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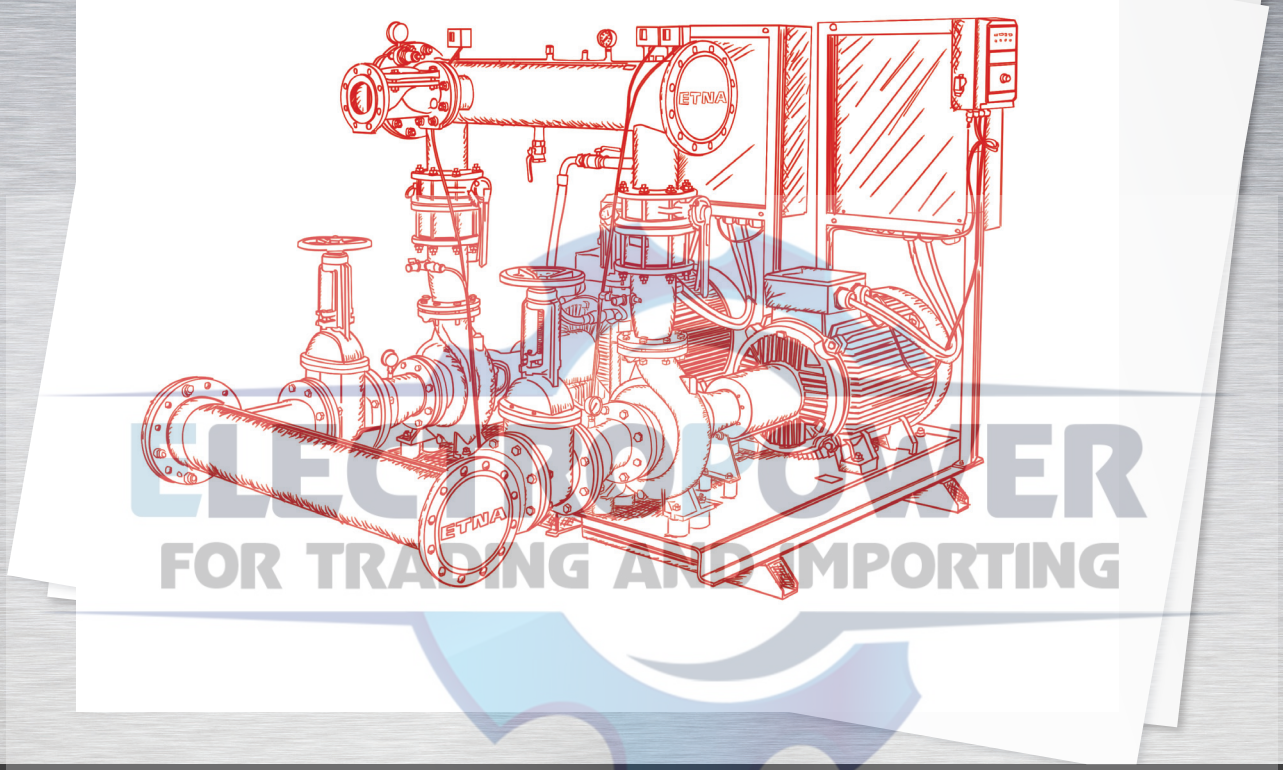

Fire Pump Systems in NFPA 20 Standard

✓ ETN YN Series

ELECTROPOWER
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The National Fire Protection Association (NFPA) was established in 1896 in the USA. NFPA 20 is referred to as the "Standard for the Installation of Stationary Pumps for Fire Protection" belonging to this organization and was first released in 1899. This standard identifies the features, performance and assembly rules of fire pumps, control panels and required auxiliary elements. NFPA 20 was revised multiple times since its initial release, with its most up-to-date version being the 2016 release.

In Turkey, automatic sprinkler systems are required by Turkish Fire Safety Regulations to be built according to EN 12845 standards. Even though sprinkler systems, fire cabinets and hydrants are mostly designed based on Turkish Fire Safety Regulations, fire extinguishing systems designed according to NFPA standards are also very popular in Turkey. One of the most important reasons behind this choice is the demand of American investors for fire extinguishing systems in compliance with NFPA standards.

Moreover, since Middle Eastern, African and Asian countries still lack national fire fighting standards, the internationally recognized NFPA standards have become widely accepted for fire extinguishing systems in these countries. The FM Global insurance company and some investors demand solutions based on NFPA 20 from project owners.

ETNA (Alp Pompa Inc.) manufactures fire pumps in line with both EN 12845, a European Union standard, and NFPA 20 in order to fulfill national and international demands with its production experience of more than 35 years and expert sales team. ETNA, has been a member of NFPA since 2013.

