FIRE PUMPS
NFPA 20 standard defines the installation requirements of the fixed pumps for fire protection. This standard is the most common and the most detailed standard in the world used for fire protection services.

The scope of NFPA 20 document include the selection of fire pumps, installation, acceptance tests and operation.

Standart Pompa, being a member of NFPA, follows all studies and publications related within the fire protection area.

Most of the consultant companies related with fire protection system design are making their designs according to NFPA standards. Besides, insurance companies are not taking risk and reducing the policy costs, if the fire system is not designed according to NFPA standards and the fire pumps are not selected according to NFPA 20.

**STANDART Fire Fighting Pump Features**

STANDART fire pumps are used to pressurize and keep the pressure of fire fighting systems such as;

- Sprinkler
- Fire Cabinets
- Hydrants

Different type of pumps may be used in fire fighting systems;

- End suction pumps
- Vertical in-line pumps
- Double suction split-case pumps
- Multistage pumps

**STANDART Fire pumps an groups fully conform the requirements of NFPA 20**

- Separate controller for each pump.
- Max. flow velocity in suction pipe is below 3 m/s at rated capacity
- Pressure at zero flow is less than 1.4 times rated pressure
- Pressure at 1.5 x rated capacity is not less than 0.65 x rated pressure
- Service factor shall not exceed 1.15
- Materials:
  - Casing: Cast iron
  - Impeller: Bronze
  - Shaft: Stainless steel
- Shaft sealing: Soft packing or mechanical seal
- Bearings: L-10 rating of not less than 5000 hours at maximum load.
- Flanges according to EN 1092-2 PN 16.

**Suggested accessories on the pump**

- Automatic air release valve
- Circulation relief valve
- Increaser and reducer piping elements
- Pressure gauges at suction and discharge
- Flexible coupling
Fire Pump Performance Characteristics Conform to NFPA 20

![Graph showing fire pump performance characteristics with shut-off, steep characteristic, flat characteristic, and rated head.]

Fire Pump Capacities Conform to NFPA 20

Rated capacities as per NFPA 20 [2016]

<table>
<thead>
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<th>(CPM)</th>
<th>(l/min)</th>
<th>(m³/h)</th>
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## STANDART Fire Pump Types

### SNT End Suction

Horizontal, radially split volute casing type, single stage, end suction centrifugal pump with closed impeller.

<table>
<thead>
<tr>
<th>rated capacities (GPM)</th>
<th>rated pressures (m)</th>
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<tbody>
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### SDS Double Suction

Horizontal, single stage, axially split volute casing pumps with double suction radial impellers.

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### SKM Multistage

Horizontal ring section multistage centrifugal pumps with closed impellers and diffusers.

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### SKM Multistage - Multioutlet

Multioutlet design horizontal ring section multistage centrifugal pumps with closed impellers and diffusers.

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Fire Pump with Electric Motor

Fire Pump with Diesel Engine

Generally 100 % redundancy is obtained by diesel engine-driven pumps. The requirements of diesel engine-driven pumps are defined in NFPA 20.

Jockey Pump

Jockey pumps should be selected at a capacity at which to increase the system pressure to the required value in 10 minutes after sensing the leakage in fire fighting system.

Generally a pump with %3 of rated capacity (min 1 GPM), %110 of rated pressure.
Fire Pump Group Operation Algorithm

Graphical representation of the fire pump group operation algorithm

H / Hn [%]
Q / Qn [%]

If the pressure drops below the set value (PSET), jockey pump starts running with the signal coming from the pressure switch and continues to run for 10 minutes until the system pressure reaches the set value (PSYSTEM). If the pressure continues to drop, (PSET) first the main pump starts to run. If the system pressure (PSYSTEM) can not supplied and pressure continues the drop

Manual Electric Control

The manually operated switch (push button) can be used to run the motor manually. In this case operation can not be affected by the pressure-actuated switch.

Mechanical Control

Emergency run handle on the controller can be used to operate pumps by mechanically closing the motor-circuit switching mechanism.

P&I Diagram for Fire Fighting Groups Conform to NFPA20

Pump BV Butterfly Valve
Valve DCP Diesel Engine Control Panel
Check Valve PS Pressure Switch
Manometer SV Solenoid Valve
Reservoir RV Relieve Valve
Discharge Collector CRV Casing Relieve Valve
Electric Motor ECP Electric Motor Control Panel
Diesel Engine JP Jockey Pump
Eccentric Reducer ET Expansion Tank
Outside Screw & Fork JCP Jockey Control Panel
Concentric Reducer FM Flow Meter
Waste Cone
Automatic Operation Algorithm In Case Of Fire

NOTE: Pressure adjustments must be like $P_{\text{SYSTEM}} > P_{\text{JSET}} > P_{\text{1SET}} > P_{\text{2SET}}$. 

