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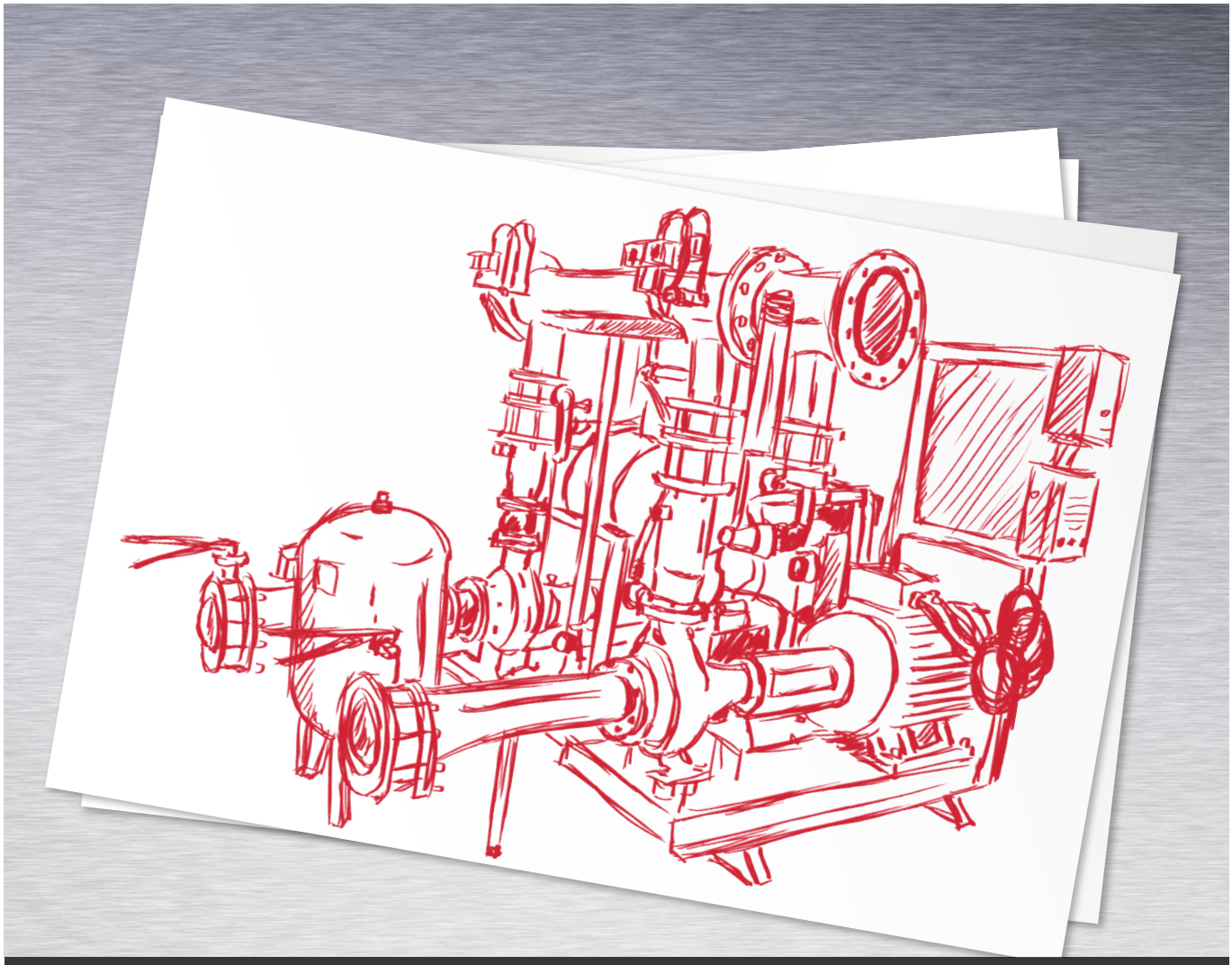


FIRE PUMP SYSTEMS INSTALLATION GUIDE

√ EN 12845

IN LINE WITH THE EN 12845+A1 STANDARD WATER BOOSTER SYSTEMS

This document contains technical information about fire booster pumps produced in accordance with European Union standards, which are mandatory to connect to sprinkler systems in buildings. Upon request, you can obtain a technical brochure for fire pump systems compliant with the EN 12845 +A1 standard from our sales department for more detailed information. Additionally, you can watch the installation video of the modularly delivered fire booster pump in the after-sales services section on our website to gain further insight into the installation process.

Usage of Fire Booster Sets

Electric motors used in fire booster sets do not have thermal protection which protects the motor according to EN 12845+A1 standard. The intended purpose here is that, even though the electric motor remains in two phases at the time of the fire, the pumps continue to operate until the motor windings are burned. For this reason, boosters can not be connected to any other facility other than the fire system, it can not be used for the water supply purposes. If it is used, any faults that will occur in the device will not be covered by the guarantee.

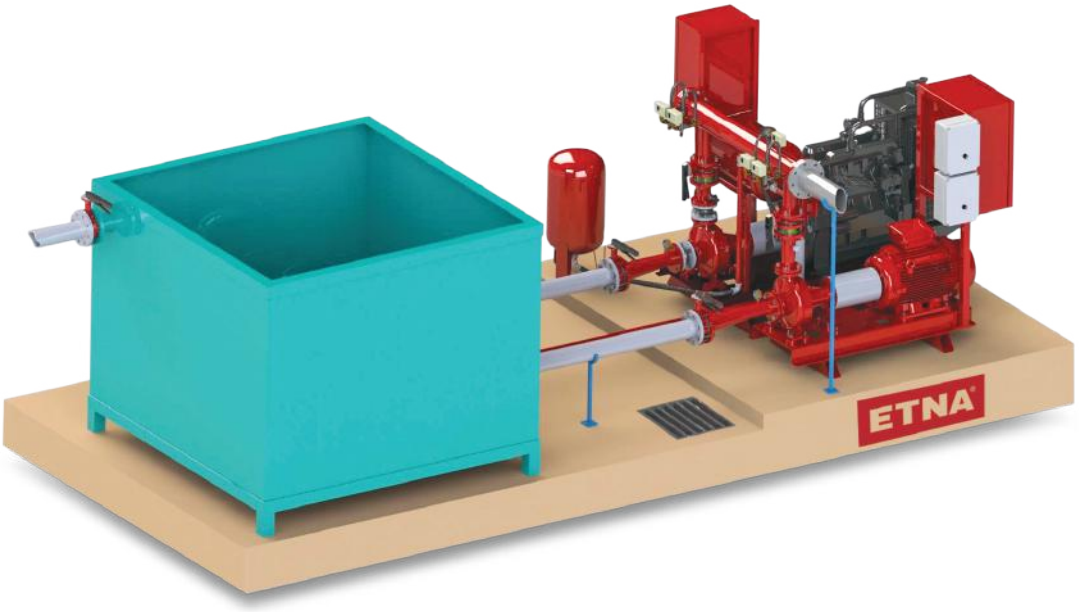
Characteristics of Fire Booster Set Suction Line (Sucking From Storage With The Same Elevation Difference)