General Properties of ETNA Fire Pump Systems in accordance with NFPA 20

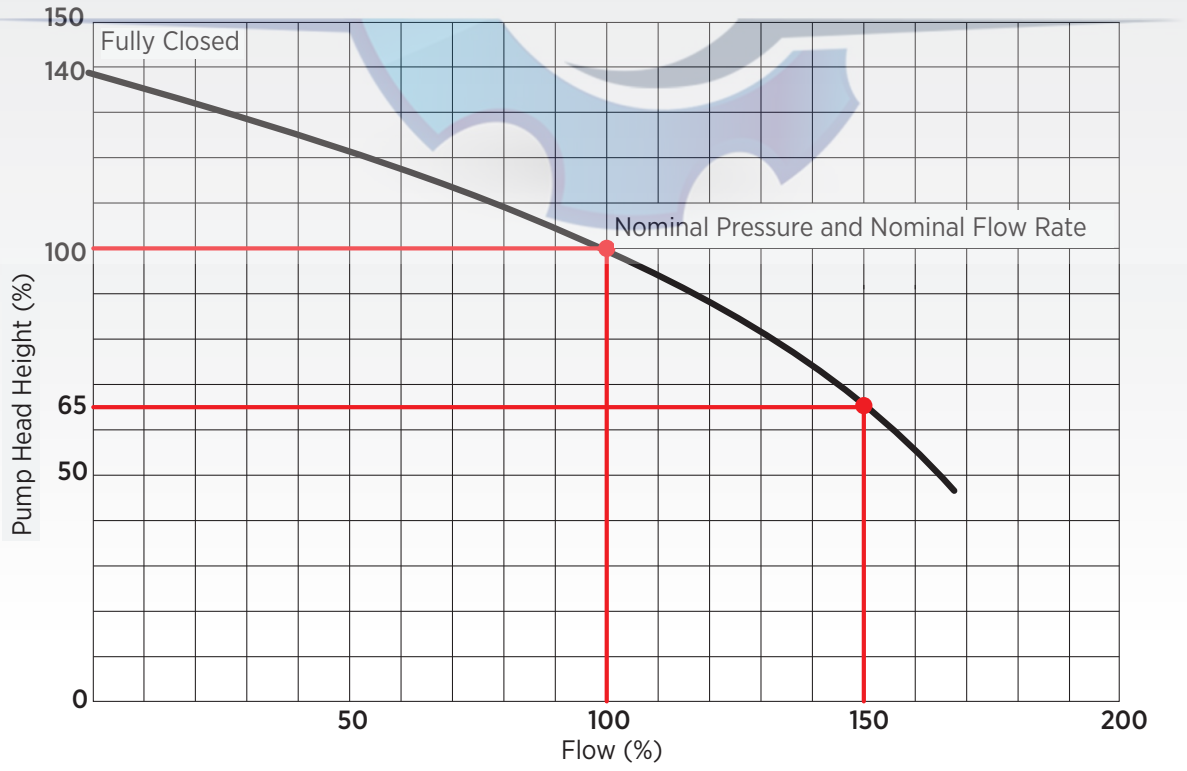
Throughout the life cycles of the fire pumps, the maximum reliability is always the first priority. Thus, contrary to other pumps, savings and efficiency are not the main consideration.

What should the Performance Properties of a Fire Pump in line with NFPA 20 be?

Shut-off Pressure Value: The shut-off pressure value of the fire pump (maximum pump pressure at zero flow rate) should not exceed 140% of the nominal value.

Nominal Values: The intersection point of the requested flow rate and the pressure value on the pump hydraulic curve.

Maximum load: The fire pump curve should provide 150% capacity value of the nominal flow rate, and the pressure value at 150% flow rate capacity should not be less than 65% of the nominal pressure. "Curve 1" shows the curve limit values.



Curve 1: Characteristic Limit Value Curve

Note: The pump's closed valve pressure cannot be more than 1.4 times the nominal pressure. The pump pressure at 150% flow rate cannot be smaller than 65% of the nominal pressure.

- According to NFPA 20, the nominal flow rates of fire pumps are in the range of 25-5000gpm.
- Nominal pressure value is required to be 40psi or higher.
- Standard pump types are identified as end suction, vertical inline, horizontal split case and vertical split case vertical turbine.
- Each pump should have an individual control panel.
- In NFPA 20, fire pump suction diameters are identified based on the maximum velocity at 150% of nominal flow rate (4.6m/sec).
- There should be a rising stem valve between the suction line and suction collector of the fire pumps.
- The suction line should never include a strainer.
- NFPA 20 allows suction from negative level only for "Vertical Turbine" pumps among fire pumps, and forbids negative suction by end suction and split case pumps.
- There should be a check valve and butterfly valve in the discharge line of the fire pumps, in that order.
- If the fire pump are electric driven fire pumps, power supply need to be sustained or at least one fire pump need to be diesel engine fire pump.
- Jokey pump is used to solve the issue of small pressure drops in the fire installation before the main fire pumps are activated; its flow rate must be min. 1/100 of the flow rate of the main fire pump and its pressure must be min. 1 bar above the pressure of the main fire pump.

Material Specifications

- Pump Impeller: Bronze or AISI 304
- Pump Shaft: AISI 304 or AISI 316
- Pump Body: GG25 pig iron or GGG40 pig iron
- Impermeability: Mechanical seal
- Coupling: Flexible coupling
- Bearing: Grease lubrication rolling bearing (bearing service life should be min. 5000 hours)

Pump Equipments

- Air Release Valve (for both electrical and diesel pumps)
- Casing Relief Valve (only for electrical pumps)
- Manometer on delivery line and vacuum meter on suction line
- Required to be +4°C above the pump room against the risk of freezing.

