

Commissioning of fire pumps is much more involved than commissioning of most other systems and must be completed correctly to verify operation of this critical equipment. This chapter provides information to assist the registered design professional (RDP), the commissioning agent, the authority having jurisdiction (AHJ), and the installing contractor in the proper commissioning of water supplies for water-based fire protection systems. It includes information needed for the submission of plans and calculations during the permitting process and for inspections and tests required to verify system performance. The RDP, commissioning agent, and/or AHJ can use this information to develop the system-specific commissioning requirements, methods, and procedures for a project specification.

## FIRE PUMP OVERVIEW

### Fire Pump Unit Defined

A fire pump is a device that provides the required water flow and pressure for a fire protection system. The fire pump unit itself consists of a pump, a drive, a driver coupling connecting the two, and a base plate. Fire pumps are normally purchased as a complete package that includes the following:

- *Pump accessories (electric drive)*: Including automatic air release valve, pressure gauges (suction and discharge), circulation relief valve, and hose header complete with hose valves for outdoor use or flow meter
- *Fire pump controller with remote pump panel*: Including power transfer switch (where required)
- *Pump accessories (diesel drive)*: Including automatic air release, pressure gauges (suction and discharge), fuel tank with support legs, fuel system connections, hose header complete with hose valves for outdoor use or flow meter, main relief valve, and waste cone (open or closed)
- *Pressure maintenance pump*: Including casing relief valve
- *Pressure maintenance pump controller*

### Fire Pump Unit Responsibility

The fire pump unit, consisting of a pump, driver, and controller, shall perform in compliance with this standard as an entire unit when installed or when components have been replaced. [NFPA 20-10: 4.4.1]

**A** A single entity should be designated as having unit responsibility for the pump, driver, controller, transfer switch equipment, and accessories. *Unit responsibility* means the accountability to answer and resolve any and all problems regarding

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the proper installation, compatibility, performance, and acceptance of the equipment. Unit responsibility should not be construed to mean purchase of all components from a single supplier. [NFPA 20-10: A.4.4.1]

The registered design professional (RDP) or commissioning agent may play a significant role regarding unit responsibility. In addition to the minimum requirements of the standard, fire pumps should be subject to additional inspections in the manufacturer's fabrication shop and particularly in the field.

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The complete fire pump unit shall be field acceptance tested for proper performance in accordance with the provisions of this standard. [NFPA 20-10: 4.4.2]

A fire pump is a complex piece of equipment and often requires an entire day for acceptance testing. Pre-functional testing and inspections should be conducted to ensure that the individual components and the system as a complete installation function as intended.

## APPROVAL AND ACCEPTANCE

### Approval Requirements

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A complete plan and detailed data describing pump, driver, controller, power supply, fittings, suction and discharge connections, and liquid supply conditions shall be prepared for approval. [NFPA 20-10: 4.2.3]

Each pump, driver, controlling equipment, power supply and arrangement, and liquid supply shall be approved by the authority having jurisdiction for the specific field conditions encountered. [NFPA 20-10: 4.2.4]

Certified shop test curves showing head capacity and brake horsepower of the pump shall be furnished by the manufacturer to the purchaser. [NFPA 20-10: 4.5.1]

The certified shop test is performed when the fire pump and driver are assembled at the manufacturing facility. On some projects, the commissioning agent may wish to witness the shop test. In such cases, the test should be coordinated with the purchaser and the commissioning agent. The certified shop test curve must be submitted for review prior to the field acceptance test.

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The purchaser shall furnish the data required in 4.5.1 to the authority having jurisdiction. [NFPA 20-10: 4.5.2]

Upon completion of the entire fire pump installation, an acceptance test shall be conducted in accordance with the provisions of this standard. [NFPA 20-10: 4.32]

Most building codes will require plans and calculations to be submitted when applying for a building permit or a permit to install fire protection systems. On every project, plans should be submitted for review and approval before installation begins. Installing any system or equipment prior to approval can expose the installer to expensive field modifications if the plan review reveals the need for modifications to the proposed system.

