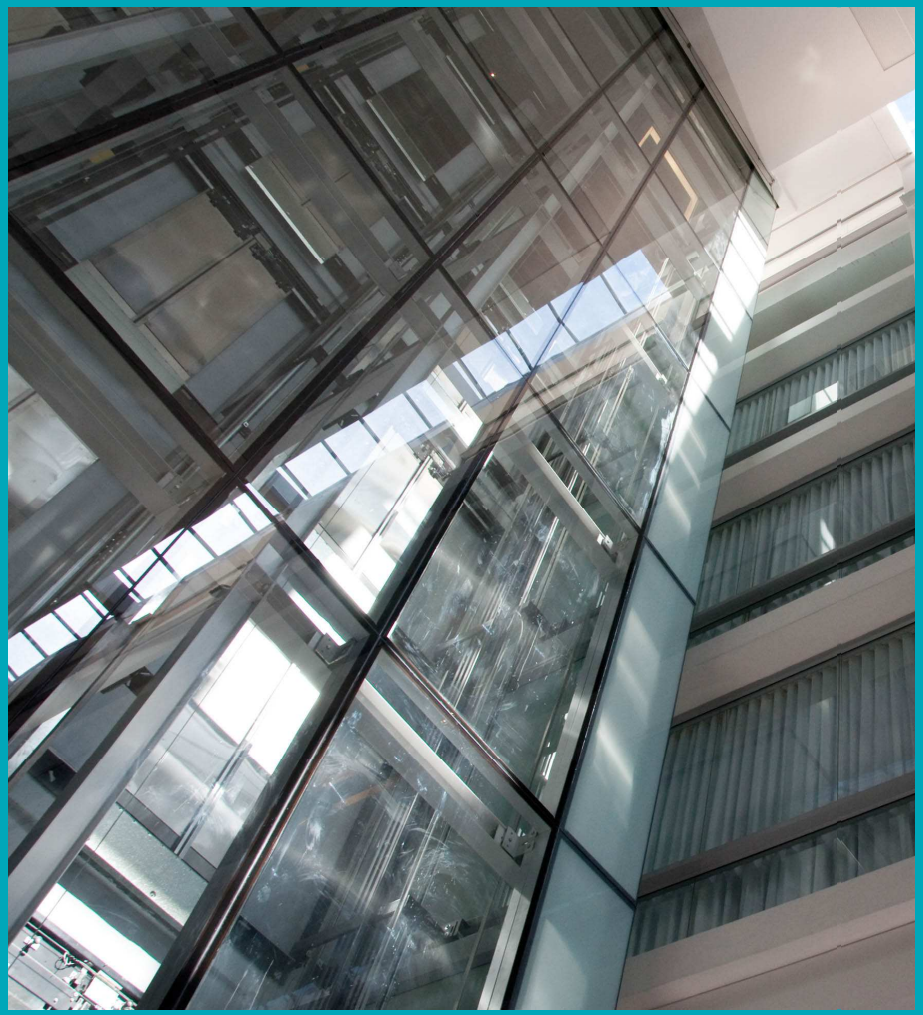


Owner/Operator Guide for Successful Sprinkler and Fire Pump Systems

Adam Olomon, P.E.

Associate Consultant – Fire & Life Safety and Fire Protection

UNITED BY OUR DIFFERENCE

WSP

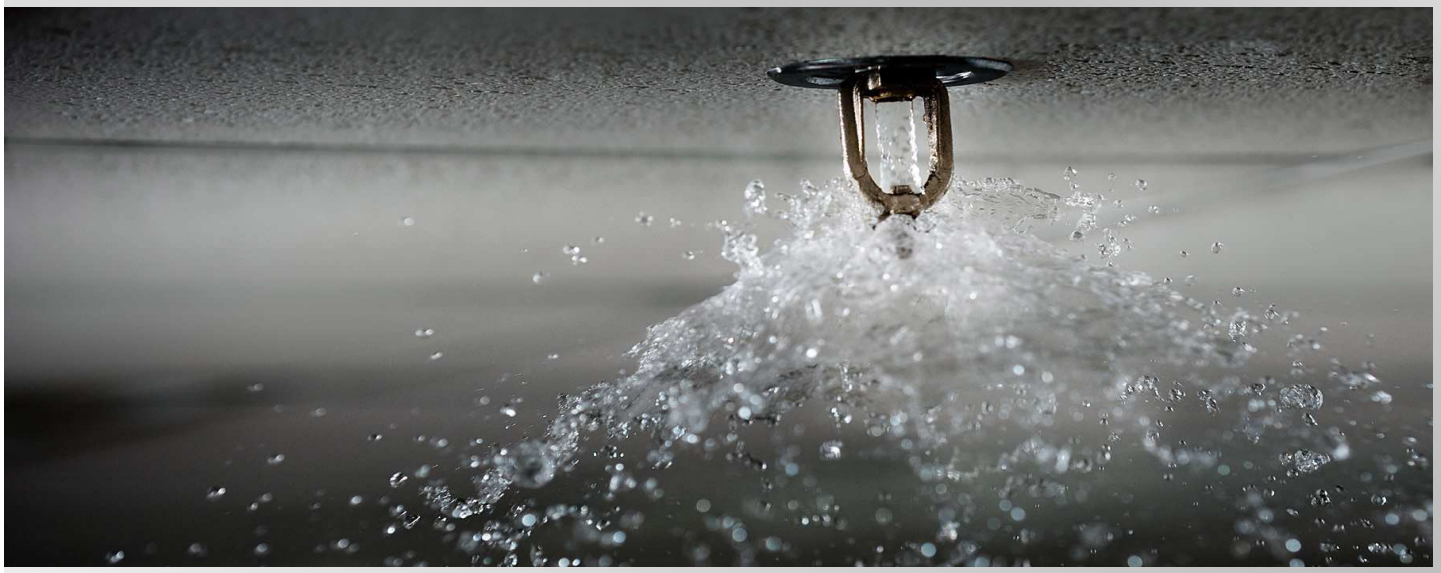
Introduction

Adam Olomon

Licensed Professional Engineer in the field of fire protection in the United States. Worked for over 9 years as a fire protection consultant specializing in wet fire suppression systems and code consulting.