Note: The suction and delivery lines of the fire pumps should be fixed to a stable surface with seismic protectors for protection against possible earthquakes and vibrations.

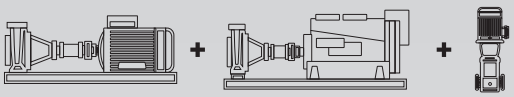
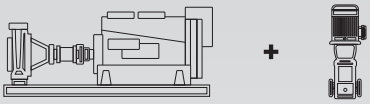
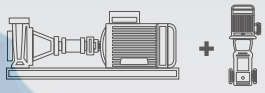
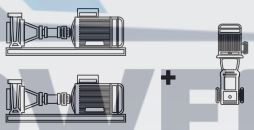
Description	
Pump set with diesel engine, electrical engine, and pilot pump	
Fire pump set with diesel engine and jokey pump	
Pump set with electrical engine pump and pilot pump	
Pump set with two electrical engine pumps and one pilot pump	

Table 1: NFPA 20 Fire Pump Versions

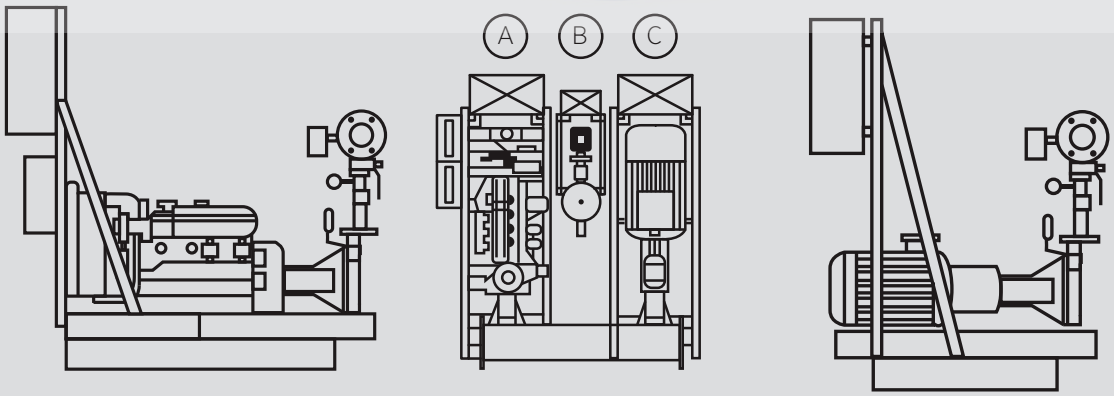


Figure 1: Modular System

- The diameter of the line between the fire pump and the suction collector should be a straight line with a length at least 10 times the suction diameter value of the pump in NFPA 20. Figure 2 indicates the right and wrong applications of this connection.

