

**Minimum Fire Sprinkler Design Criteria
For
Brigham Young University – Idaho
Revised June 2003**

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Instructions:

NFPA Standard 13 is to be used as a guide for the design and installation of fire sprinkler systems at BYU – Idaho. However, NFPA 13 is only a minimum standard. This document will serve as an additional specification for all new or retrofit fire sprinkler installations.

Fire Protection

1. At the completion of the project, the fire sprinkler contractor shall submit to the BYU-Idaho Construction Department one (1) set of “Mylar” fire sprinkler system as-built drawings.
2. The University Insurance Carrier is to be specified as an approval authority. Prior to job bidding, specific detailed rulings can be obtained by contacting the BYU-Idaho Construction Department, the BYU-Idaho Safety Department, and/or the University Insurance Carrier, FM Global.

Submittals:

Sprinkler Contractors are to provide the General Contractor with eight (8) copies, and the Rexburg City Fire Department with two (2) copies of the shop drawings. The General Contractor is to deliver or mail copies of the drawings to the following:

Shop Drawings to be Delivered To

Number of Copies

General Contractor	1 Copy
Architect	1 Copy
Engineer	2 Copies (Returns on copy with comments to Contractor)
University Construction Manager	4 Copies
The University Construction Manager will distribute received shop drawings as follows:	
University Construction Manager	1 Copy (Returns one copy with comments to Construction Coordinator)
University Fire Protection Officer	3 Copies

Final Submittals

Sprinkler contractors shall correct drawings, incorporating comments noted above. Corrected drawings shall be resubmitted, with eight (8) copies being sent out for review as noted above.

The University Fire Protection Officer will deliver or send copies of the shop drawings to the University Insurance Carrier. The University Fire Protection Officer will correlate with the assigned BYU-Idaho Construction Manager so that plan review comments from the University Insurance carrier are returned expeditiously.

Approval of shop drawings must be obtained prior to installation. Questions can be forwarded to the University Construction Manager and/or the Campus Fire Protection Officer.

3. All codes and regulations listed pertaining to fire protection shall be complied with. In addition, code(s) adopted by the Idaho State Fire Marshals office shall apply.
4. All new installations or retrofit applications required by code where it is necessary to install fire protection systems where commercial cooking is conducted, or cooking areas where grease laden vapors are produced, are to meet the requirements as set forth by the University Insurance carrier, and the BYU-Idaho Safety Department. Required Specifications for the installation of fire suppression equipment designed for the protection of commercial cooking operations can be obtained at BYU-Idaho Safety Office. Contact the BYU-Idaho Fire Protection Officer for more details.
5. All fire sprinkler designs involving more than 100 sprinkler heads are to be based on a current flow test of the available water supply. Flow tests are to be witnessed by the University Fire Protection Officer or his designee. Flow test analysis and calculations are to be submitted along with all shop drawings. Where city water provides the sole fire protection water supply, hydraulic calculations should utilize 90% of the supply.
6. For hydraulically calculated or performance specified systems, the most recent edition of NFPA Standard 13 is to be used, however the additional features listed below shall prevail.
 - a) The entire system shall be designed and installed in accordance with the latest issue of NFPA Standard 13 and these guidelines.
 - b) For all hydraulically designed systems the designed area shall be the most hydraulically demanding rectangular area having a dimension parallel to the branch lines at least 1.4 times the square root of the area of the sprinkler operation used.
 - c) Only schedule 40, ASTM 53, A-135, or A-795 pipe shall be used. No foreign pipe is allowed. Piping with alternative wall thickness to schedule 40 is **not** allowed.
 - d) A simultaneous 250 gpm hose stream demand shall be included in all calculations where Light Hazard Occupancies exist. A 500 gpm hose stream demand shall be included in all calculations for Ordinary Hazard or Higher Hazard occupancy classification, then the entire area, including the lesser hazard classification is to receive a 500 gpm hose stream allotment.
 - e) Design Calculations for inside pipe are to include C=100 for dry pipe and preaction systems, C=120 for wet and deluge systems.

f) The maximum allowable velocity pressure in fire sprinkler pipe is to be in accordance with the most recent edition of NFPA 13.

g) Construction scheduling should be such that any water supply connection, underground pipe, or fire hydrant(s) installed are to be tested, and in service as soon as practically possible. Sprinkler installation should begin as soon as roof framing or floors are complete and should be in operation to protect as much of the construction as possible. Existing systems that need to be shut down **require** the contractor to contact BYU-Idaho Construction Manager and BYU-Idaho Fire Protection Officer prior to any system shut down. All tests are to be witnessed by the owner's representative. Contact the BYU-Idaho Construction Manager to schedule tests.