WSP Middle East is one of the region's leading multi-disciplinary engineering consultancies. We provide creative, sustainable and cost-effective engineering and architectural solutions through innovative thinking.

Automatic Sprinkler Systems



Extinguish or Control the Spread of Fire

Protect Property

Limit the Spread and Development of Smoke

Provide Occupants Additional Time to Evacuate

Protect Occupants Sheltering in Place (Refuge)

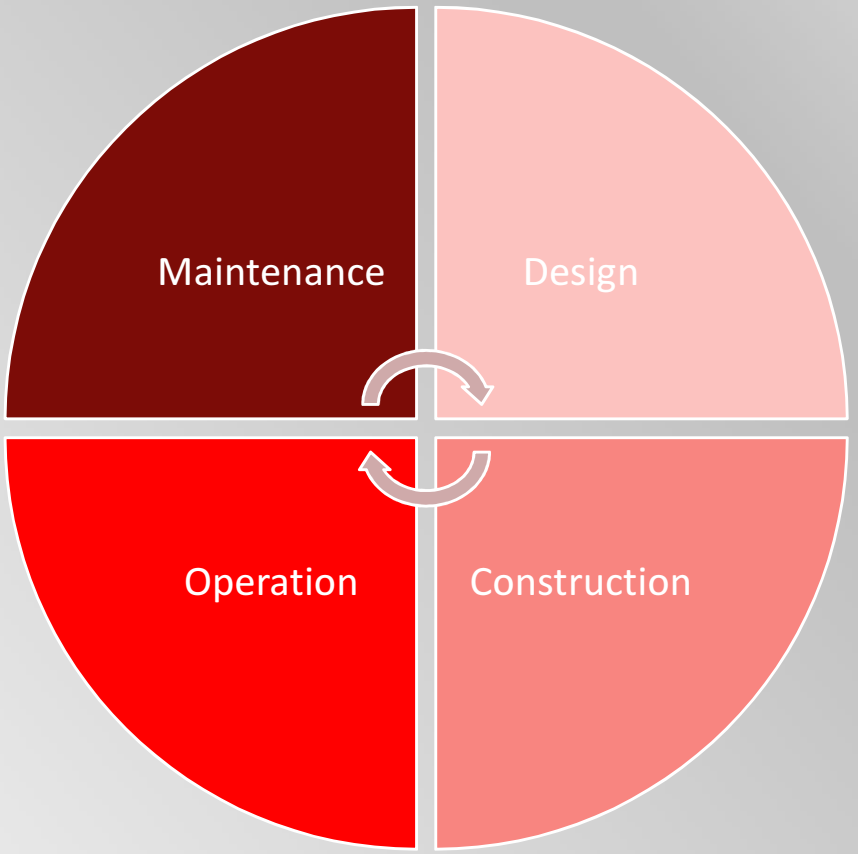
Reduces Risk to Civil Defense Personnel

But…Not if the system is impaired

Fire Pump Controller Off

Pump Discharge Closed

Successful Suppression System



GOAL

To provide a better understanding of what to look for the in the 4 key parts of a fire sprinkler system

DESIGN

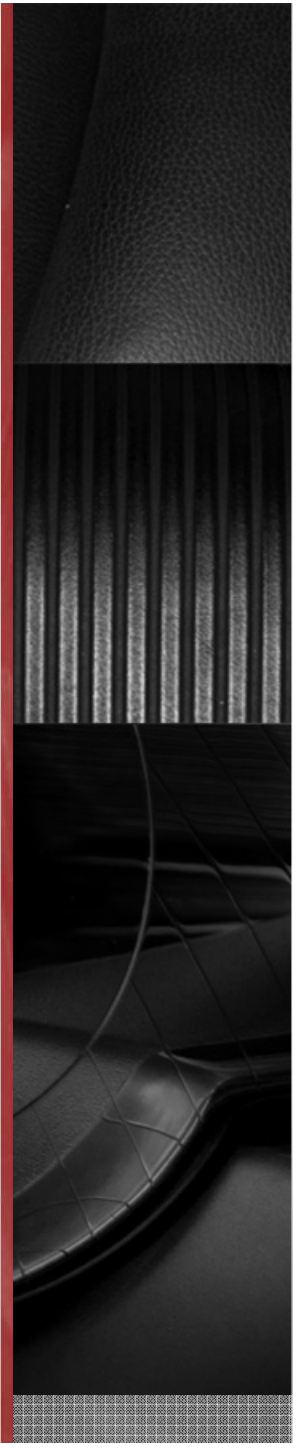
Ownership

Who owns the responsibility of the that system?

Examples:

Multiple Towers with different Owners/Operators with a shared fire pump set. *Who maintains the pumps?*

Mall or Multi-Tenant Building. *Who supervises the sprinkler control valve?*



DESIGN

Tenant Isolation Valve for sprinkler system outside tenant boundary line in the Mall’s mechanical space.

Not Monitored!

DESIGN

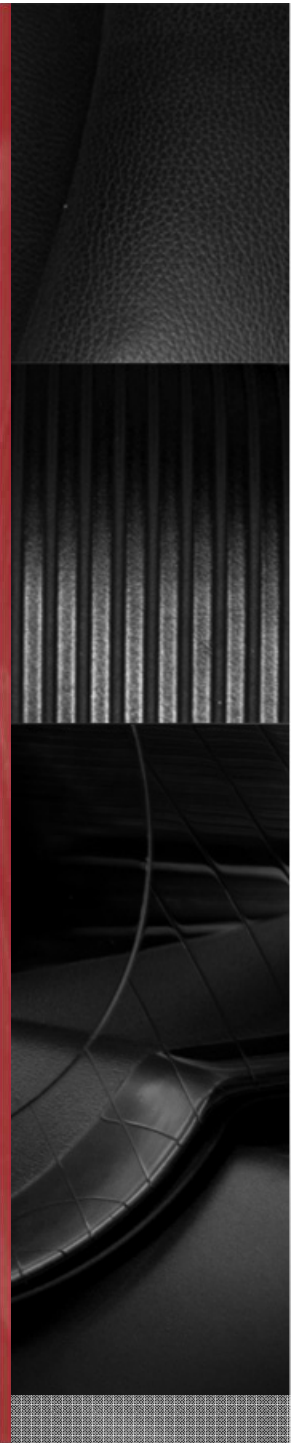
OWNERSHIP

Clear Contractual Ownership of **Each Sprinkler System** should be provided in regard to:

Design – Base Building (Shell & Core) or Build Out (Fit Out) (recommend 3rd party review)

Maintenance – What is Base Building and What is Tenant?