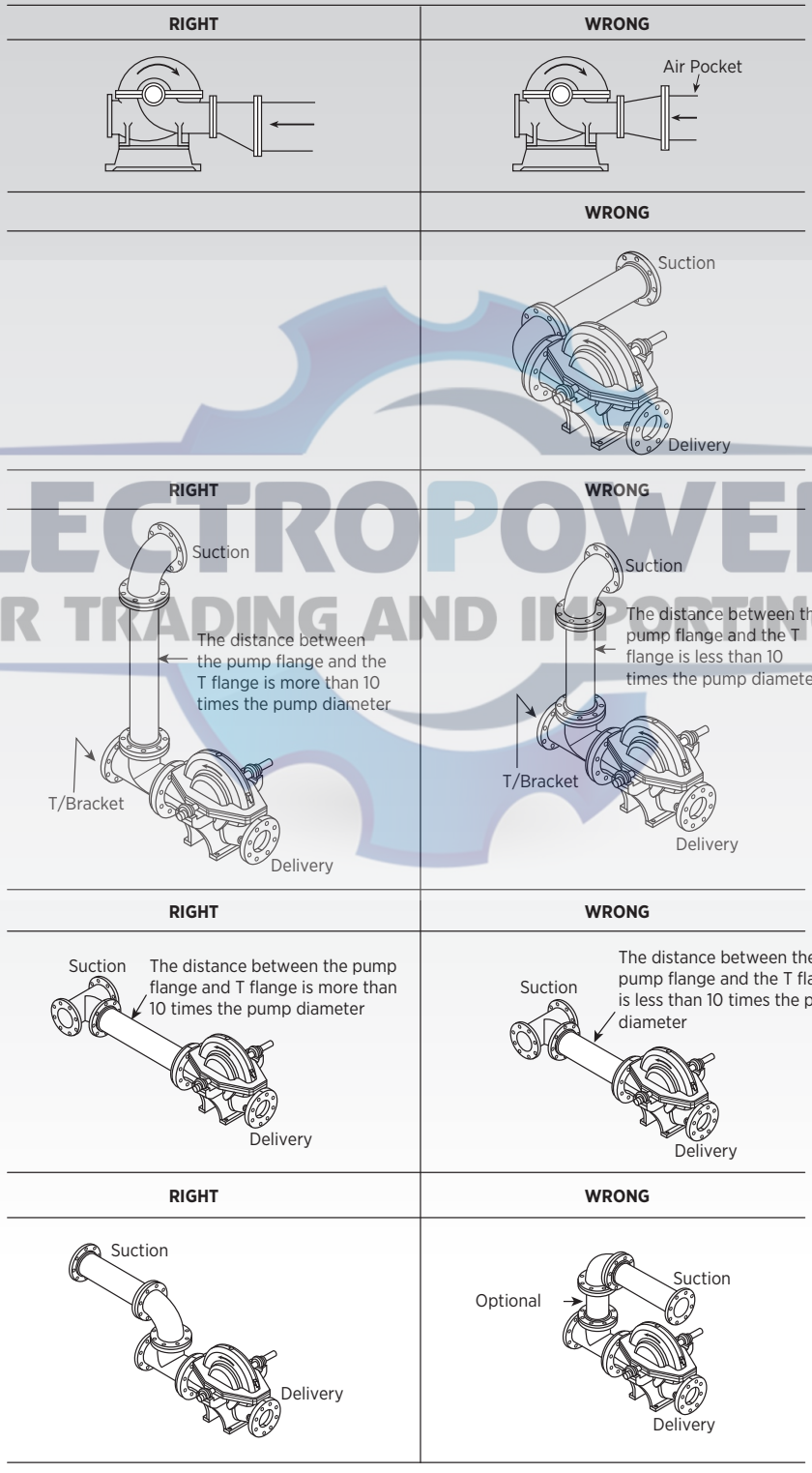


Figure 2: Pump Suction Line Connection Examples

- If the fire pumps directly suck water from the tank without a suction collector, a vortex plate should be placed. The dimensions of the vortex plate should be as follows. The dimensions of the vortex plate are given in Figure 3.
- If required, an eccentric reduction must be placed at the inlet of the pump on the suction line, and a concentric reduction must be placed at the delivery line. The top of the eccentric reduction should be flat. The use of reduction on suction and delivery lines should be determined based on Table 1 in line with the pump flow rate.
- For example: if the suction diameter of a 750gpm pump is 6″, there is no need to use a reduction. But if it is 4″, it is required to use an eccentric reduction from 4″ to 6″.
- Flow meter diameter should be selected based on "Table 1" in line with the pump flow rate. Moreover, unlike in EN 1284 which specifies a connection to the delivery collector, the NFPA 20 standard requires the flow meter to be connected between the butterfly valve and check valve on the pump delivery line, as shown on Figure 4.