h) A Contractor's Material and Test Certification for Aboveground Piping must be completed in full and submitted to the University Construction Department Representative prior to system acceptance. (See Exhibit "A") Where connection into an underground pipe system occurs, a Contractor's Material and Test Certificate for Underground Piping must also be submitted. (See Exhibit "B") The lead-in connection to a fire sprinkler riser shall be completely flushed before connection is made to sprinkler piping. The flushing operation should be continued for a sufficient time to ensure thorough cleaning. The minimum rate of flow shall be that listed in the most recent edition of NFPA Standard 13.

i) Minimum fire sprinkler head operating pressures shall be seven (7) psi. The design of operating sprinkler pressures in the 30 to 70 psi range is recommended. Fire sprinkler heads should be frangible bulb type in areas that have finished ceilings, an adjustable concealed fire sprinkler head shall be used. For tile ceilings, the fire sprinkler head shall be located in the center of the tiles. In areas that have no finished ceilings an upright/pendent fire sprinkler head shall be used. The head shall have a chrome finish in areas with unpainted surroundings, or a white finish in areas with painted surroundings.

Approved manufacturers are:

- Reliable
- Central
- Victaulic

All models of fire sprinkler heads are to meet this criteria, the criteria of the University Insurance Carrier, FM Global, and the most recent edition of NFPA 13.

j) Maximum floor areas to be protected by one fire sprinkler system is not to exceed 52,000 sq. ft. for Light Hazard Occupancies, 52,000 sq. ft. for Ordinary Hazard Occupancies, and 40,000 sq. ft. for Extra Hazard Occupancies. For other than hydraulically calculated systems, contact the BYU-Idaho Construction Manager and the University Fire Protection Officer for assistance.

k) Use of 17/32-inch orifice sprinklers with ½-inch threaded fittings are not permitted for any system.

l) Sprinkler design densities are to be those specified in **Exhibit “C”** of this document.

NOTE: This is a higher standard for design criteria than NFPA 13

m) O S & Y, indicating, and isolation valves are to be equipped with a tamper switch.

n) In addition to the information required on preliminary or working drawings as indicated in the current edition of NFPA Standard 13, the following data should be provided in the plans:

- Symbol legend
- Scale
- Orifice size of sprinkler should include NPT
- Pipe joining method
- Schedule of pipe used for all branch lines, cross mains, and feed mains
- Seismic bracing depicting both longitudinal and lateral braces
- Type of fittings used, including manufacturer, model and listing authority
- Detail of trapeze hanger assemblies using NFPA Tables 6-1.1.3 a, b and c

Brigham Young University - Idaho
Contractor's Material and Test Certificate
For
Aboveground Piping
Fire Sprinkler Systems and Standpipe Systems
Exhibit "A"

Instructions

Upon completion of work, inspection and tests shall be made by the contractor or his representative. Where indicated with an asterisk (*) the inspection and tests are to be witnessed by a designated University representative. Please consult with the construction department to determine who should witness tests where required. It is understood that the owner's representative's signature in no way prejudices any claim against the contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Fill out all information called for and submit this report to the University Construction Department.

Property/Building Name _____

Date _____

Name of Person Making This Report _____

Company/Contractor Responsible for Work _____

All applicable specifications and NFPA standards found on this form are to be completed and answered as a **"yes"**, or **"no"**. Any **"no"** answer is to be explained and approved by the University Construction Department prior to system approval.

Plans

As built drawings provided to Construction Department: Yes: ___ No: ___

Installation conforms to plans and equipment meets with design specifications: Yes: ___ No: ___

Pipe, Fittings, and Valves

Type of Pipe _____

Type of Fittings _____

Alarm Valve or Flow Indicator:

Type _____

Make _____

Model _____

Sprinklers

Make _____

Model _____

Year of Manufacture _____

Orifice Size _____

Quantity _____

Temperature Rating(s) by Location _____

Dry Pipe Operation Test (Check here if not applicable _____)

Alarm Device

Type _____ **Make** _____ **Model** _____

***Trip Test**

Min _____ **Sec** _____

Air Pressure PSI _____ **Water Pressure PSI** _____

***Time Water Reaches Test Outlet** _____

***Alarm Operated Properly:**

Deluge and Preaction Valves (Check here if not applicable __)