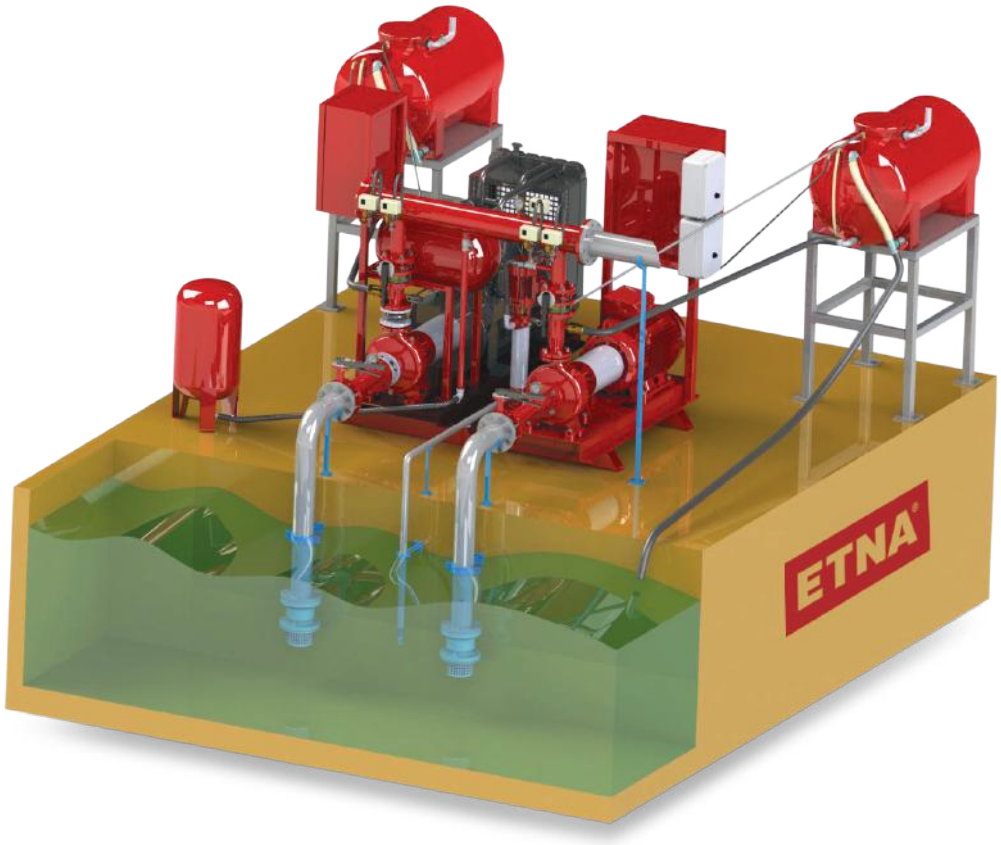
- First examine the detailed drawing related with the installation of the device.
- It is necessary that the suction lines of the pumps are smaller than the pump suction diameter and laying the installation pipes parallel to the floor at the shortest distance to the pump suction line from the reservoir without using too many elbows and to avoid formation of possible air pockets.
- Water suction will be easier if the suction line is laid as properly as possible. Easy flow of water through the pump suction line will prevent the pump from running under negative conditions which are described as cavitation (local evaporation and condensation cycle of the fluid in the pump).
- In the fire pump assembly drawing, how to connect the suction pipe to the reservoir storage is shown in detail. Here, attention must be paid to the dimensions.

Characteristics of Fire Booster Set Suction Line (Sucking From Storage or Well With Minus Elevation Difference)

- First examine the detailed drawing related with the installation of the device.
- At the pump connections, it is an undesirable and unfavorable condition for the pump to operate by sucking from the negative elevation difference . Problems such as the formation of an air gap in the suction line or an increase in the NPSH value occur. (The NPSH value is the minimum positive pressure that must be in the pump suction line.) However, if necessary, installation may be carried out (as explained in the drawing) provided that the conditions specified are met.
- It is recommended that the suction lines of the pumps have the same or a larger diameter than the pump suction diameter. A separate suction line is required for each pump. The collector must not be used in the suction line. Separate lines should also be laid to these lines for the jockey pump. Water suction will be easier if the suction line laid has the proper diameter. Easy flow of water through the pump suction line will prevent the pump from running under negative conditions which are described as cavitation (local evaporation and condensation cycle of the fluid in the pump).
- The maximum suction depth of the pump should not exceed 3.2 meters. In practice, it is desirable that the pump be located at the shortest distance to suction location. It is necessary to submerge each suction tube with an elbow and to put a filtered flap at the end of the suction tube. This flap will prevent emptying the suction pipe filled with water.
- The shut-off valve should not be placed on the suction line.
- EN 12845+A1 standard requires that the operating tank installed for each pump has suction from negative elevation difference. These tanks are used to continuously supply water to the suction line against the risk of water leakage from the flap at the end of the suction pipe. In this way, formation of the air gap in the suction line of the pump and the possibility of suction of the pump becoming impossible will be avoided. Inside these tanks there is an inlet for the tank to be filled with mains water and after this inlet a floater tap is placed into the tank. If the tank is emptied, the tank will be filled from this inlet and floater tap will prevent overflow. Also, if there is a floater switch in the tank and if the water level in the tank is low, a “Low Water” warning will be sent to the main panel to trigger the main pump and alert them with an audible alarm.
- The filter at the end of the suction flap should be cleaned from time to time and prevented from clogging due to foreign matter. During the cleaning, the reserve tank (operating tank) should not be evacuated and the suction pipe must be removed.

IN LINE WITH THE EN 12845+A1 STANDARD
WATER BOOSTER SYSTEMS





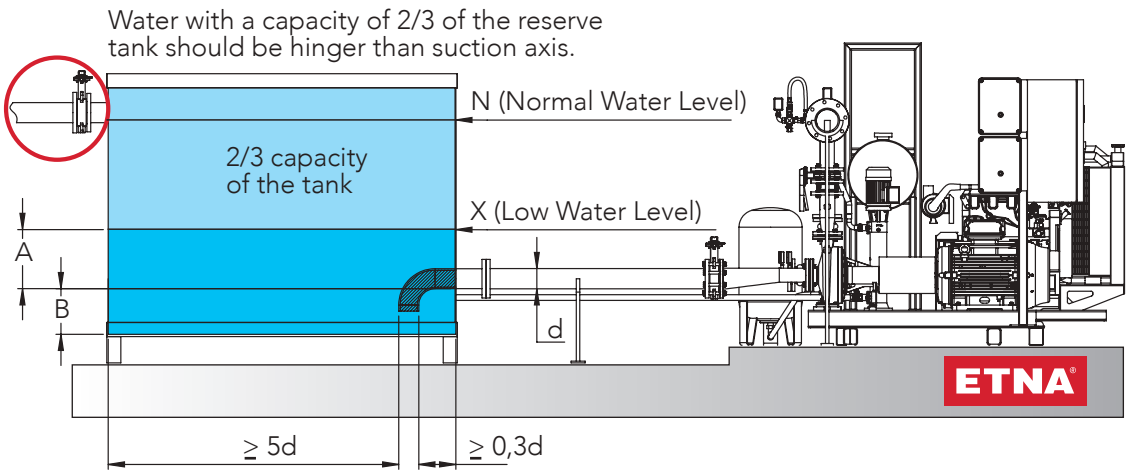
Explanations on the Installation Location of the Fire Booster Set

- The fire pump room, where the booster set is installed must have a minimum temperature of +10°C for closed diesel engines and minimum +4°C for electric motors (against the risk of water freezing and diesel engine not working smoothly) and must be free from moisture and dust, ventilation must be provided for indoor.
- In order to perform the service works easily around the fire pump, it must be easily accessible from every side for a minimum of 80 cm.
- A required size of water discharge must be provided to evacuate water against risk of explosion of the pipe in the fire pump chamber.
- The exhaust pipe of the diesel engine should not be smaller than the diameter of the flexible pipe placed at the silencer outlet of the diesel engine. If the line is long, this should be larger than this diameter.
- The exhaust pipe should be made of iron pipes, insulated from the outside and fastened with clamps to the ceiling, so as to be out of the building (outdoors).
-

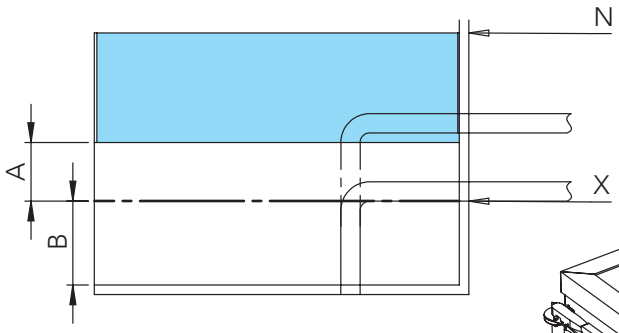
Attention Should be Paid to the Following During Installation

- The fire pumps must be placed on a level surface and they must be tightly fixed on the floor's concrete by means of steel dowels.
- Securing the pipes on suction line as well as delivery line to the floor by means of metal struts will prevent pressure of those lines on the pump and will not allow the damaging of pump coupling settings.
- The panel of the fire pump and the pump to be put into the reservoir should be connected by the floater level switch which will give a warning when the water is emptied.
- During the weekly testing process of the fire pump, there is a potential for damage due to overheating of the pump body and heat of the mechanical seal because there is no water consumption in the plumbing. To prevent this situation, a return pipe with 8 mm diameter should be laid to the water tank from the connection point on the pump body. This line is called the pump body circulation line.
- Power cables must be laid separately to the motors of the fire pump for each pump and care must be taken to ensure that these cables are fire resistant. Cables laid from the main conduit box must have diameters suitable to the length. Please see page 21 for a chart of cable crosssections to calculate the diameters.

