# Application of Fixed Water Spray Systems for Fire Protection in the Petroleum and Petrochemical Industries

API RECOMMENDED PRACTICE 2030
FOURTH EDITION, SEPTEMBER 2014




AMERICAN PETROLEUM INSTITUTE

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# Application of Fixed Water Spray Systems for Fire Protection in the Petroleum and Petrochemical Industries

## 1 Scope

### 1.1 General

When addressing loss prevention, an organization should consider the use of fixed fire protection systems, one of which is water spray systems. *Water spray systems* appear similar to *sprinkler* systems in some respects however, the intended uses, applicable Fire Codes and design criteria differ. This publication provides guidance for the petroleum industry and some petrochemical industry applications (for non-water-reactive petrochemicals with physical and combustion characteristics comparable to hydrocarbons) in determining where water spray systems might be used to provide protection from fire damage for equipment and structures.

Damage to process equipment and structural steel also can be limited by fireproofing, applying water through manual hose streams or applying water from fixed or mobile monitor nozzles; these methods are covered in API Recommended Practice 2218 *Fireproofing Practices in Petroleum and Petrochemical Processing Plants*, API Recommended Practice 2001 *Fire Protection in Refineries* and other reference documents such as the National Fire Protection Association (NFPA) *Fire Protection Handbook and various NFPA Codes*.

The specifics of water spray system design, installation and component types are covered in the publications referenced in Section 2, principally NFPA 15, and are not duplicated in this publication.

The following other special applications of water spray are outside the scope of this publication:

— foam sprinkler systems used to supplement water spray systems and extinguish flammable liquid fires (see NFPA 16 for details);

— vapor mitigation systems [which have been used successfully by several major corporations to reduce the potential effects of releases of hazardous materials such as HF acid (see API Recommended Practice 751 for additional information)];

— water curtains used in special situations to minimize radiant heat or disperse hydrocarbon vapors before ignition;

— traditional applications of sprinklers in non-process buildings;

— water mist systems as described in NFPA 750.

### 1.2 Concept of Hazard vs. Risk

Hazards are conditions, or properties of materials, with the inherent ability to cause harm. Risk involves the potential for *exposure* to hazards that will result in harm or damage. For example, a hot surface or material can cause thermal skin burns or a corrosive acid can cause chemical skin burns, but these injuries can occur only if there is contact exposure to skin. A person working at an elevated height has “stored energy” and a fall from a height can cause injury—but there is no risk unless a person is working at heights and is thus exposed to the hazard. There is no risk when there is no potential for exposure.

Determining the level of risk for any activity involves understanding hazards and estimating the probability and consequences of exposures that could lead to harm or damage. While the preceding examples relate hazards to the risk to people, the same principles apply to property risk. For instance, hydrocarbon vapors in a flammable mixture with air can ignite if exposed to a source of ignition resulting in a fire which could cause injury and damage property. Water spray systems do not change the probability of a flammable material release. Proper application of water spray systems can reduce the consequences (damage) and thus reduce risk to people, property, or the environment.