Operation – Who is ensuring the regular operation of these system? (supervision by Base Building or Tenant)



DESIGN

Access to Equipment

How will the fire pump be Replaced, Removed or Serviced when you have to climb into the room?

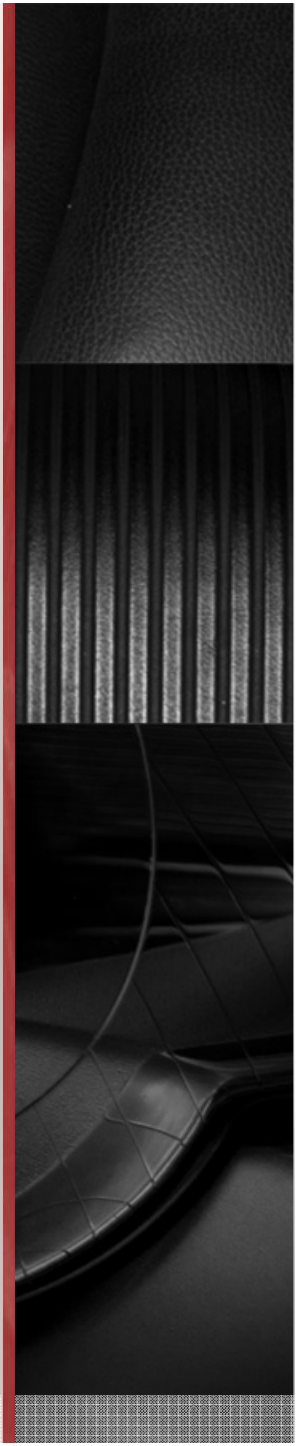
DESIGN

Access to Equipment

Provide 915mm in front of fire pump controllers

Pipe fittings should be 300mm – 450mm from walls or other immovable objects

Have a plan for plant replacement (crane, clear floor area, lift)



DESIGN

Testing

How will the fire pumps be Tested with no gauges, no means to measure RPM, and no test header?

DESIGN

Testing

Fire Pumps that recirculate back to a tank require BOTH a flow meter and test header. (NFPA 20 - 4.20.2.10)

Sprinkler Systems require inspectors test drain (NFPA 13 - 25.2.3.1)

Standpipe Systems require a flow test (NFPA 14 – 11.5.1)

Roof Manifold for Class I Standpipe System Flow Testing

CONSTRUCTION

Oversight

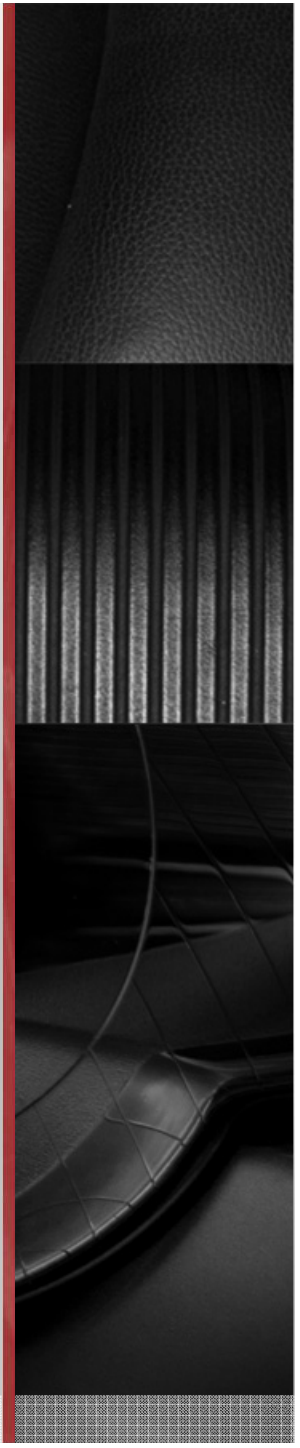
Neat pumps painted red but…
Not listed for fire protection use by UL, FM or anyone else.

CONSTRUCTION

Oversight

Request and Review Manufacturer's Data Sheets for:

- Listings (UL, FM or locally acceptable testing lab)
- Manufacturer's Installation Instructions (Spacing for flow meter, Grouting for pumps, etc.)
- Proper Installation Environment



CONSTRUCTION

Oversight

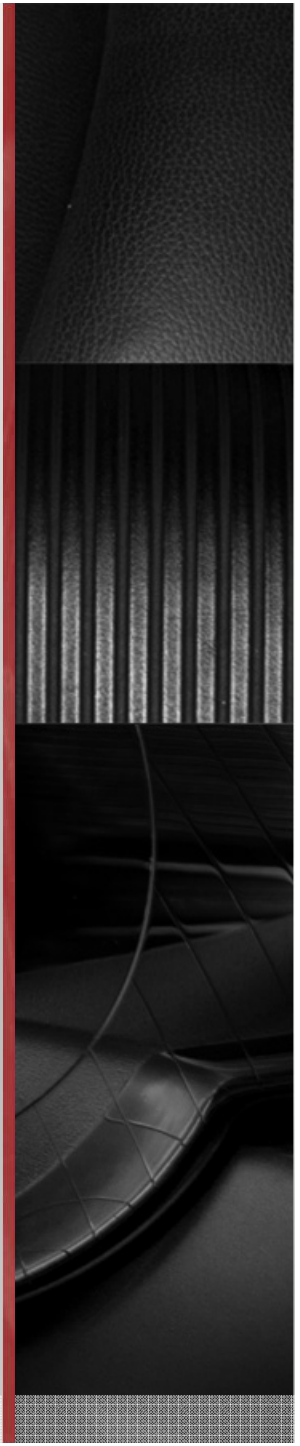
Fire Pump base plate not grouted as directed by Manufacturer's Installation Instructions

Grooved coupling installed on underground piping, against listed use and environment

OPERATIONAL

Day to day functionality of the building safety systems is the **responsibility of the Owner/Operator**

Having a Testing & Emergency Maintenance contract is **not sufficient**.