POSITIVE SUCTION CONNECTION



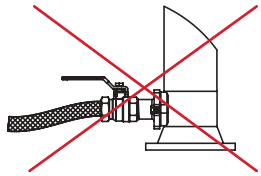
Pump suction axis in the tank should be in accordance with EN 12845 Article 9.3.5 Figure 4, Chart 15.



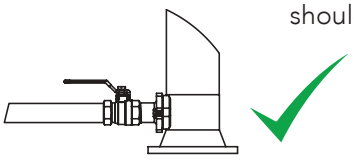
d	A	B
Water inlet pipe rated diameter (mm)	Minimum (mm)	Minimum (mm)
65	0,25	0,08
80	0,31	0,08
100	0,37	0,1
150	0,5	0,1
200	0,62	0,15
250	0,75	0,2
300	0,9	0,2
400	1,05	0,3
500	1,2	0,35

Connentric reduction is used in order to eliminate losses in the pressure line.

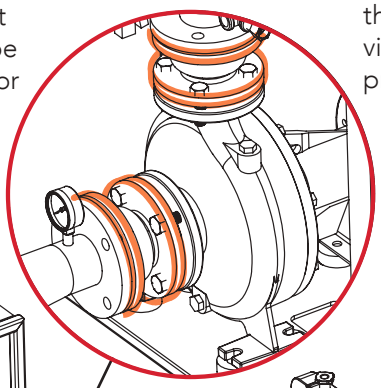
Eccentric suction kit is used in order to eliminate air pockets during pump suction

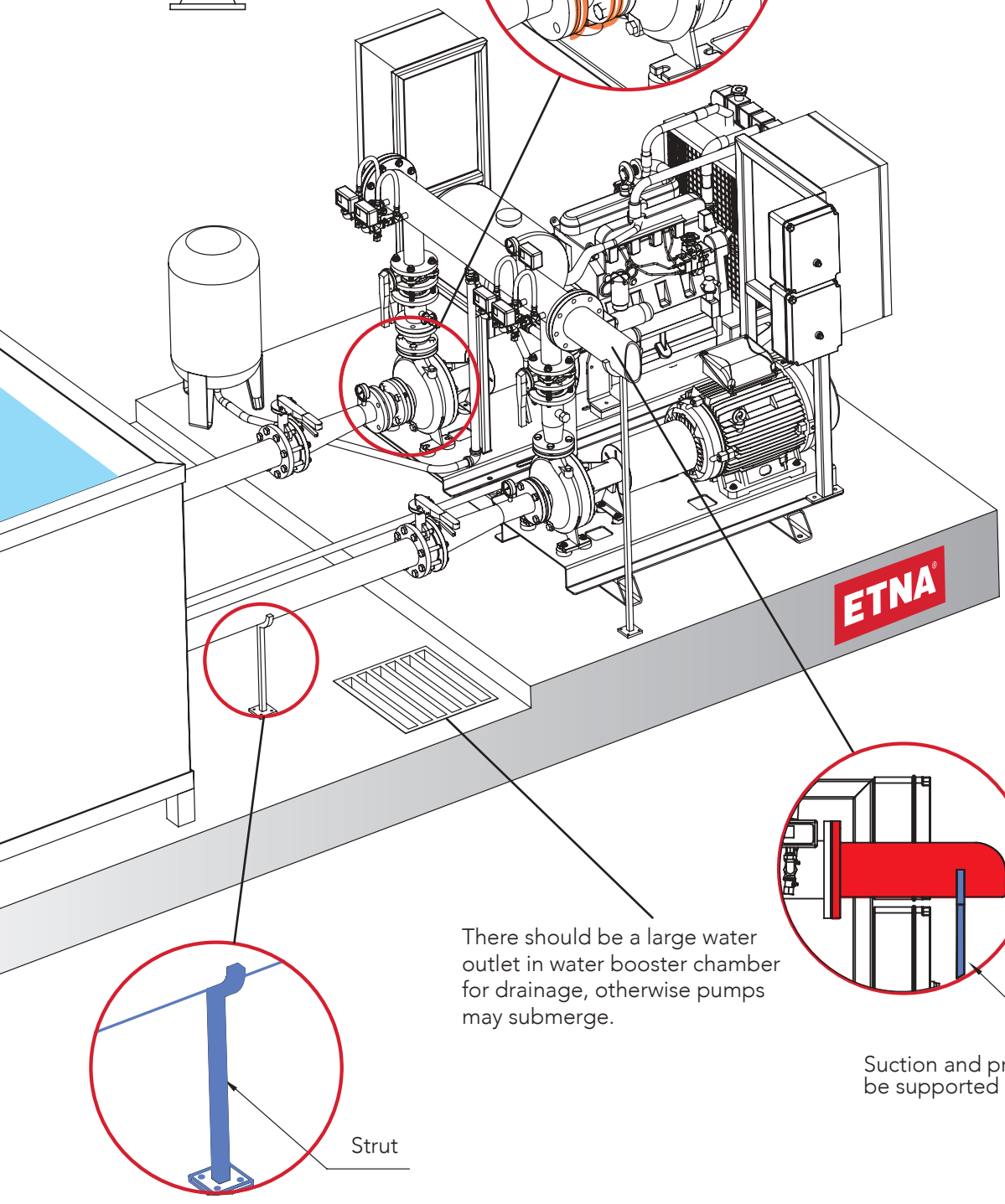


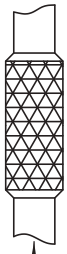
Flexible pipe can't be connected to pilot pump suction, pipe which is suitable for suction diameter should be used



In diesel module, compensators should be connected as shown in the figure in order to absorb vibrations at the suction and the pressure line.







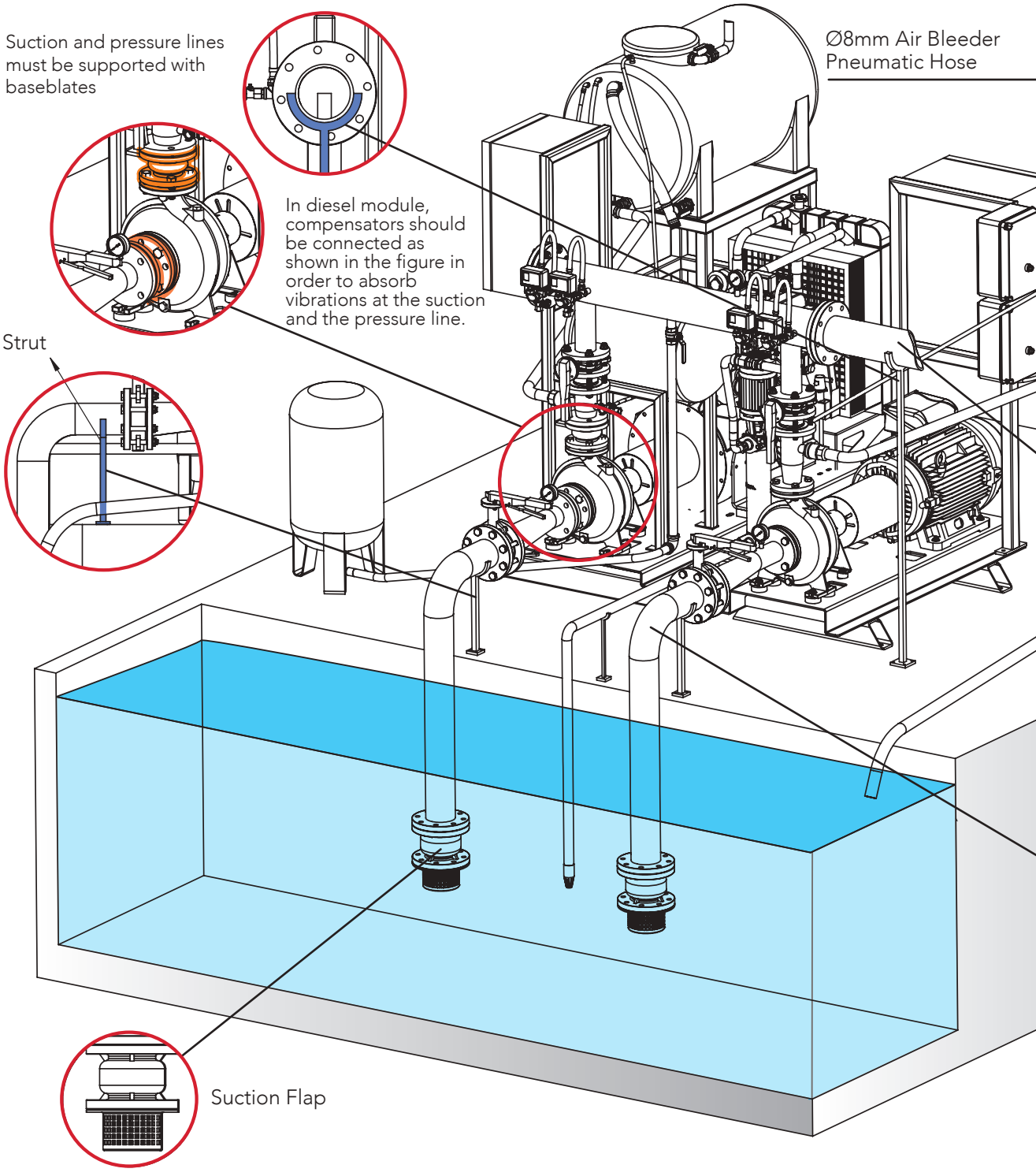
Exhaust port should be metallic and should reach to outside air with minimum number of elbows.

