

EF

BREAKDOWN

Fire Protection 101

Sprinklers & Other Systems

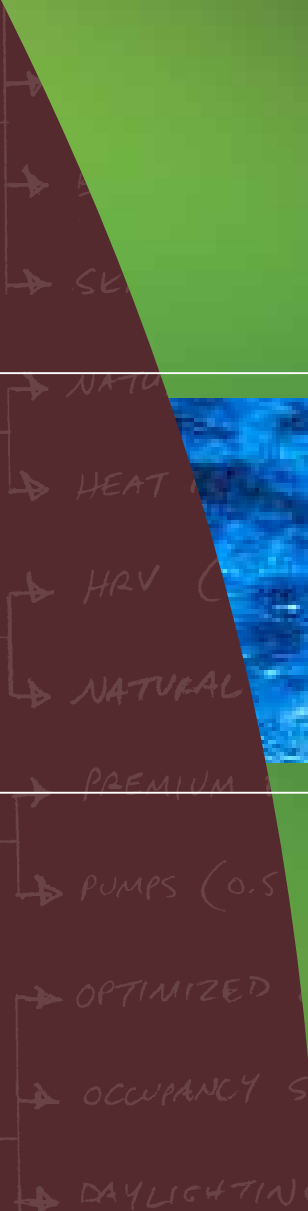
→ SKIN (39%)

→ VENTILATION (17%)

→ FANS (8%)

→ PUMPS (7%)

→ INTERIOR LIGHTS (12%)



OVERVIEW

- » Codes
- » Types of fire suppression systems
- » Building sizes & riser room locations
- » Backflow preventers, control valves, FDCs
- » Types of sprinkler heads & finish options
- » Sprinkler spacing rules & room layout
- » Ceiling features, soffits, bldg overhangs
- » Standpipes
- » IT & MDF room protection
- » Fire pumps & pump rooms

SUPPRESSION SYSTEMS

- » Wet
- » Antifreeze
- » Dry (compressed air or nitrogen)
- » Preaction (detector activated)
- » Water mist
- » Clean agents (gas-no residues)
- » Others
 - » Foam
 - » Dry chemical (Co₂)

SPRINKLER

- » Building Code – Where to install
- » NFPA 13 – How to install
- » NFPA 25 – How to test / maintain
- » Products
 - » UL Listed
 - » FM Approved
 - » ICC: International Code Council Evaluation Service (ICC-ES)

