

Fire Detection in Warehouse Facilities

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Automatic sprinklers systems are the primary fire protection system for use in warehouse and storage facilities. The effectiveness of this strategy has recently come into question at the National Fire Protection Research Foundation Workshops conducted in 2009 and 2010. These concerns arose due to the increasing challenges presented by modern warehouse facilities, including increased storage heights and areas, the use of automated storage retrieval systems (ASRS), limitations in available water supplies, and changes in firefighting strategies. The application of fire detection devices used to provide early warning and notification of incipient warehouse fire events is being considered as a component of modern warehouse fire protection.

The purpose of this project was to provide technical information to aid in the development of guidelines and standards for the use of fire detection technologies for modern warehouse fire protection. The goal of this phase one project was to assess the potential role for fire detection in modern warehouse facilities and to develop a proposed research plan to implement the overall project goal.

The phase one project was broken into three distinct tasks. The first task consisted of a literature review focused upon various aspects of the warehouse fire detection issue. These aspects included:

- 1) A characterization of existing warehouse facilities, both within the United States and abroad. This included a review of the number and size of warehouse facilities, as well as the general design characteristics and features, both voluntary and compulsory. Some additional discussion was included regarding the general fire department response and actions in various jurisdictions for warehouse fire incidents.
- 2) A review of modern fire loss incidents in warehouses, including both statistical and narrative components. The review focused upon the typical loss scenarios, the ignition, flame spread, and commodity types, the presence and role of fire protection features, and the actions of the fire department.
- 3) The types of fire detection equipment that may be applicable to warehouse installations.
- 4) Existing research relevant to the application and performance of fire detection systems in warehouses.

The second task consisted of development of a fire hazard assessment for modern warehouse facilities. The assessment was intended to provide insights into the potential impact of early warning detection and notification with a goal of reducing the destruction of property during

warehouse fire incidents. The fire hazard analysis focuses upon four factors related to the severity and impact of warehouse fire incidents. These aspects include:

- 1) Development of characteristic warehouse building designs, including building sizes, storage configurations, and suppression systems. The proposed warehouse designs are intended to encompass a variety of designs that are compliant with NFPA 13 requirements [3].
- 2) Development of characteristic fire incidents based upon statistically significant ignition scenarios and locations. Mathematic correlations have been used to estimate potential fire growth, smoke production rates, and likely sprinkler activation times of the fires within the design warehouses. The potential extent and growth rate of each fire has been considered both with and without operating and/or effective sprinkler systems present.
- 3) Description of the general fire fighting assessments and tactics used for fighting warehouse fires is provided. The expected fire department response times occurring after discovery of a fire event are also reviewed and compared with the calculated fire growth calculations to estimate the condition of the warehouse at the time fire combat is ready to begin.
- 4) Evaluation of the potential impact of detection technologies with regard to the fire department response time after ignition and the severity of the fire at that time. An assessment has been made to determine the potential ability to provide earlier warning to reduce the total response time and reduce the severity of the fire at the beginning of combat operations. Individual detection methods and devices are not reviewed for this analysis, but rather a general time window available to any detection technologies has been considered.

The third and final phase of the overall project was to identify information gaps and recommend future work to aid in the development of guidelines and standards for the use of detection technologies in warehouse fire protection design.

Full Report:

Dinaburg, J. and Gottuk, D.T., "Fire Detection in Warehouse Facilities," The Fire Protection Research Foundation, Quincy, MA, January, 2012.

<http://www.nfpa.org/assets/files//Research%20Foundation/RFWarehouseFireProtection.pdf>