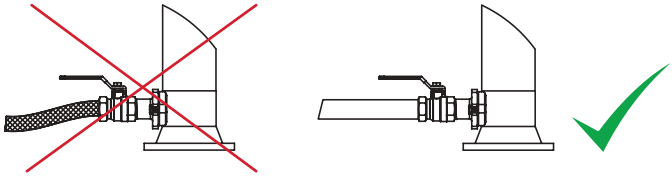
There should be a large water outlet in water booster chamber for drainage, otherwise pumps may submerge.

Suction and pressure lines must be supported with baseplates

NEGATIVE SUCTION CONNECTION

Floater Connection
Should be connected to terminal no. 5 and 6 on electirical module panel and terminal no. 2 and 3 on diesel module panel.





Flexible pipe can't be connected to pilot pump suction, pipe which is suitable for suction diameter should be used.

Mains Supply

Floater with Buoy

Electrical Floater

Electrical Floater - Panel Connection Cable

1" Spiral Hose Feeding Water from Tank to Suction Flap (Tank connection should be placed higher.)

Tank Drain Hose (1" Spiral Hose)

Line

Strut

Must be maximum 3.2 m.

Exhaust port should be metallic and should reach to outside air with minimum number of elbows.

DRF - 80FP / DRF - 60FP CONTROL VALVES TECHNICAL DIMENSIONS AND VALUES

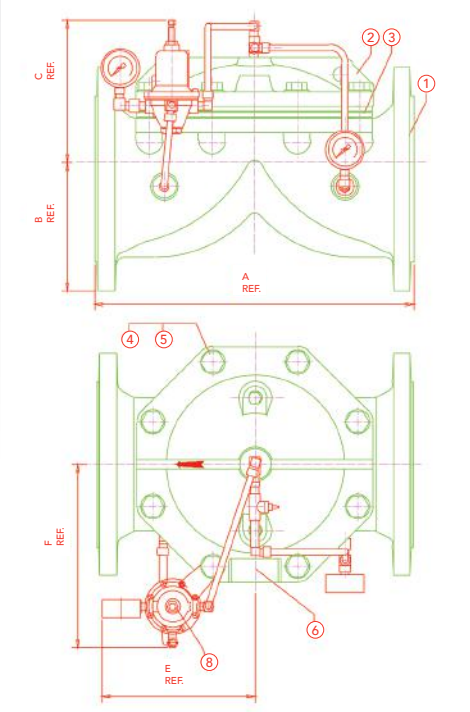
Diameters	2"	3"	4"	6"	8"

MATERIALS	
BODY	Nodular Cast Iron
COVER	Nodular Cast Iron
DIAPHRAGM	Nylon Fibre Reinforced Rubber
COATING	Rilsan - Nylon 11 (Red or Blue)
PILOT BODY and COVER	Brass
MEMBRANE	Nylon Fibre Reinforced Rubber
PILOT INTERIOR MATERIAL	303 SS
PIPING	Copper
FITTINGS	**Brass**
TEMPERATURE CLASS	**39 °F - 150 °F**

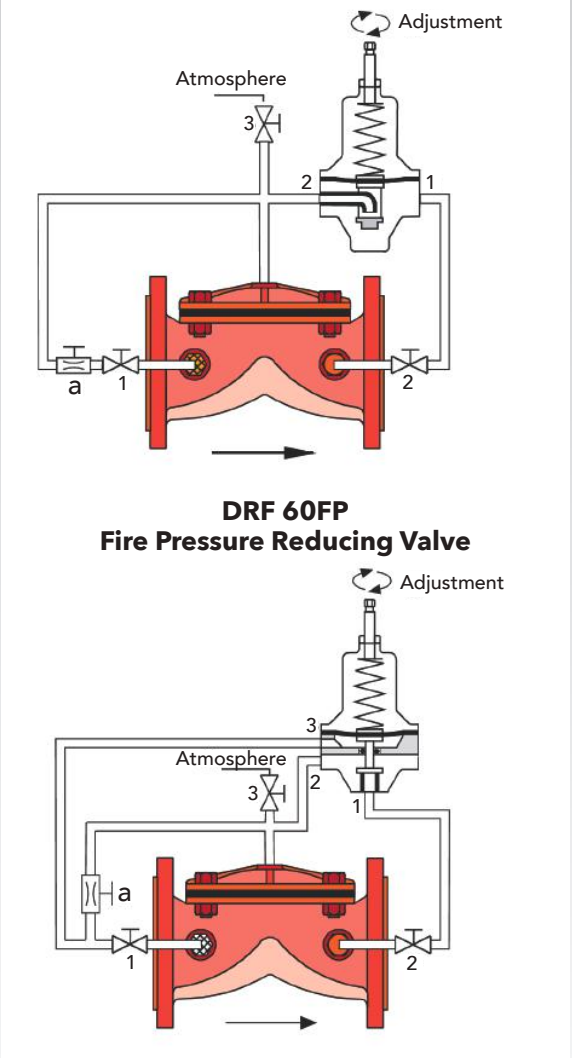
Valve Capacity in Accordance with NFPA 20 / FM					
CAPACITY	**2"**	**3"**	**4"**	**6"**	**8"**
GPM	**250**	**500**	**1000**	**2500**	**5000**

Class	Flanged/ Threaded	Pressure Class	Pilot Valve Adjustment Springs - Min - Max			
PN-16	PN-16	12 BAR	BLUE	RED	GREEN	YELLOW
125	125	175 PSI	7-70	7-90	30-145	30-230
PN-16	PN-16	12 BAR				
125	125	175 PSI				

Measures (mm)						
Diameter	**A**	**B**	**C**	**E**	**F**	**Kg.**
2″	190	82	175	163	208	10,5
3″	283	100	198	180	235	21,2
4″	305	111	211	201	246	29,2
6″	406	142	241	171	292	53,6
8″	470	170	277	173	330	75,4

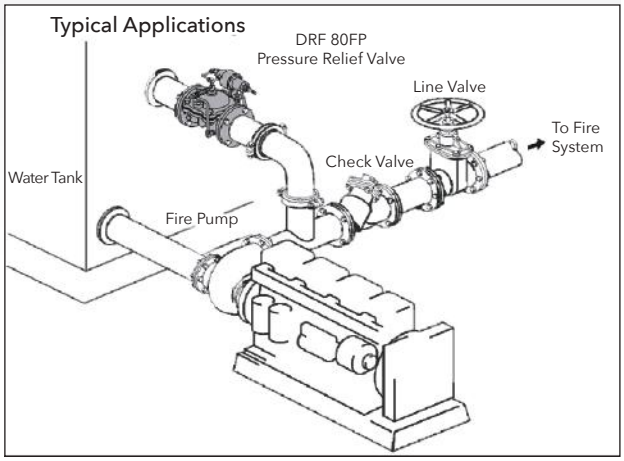


FIRE CONTROL VALVES



DRF 60FP
Fire Pressure Reducing Valve

DRF 80FP
Fire Relief Valve



Assembly
Attention!