OPERATIONAL

NFPA 25 *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.*

Table 5.1.1.2 Summary of Sprinkler System Inspection, Testing, and Maintenance

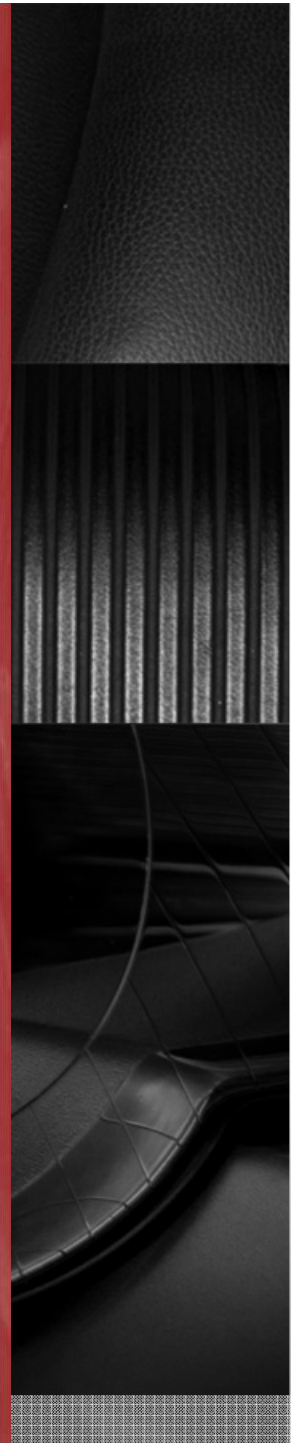
Item	Frequency	Reference
Inspection		
Gauges (dry, preaction, and deluge systems)	Weekly/monthly	5.2.4.2, 5.2.4.3, 5.2.4.4
Control valves		Table 13.1
Waterflow alarm devices	Quarterly	5.2.5
Valve supervisory alarm devices	Quarterly	5.2.5
Supervisory signal devices (except valve supervisory switches)	Quarterly	5.2.5
Gauges (wet pipe systems)	Monthly	5.2.4.1
Hydraulic nameplate	Quarterly	5.2.6
Buildings	Annually (prior to freezing weather)	4.1.1.1
Hanger/seismic bracing	Annually	5.2.3
Pipe and fittings	Annually	5.2.2
Sprinklers	Annually	5.2.1
Spare sprinklers	Annually	5.2.1.4
Information sign	Annually	5.2.6.1
Fire department connections		Table 13.1
Valves (all types)		Table 13.1
Obstruction, internal inspection of piping	5 years	14.2
Test		
Waterflow alarm devices		
Mechanical devices	Quarterly	5.3.3.1
Vane and pressure switch type devices	Semiannually	5.3.3.2
Valves supervisory alarm devices		Table 13.1
Supervisory signal devices (except valve supervisory switches)		Table 13.1
Main drain		Table 13.1
Antifreeze solution	Annually	5.3.4
Gauges	5 years	5.3.2
Sprinklers — extra-high temperature	5 years	5.3.1.1.1.4
Sprinklers — fast-response	At 20 years and every 10 years thereafter	5.3.1.1.1.3
Sprinklers	At 50 years and every 10 years thereafter	5.3.1.1.1
Sprinklers	At 75 years and every 5 years thereafter	5.3.1.1.1.5
Sprinklers — dry	At 10 years and every 10 years thereafter	5.3.1.1.1.6
Maintenance		
Valves (all types)		Table 13.1
Low-point drains (dry pipe system)		13.4.4.3.2
Sprinklers and automatic spray nozzles protecting commercial cooking equipment and ventilation systems	Annually	5.4.1.9
Investigation		
Obstruction		14.3

Table 8.1.1.2 Summary of Fire Pump Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
Pump house, heating ventilating louvers	Weekly	8.2.2(1)
Fire pump system	Weekly	8.2.2
Test		
Pump operation		
No-flow condition		8.3.1
Diesel engine driven fire pump	Weekly	
Electric motor driven fire pump	Monthly	
Flow condition	Annually	8.3.3
Fire pump alarm signals	Annually	8.3.3.5
Maintenance		
Hydraulic	Annually	8.5
Mechanical transmission	Annually	8.5
Electrical system	Varies	8.5
Controller, various components	Varies	8.5
Motor	Annually	8.5
Diesel engine system, various components	Varies	8.5

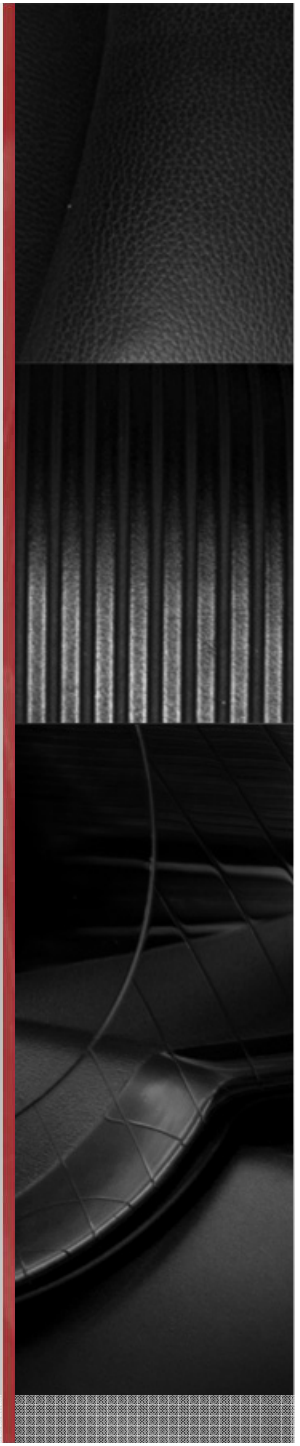
NFPA 25 has a series of easy to use Tables with Inspection, Testing and Maintenance schedules.