Operation

Pneumatic _____ **Electric** _____ **Hydraulic** _____

Piping Supervised:

Yes: __No: __

Detecting Media Supervised: Yes ___ No ___

Valve Operates From Manual Trip, Remote, or Booth Control Stations: Yes ___ No ___

Is There an Accessible Facility in Each Circuit for Testing: Yes ___ No ___

Make _____ Model _____

Does Each Circuit Operate Supervision Loss Alarm: Yes ___ No ___

Does Each Circuit Operate Valve Release: Yes ___ No ___

Maximum Time to Operate Release: Min. _____ Sec. _____

Pressure Reducing Valve Test

Location and Floor _____

Make and Model _____

Setting _____ Static Pressure Inlet PSI _____ Outlet PSI _____

Residual Pressure (Flowing) Inlet PSI _____ Outlet PSI _____ Flow GPM _____

Test Description

Hydrostatic tests shall be made at not less than 200 psi for 2 hours or 50 psi above static pressure in excess of 150 psi for 2 hours. Differential dry-pipe valve clappers shall be left open during the test to prevent damage. All aboveground piping leakage shall be stopped.

Pneumatic: Establish 40 psi air pressure and measure drop, which shall not exceed 1 ½ psi in 24 hours. Test pressure tanks at normal water level and air pressure. Measure air pressure drop, which shall not exceed 1 ½ psi in 24 hours.

Tests

***All piping hydrostatically tested at ___ psi for _____ hours**

***Dry piping pneumatically tested: Yes ___ No ___ N/A ___**

Equipment operates properly: Yes ___ No ___ N/A ___

Do you certify as the sprinkler contractor that additives and corrosive chemicals were not used for testing systems or stopping leaks: Yes ___ No ___

Drain Test

Gauge reading located near water supply test connection _____ psi

Residual gauge pressure, with valve test connection fully open _____ psi

*Drain test: pass _____ fail _____

Underground water mains and lead in connective to sprinkler system riser flushed before connection made to sprinkler piping: Yes _ No ____

Welding

Field welded piping: Yes _____ No _____ If yes, what location: _____

Do you certify as the sprinkler contractor that any welding procedure Complies with the requirements of at least AWS D10.9 level AR-3: Yes ___ No ____

Do you certify that welding quality control procedures were used to ensure that all discs are retrieved, that openings in piping are smooth, that slag and other welding residues are removed, and that the internal diameters for piping are not penetrated: Yes _____ No _____

Hydraulic Data Nameplate

Nameplate provided at main riser location Yes _____ No _____

Signatures

Names of Installing Contractor _____

Date _____

Certification of Completion Approved by _____

Date _____

Brigham Young University - Idaho
Contractor's Material and Test Certificate
For
Underground Piping
Exhibit "B"

Instructions:

Upon completion of work, inspections and tests shall be made by the contractor or his representative. Where indicated with an asterisk (*) the inspection and tests are to be witnessed by a designated University representative. Please consult with the Construction Department to determine who should witness tests where required. It is understood that the owner's representative's signature in no way prejudices any claim against the contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

Fill out all information called for, and submit this report to the University Construction Department.

Property Name _____

Date _____

Name of Person Making This Report _____

Company/Contractor Responsible for Work _____

All applicable specifications and NFPA standards found on the form are to be completed and answered as a **"yes"** or **"no"**. Any **"no"** answer is to be explained and approved by the University Construction Department prior to system approval.

Plans

Installation Conforms to Accepted Plans and Specification Yes ___ No ___
If No, State Deviations _____

Underground Pipes and Joints

Pipe Types and Class _____

Type Joint(s) _____

Test Description

Flushing: Flow the required rate until water is clear as indicated by no collection of foreign material.

Hydrostatic: Hydrostatic tests shall be made not less than 200 psi for two hours or 50 psi above static pressure in excess of 150 psi for two hours.

