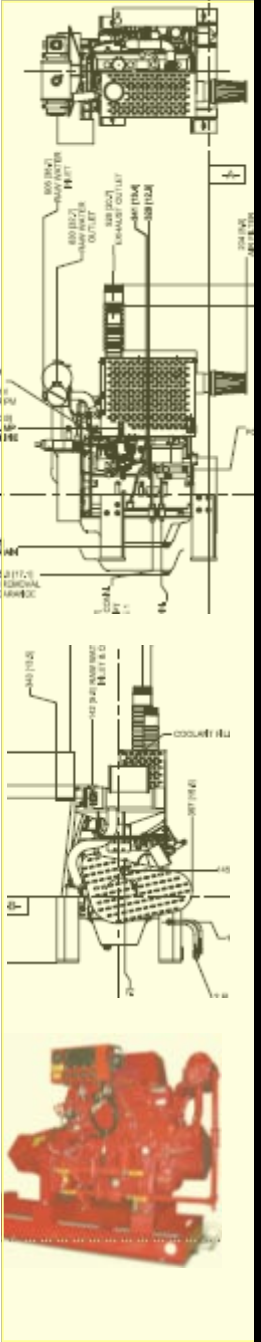
NFPA 20 – System Operation

- Batteries shall be kept charged at all times and tested frequently (weekly test) to determine condition.
- Only distilled water shall be used.
- Battery plates shall be kept submerged at all times.
- The fuel storage tanks shall be kept as full as practical at all times, but never below 66% of tank capacity. A fuel level indicator shall be provided to activate at the 2/3rds tank level.



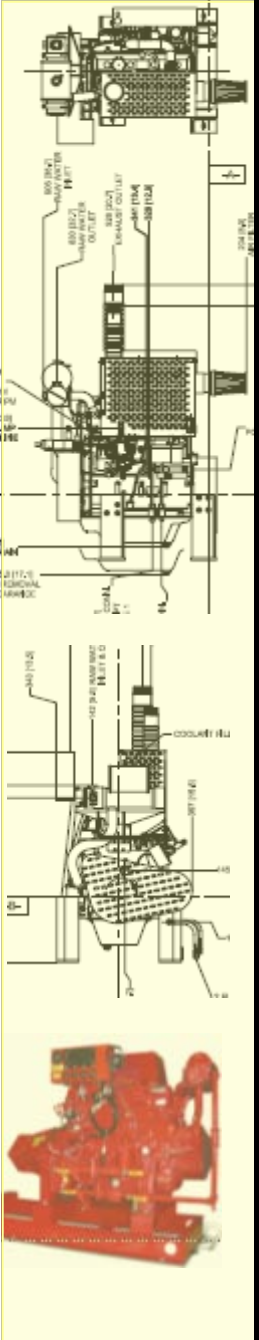
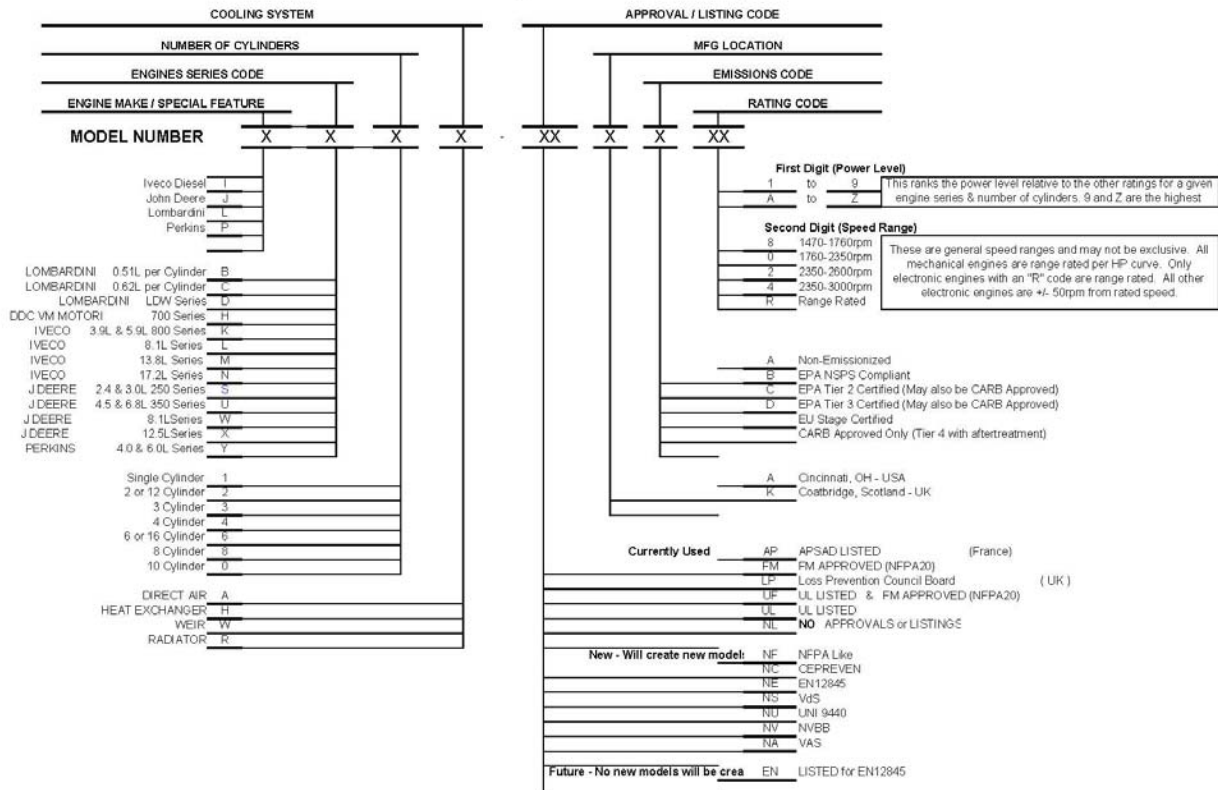
2009 EMISSION SUMMARY

- Beginning Jan 1, 2010
 - Diesel Fire Pump drivers with horsepower between 100 bhp and 750 bhp and with rpms between 1470 and 2650 rpm must meet be certified Tier 3 engines.
 - NSPS compliant engines manufactured before Jan 1, 2010 in the above horsepower and rpm range can still be sold in 2009.



Clarke Model Nomenclature

New 10 Digit Model Number System



Clarke Website

www.clarkefire.com

- Current Models
- Installation & Operation Data
- Emission Data
- Exhaust Sizing
- Operations Manual
- Spare Parts Illustration
- Installation Checklist
- Power Curves
- Installation Drawings
- Contact List
- Wiring Diagrams
- Technical Manual
- Service Dealer Directory
- Startup and Warranty Forms