Product data or equipment catalog cuts should be included as part of the submittal process. This submittal should include details of each piece of equipment associated with the proposed fire pump installation.

### Flushing

Flushing the suction line is intended to remove any debris that may enter the pump and damage the pump impeller.

Suction piping shall be flushed at a flow rate not less than indicated in Table 14.1.1.1(a) [Exhibit 4.1] and Table 14.1.1.1(b) [Exhibit 4.2] of NFPA 14(2010) or at the hydraulically calculated water demand rate of the system, whichever is greater. [NFPA 20-10: 14.1.1.1]

Flushing shall occur prior to hydrostatic test. [NFPA 20-10: 14.1.1.2]

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#### EXHIBIT 4.1 Flow Rates for Stationary Pumps

Metric Units		U.S. Customary Units	
Pipe Size (mm)	Flow Rate (L/min)	Pipe Size (in.)	Flow Rate gpm
100	2,233	4	590
125	3,482	5	920
150	5,148	6	1,360
200	8,895	8	2,350
250	13,891	10	3,670
300	20,023	12	5,290

Source: NFPA 20, 2010, Table 14.1.1.1(a).

#### EXHIBIT 4.2 Flush Rates for Positive Displacement Pumps

Metric Units		U.S. Customary Units	
Pipe Size (mm)	Flow (L/min)	Pipe Size (in.)	Flow (gpm)
40	378.5	1½	100
50	945.25	2	250
80	1514.0	3	400
100	1703.25	4	450
150	1892.5	6	500

Source: NFPA 20, 2010, Table 14.1.1.1(b).

### Hydrostatic Test

The flushing and hydrostatic tests are identical to the tests required for all water-based fire protection systems.

### Testing Pressure

All new systems are required to be tested hydrostatically at a minimum pressure of either 200 psi (13.8 bar), or 50 psi (3.4 bar) above the maximum discharge pressure, whichever is greater, at the fire pump discharge flange. Verification that the proper pressure rating for pipe and fittings is used in the installation is important. This value is set to ensure that all pipe joints and other equipment are installed properly to withstand that pressure without coming apart or leaking. Although the test is primarily a quality control test on

the installation and not a materials performance test, damaged materials (e.g., cracked fittings, leaky valves, bad joints, etc.) are routinely discovered during the hydrostatic test.

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Suction and discharge piping shall be hydrostatically tested at not less than 200 psi (13.8 bar) pressure or at 50 psi (3.4 bar) in excess of the maximum pressure to be maintained in the system, whichever is greater. [NFPA 20-10: 14.1.2.1]

The pressure required in NFPA 20 (2010) 14.1.2.1 shall be maintained for 2 hours. [NFPA 20-10: 14.1.2.2]

### Contractor's Certificate

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The installing contractor shall furnish a certificate for flushing and hydrostatic test prior to the start of the fire pump field acceptance test. [NFPA 20-10: 14.1.2.2]

The certificate referred to in 14.1.3 of NFPA 20 is the contractor's material and test certificate in NFPA 13. Both flushing and hydrostatic tests must be documented and witnessed by the AHJ, the RDP, and/or the commissioning agent. The completed certificate should be included in the turnover package at the end of the project.

### Field Acceptance Tests

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Pumps and drivers on separately coupled-type pumps shall be aligned in accordance with the coupling and pump manufacturers' specifications and the *Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating*. [NFPA 20-10: 6.5.2]

A pump and driver shipped from the factory with both machines mounted on a common base plate are accurately aligned before shipment. All base plates are flexible to some extent and, therefore, should not be relied upon to maintain the factory alignment. Realignment is necessary after the complete unit has been leveled on the foundation and again after the grout has set and foundation bolts have been tightened. The alignment should be checked after the unit is piped and rechecked periodically. To facilitate accurate field alignment, most manufacturers either do not dowel the pumps or drivers on the base plates before shipment or, at most, dowel the pump only.

After the pump and driver unit has been placed on the foundation, the coupling halves should be disconnected. The coupling should not be reconnected until the alignment operations have been completed.

The purpose of the flexible coupling is to compensate for temperature changes and to permit end movement of the shafts without interference with each other while transmitting power from the driver to the pump.