Sprinklers, Standpipe, Underground, Fire Pumps, Storage Tanks, Valves, and more.



OPERATIONAL

Visual Inspections	
Weekly	Monthly
For Diesel Pump	Control Valves
Fuel Level	Alarm Check Valves
Oil Level	Pressure Reducing Valves
Coolant Level	Pressure Relief Valves
Battery Charge	Pressure Gauges
	Water Tank Level
Quarterly	Annually
Valve Supervisory Devices	Hangers/Supports
Name Plates	Piping and Fittings
Water Tank Exterior	Spare Sprinklers
Water Tank Ladder	Hydraulic Placard
Breeching Inlet	Hoses
	Hose Cabinets



OPERATIONAL

Testing

Weekly	Semi-Annually
Diesel Pump (no flow 30 min)	Water Flow Switches
	Water Level Alarms
	Valve Supervisory Switches
	0.7 hour of total running time
Monthly	**Annually**
Electric Pump (no flow 10 min)	Monitor Nozzles (flow test)
Quarterly	Hydrants (flow test)
Water Motor Gongs	Fire Pumps (flow condition)
	Main Drain (flow supply)
	Control Valves (functionality)
	Deluge Valves (flow test)

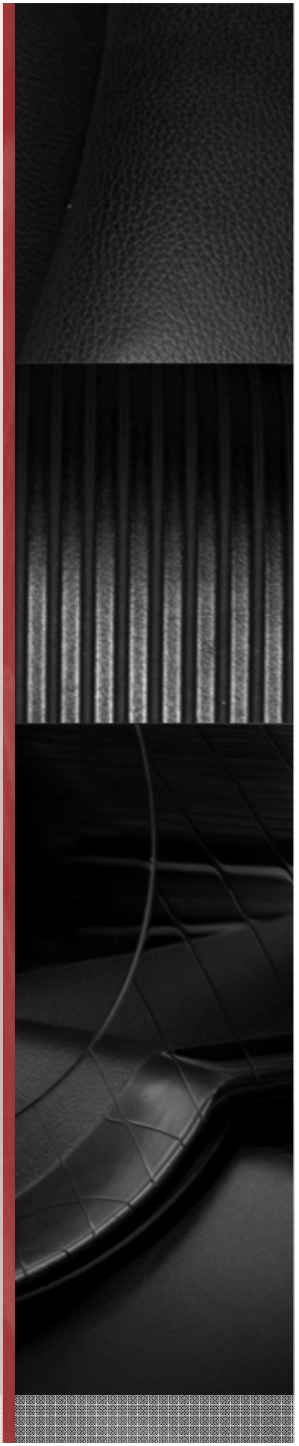
MAINTENANCE

Review the NFPA 25 Tables along with the maintenance contract.

The contract should state what tasks to perform and with what frequency

Many of the inspection tasks and some testing tasks will be the **Owner/Operator's responsibility**

Review the documentation



MAINTENANCE

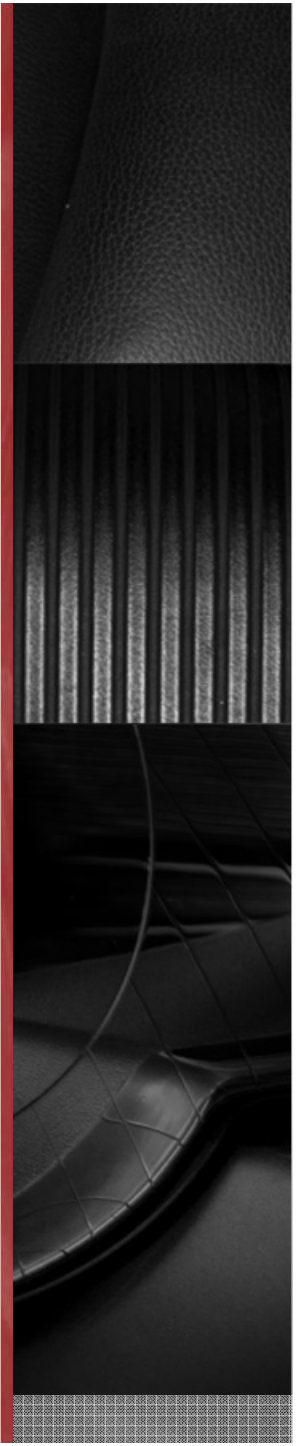
DOCUMENTATION
DOCUMENTATION
DOCUMENTATION

Marked as defective but Owner/Operator was not informed

Document your inspections
Document your tests
Demand documentation from contractors
Demand documentation from operators
Review the documentation and have a close out procedure

MAINTENANCE

EXERCISE	vs	TEST
Running for 20 Minutes		Running 3km in 15 minutes
Spraying water from a hose		Flowing 1,000 gpm GPM @ 6.9 Bar from remote hose valves
Turning on the pump		Flowing rated flow within 95% of the rated pessure