Flushing Tests

*New Underground Piping Flushed According to Instructions Above Yes ___No___
If No, Explain _____

Hydrostatic Test

*All new Underground Piping Hydrostatically Tested Per Instructions Above
Yes ___No___
If No, Explain _____

Hydrants

Number Installed _____, Type and Make _____
All Operate Satisfactorily

Water Control Valves

Water Control Valves Left Wide Open Yes ___No___
If No, State Reason _____

Signatures

Name of Installing Contractor _____
Date: _____
Certification of Completion Approved By _____
Date: _____

Additional Explanation and Notes

Brigham Young University – Idaho
Minimum Fire Sprinkler Design Criteria
Exhibit “C”

1. Fire sprinkler design densities shall comply with the following:

Hazard Classification	Design Criteria
Light Hazard	0.10-0.15 gpm/sq. ft. over the most remote 1,500-2,000 sq. ft. Spacing to be in the range of 130-225 sq. ft. using quick response fire sprinkler heads with head temperatures complying with NFPA 13, Table 3-2.5.1
Ordinary Hazard Group I	0.15-0.20 gpm/sq. ft. over the most remote 3,000-4,000 sq. ft. Fire sprinkler heads with head temperatures complying with NFPA 13, Table 3-2.5.1 shall be used.
Ordinary Hazard Group II	0.20-0.25 gpm/sq. ft. over the most remote 3,000-4,000 sq. ft. Fire sprinkler heads with head temperatures complying with NFPA 13, Table 3-2.5.1 shall be used.
Extra Hazard Group I & II	These areas are to be determined separately on an individual basis along with the assistance of University Insurance Carrier, and the BYU-Idaho Risk Management and Safety Department. Designs should anticipate criteria for Extra Hazard Group I at 0.30-0.35 gpm/sq. ft. over the most remote 3,000-4,000 sq. ft.

2. The following examples shall serve to assist in calculations of fire sprinkler design for BYU-Idaho.
3. This sample only represents a small portion of the University. The design criteria for miscellaneous storage, library stack rooms, and hazardous material storage areas will require additional consultation with the Insurance Carrier, and University Risk Management and Safety Department.

Light Hazard

Individual Areas in a Building as an Example

Theaters and auditoriums, excluding stages and prosceniums
Art galleries, museums
Restaurants and cafeteria seating areas
Stadiums
Hospitals (other than laboratories, service and storage areas)
Apartments
Dormitories
Offices
Post offices (excluding mail processing plants)

Manwaring Center

Student Health Center

Lamprecht Hall
Kimball

The design criteria for Light Hazard Occupancies would be 0.10-0.15 gpm/sq.ft. over the most remote 1500-2000 sq. ft. with spacing in the range of 130-225 sq. ft. using quick response fire sprinklers with head temperatures proportional to predicted maximum ceiling temperatures.

NOTE: This is a higher standard for design criteria than NFPA 13

Ordinary Hazard Group I

Individual Areas in a Building as an Example

Service areas for cafeterias and restaurants
Electrical rooms
Mechanical Rooms
Parking garages

Docks, delivery/storage areas
All buildings
All buildings

The design criteria for Ordinary Hazard Group I Occupancies would be 0.15-0.20 gpm/sq. ft. over the most remote area 3,000-4,000 sq. ft. **NOTE: This is a higher standard for design criteria than NFPA 13**

Ordinary Hazard Group II

Individual Areas in a Building as an Example

Arenas which may be used for exhibition purposes
Exhibition halls
Stages
Post Offices, bulk mail centers
Wood shops, metal shops, machine shops, workshops
Boutiques
Retail Stores
Grain/dust elevators
Laboratories (flamm. liqs. Not in excess of allowable quantities)
Printing & publishing
Repair Garage
Dry Cleaners

Manwaring Center

Student Aux. Services
Campus Craft Sales Arena
Bookstore
Heating Plant
Photo developing rooms
Press Building
Auto Shops
Aux. Services

Horse Stables

BYU-Idaho Livestock
Center

The design criteria for Ordinary Hazard Occupancies Group II would be 0.20-0.25 gpm/sq. ft. over the most remote 3,000-4,000 sq. ft. **NOTE: This is a higher standard for design criteria than NFPA 13**

Extra Hazard Group I

Printing (using inks having flash points below 100 degree f.)
Upholstering shops
Chemistry laboratories

Individual Areas in a Building as an Example

University Press Area
Upholstery Shop
Romney Building

The design criteria for Ordinary Hazard Occupancies Group II would be 0.20-0.25 gpm/sq. ft. over the most remote 3,000-4,000 sq. ft. **NOTE: This is a higher standard for design criteria than NFPA 13**

Extra Hazard Group II

Flammable liquids spraying
Open oil quenching, dip tanks
Solvent cleaning

Individual Areas in a Building as an Example

The design criteria for Extra Hazard Group II Occupancies would be 0.40 gpm/sq. ft. over the remote 3,000-5,000 sq. ft. **NOTE: This is a higher standard for design criteria than NFPA 13**