The two forms of misalignment between the pump shaft and the driver shaft are as follows:

- (1) *Angular misalignment* — shafts with axes concentric but not parallel
- (2) *Parallel misalignment* — shafts with axes parallel but not concentric

The faces of the coupling halves should be spaced within the manufacturer's recommendations and far enough apart so that they cannot strike each other when the driver rotor is moved hard over toward the pump. Due allowance should be made for wear of the thrust bearings. The necessary tools for an approximate check of the alignment of a flexible coupling are a straight edge and a taper gauge or a set of feeler gauges.

A check for angular alignment is made by inserting the taper gauge or feelers at four points between the coupling faces and comparing the distance between the faces at four points spaced at 90-degree intervals around the coupling. The unit will be in angular alignment when the measurements show that the coupling faces are the same distance apart at all points.

A check for parallel alignment is made by placing a straight edge across both coupling rims at the top, bottom, and both sides. The unit will be in parallel alignment when the straight edge rests evenly on the coupling rim at all positions.

Allowance might be necessary for temperature changes and for coupling halves that are not of the same outside diameter. Care should be taken to have the straight edge parallel to the axes of the shafts.

Angular and parallel misalignment are corrected by means of shims under the motor mounting feet. After each change, it is necessary to recheck the alignment of the coupling halves. Adjustment in one direction can disturb adjustments already made in another direction. It should not be necessary to adjust the shims under the pump.

The permissible amount of misalignment will vary with the type of pump, driver, and coupling manufacturer, model, and size.

The best method for putting the coupling halves in final accurate alignment is by the use of a dial indicator.

When the alignment is correct, the foundation bolts should be tightened evenly but not too firmly. The unit can then be grouted to the foundation. The base plate should be completely filled with grout, and it is desirable to grout the leveling pieces, shims, or wedges in place. Foundation bolts should not be fully tightened until the grout has hardened, usually about 48 hours after pouring.

After the grout has set and the foundation bolts have been properly tightened, the unit should be checked for parallel and angular alignment and, if necessary, corrective measures taken. After the piping of the unit has been connected, the alignment should be checked again.

The direction of driver rotation should be checked to make certain that it matches that of the pump. The corresponding direction of rotation of the pump is indicated by a direction arrow on the pump casing.

The coupling halves can then be reconnected. With the pump properly primed, the unit should be operated under normal operating conditions until temperatures have stabilized. It then should be shut down and immediately checked again for alignment of the coupling. All alignment checks should be made with the coupling halves disconnected and again after they are reconnected.

After the unit has been in operation for about 10 hours or 3 months, the coupling halves should be given a final check for misalignment caused by pipe or temperature strains. If the alignment is correct, both pump and driver should be dowelled to the base plate. Dowel location is very important, and the manufacturer's instructions should be followed, especially if the unit is subject to temperature changes.

**A** The unit should be checked periodically for alignment. If the unit does not stay in line after being properly installed, the following are possible causes:

- (1) Settling, seasoning, or springing of the foundation and pipe strains distorting or shifting the machine
- (2) Wearing of the bearings
- (3) Springing of the base plate by heat from an adjacent steam pipe or from a steam turbine
- (4) Shifting of the building structure due to variable loading or other causes
- (5) If the unit and foundation are new, need for the alignment to be slightly readjusted from time to time [NFPA 20-10: A.6.5]

Prior to operating the pump a number of inspections and mechanical adjustments should be made. Coupling alignment verification is a required commissioning activity and should be documented in the commissioning report. Also prior to operation of the pump, the pump shaft bearings (Exhibit 4.3) should be lubricated with the lubricant recommended by the pump manufacturer. Packing gland adjustment should also be completed at this