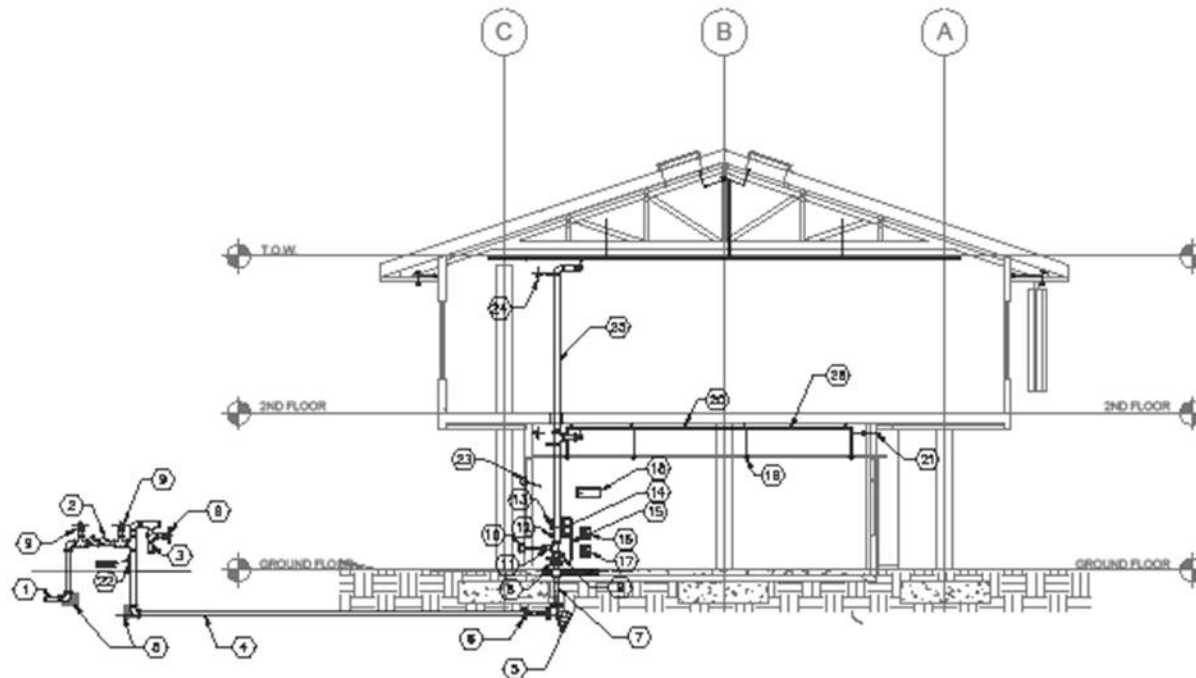
SPRINKLER SYSTEMS

Wet Pipe Systems

- » Filled with water
- » Most reliable, cheapest
- » Subject to freezing
- » Water discharges from each sprinkler as heat activates it

SPRINKLER SYSTEMS

- » Pipes sized as if all heads in a design area are discharging simultaneously –
- » Not as if all heads in building are discharging
- » Design area usually 1500 sf



WET PIPE SPRINKLER SYSTEM

- 1 FROM PUBLIC WATER SUPPLY.
- 2 BACKFLOW PREVENTER.
- 3 FULL FORWARD FLOW TEST PORT.
- 4 UNDERGROUND SUPPLY, DUCTILE IRON OR PVC.
- 5 THRUST BLOCK OR RESTRAINED JOINT SYSTEM.
- 6 TEST FLANGE. REMOVE AFTER TESTING.
- 7 DUCTILE IRON PIPE THROUGH FLOOR.
- 8 FLOOR FLANGE.
- 9 CONTROL VALVE WITH SUPERVISORY SWITCH.
- 10 FIRE DEPARTMENT CONNECTION (FDC).
- 11 FOG CHECK VALVE WITH AUTOMATIC BALL DROP DRAIN.
- 12 GRADE.
- 13 FLOW SWITCH CONNECTED TO BELL AND FIRE ALARM SYSTEM.
- 14 INSPECTOR'S TEST CONNECTION.
- 15 SYSTEM MAIN DRAIN. DRAIN TO SANITARY SEWER OR DAYLIGHT WHERE NO DAMAGE WILL BE CAUSED.
- 16 HYDRAULIC INFORMATION PLACARD.
- 17 INFORMATION SIGN.
- 18 SPARE SPRINKLER CABINET.
- 19 PENDENT SPRINKLER.
- 20 UPRIGHT SPRINKLER.
- 21 SIDEWALL SPRINKLER.
- 22 CONDUIT TO BUILDING FOR SUPERVISORY SWITCHES.
- 23 ELECTRIC BELL.
- 24 4-WAY SWAY BRACE.
- 25 MAIN RISER.
- 26 BRANCHLINE.

SPRINKLER SYSTEMS

- » Light & ordinary hazards
 - » 52,000 sf footprint per system
- » Extra hazards & storage
 - » 40,000 sf footprint per system



WATER SUPPLIES

Connection to water

- » City main
 - » Good flow (GPMs) and pressure
 - » Good GPMs but poor pressure
 - » Fire pump to boost pressure
 - » Poor GPMs or high rise
 - » Fire water tank with pump

BACKFLOW PREVENTERS

- » Detector check
- » Double detector check (in or out)
- » Reduced pressure backflow preventor (inside)



BACKFLOW PREVENTERS

- » Above ground (California)
- » Above ground (Insulated, heated box)



CONTROL VALVES ACCESSIBLE

PIV (Post Indicator Valve in yard)