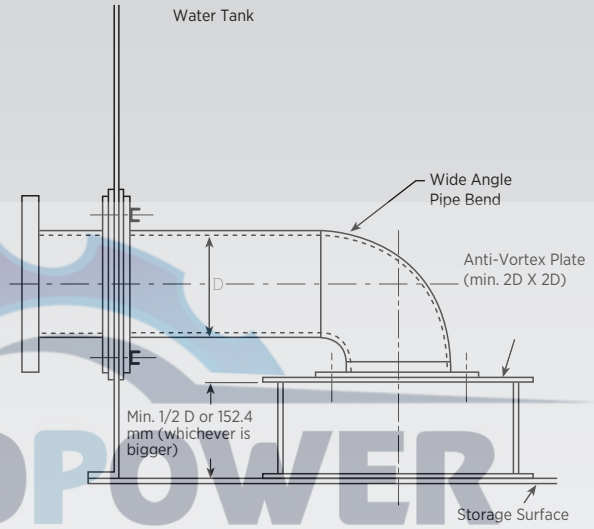


Figure 3: Vortex Plate Dimensions

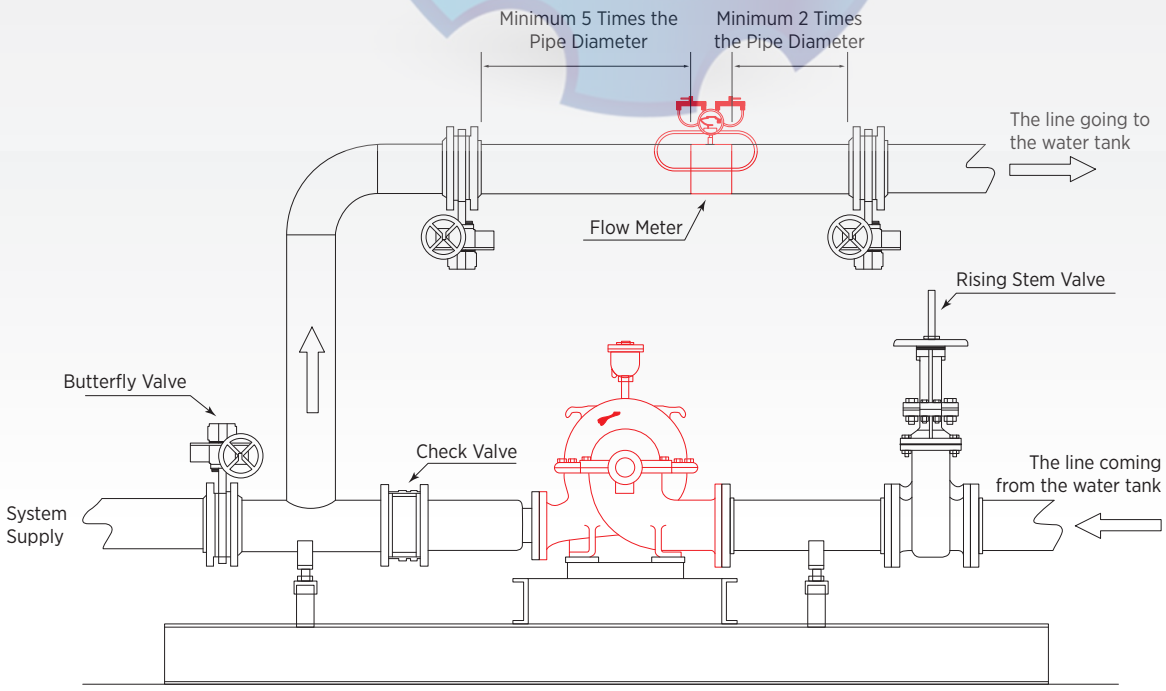


Figure 4: Flow Meter Connection Diagram

Pump Flow Rate		Minimum Pump Diameters (Nominal) (inch)				
m³/h	(gpm)	Suction	Discharge	Relief Valve	Relief Valve Discharge	Flow Meter
6	25	1	1	¾	1	1 ¼
11	50	1 ½	1 ¼	1 ¼	1 ½	2
23	100	2	2	1 ½	2	2 ½
34	150	2 ½	2 ½	2	2 ½	3
45	200	3	3	2	2 ½	3
57	250	3 ½	3	2	2 ½	3 ½
68	300	4	4	2 ½	3 ½	3 ½
91	400	4	4	3	5	4
102	450	5	5	3	5	4
114	500	5	5	3	5	5
170	750	6	6	4	6	5
227	1000	8	6	4	8	6
284	1250	8	8	6	8	6
341	1500	8	8	6	8	8
455	2000	10	10	6	10	8
568	2500	10	10	6	10	8
682	3000	12	12	8	12	8
795	3500	12	12	8	12	10
909	4000	14	12	8	14	10
1023	4500	16	14	8	14	10
1136	5000	16	14	8	14	10