The correct lifting equipment must be used.
Do not work alone.
Protective equipment must be used.

When the engine and its components are to be operated in a confined and restricted space, such as a container, the for easy disassembly and assembly of parts as well as routine maintenance a comfortable space should be left around it.

- Cylinder covers
- Recirculation pump
- Karter
- Adjustment gearbox
- Mars engine and charging dynamo
- Flexible connections

Parts related to operations to be performed during routine maintenance;

- Oil filters
- Air filters
- Fuel filters
- Block ventilation
- Dipstick
- Radiator filler cap and distance required for filling

Assembly Instructions

1. Plastic and inappropriate materials, including galvanized materials, in fuel pipes and connections should not be used.
2. Fuel pipes should be kept as far away from the exhaust system as possible.
3. Use suitable materials in the section of the exhaust system after the elbow outlet. heat insulation should be made by winding or using heat shields and this part should be insulated with wood. be installed as far away as possible from the compartments (if any). Note: Exhaust manifold or turbochargers are not heat insulated.
4. There must be one fire extinguisher in the engine room.
5. Batteries (if possible) must be housed in a separately ventilated and easily maintainable
   section and battery cable sizes should be kept as short as possible.
6. A suitable arrangement should be made in the crankcase for oil drainage and a drip tray should be placed under the crankcase. should be placed.
7. The room should be of sufficient size for easy entry and exit of the machine.
8. The room should have adequate lighting and sufficient number of sockets.
9. A lifting beam can be mounted on the ceiling for ease of maintenance.
10. Provision should be made for drainage of the coolant.
11. Fully rotating parts must be protected for operational safety

Considerations When Designing a Machine Room

1. The room for the placement of the machine is of sufficient size and the base is formed according to the weight of the machine must be suitable for the loads.
2. The ventilation system must be suitable for cooling and intake air intake.
3. Consideration must be given to coolant and fuel supply.
4. Exhaust gas must be discharged to the atmosphere within the permissible exhaust back pressure values.
5. If the air filters and exhaust silencer are located outside the room, this will cause power loss in the engine.may be, the size of the room to accommodate these components should be taken into account.
6. If an existing room is to be used, the construction works for the air intake and exhaust louvers should beshould not affect the structural stress of the building.
7. Sound intensity should be taken into consideration for machines that will operate in residential areas and sound cutting paths should be sought.

Engine Room Ventilation (Radiator Engines)

The fundamental principle of ventilation is to remove hot air from the room and to introduce outside ambient air into the room with minimal circulation. Figure 1 illustrates the optimal positioning of the unit relative to the room walls. The aim here is to ensure that air is drawn in from the lowest possible point and discharged through the radiator matrix to the outside of the building.

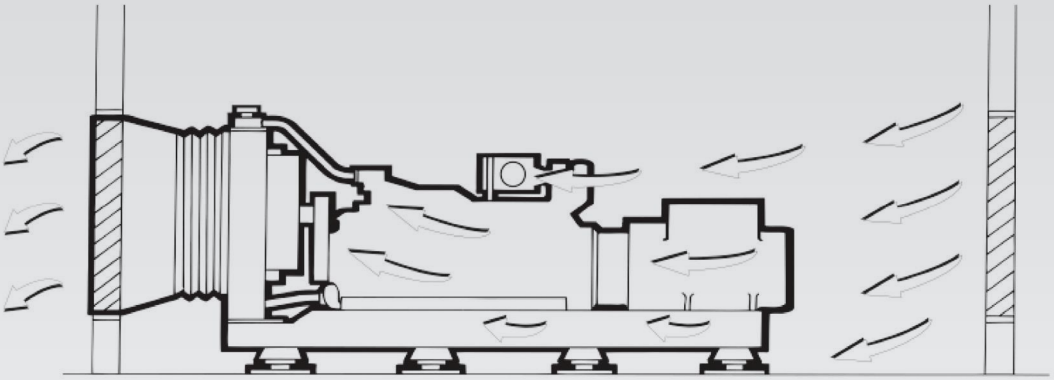


Figure 1.

Placing the radiator close to the air exhaust wall is not sufficient. In such a case, the air escaping between the radiator and the wall may recirculate back to the radiator fan. This leads to insufficient cooling and may cause overheating problems in the motor.
The air exhaust opening on the wall in front of the radiator should have the same rectangular shape as the radiator and be at least 25% larger than the radiator matrix area. The radiator flange should be flexibly connected to the louver frame using a hood made of metal or canvas fabric. If the machine is mounted on vibration isolators, having a flexible connection is especially important.

Similarly, the dimensions of the air intake opening should be 25% larger than the radiator matrix. For example, in an engine with a radiator matrix area of 1.44 m², the air inlet and outlet louver areas should each be 1.80 m². If the louvers include grilles, the area should be increased by an additional 25%, bringing it to 2.25 m².
See Figure 2.