CONTROL VALVES ACCESSIBLE

WPIV (Wall Post Indicator Valve)



CONTROL VALVES ACCESSIBLE

OS&Y or Butterfly Valve

- » In riser room or stairwell with direct exterior access



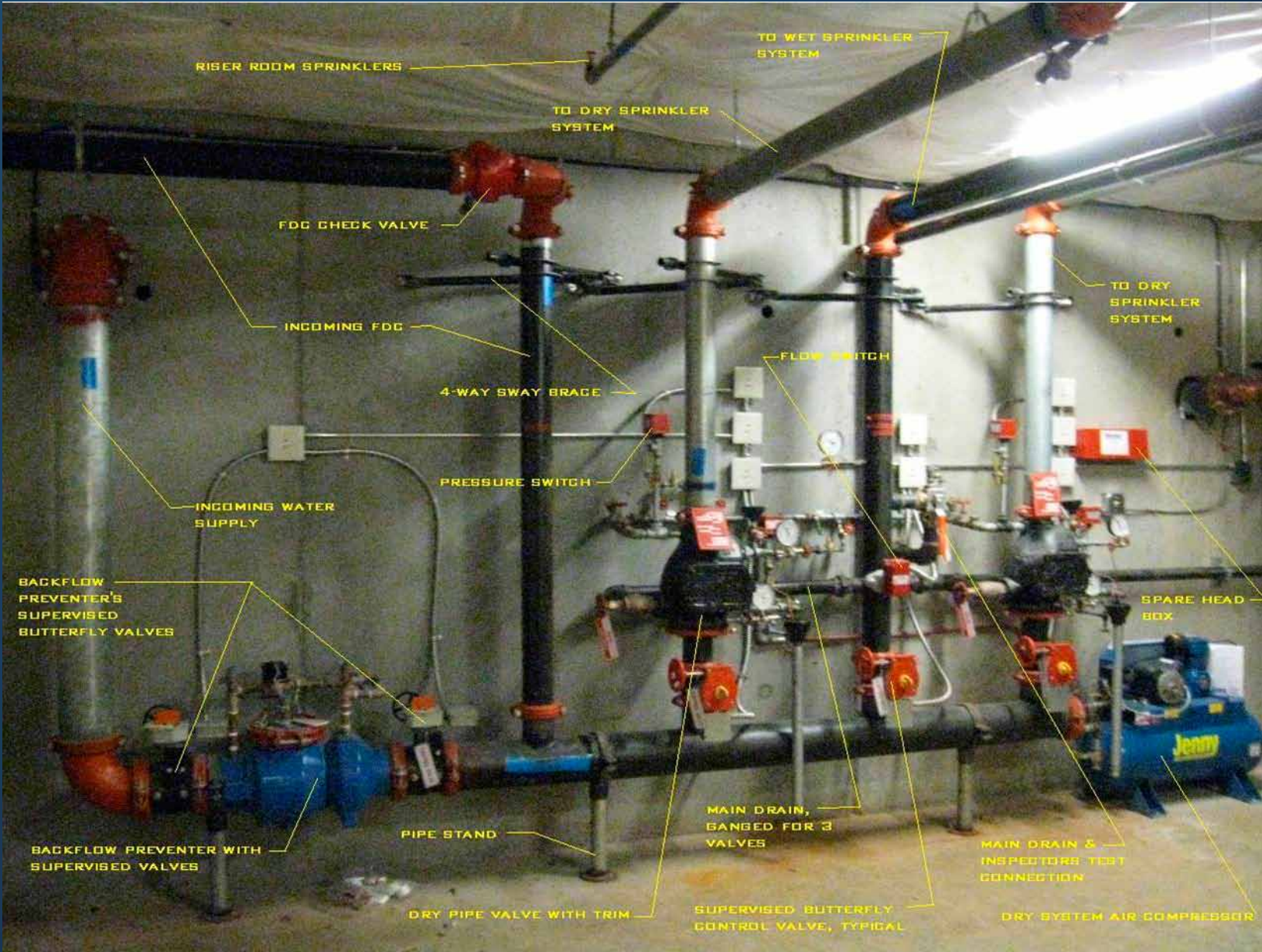
CONTROL VALVES



RISERS

Main riser (vertical pipe)