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**Automatic Position**

- **Normal**
  - **$P < P_{\text{1SET}}$**
    - **YES**: Run EM
  - **$P > P_{\text{1SET}}$**
    - **YES**: EM Running
    - **NO**: Timer
      - **YES**: Stop EM
      - **NO**: Failure
  - **$P < P_{\text{JSET}}$**
    - **YES**: Run JP
  - **$P > P_{\text{JSET}}$**
    - **YES**: JP Running
    - **NO**: Failure
    - **YES**: Stop
    - **NO**: Stop PM
  - **$P < P_{\text{2SET}}$**
    - **YES**: Run DM
  - **$P > P_{\text{2SET}}$**
    - **YES**: DM Running
    - **NO**: Failure
    - **YES**: Stop DE
    - **NO**: Timer
      - **YES**: Stop
      - **NO**: Failure

- **Failure**
  - **LRP**
    - **YES**: Alarm (Sound & Light) and Stop
    - **NO**: Over Speed
      - **YES**: Alarm (Sound & Light) and Stop
      - **NO**: Over Speed
Control Panel

Control Panels According to NFPA 20

For Electric Motor

For Diesel Engine

The pictures used are representative.
Fire Pump Group Control System

• Individual control panels are used for electric pump, diesel pump and jockey pump
• Lock mechanism are used on panels
• Continuous grounding
• Pumps can run by manual control and emergency-run mechanical control on controller
• By the help of Locked Rotor Protection (LRP), in case of locking rotor main switch is automatically shut down.
• No thermic protection on controller (except jockey pump controller)
• Alarm signals on electric pump controller (except jockey pump)

1. pump running
2. pump failure
3. minimum water level (if required)
4. phase reversal
5. loss of phase
6. power suitable
7. lamp test (if required)
8. audible (can be switched off) and visible (can not be switched off) alarms
9. LRP

• Two 12 V batteries for diesel engine
• Battery chargers
• Additive alarm signals for diesel driven pumps

1. high motor temperature
2. low oil pressure
3. over speed
4. control is in automatic mode
5. charger lamp
6. failure of 1st battery
7. failure of 2nd battery
8. starting failure
9. failure of battery charger
10. engine running
11. lamp test button (optional)
12. audible (can be switched off) and visible (can not be switched off) alarms

STANDARD fire pump groups can communicate with building automation systems. But to operate and stop fire pump groups from the control room is not suggested because of safety reasons.

Pressure switches are very important, because they generate “run command”. There shall be at least one pressure switch for each pump and at least two for the system.

After the adjustments pressure switches should be locked at the factory. They should be in control panel and not effected from vibrations. Min and max set levels sould be adjusted individually.

Fire pumps should operate automatically by pressure switches and also should operate manually by pressing an electric push button or pressing a mechanical handle.
Periodic Tests During Operation

Weekly Automatic Test
The timer which is preset at a certain time of the week, opens the solenoid valve. System pressure decreases due to discharge water and solenoid valve is closed after motor starts running. Pump runs for a period which is already programmed and then stops.

During weekly tests the fire security person is supposed to be at the test area (it is not easy to recognize mechanical failures during automatic test).

Minimum run time is 10 minutes for electric motor driven pumps and 30 minutes for diesel engine driven pumps. Diesel engine controller should generate an alarm signal in case of failure which is 15 seconds of cranking and 15 seconds of rest, in six consecutive cycles.

Weekly Manual Test
After completion of automatic weekly tests, manual-electrical (by pressing a button on controller) and manual-mechanical (by pressing a handle on controller) tests are done for a short period of time.

Monthly and Annual Test
These tests are for the purpose of protective maintenance and defined in NFPA-25
Standart Pompa technical team is ready to help on this matter if required.

Factory Test
Each fire pump is hydrostatically tested 1.5 times of shut off pressure (not less than 17 bars) for a minimum 5 minutes period.
Each fire pump is factory tested as per NFPA-20 requirement.
Fire pump groups and fire booster sets are functionally tested at factory.

Optional Accessories of Fire Pump Group (*)
Standart fire pump groups include all the required elements per NFPA-20.
Optional elements are shown below:
- suction valve position monitoring switch
- suction valve lock
- waste cone
- discharge valve position monitoring switch
- discharge valve lock
- flowmeter at the flow rate 1.75 times of rated flow

(*) Fire Pump Group: Main pump, stand-by pump, jockey pump, electric control panels, collectors, valves etc. all on common base plate.
Automatic Weekly Test Algorithm

For Electric Pump

1. TIMER
2. OPEN SV
3. RUN EM
4. CLOSE SV
5. FAILURE
   - YES: ALARM (SOUND & LIGHT) and STOP
   - NO: RUN 10 MIN.
7. STOP EP

For Diesel Pump

1. TIMER
2. OPEN SV
3. RUN DM
4. CLOSE SV
5. FAILURE
   - YES: ALARM (SOUND & LIGHT) and STOP
   - NO: RUN 30 MIN
7. STOP DP