**EXHIBIT 4.3** Pump Shaft Bearing Lubrication

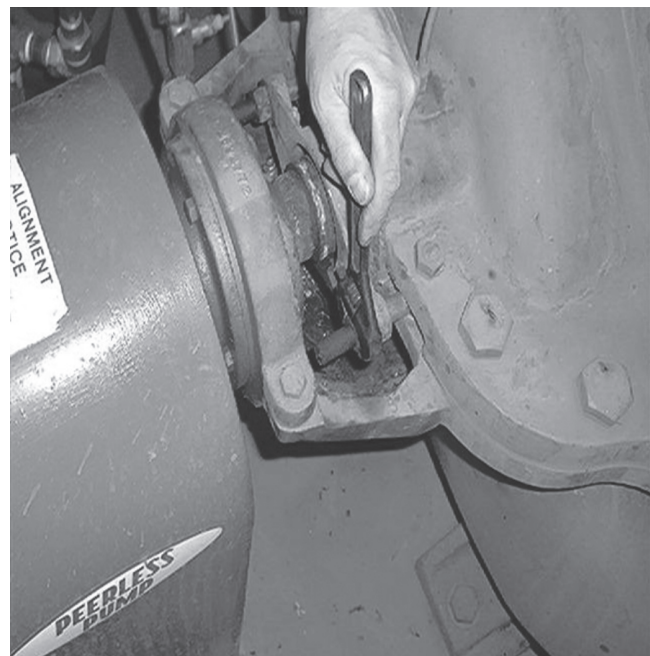


time (Exhibit 4.4); one drop of water per second is appropriate when the pump is not operating, and a steady trickle of water is needed when the pump is operating.

### Test Participants

The manufacturer's representative for each major component of the fire pump installation must be present to perform the field acceptance test. The AHJ, including the fire code official, RDP, and/or the commissioning agent must be present to witness the acceptance test and sign the test forms as a witness.

**EXHIBIT 4.4** Packing Gland Adjustment





The pump manufacturer, the engine manufacturer (when supplied), the controller manufacturer, and the transfer switch manufacturer (when supplied) or their factory authorized representatives shall be present for the field acceptance test. [NFPA 20-10: 14.2.1]

All the authorities having jurisdiction shall be notified as to the time and place of the field acceptance test. [NFPA 20-10: 14.2.2]

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### Electrical Equipment Testing

The fire pump controller is an electrical device; its operation must be verified by a qualified electrical contractor prior to testing. The pre-acceptance testing can include starting and operating the pump and the pressure maintenance pump and performing other control-related activities, including operating time, alarms, and so on.

All electric wiring to the fire pump motor(s), including control (multiple pumps) interwiring, normal power supply, alternate power supply where provided, and jockey pump, shall be completed and checked by the electrical contractor prior to the initial startup and acceptance test. [NFPA 20-10: 14.2.3]

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### Performance Results

In addition to verifying proper operation of the pump and pump system components, the most important purpose of the fire pump acceptance test is to re-verify the manufacturer's shop test curve. The field acceptance test should illustrate the same performance of the pump following installation as that observed during the shop test. Therefore, it is critical to have the shop test results available for the field acceptance test.

A properly plotted fire pump curve will illustrate at least three points:

1. *Churn*: The pump is operating with no flow.
2. *Rated capacity*: The pump is discharging water at the specified pressure.
3. *Overload*: The pump is discharging water at a rate of 150 percent of rated flow at a pressure of 65 percent of rated pressure.

A copy of the manufacturer's certified pump test characteristic curve shall be available for comparison of the results of the field acceptance test. [NFPA 20-10: 14.2.4.1]

The fire pump as installed shall equal the performance as indicated on the manufacturer's certified shop test characteristic curve within the accuracy limits of the test equipment. [NFPA 20-10: 14.2.4.2]

The fire pump shall perform at minimum, rated, and peak loads without objectionable overheating of any component. [NFPA 20-10: 14.2.5.2.1]

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### Test Procedures

Initial operation of a fire pump may involve adjustments of the equipment and accessories. The pump operation should be carefully observed for vibration, leaks, packing gland adjustment, and so on. Following the acceptance test, the equipment will normally be left in the operating position. Final adjustments must be made at this time.

Note that the pressure maintenance pump (or jockey pump) is a low-flow pump installed to maintain system pressure to avoid intermittent starting of the fire pump. The pressure maintenance pump should have sufficient flow to compensate for any leaks in the system piping but not enough flow to maintain system pressure in the event of the discharge of a single sprinkler. The churn pressure is the pressure produced at the outlet of the pump when the pump is running with no water flow occurring in the fire protection system.