- » Single
- » Multiple manifold from one floor penetration
- » Control valve (supervised)
- » Gauge & drain
- » Flow switch
 - » Local bell (and supervisory service)
- » 20+ sprinklers
 - » IBC, OSSC - Must be supervised
 - » Central station
 - » Constantly attended station



RISER ROOM SPRINKLERS

TO WET SPRINKLER SYSTEM

TO DRY SPRINKLER SYSTEM

FDC CHECK VALVE

TO DRY SPRINKLER SYSTEM

INCOMING FDC

FLOW SWITCH

4-WAY SWAY BRACE

PRESSURE SWITCH

INCOMING WATER SUPPLY

BACKFLOW PREVENTER'S SUPERVISED BUTTERFLY VALVES

SPARE HEAD BOX

BACKFLOW PREVENTER WITH SUPERVISED VALVES

PIPE STAND

MAIN DRAIN, GANGED FOR 3 VALVES

MAIN DRAIN & INSPECTOR'S TEST CONNECTION

DRY PIPE VALVE WITH TRIM

SUPERVISED BUTTERFLY CONTROL VALVE, TYPICAL

DRY SYSTEM AIR COMPRESSOR

FIRE DEPT CONNECTION = FDC



FIRE DEPT CONNECTION = FDC

- » Close to fire hydrant
- » Inlet for boosting pressure
- » Responding Fire Dept Connects
 - » Hose from pump on pumper truck to hydrant
 - » 2ND hose from truck to FDC
 - » Normally connect FDC to system side of sprinkler control valves



RISER ROOMS

- » Heat & light
- » No pipe under buildings
 - » Exceptions:
 - » 1 stick of pipe with 1 elbow up to riser rm
 - » Pipe run in concrete trench with grate
- » Locate on an outside wall
 - » Exceptions
 - » Door = preferred
- » Main drain to drain or exterior

RISER ROOMS

» Riser rooms

- » 1 wet riser: $\sim\sim 3' \times 4'$
- » 2 wet risers or 1 dry riser $\sim\sim 3' \times 5'$
- » 1 wet + 1 dry riser: $\sim\sim 4' \times 6'$

PIPE

- » Steel (black or galvanized)
- » Copper - \$\$\$\$\$
- » CPVC - \$ (limitations)

PIPE

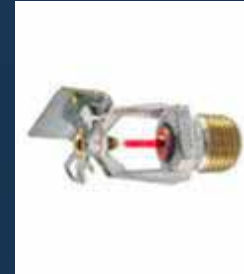
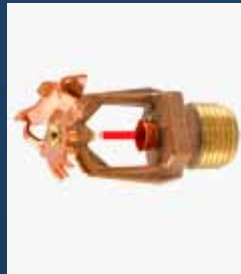
- » Corrosive areas:
 - » Pools, spas
 - » Stainless steel, CPVC
- » Pool equipment rooms, chemical storage, laundries, etc.
 - » Stainless steel \$\$\$
- » Beachside, marine environs
 - » CPVC, galvanized steel, stainless steel
- » Parking garages, exteriors
 - » Galvanized steel

SPRINKLERS

Pendent / upright



Horizontal sidewall



SPRINKLERS



Standard coverage

- » Upright & pendent (including recessed pendent and concealed)
 - » 120-225 sf (max 15' head to head, light hazard, depending on construction & roof pitch)
 - » 130 sf (max 15' head to head, ordinary hazard)
 - » 100 sf (max 12'-15' extra hazard or storage, depending on density)
 - » Concealed costs ~50% more than recessed



SIDEWALL SPRINKLERS

Standard coverage

» 12'X12'

» 12'X14'



SIDEWALL SPRINKLERS

Sidewall sprinklers

- » only under smooth monolithic ceilings
- » Not here:



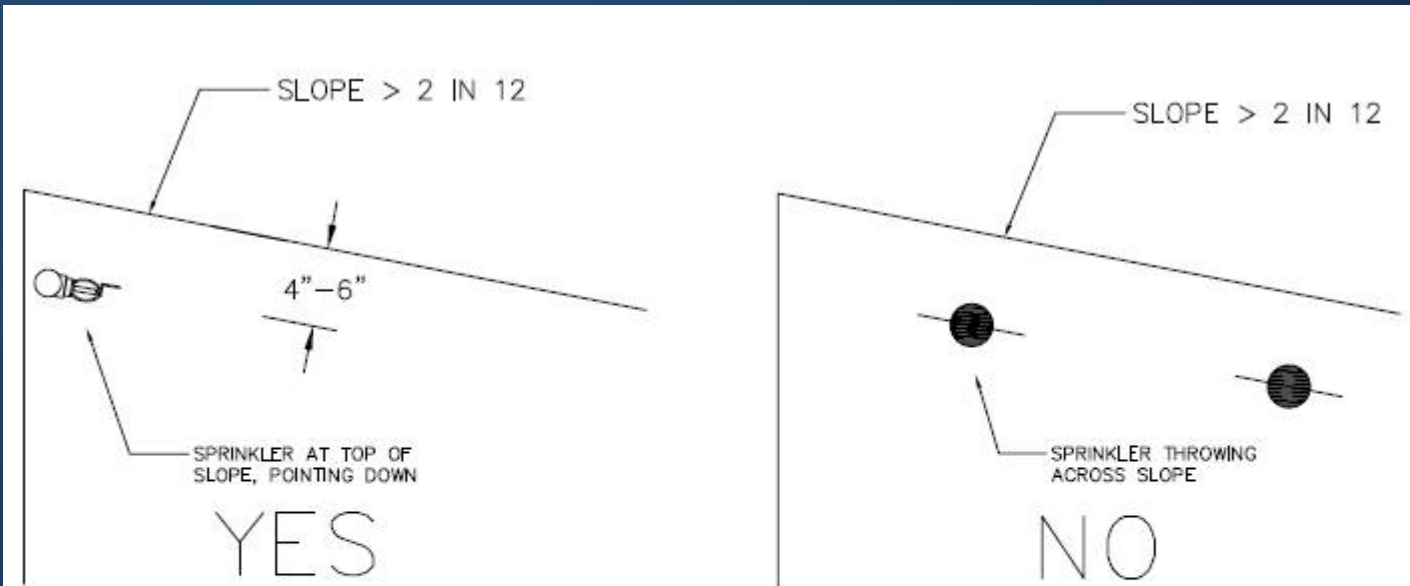
SIDEWALL SPRINKLERS

Sidewall sprinklers on slopes

- » Only at top of slope pointing down
- » Never across the slope

SIDEWALL SPRINKLERS

No sidewall sprinklers spraying across slope



SIDEWALL SPRINKLERS

NO SCALE

SIDEWALL SPRINKLERS

**No sidewall sprinklers
spraying across slope**



SPRINKLERS

Extended coverage

- » Upright & pendent (requires extra pressure)
 - » 16'x16'
 - » 18'x18'
 - » 20'x20'
- » Sidewall (requires extra pressure)
 - » 16'x16'...16'x18'...16'x20'...16'x22'...16'x24'...16'x26' (measured head to head along wall x throw across room)
- » Specialty
 - » Attic, corridor, concealed space, etc.
 - » Window sprinklers

DRY SPRINKLERS

Dry (aka “dry barrel”)



DRY SPRINKLERS

Wet systems

- » To protect small areas $< 40^{\circ}$ F
- » Freezers/coolers, with “boot”
- » Some building overhangs
- » Extent into warm area depends on how cold area of protection is
 - » Usually 12-inches



DRY SPRINKLERS

Dry systems

- » Pendants and sidewalls
- » \$\$\$ Sold by the dry-barrel inch
- » 6"SR~\$120, 12"SR~\$129.50,
48"ECQR~\$342