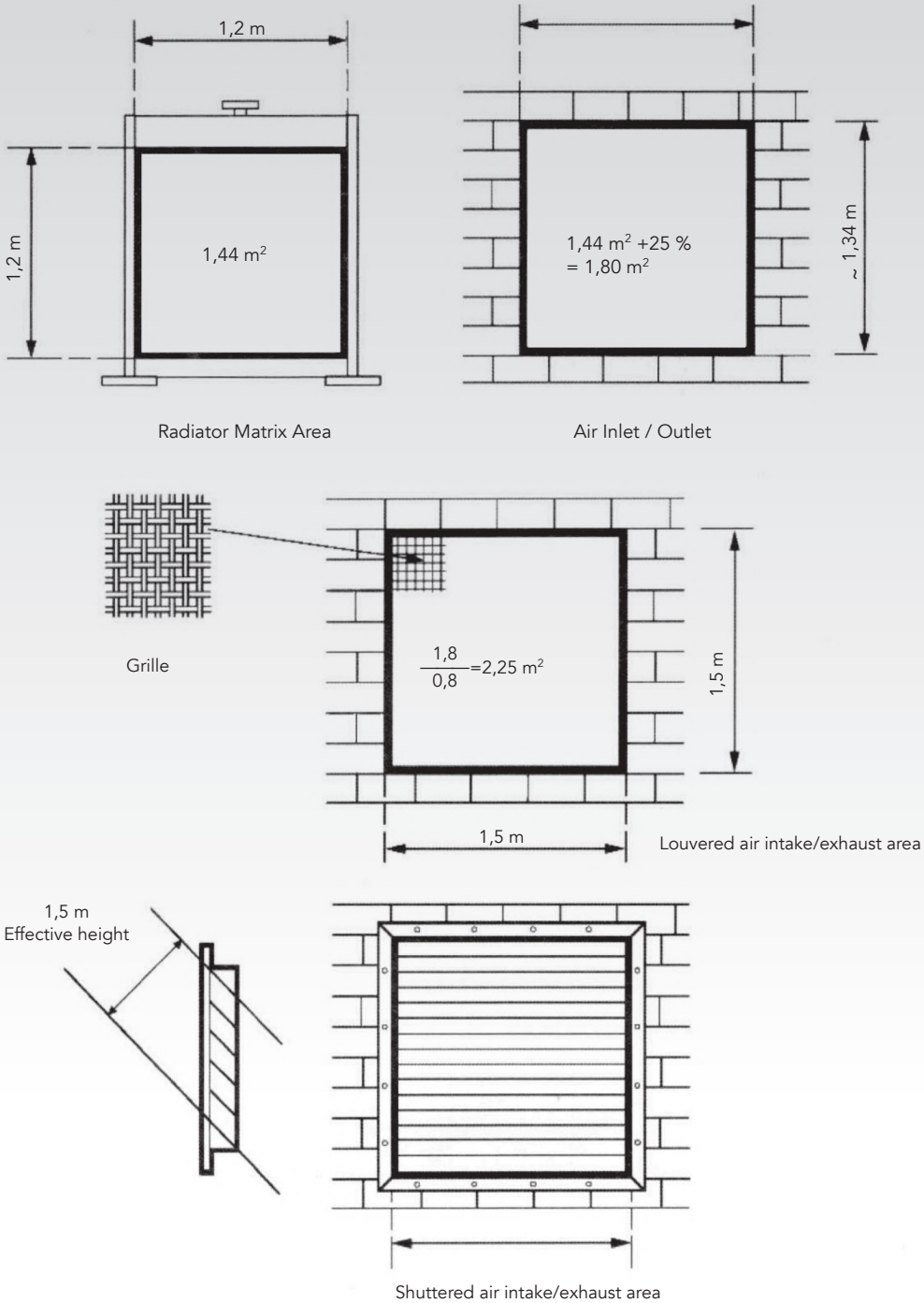


Figure 2

Diesel Pump

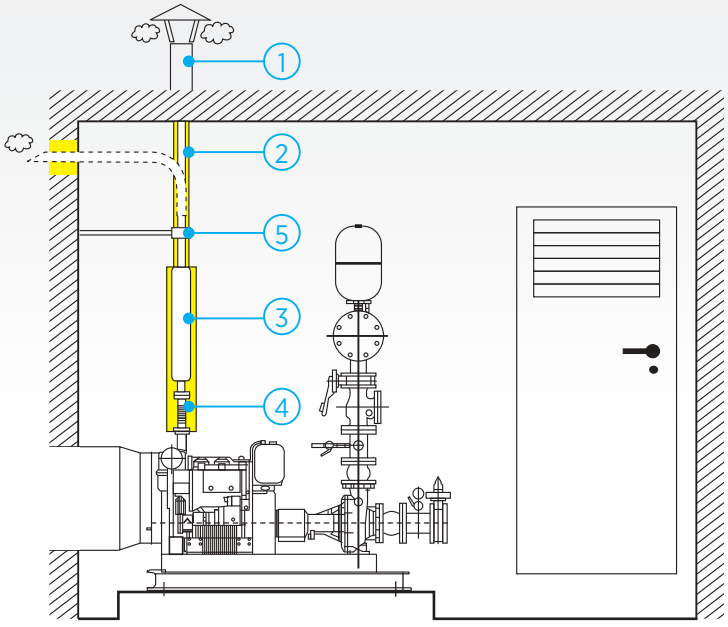
Considering for the cases of the water supply network being cut by authorities during a fire or the network getting disabled, EN 12845 proposes a diesel pump to be put next and in parallel to the electrical pump. In this case, the diesel pump is required to be of same capacity as the electrical pump; and the diesel pump is designed to immediately enable with the pressure dropping when the electrical pump gets disabled. Thus seamless water supply to the sprinkler system would be possible.

There are number of points to consider regarding diesel pump assembly and surrounding environment. These are, in the order;

1. Pump room should be ensured to be well-ventilated. Proper combustion air supply as well as fresh air cooling in air or water cooling types are of significant importance. Furthermore, against the possibility of exhaust gas escaping into the room, the room should be most appropriately ventilated with outer air. If possible, this ventilation should be ensured through a direct channel from the radiator inlet of the diesel pump to the outer air. (Figure 3)

2. Exhaust pipe should be definitely channeled outside in a proper way and with an appropriate diameter apart from any obstruction. This pipe should be necessarily headed outside and never considered to be directed to inside the building, another room within the building, or ventilation hall of the building.

3. There should be venting windows in the room, allowing the outer air to readily enter inside, and fresh air entrance should be ensured.



Comments

1. Rain capped chimney
2. Exhaust pipe insulation (rock wool)
3. Silencer
4. Vibration absorber
5. Exhaust pipe should be secured to the wall.

Figure 3

Underground Diesel Pump

Diesel pumps may be placed underground fire rooms when necessary. In this case, a ventilator should be positioned to throw the heated air inside out for the air cooling Diesel motor and fresh air should be supplied to inside through another vent as demonstrated in Figure 4.

In this case, a strong ventilation fan should be preferred and controlled by the room thermostat. Besides, also the smoke detector should control the fan motor, operating in parallel to this thermostat. In this manner, when the air inside is heated or there occur any smoke, the air fan should enable.

As shown, when a radiator and a water cooling diesel motor are used together, a ventilation venting should be put for the combustion air from outside and the exhaust pipe should be directed to the outer air. A proper ventilation should be definitely ensured. Exhaust pipe should be headed outside and insulated. Pipe height should be at least 2.4 m and of distance from living quarters away from human beings.

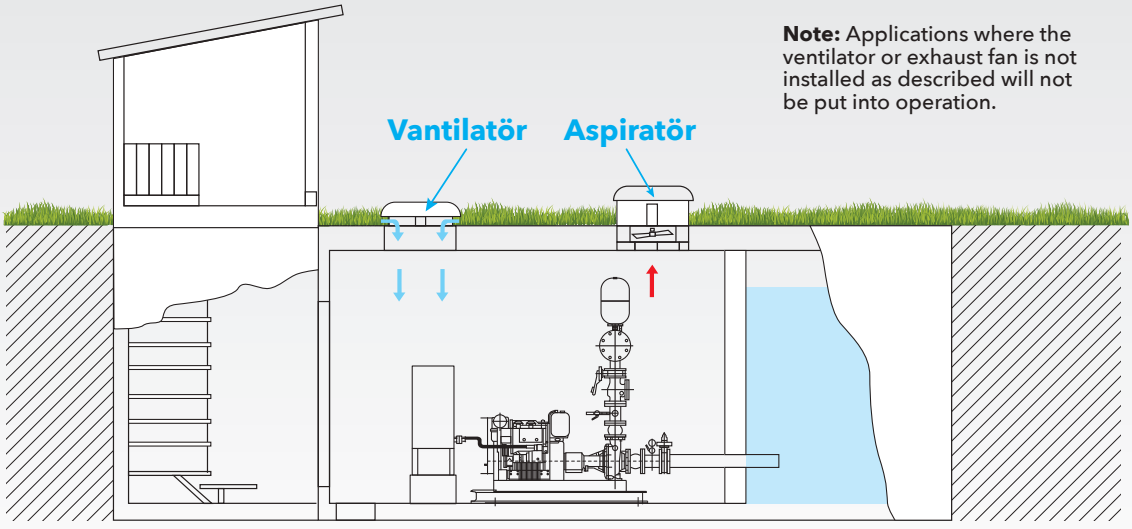


Figure 4

Pump Room

According to EN 12845 standard, the fire pump room should be an environment in line with this standard provisions. This room should resist fire for 60 minutes and protected and not be used for any other purpose. Considering this condition, the fire pump room should be built in accordance with the following;

7.1 Pump Room

a) It should be considered as an independent building.

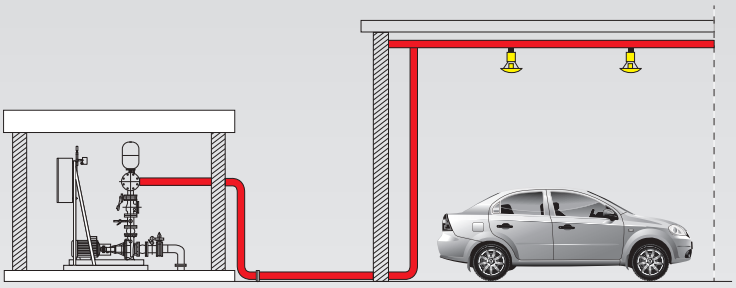


Figure 5

b) Adjacent buildings can be used provided that there is a sprinkler system and an outlet to outside is provided.

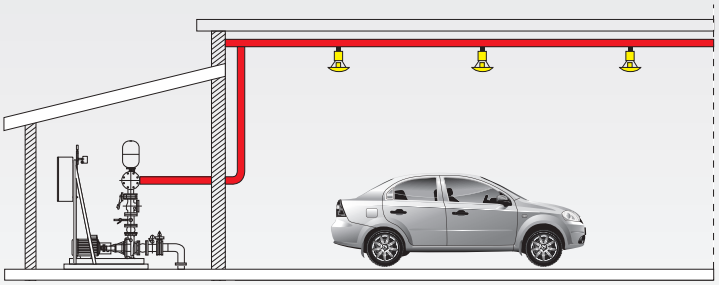


Figure 6

c) There can be a fire room inside the building provided that there is a sprinkler system and an outlet to outside is provided.