The fire pump operation is as follows:

- (1) *Motor-Driven Pump*. To start a motor-driven pump, the following steps should be taken in the following order:

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- (a) See that pump is completely primed.
  - (b) Close isolating switch and then close circuit breaker.
  - (c) Automatic controller will start pump if system demand is not satisfied (e.g., pressure low, deluge tripped).
  - (d) For manual operation, activate switch, push-button, or manual start handle. Circuit breaker tripping mechanism should be set so that it will not operate when current in circuit is excessively large.
- (2) *Steam-Driven Pump.* A steam turbine driving a fire pump should always be kept warmed up to permit instant operation at full-rated speed. The automatic starting of the turbine should not be dependent on any manual valve operation or period of low-speed operation. If the pop safety valve on the casing blows, steam should be shut off and the exhaust piping examined for a possible closed valve or an obstructed portion of piping. Steam turbines are provided with governors to maintain speed at a predetermined point, with some adjustment for higher or lower speeds. Desired speeds below this range can be obtained by throttling the main throttle valve.
- (3) *Diesel Engine–Driven Pump.* To start a diesel engine–driven pump, the operator should be familiar beforehand with the operation of this type of equipment. The instruction books issued by the engine and control manufacturer should be studied to this end. The storage batteries should always be maintained in good order to ensure prompt, satisfactory operation of this equipment (i.e., check electrolyte level and specific gravity, inspect cable conditions, corrosion, etc.).
- (4) *Fire Pump Settings.* The fire pump system, when started by pressure drop, should be arranged as follows:
- (a) The jockey pump stop point should equal the pump churn pressure plus the minimum static supply pressure.
  - (b) The jockey pump start point should be at least 10 psi (0.68 bar) less than the jockey pump stop point.
  - (c) The fire pump start point should be 5 psi (0.34 bar) less than the jockey pump start point. Use 10 psi (0.68 bar) increments for each additional pump.
  - (d) Where minimum run times are provided, the pump will continue to operate after attaining these pressures. The final pressures should not exceed the pressure rating of the system.
  - (e) Where the operating differential of pressure switches does not permit these settings, the settings should be as close as equipment will permit. The settings should be established by pressures observed on test gauges.
  - (f) Examples of fire pump settings follow (for SI units, 1 psi = 0.0689 bar):
    - i. Pump: 1000 gpm, 100 psi pump with churn pressure of 115 psi
    - ii. Suction supply: 50 psi from city — minimum static; 60 psi from city — maximum static
    - iii. Jockey pump stop = 115 psi + 50 psi = 165 psi
    - iv. Jockey pump start = 165 psi – 10 psi = 155 psi
    - v. Fire pump stop = 115 psi + 50 psi = 165 psi
    - vi. Fire pump start = 155 psi – 5 psi = 150 psi
    - vii. Fire pump maximum churn = 115 psi + 60 psi = 175 psi
  - (g) Where minimum-run timers are provided, the pumps will continue to operate at churn pressure beyond the stop setting. The final pressures should not exceed the pressure rating of the system components.
- (5) *Automatic Recorder.* The performance of all fire pumps should be automatically indicated on a pressure recorder to provide a record of pump operation and assistance in fire loss investigation. [NFPA 20-10: A.14.2.5]



## Test Equipment

The installing contractor usually performs the flow test portion of the acceptance test and provides the test equipment. It is important to verify that the test equipment is properly calibrated and that a spare set of equipment is available in the event of failure of any piece of test equipment. Doing so will avoid costly delays should any piece of equipment fail during the test.