SPRINKLERS

Institutional (anti-suicide)



Tyco WS Window



WINDOW SPRINKLERS



SPRINKLERS

Sprinkler finishes

- » **Only factory finishes allowed - *No field painting!!!!***
- » Standard frames
 - » Chrome, white, brass
- » Standard escutcheons
 - » Chrome, white, brass
- » Premium finishes
 - » Off white, black, copper, stainless steel
- » Custom colors
 - » ~\$300-\$350 color set up fee

ASCE 7 COMPLIANCE

- » Seismic zones D, E and F
- » Suspended ceilings not rigidly braced, or braced with diagonal splay wires
- » Oversized ceiling penetration 2” larger than sprinkler, with oversized escutcheon

OR

- » Flexible connector between head and branchline (flexhead)

ASCE 7 COMPLIANCE

Flexible connector



Oversized hole & ring



CEILING FEATURES

- » Sprinklers required:
 - » Above & below cloud ceilings
 - » Under overhangs exceeding 4 ft
 - » Under soffits used for installation of sidewall sprinklers which are > 8 inches in width or projection from wall
 - » Soffits greater than 30" wide
 - » Some soffits less than 30" wide

NFPA 13 PERMISSIBLE SPRINKLER OMISSIONS

- » In skylights <32 sf separated from other skylights or ceiling pockets by 10 ft or more
- » Some ceiling pockets
- » Some concealed spaces
 - » Some concealed spaces trigger increased design area to 3000 sf

STANDPIPES

IBC, OSSC:

- » Where highest occupied floor is more than 30' above lowest level of fire dept access
 - » Required stairwells
 - » Horizontal exits
 - » Malls
- » Class I (2 1/2" outlets) sprinklered bldg
 - » High-rise – fire pump
 - » Non-high-rise – pressure supplied by fire dept
- » Class III (2 1/2" and 1 1/2" outlets)
 - » non-sprinklered bldg
 - » 100 psi – usually means fire pump

STANDPIPES

Class I



Class I



STANDPIPES

Class I

with floor control station



Class I

with floor control station



CLASS II STANDPIPES



- » Stages
- » Assembly occupancies
- » 1 1/2" outlets
- » Frequently fire pumped

CLASS III STANDPIPES



PREACTION SYSTEMS

» Single Interlock

- » One smoke or one heat detector activates
.....> pipe fills with water
- » Water discharged only when head activates
or pipe breaks

» Double Interlock

- » Two events to fill pipes with water
- » Detector activates + loss of air pressure due
to pipe break or head activation

» Viking Firecycle – on/off - \$\$\$\$\$

CLEAN AGENT

- » Gaseous

- » SAPPHIRE (NOVEC 1230), FM200, INERGEN

- » Where?

- » Computer server rooms

- » Museums

- » Small, valuable spaces

- » Sold by cubic foot of space, \$\$\$\$\$

- » Room must be air tight

- » Dampers, gaskets, walls to structure

OTHER SYSTEMS

» Water Mist

- » Creates a fog
- » Areas of low water availability
- » High value areas
- » \$\$\$\$\$