Table 2: Diameter Table

Fire Booster Flow Diagram in NFPA 20

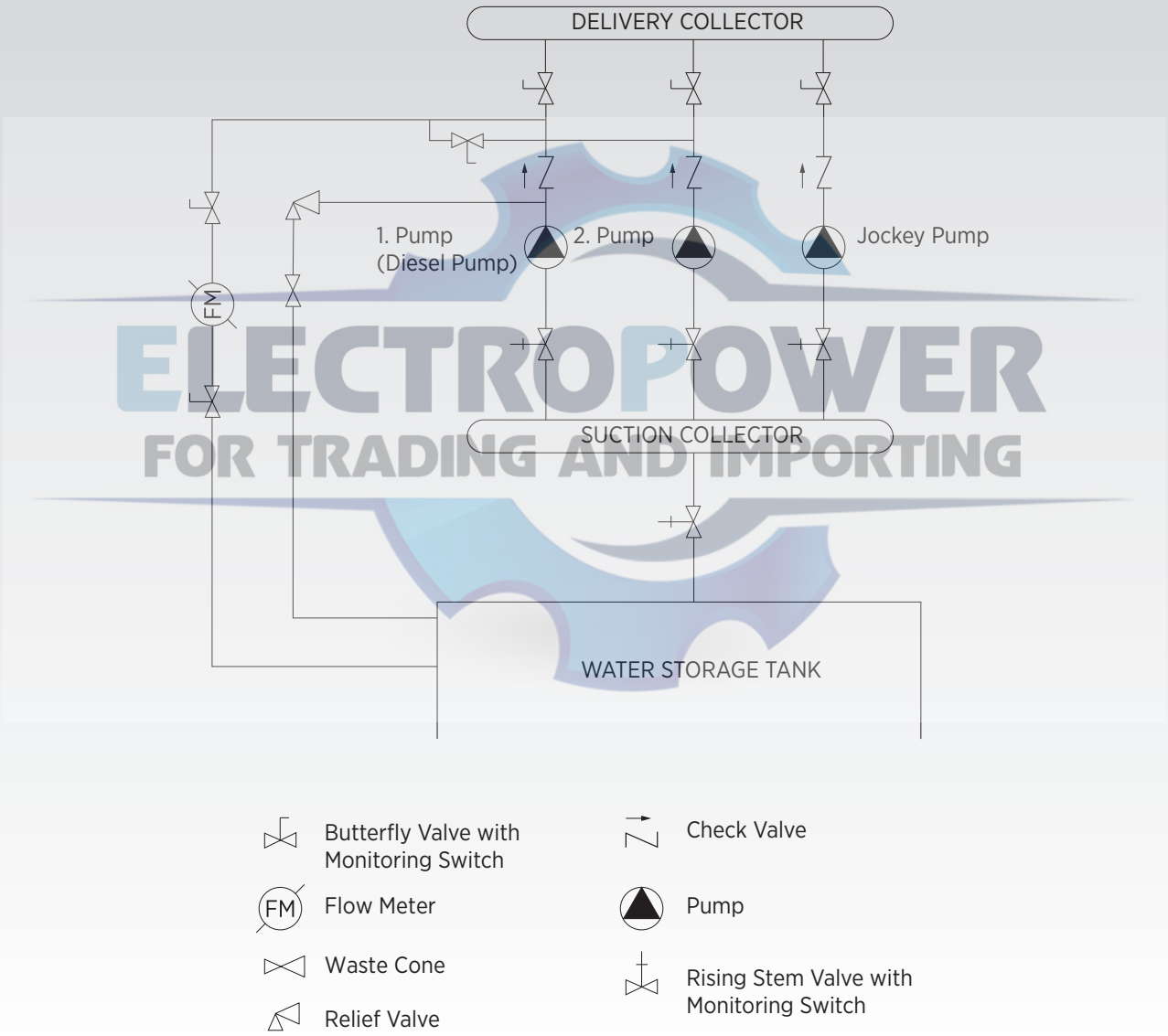
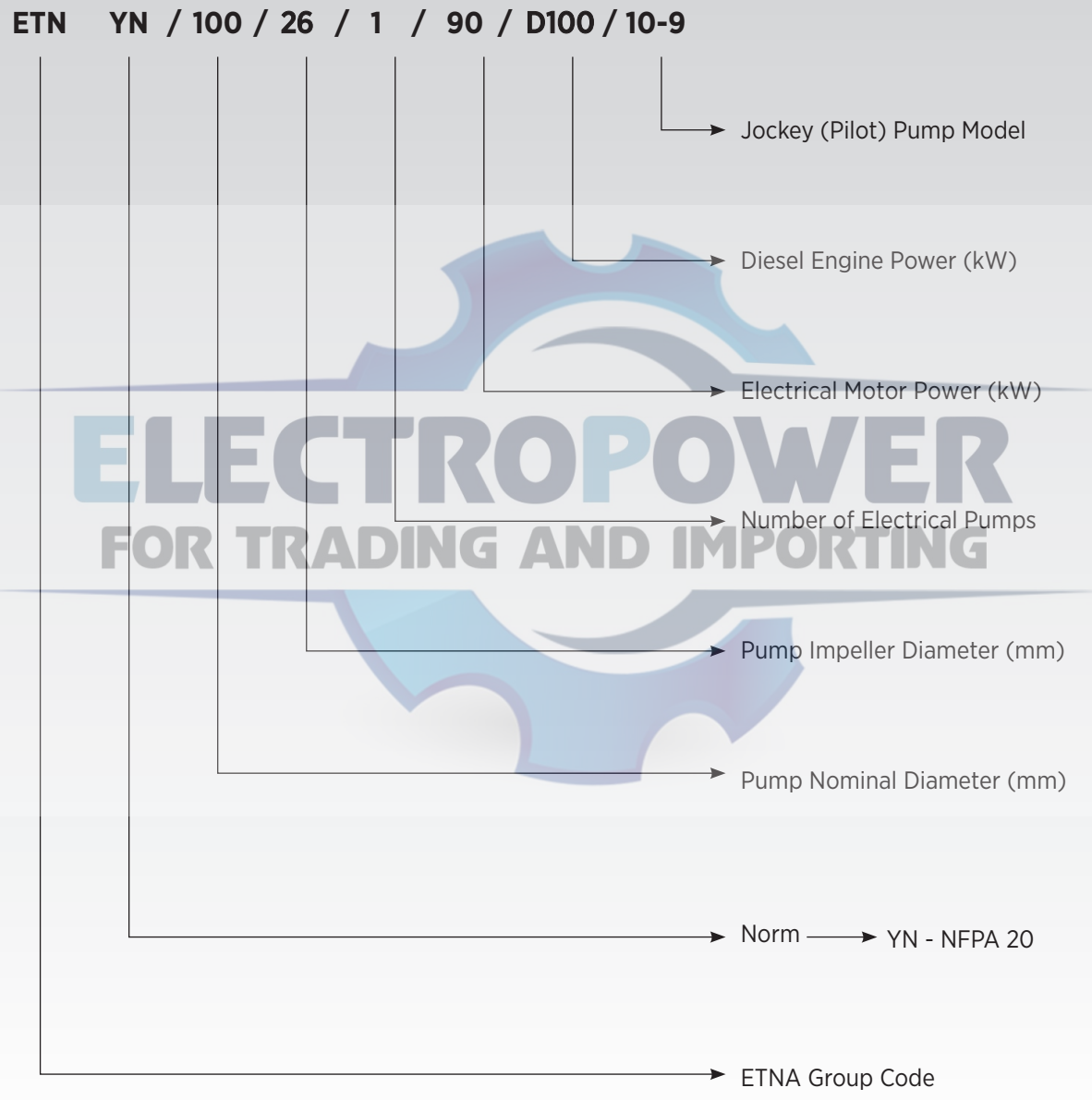
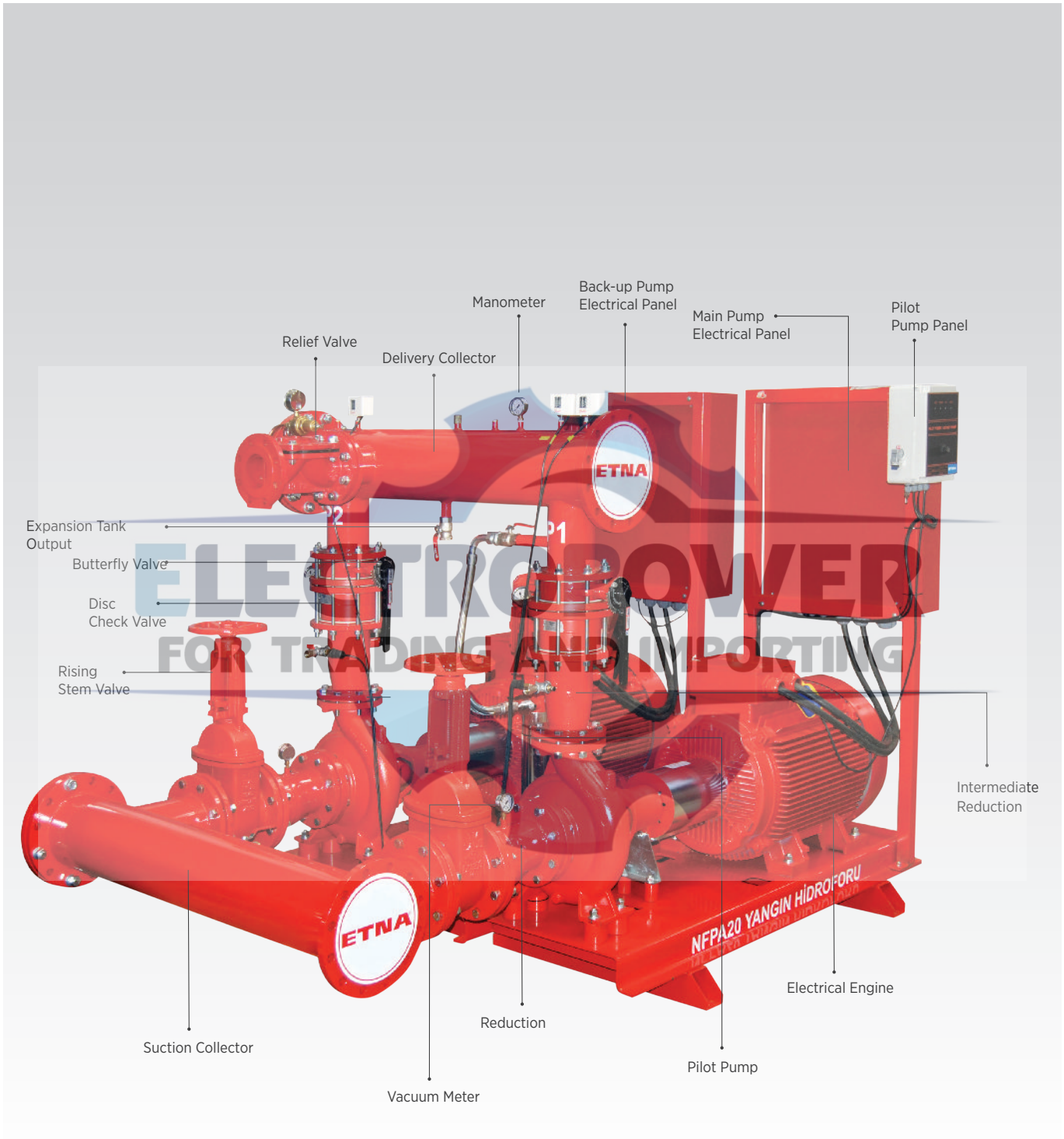