Calibrated test equipment shall be provided to determine net pump pressures, rate of flow through the pump, volts and amperes for electric motor-driven pumps, and speed. [NFPA 20-10: 14.2.5.1.1]

**A** The test equipment should be furnished by either the authority having jurisdiction or the installing contractor or the pump manufacturer, depending upon the prevailing arrangements made between the aforementioned parties. The equipment should include, but not necessarily be limited to, the following:

- (1) *Equipment for Use with Test Valve Header.* 50 ft (15 m) lengths of 2½ in. (65 mm) lined hose should be provided including Underwriters Laboratories' play pipe nozzles as needed to flow required volume of water. Where a test meter is provided, however, these might not be needed.
- (2) *Instrumentation.* The following test instruments should be of high quality, accurate, and in good repair:
  - (a) Clamp-on volt/ammeter
  - (b) Test gauges
  - (c) Tachometer
  - (d) Pitot tube with gauge (for use with hose and nozzle)
- (3) *Instrumentation Calibration.* All test instrumentation should be calibrated by an approved testing and calibration facility within the 12 months prior to the test. Calibration documentation should be available for review by the authority having jurisdiction.

A majority of the test equipment used for acceptance and annual testing has never been calibrated. This equipment can have errors of 15 to 30 percent in readings. The use of uncalibrated test equipment can lead to inaccurately reported test results.

While it is desirable to achieve a true churn condition (no flow) during the test for comparison to the manufacturer's certified pump test characteristic curve, it might not be possible in all circumstances. Pumps with circulation relief valves will discharge a small amount of water, even when no water is flowing into the fire protection system. The small discharge through the circulation relief valve should not be shut off during the test since it is necessary to keep the pump from overheating. For pumps with circulation relief valves, the minimum flow condition in the test is expected to be the situation where no water is flowing to the fire protection system but a small flow is present through the circulation relief valve. During a test on a pump with a pressure relief valve, the pressure relief valve should not open because these valves are installed purely as a safety precaution to prevent overpressurization during overspeed conditions.

Overspeed conditions should not be present during the test, so the pressure relief valve should not open. When pressure relief valves are installed on systems to relieve pressure under normal operating conditions, and if a true churn condition is desired during the acceptance test, the system discharge valve can be closed and the pressure relief valve can be adjusted to eliminate the flow. The pressure readings can be quickly noted and the pressure relief valve adjusted again to allow flow and relief of pressure. After this one-time test, a reference net pressure can be noted with the

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relief valve open so that the relief valve can remain open during subsequent annual tests with the comparison back to the reference residual net pressure rather than the manufacturer's curve. [NFPA 20-10: A.14.2.5.1]

### Flow Tests

The field acceptance test is intended to verify that the pump is operating in accordance with the specified pump output. During the flow test, pump output pressure and flows are measured and then plotted on hydraulic graph paper. Field acceptance test results are compared to certified shop test curves.

### Determining Loads

The minimum, rated, and peak loads refer to the amount of water flow that the pump will allow. The more water that is flowing, the more work the pump is performing; therefore, less pressure is available. The pump must produce not less than 65 percent of rated pressure when flowing water at a rate of 150 percent of rated flow.

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The minimum, rated, and peak loads of the fire pump shall be determined by controlling the quantity of water discharged through approved test devices. [NFPA 20-10: 14.2.5.2.3]

**A** Where a hose valve header is used, it should be located where a limited [approximately 100 ft (30 m)] amount of hose is used to discharge water safely. Where a flow test meter is used in a closed loop according to manufacturer's instructions, additional outlets such as hydrants, hose valves, and so forth should be available to determine the accuracy of the metering device. [NFPA 20-10: A.14.2.5.2.3]

### Measurement Procedure

While water is flowing and being measured, the pressure gauges on the pump are read and the suction and discharge pressures are recorded. This information is then used to plot the performance curve.

Water flow can be determined in a number of ways. One method uses a pitot tube to measure velocity pressure. Velocity pressure can then be used to calculate flow using the following formula:

$$Q = 29.83cd^2\sqrt{P}$$

Where:

- $Q$  = flow (gpm)
- $C$  = coefficient of the flowing orifice
- $d$  = diameter of flowing orifice squared
- $P$  = velocity pressure measured by the pitot tube

A flow table derived from this formula can be used for convenience. Other devices that have a built-in pitot tube can be used for determining flow. Such devices may improve the accuracy of the readings taken and are much easier to use.