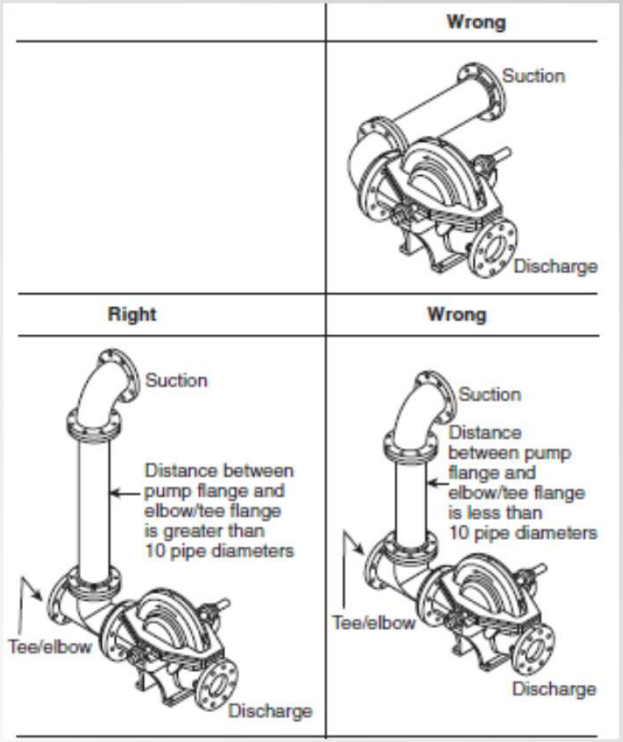
Tests have a PASS/FAIL criteria

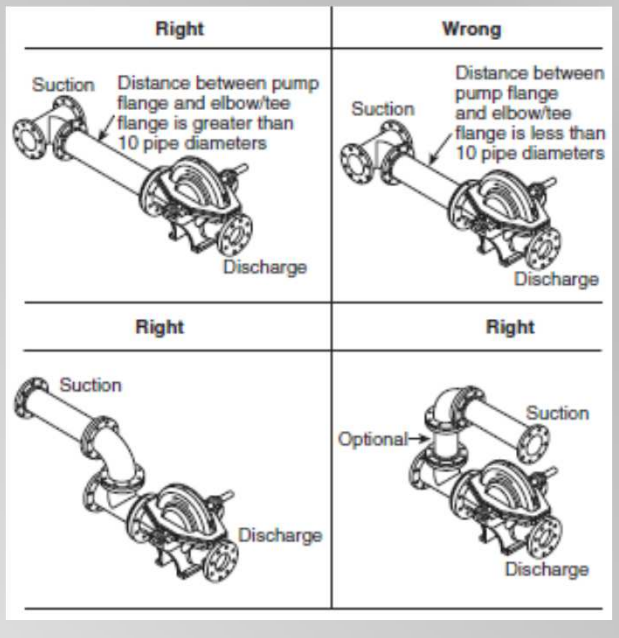
- Know what the PASS/FAIL is
- Demand it to be Documented

COMMON PITFALLS

Elbows into Horizontal Split Case Pumps

NFPA 20 section 4.14.6.3.1 prohibits elbows and tees with a center line parallel to the shaft of the pump within 10 pipe diameters for horizontal split case pumps.





COMMON PITFALLS

Elbows into Horizontal Split Case Pumps

This only applies to horizontal split case pumps, not vertical inline or end-suction

COMMON PITFALLS

Pump Bases Not Grouted

NFPA 20 section 6.4.1 requires overhung impeller and impeller between bearings designed pump and driver (horizontal split case pumps) to be grouted

COMMON PITFALLS

Pressure Relief Valves

NFPA 20 section 4.18.1 only permits pressure relief valves on diesel fire pumps and variable speed pressure limiting pumps and only to act as emergency relief under pump controller failure conditions.

PRV on common discharge manifold

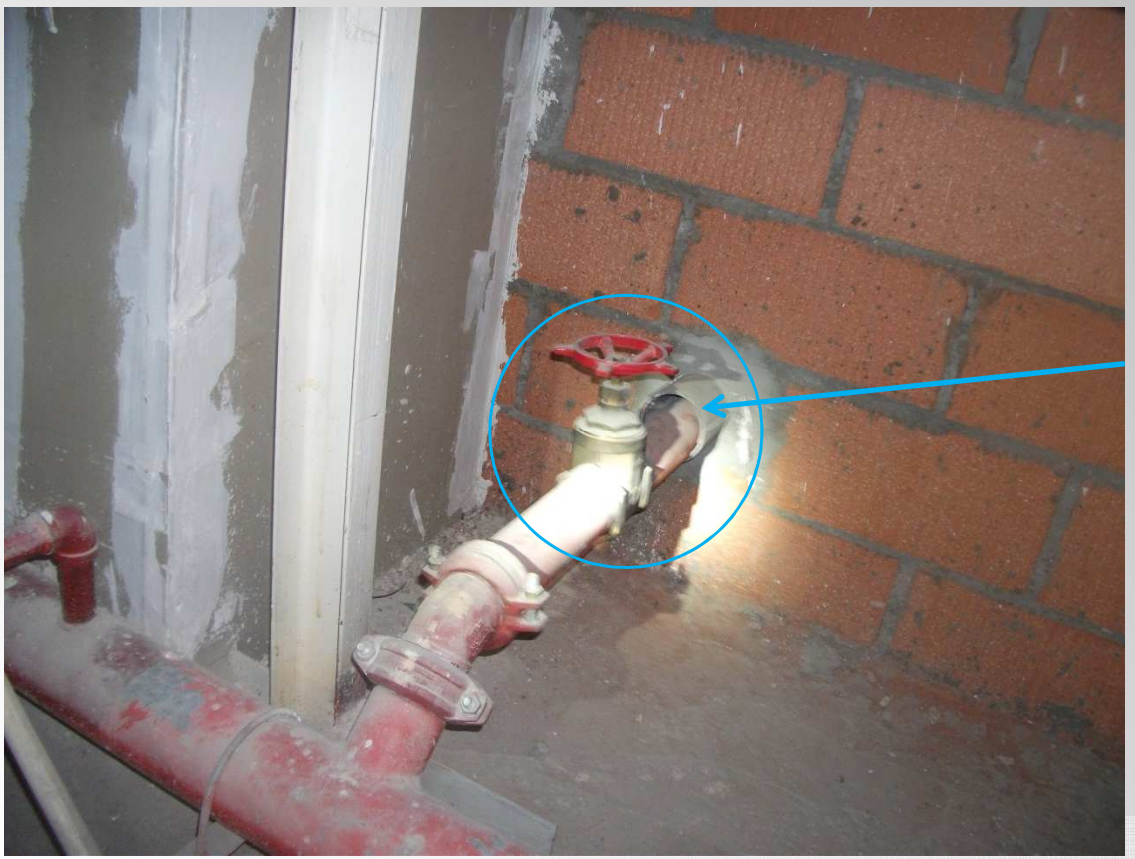
NFPA 20 A.4.7.7 states:

“A pressure relief valve is not an acceptable method of reducing system pressure under normal operating condition”

COMMON PITFALLS

Non-Indicating Valves

NFPA 13 section 6.7.1.3 requires all valves controlling water supplies to sprinklers to be **indicating type** (except some underground valves)

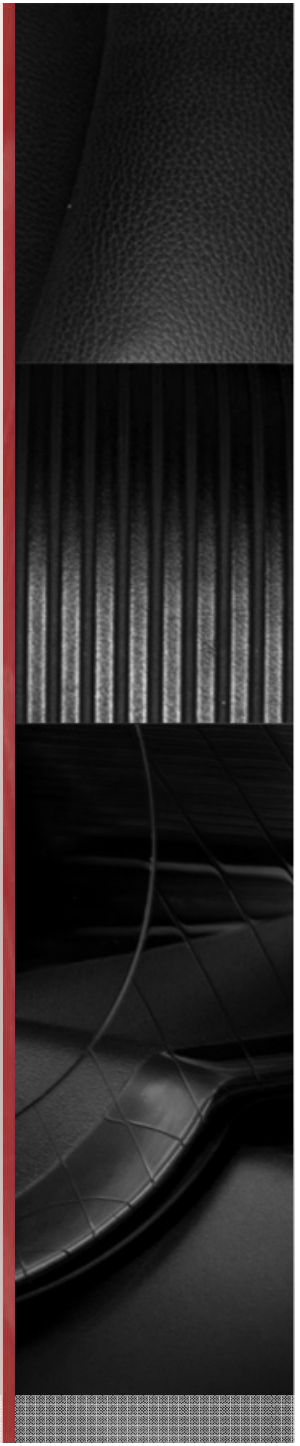


COMMON PITFALLS

Unsupervised Valves

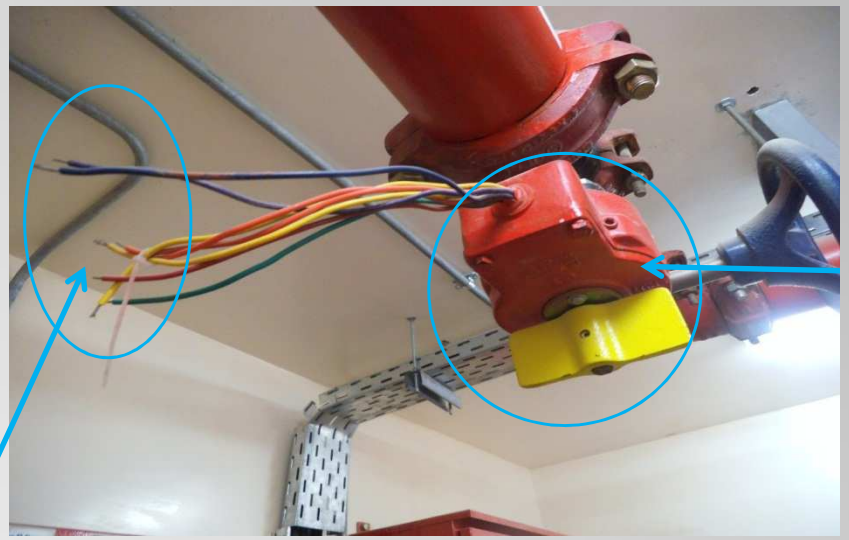
NFPA 13 section 8.16.1.1.2 requires all valves controlling water supplies to sprinklers to be supervised by one of the following methods:

- Central station (fire alarm with remote monitoring and signaling)
- Local signal causing audible alarm at constantly attended location
- (fire alarm control panel security station)
- Valves locked in the correct position (chain and lock, valve in secure location)
- Valves located in fenced enclosure locked in correct position, inspected weekly (chain and lock, but valve in a less secure location)



COMMON PITFALLS

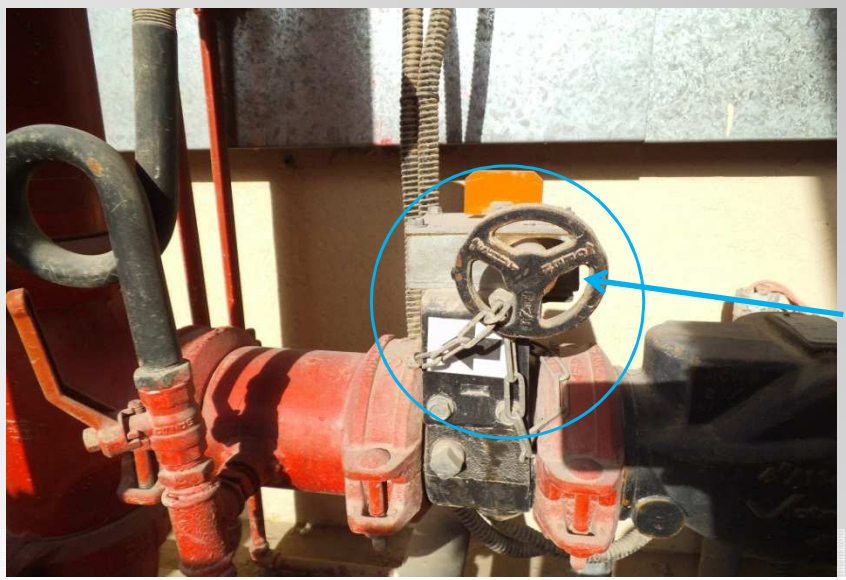
Supervising Valves



Indicating type butterfly valve with integral supervisory switch

Not Connected!

