

# The Locomotive

## Installing Fire Protection Systems

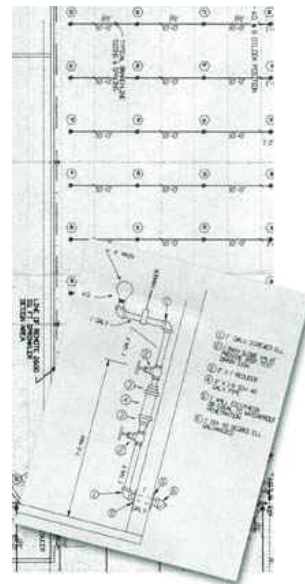
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### A Network of Systems

Chances are that one or more new fire protection systems will be installed in a new or existing commercial or industrial facility as a result of an insurance company recommendation, a requirement of the local fire authority, or a corporate standard.

In order for fire protection systems to perform as intended it is important to understand that fire protection at a facility consists not of just a few sprinkler heads, but of a network of engineered systems that must all function in synchrony to get the intended effect. Unlike most other engineered systems, however, installed fire protection systems cannot be tested under actual conditions to judge whether or not they "work."

For this reason, the specification, design, installation and testing of fire protection systems need to closely adhere to accepted industry fire protection standards. As with any engineering project, the owner should get the best system available for a reasonable cost. This article addresses the steps involved to achieve the latter and avoid common mistakes. While this article emphasizes sprinkler systems, the methodology is identical for other types of fire protection systems.



### Specifications

Merely stating the industry standard for installing fire sprinkler systems — "install automatic sprinklers per NFPA (National Fire Protection Association) standard #13" — is not enough. Such a specification lacks pertinent information about what is expected in a system. Yet, too often, specifications books generated by architect/engineering firms



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contain this type of statement. A vague specification will result in a vague bid and leaves many important details up to the contractor's discretion. The party that initiates the new system should make sure all design parameters are available before obtaining bids.

To select the appropriate specifications for a fire protection system installation, information about the building and its intended occupancy must be known. For the building, this information would include type of construction, number of floors, gross area, height, the presence of basements, and the like. Similarly, for the occupancy, the presence of storage areas and special hazards (boiler rooms, processes involving flammable/combustible liquids) must be available.

### Using the Information

Based on this information, the owner's engineering representative should prepare detailed fire protection specifications such as the type of system (e.g., wet, dry, preaction, deluge). Also, the design densities and where they apply, materials to be used, and last but not least, the year edition of the standard to be used.

A safety margin of at least 10 psi or 10 percent should be specified to avoid rendering a system inadequate because of deterioration in the water supply. Remember that installation standards only contain minimum requirements. Property insurance carriers often have more conservative standards than typical codes and local jurisdictions.

The reason for this variance is that codes and jurisdictional requirements are largely based on occupant safety and egress. The property insurance carrier is mainly concerned about protection of the building and contents. The carrier's written agreement to the specifications will prevent surprises, such as higher densities, once the design is already completed.

### The Bid

Most fire protection contractors specialize in one area of fire protection, such as sprinkler systems, fire detection systems or special detection systems. They may take charge of an entire system installation, even if portions of the system are outside of their area. But they will usually subcontract that portion of the system to a contractor who specializes in that area.

The owner should know whether subcontractors would be used because of the possibility of mechanic's liens. If so, protect yourself accordingly. Once a complete fire protection specification has been written, solicit bids from installing contractors. With all the specifications addressed, the contractors should be able to give an accurate and meaningful bid with few questions.

Once all bids are received, the owner's agent should thoroughly review them for conformance to the original specifications and for completeness. It is extremely important that the contract between the owner and the designer/installer specify that final payment is subject to final acceptance of the system(s) by all necessary review agencies (e.g., insurance carrier, fire department, building official).

This will protect the owner from being presented with additional changes that could have been avoided and also gives the designer/installer incentive to cooperate with the review agencies.

### The Design

In general industry practice, the fire protection contractor prepares the design drawings, which are to be submitted for approval based on the submitted specifications. The contractor employs or retains design technicians who are proficient in typical fire protection system layouts.

As with the bids, the owner's engineering representative should thoroughly review the design drawings and calculations for technical correctness and compliance with the specifications. Only after the owner's representative and the insurance carrier have accepted the drawings and calculations should they be submitted to the local jurisdiction for approval.



This acceptance will ensure that the people with the final approval will put their stamp on the drawings last. Otherwise, a design may be approved by the fire department or building official and then rejected by the owner and/or the insurer, only to be resubmitted to the fire department or building official.

Most contractors do not have the capabilities to develop certain specialized designs, such as turbine/generator protection, flammable liquids storage/handling and LPG tanks. In such cases, an experienced fire protection engineer should be consulted for the preparation of design drawings. The contractors should then be asked to bid the installation based on the already prepared design drawings.

### The Installation

Only after acceptance/approval has been obtained in writing from all review agencies should the installation begin. The failure to do so could result in major changes after the system has already been installed. The contractor would

likely pass those additional costs along to the owner. Fire safe practices should be in place during installation, including good housekeeping and the proper supervision of cutting and welding. The owner's representative should make periodic progress inspections to check for nonconformance issues and good work practices.

### Acceptance Evaluation

Acceptance evaluation of installed fire protection systems includes both design and installation verification as well as acceptance testing. A final "walk-down" of the installation by an experienced fire protection specialist ensures that the systems were installed as designed.

The specialist checks to make sure that no unauthorized or non-conforming changes have been made during the installation, and that field changes have been appropriately made. The final verification includes all details, equipment and devices and includes functional tests of components and integrated tests of the system.

Significant engineering compliance with standards and safeguards go into a fire protection system. Fire protection systems require additional safeguards because testing under actual performance conditions is not feasible.

### Acceptance Testing

Even though fire protection systems cannot be tested under actual operating conditions, several steps need to be completed before a system can be considered as reliable and ready. Acceptance testing refers to the nondestructive tests that can be performed to assess the system's ability to meet the established performance criteria.

For water-based systems, this includes pipe flushing and hydrostatic tests, full trip testing of actuating valves and testing of all associated alarms. For gaseous fire suppression systems, this includes a complete operational (trip) test and the release of agent for carbon dioxide and clean agent fire suppression systems.

For other gaseous systems, a door fan test should be performed to assess the "tightness" of the protected space. Integrated system tests ensure that suppression systems, fire detection systems, fire alarm systems and any associated systems work properly together.

### Reviewing Agencies

All reviewing agencies must be notified of the test date so that they may send representatives to witness the test. The failure to have representatives of all agencies present may result in one or more requests to repeat the test.

Before conducting the actual test, the desired test methods and results should be reviewed with the witnessing parties to ensure that the installing contractor is ready on the agreed date. Should it be impossible to have all representatives present at once, the test may be videotaped and tapes and/or detailed test result documentation can be submitted to the absent parties.

Carefully following the steps outlined above will help ensure that the fire protection system is properly installed for years of effective, reliable and trouble-free service.

### About the Author

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