FIRE PUMPS

Inlet from tank @ R



Horizontal Split Case



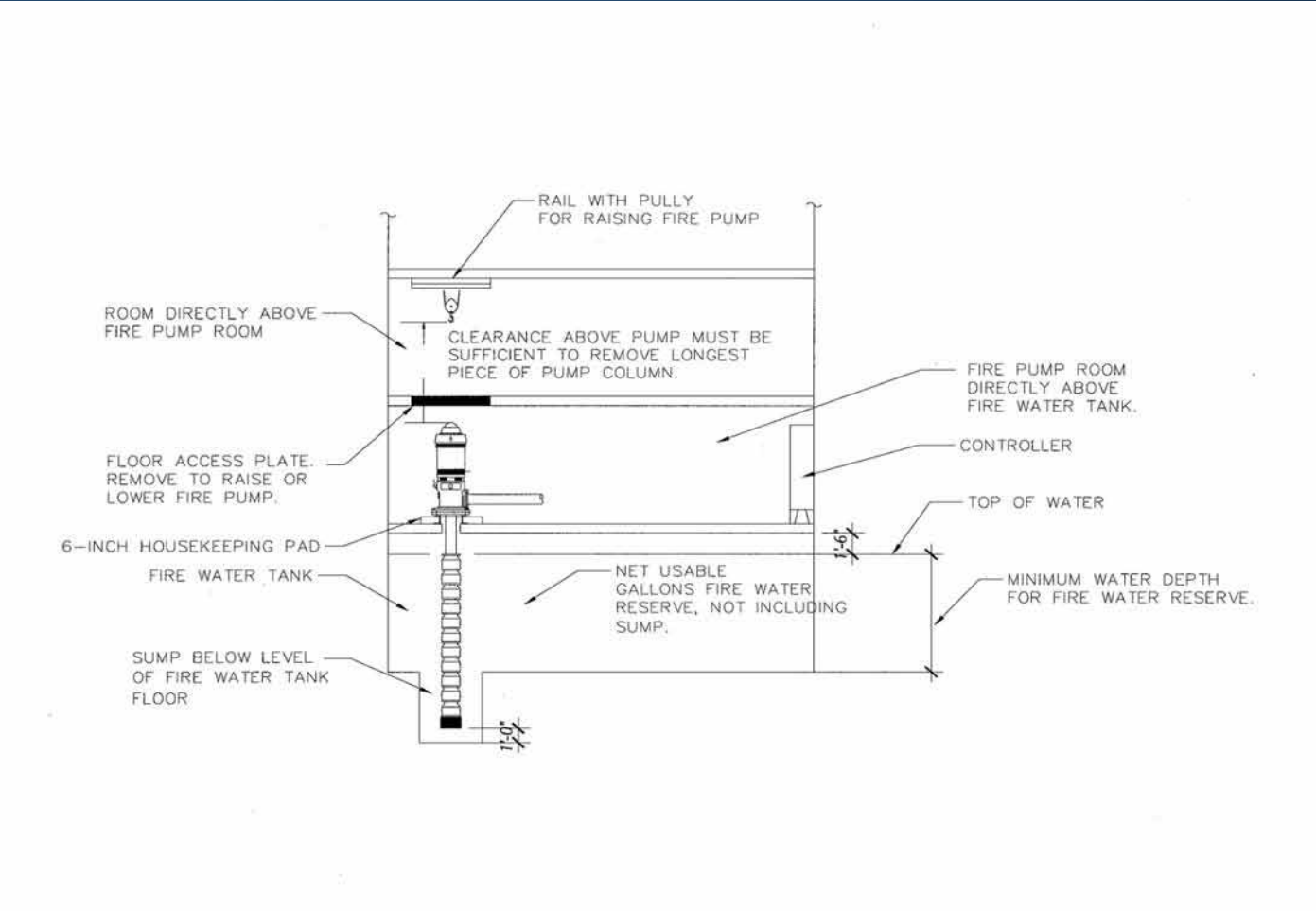
FIRE PUMPS

Vertical Inline Pump Motor on top



FIRE PUMPS

Vertical Turbine Fire Pump



FIRE PUMP CONTROLLERS

- » Controllers:
 - » Usually 6' wide
 - » Usually 5'-6' high
- » Front clearance:
 - » Minimum 42"
- » Usually 480 volt
- » Small jockey pump controller
- » Wet? Toss out !



FIRE PUMP ROOMS

- » Non-high-rise: 1 hr fire rated construction
- » High-rise: 2 hr fire rated construction
- » No storage
- » Depending on jurisdiction
 - » No non-fire equipment
- OR
- » Only fire & domestic water equipment

PUMP ROOMS

- » 1 pump + controllers & access
 - » 14'x16' minimum
- » 2 pumps + controllers & access
 - » 18'x18' minimum, depending on bldg



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