X



Indicating type Butterfly valve with chain & lock

GOOD

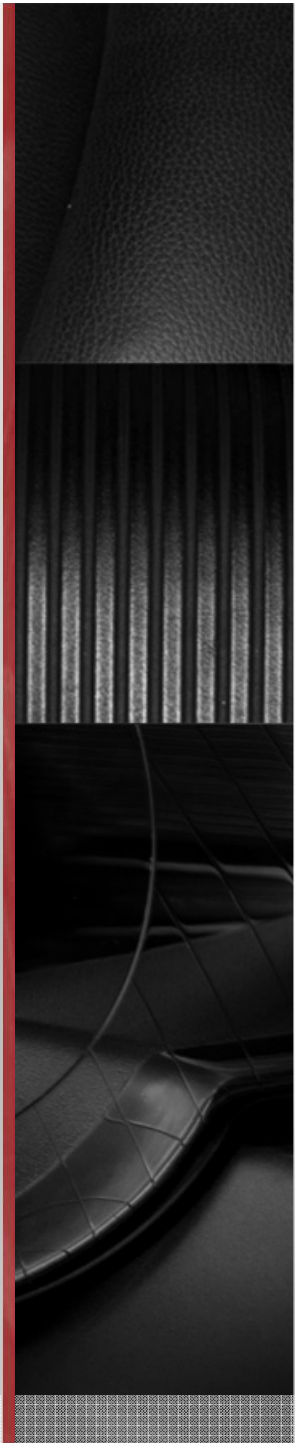
√

COMMON PITFALLS

Unsupervised Fire Pumps

NFPA 20 sections 10.4.7 (electric) and 12.4.2 (diesel) require that the following be monitored at a constantly attended location:

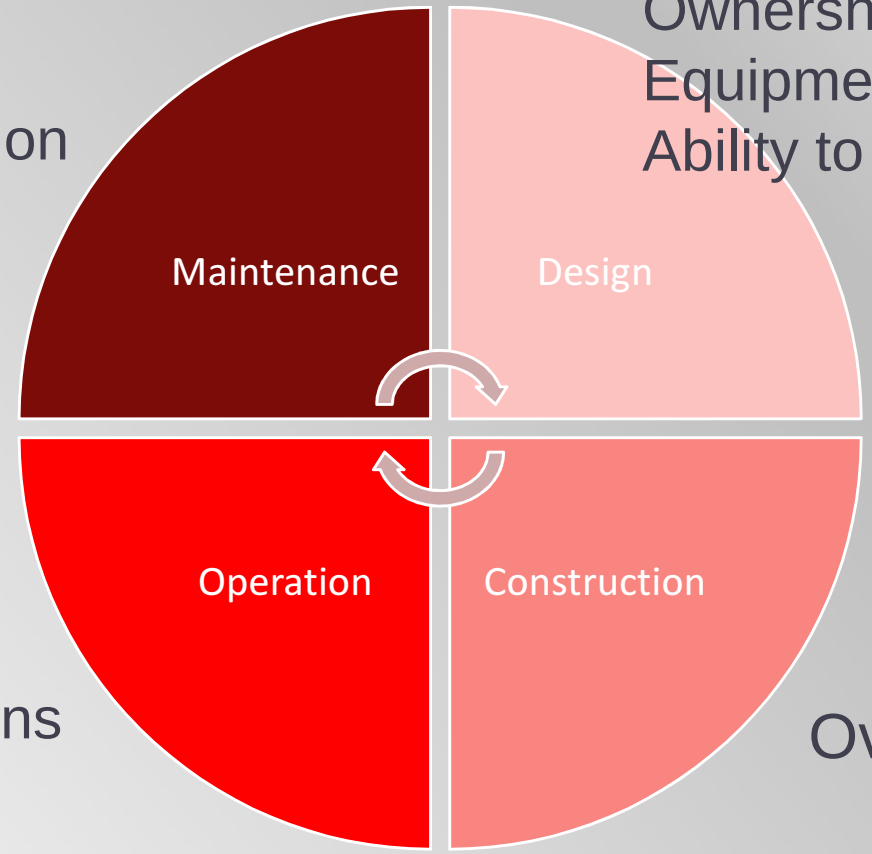
Supervise Conditions for Fire Pumps	
Electric	Diesel
Pump Running	Pump Running
Loss of Phase (Off)	Off or “Off-Auto”
Phase Reversal	Trouble on Controller or Engine (General Malfunction)



Successful Suppression System

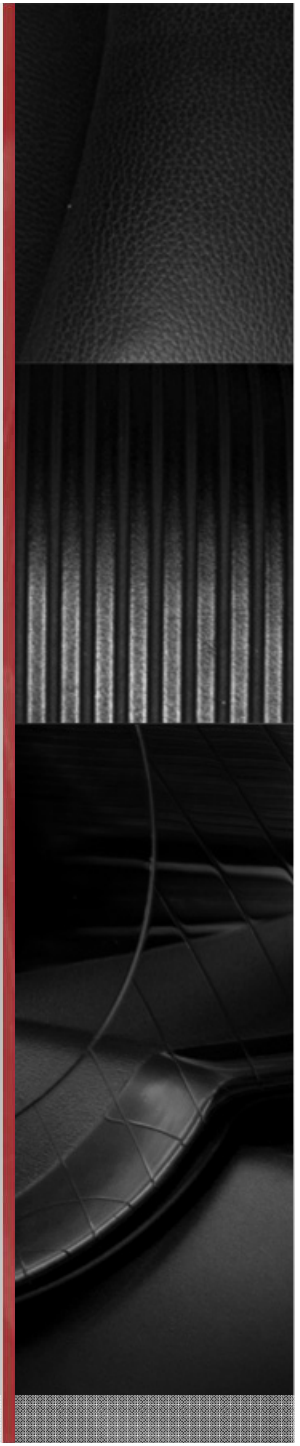
NFPA 25
Contract
Documentation

Ownership
Equipment Access
Ability to Test



NFPA 25
Inspections
Tests

Oversight



Thank You

WSP Middle East