Figure 5: Fire Booster Flow Diagram in NFPA 20

Fire Pump System Codes in NFPA 20





Fire Pump Control Panels in NFPA 20

Electrically Driven Pump Protection-Control Panel

- Except for the engine, all outlet connections are low voltage (12/24 Vdc)
- 3 Voltmeters
- 3 Ammeters (max.1000 A)
- Grid phase meter 50/60 Hz
- Phase sequence
- Wattmeter (Active power)
- Varmeter (Reactive power)
- V/A meter (Current power)
- Cosine meter (Power factor)
- Total operating time
- Partial operating time
- Automatic - Manual switch, manual start and stop in manual mode

Diesel Driven Pump Protection-Control Panel

- Except for the engine, all outlet connections are low voltage (12/24 Vdc)
- 2 Batteries
- 2 Voltmeters
- 2 Battery ammeters
- Tachometer
- Temperature gauge
- Oil temperature gauge
- Oil pressure gauge
- Fuel level gauge
- 2 Battery charging rectifiers
- Battery efficiency control
- Operation error report
- Manual operation buttons
- Warning lamp test button
- Test commissioning
- Monitoring individual charging of batteries
- 3+3 = 6-cycle automatic start-up attempt from batteries
- Automatic - Manual switch, manual start and stop in manual mode