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The quantity of water discharging from the fire pump assembly shall be determined and stabilized. [NFPA 20-10: 14.2.5.4.1]

Immediately thereafter, the operating conditions of the fire pump and driver shall be measured. [NFPA 20-10: 14.2.5.4.2]

### Engine-Driven Units

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Engine-driven units shall not show signs of overload or stress. [NFPA 20-10: 14.2.5.4.7.2]

The governor of such units shall be set at the time of the test to properly regulate the engine speed at rated pump speed. [NFPA 20-10: 14.2.5.4.7.3]

In fire pump systems, the governor is a device used to limit or control the speed of the diesel engine.

### Other Tests

Acceptance testing involves more than a flow test of the pump unit. Acceptance must also include an evaluation of the pump installation as a whole under a variety of conditions.

#### Loads Start Test

The fire pump unit shall be started and brought up to rated speed without interruption under the conditions of a discharge equal to peak load. [NFPA 20-10: 14.2.5.5]

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#### Phase Reversal Test

For electric motors, a test shall be performed to ensure that there is not a phase reversal condition in either the normal power supply configuration or from the alternate power supply (where provided). [NFPA 20-10: 14.2.5.6]

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**A** A simulated test of the phase reversal device is an acceptable test method. [NFPA 20-10: A.14.2.5.6]

### Controller Acceptance Test

In addition to fire pump operation, the controller performs a number of alarm functions, which must also be verified during the acceptance test.

Fire pump controllers shall be tested in accordance with the manufacturer's recommended test procedure. [NFPA 20-10: 14.2.6.1]

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**A** All controller starts required for tests described in 14.2.5 through 14.2.8 should accrue respectively to this number of tests. [NFPA 20-10: A.14.2.6.1]

As a minimum, no fewer than six automatic and six manual operations shall be performed during the acceptance test. [NFPA 20-10: 14.2.6.2]

An electric driven fire pump shall be operated for a period of at least 5 minutes at full speed during each of the operations required in 14.2.5. [NFPA 20-10: 14.2.6.3]

An engine driver shall not be required to run for 5 minutes at full speed between successive starts until the cumulative cranking time of successive starts reaches 45 seconds. [NFPA 20-10: 14.2.6.4]

The automatic operation sequence of the controller shall start the pump from all provided starting features. [NFPA 20-10: 14.2.6.5]

This sequence shall include pressure switches or remote starting signals. [NFPA 20-10: 14.2.6.6]

Tests of engine-driven controllers shall be divided between both sets of batteries. [NFPA 20-10: 14.2.6.7]

The selection, size, and setting of all overcurrent protective devices, including fire pump controller circuit breaker, shall be confirmed to be in accordance with this standard. [NFPA 20-10: 14.2.6.8]

The fire pump shall be started once from each power service and run for a minimum of 5 minutes.

**CAUTION:** Manual emergency operation shall be accomplished by manual actuation of the emergency handle to the fully latched position in a continuous motion. The handle shall be latched for the duration of this test run. [NFPA 20-10: 14.2.6.9]

### Alternate Power Supply

If the alternate source is a generator, the acceptance test for the generator must be performed in accordance with NFPA 110.

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On installations with an alternate source of power and an automatic transfer switch, loss of primary source shall be simulated and transfer shall occur while the pump is operating at peak load. [NFPA 20-10: 14.2.7.1]

Transfer from normal to alternate source and retransfer from alternate to normal source shall not cause opening of overcurrent protection devices in either line. [NFPA 20-10: 14.2.7.2]

At least half of the manual and automatic operations of 14.2.6.2 shall be performed with the fire pump connected to the alternate source. [NFPA 20-10: 14.2.7.3]

If the alternate power source is a generator set required by 9.3.2, installation acceptance shall be in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems*. [NFPA 20-10: 14.2.7.4]

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## SUMMARY

Water supplies are a critical component of a fire protection system. As such, the water supply must be commissioned to verify that it will operate when needed. Fire pumps typically require several different tests, some electrical and some mechanical, to verify that the pump will perform as designed and that water delivered to the sprinkler and stand-pipe systems will be of sufficient flow and pressure.