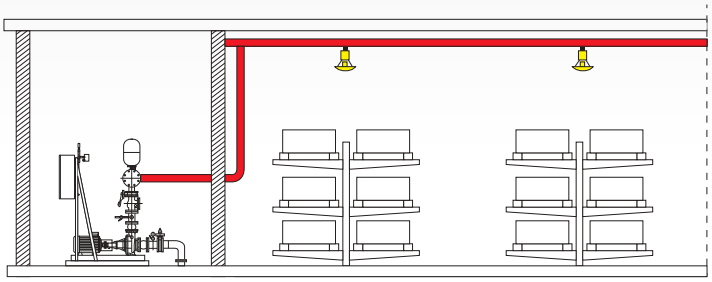


Figure 7

Pump Room Sprinkler Protection

There should be a sprinkler protection at the fire pump room (EN 12845). It would be appropriate that any sprinkler system in this room is supplied directly from the pump delivery collector. As shown in Figure 8, the sprinkler supply line should be taken immediately after the pump supply line and check valve. Over this line, a ball valve (1) and flow switch (2) should indicate the sprinkler (4) operation with an audio and flashing alarm in accordance with EN 12259-5 standard. This alarm system should be located in the control room. Using test and drainage valve (3), this system should be verified to operate (by opening the valve). Other end of the drainage valve should be connected to the reserve tank, and the water should be returned to the reserve tank during the test, which is performed by opening the valve. All the electrical devices to be used in this system should be of IP55 protection class. Why is the sprinkler system is located in the fire pump room is a frequent question. Diesel motors are used in various fire pump systems and these motors are provided with fuel. In a possible fire which may arise in the meantime, this standard is also referred for life safety of the worker in the room. Remember that the pumps in this location have electrical supply lines as well, any spark which may occur in this case is possible to cause a fire. Beyond that, a sprinkler system is a must in each location having flammable liquid or fuel. "Authorized personnel only" sign should be put on the pump room door, and this door should be locked, only the principal technician having the key. EN 12845 requires the weekly tests to be periodically and manually performed by the principal technician. Because the service technician will record and sign that they perform these tests and show this log and test performance to the authorities during fire department or municipality audits. As the building owner or building management is primarily responsible for these tests to be properly performed, they should constantly check this test log. Remember that irregular test performance and not keeping the system ready may cause life and property losses.

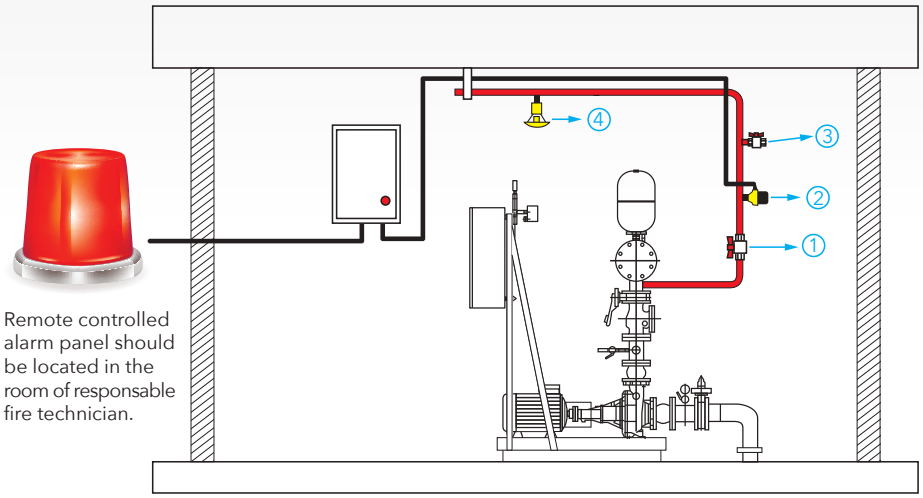


Figure 8.

It is essential that there are no obstructions in front of the radiator;
In some cases, air intake may need to be positioned toward the upper parts of the wall. In such situations, a hood should be used to direct the airflow downward. This type of hood also has the advantage of preventing the accumulation of hot air near the ceiling from entering the intake.
See Figure 9.

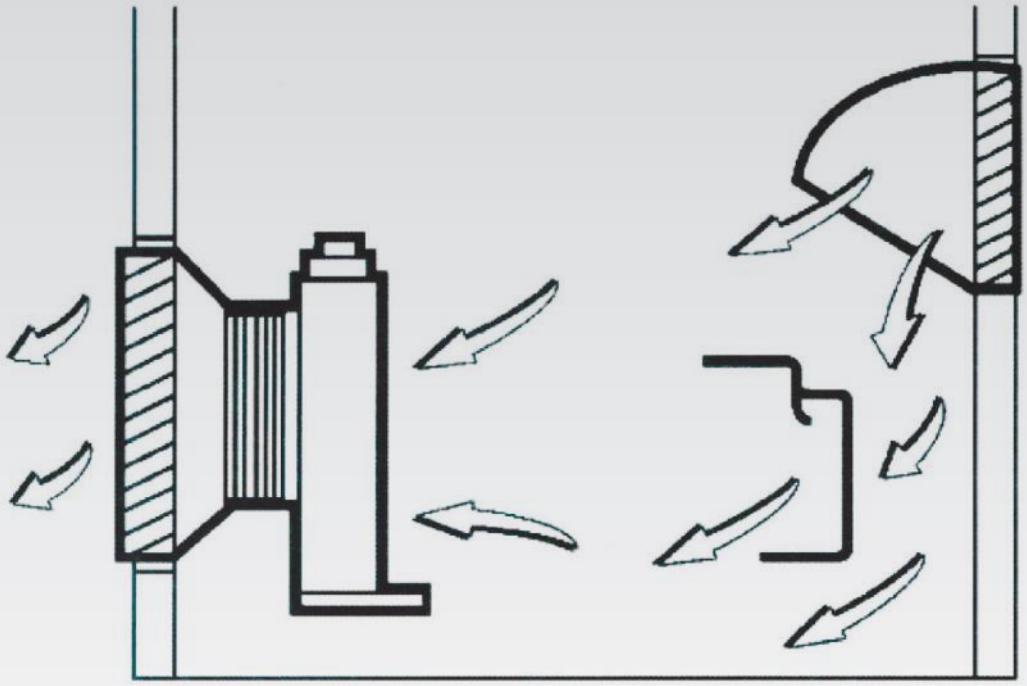


Figure 9.

Air Discharge Hood

In the design of the air discharge hood, wind speed and direction must be taken into consideration. Wind impacting the louver can create additional resistance in front of the fan, which may reduce the cooling air flow. In such environments, the following methods can be applied:

1. A 90° hood can be installed, as shown in Figure 10. In this case, the air discharge louvers will be mounted at the hood outlet. For this method, additional precautions should be taken against weather conditions such as rain.

2. Guiding panels can be used, as shown in Figure 11.

Figure 10

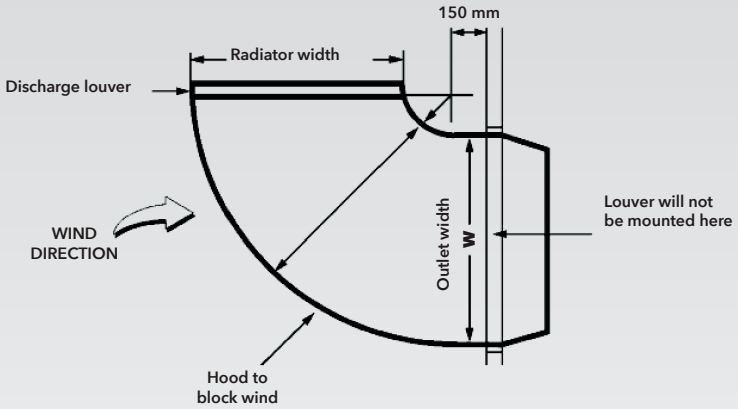
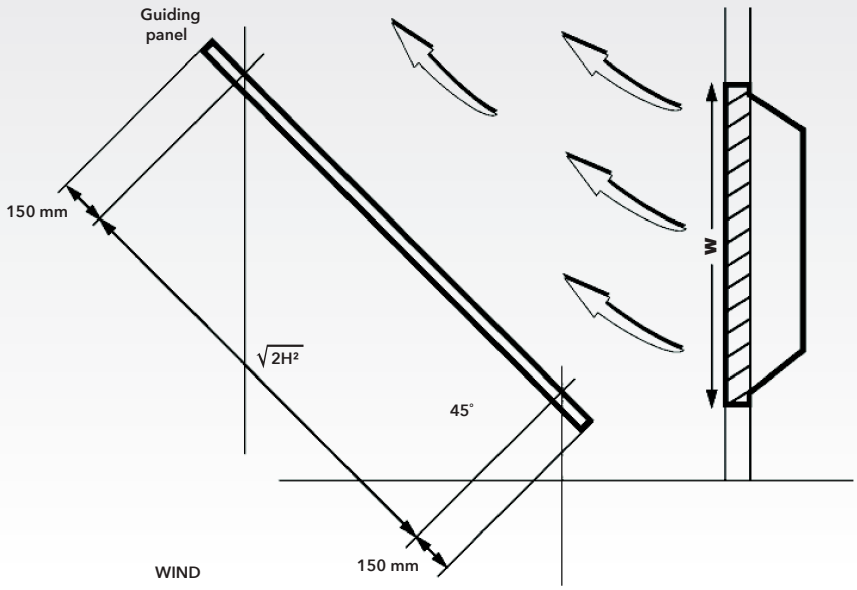