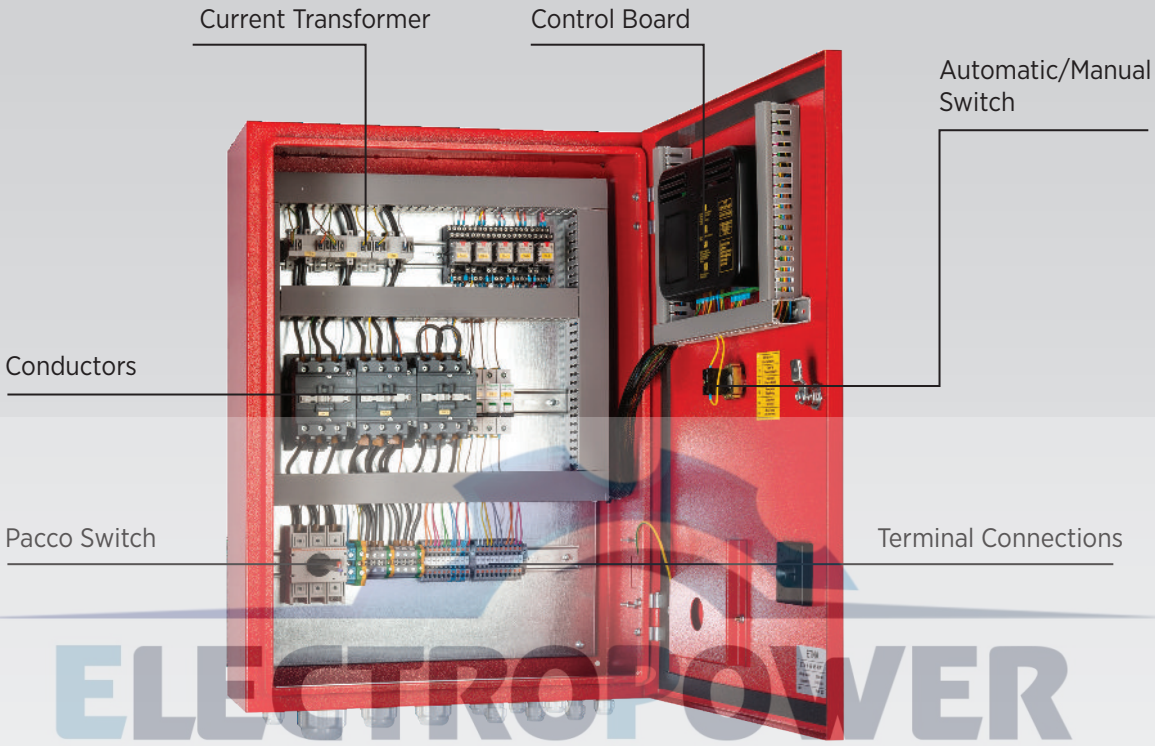


Figure 6: NFPA 20 Electrical Fire Panel Interior

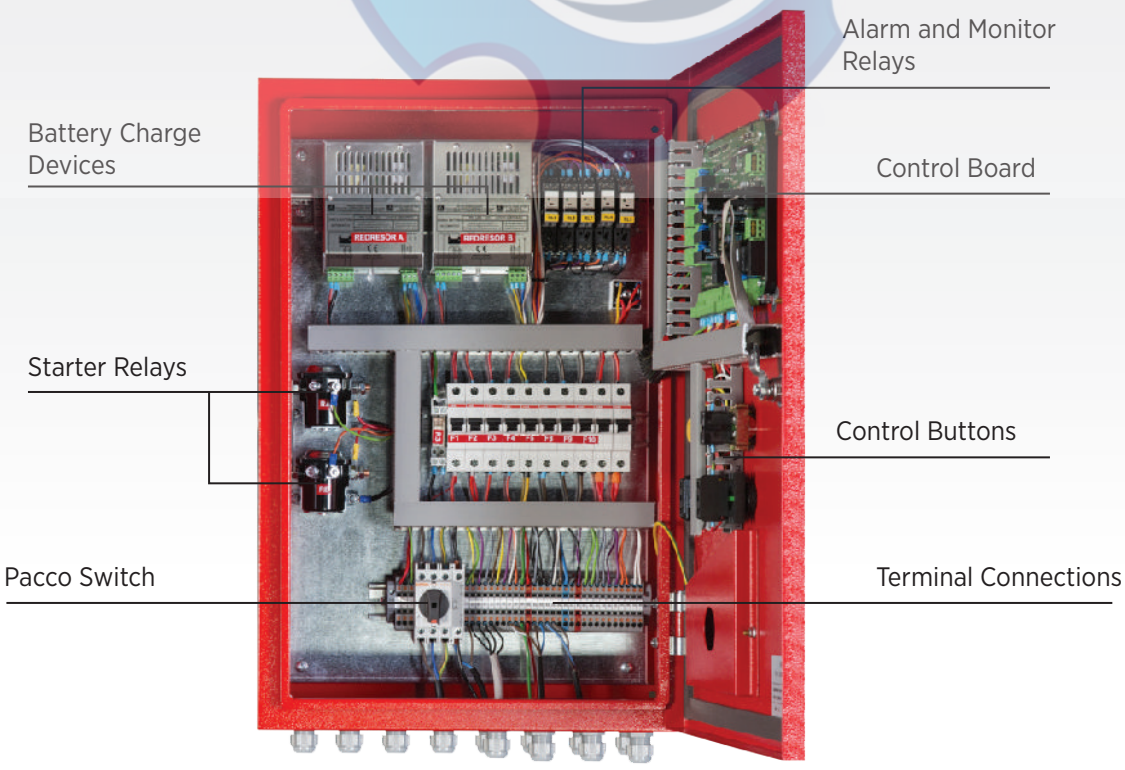


Figure 7: NFPA 20 Diesel Fire Panel Interior

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