Figure 11



Exhaust System

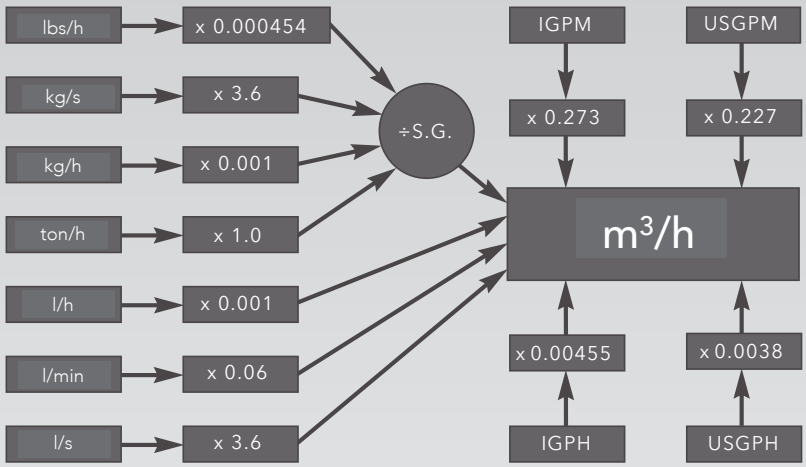
In cases where a long exhaust line needs to be installed, the back pressure generated in the exhaust system should be monitored. This value must remain below the limit specified by the engine manufacturer. As a practical application, for every elbow in the exhaust line, an equivalent extension of 1 meter should be assumed, and the pipe diameter should be increased by 1 inch for every 5 meters of length.

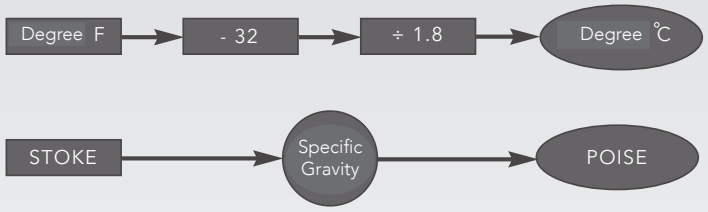
PANEL SUPPLY – CABLE SELECTION CHART													
Power		Voltage	CABLE CROSS-SECTION 3 X ...mm2										
HP	KW		1,5	2,5	4	6	10	16					
			MAXIMUM LENGTH (METERS)										
0,5	0,37	220 V	80	130									
0,75	0,55		55	90	140								
0,1	0,75		40	80	105	160							
1,5	1,10		30	50	75	115	190						
2	1,50		20	35	60	90	145	235					
3	2,20			30	50	70	120	185					
* The above table can be used for power cables running from the panel to the motors.													

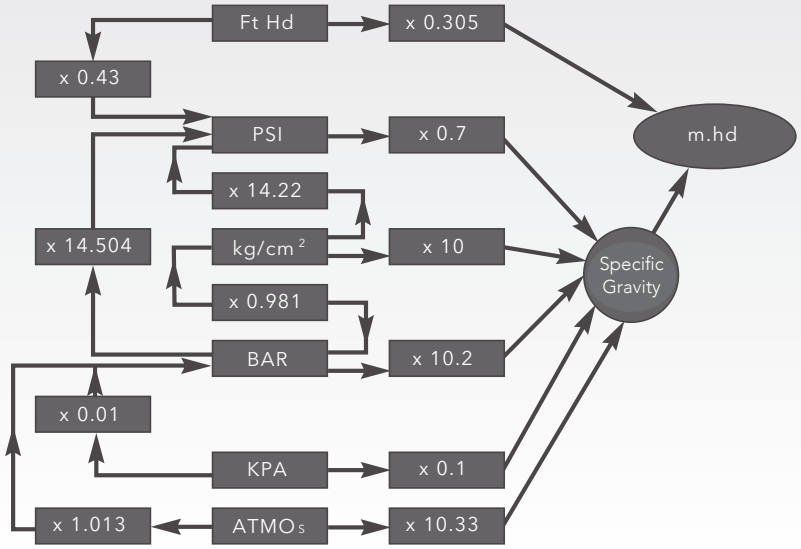
Power		Voltage	CABLE CROSS-SECTION 3 X ...mm2										
HP	KW		2,5	4	6	10	16	25	35	50	70	95	120	150
			MAXIMUM LENGTH (METERS)											
3	2,2	380 V	190	300	460									
4	3		150	240	360									
5,5	4		110	170	260	450								
7,5	5,5		80	130	190	340	540							
10	7,5		60	100	150	250	410							
12,5	9,2		50	80	120	205	330	510						
15	11			60	100	170	280	440						
17,5	13				90	150	245	385						
20	15				80	130	210	330	460	660				
25	18,5					100	170	260	370	530				
30	22					90	140	220	310	440				
35	26						120	190	270	380	540			
40	30						100	170	230	330	460			
50	37							130	190	270	380	520		
60	45							110	160	230	320	440	550	
70	52								140	200	280	385	480	
75	55								120	170	240	330	410	530
80	59								115	160	230	310	390	500
90	66								110	150	220	290	370	470
100	75								96	140	190	270	330	425
110	81									125	175	245	300	380
125	92									110	160	220	275	340
150	110										130	180	220	290
180	132											150	190	240
200	150											130	170	220
225	165											125	150	190
250	185													170
275	200													160
* The above table can be used for panel supply.														

*The maximum cable lengths specified in the tables are calculated based on a 3% voltage drop and at a temperature of 25 °C.

Calculation and Unit Conversion Tables







Conversion

Liter/sn convers

IGPM	x 0.0757
m³/h	x 0.278
m³/min	x 16.68
Ton meters/hour	x 0.278 ÷ S.G.*
L/min	x 0.0167
kg/h	x 0.000278 ÷ S.G.*
USGPM	x 0.063
ft³/s	x 28.3
ft³/min	x 0.47
British tons/hour	x 0.282 ÷ S.G.*

Conversion of Pump Pressure

Conversion to Meters

Feet	x 0.305
kg/cm²	x 10 ÷ S.G.
PSI	x 0.704 ÷ S.G.
Inch Hg	x 0.345 ÷ S.G.
cm Hg	x 0.1362 ÷ S.G.
Atmosphere	x 10.35 ÷ S.G.
kN/m² (kPa)	x 0.102 ÷ S.G.
Bar	x 10.2 ÷ S.G.

m³/h conversion

IGPM	x 0.273
L/s	x 3.60
L/min	x 0.06
Ton meters/hour	x 1 ÷ S.G.
m³/min	x 60
kg/h	x 0.001 ÷ S.G.
kg/s	x 3.6 ÷ S.G.
USGPM	x 0.227
ft³/s	x 102.0
ft³/min	x 1.7
British tons/hour	x 1.015 ÷ S.G.
British barrels/hour	x 0.163

*S.G. = Specific Gravity

Power Conversion

Conversion to Kilowatts

Horsepower x 0.746

Conversion to Horsepower

Kilowatts x 1.341

$$kW = \frac{m^3/h \times \text{in terms of mt total height} \times \text{specific gravity}}{367.87 \times \text{Pump Efficiency}}$$

$$BHP = \frac{\text{IMP.GPM in terms of Ft total height} \times \text{specific gravity} \times}{33{,}000 \times \text{Pump Efficiency}}$$

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