Fireproofing Practices in Petroleum and Petrochemical Processing Plants

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Foreword

This recommended practice is intended to provide guidelines for developing effective methods of fireproofing in petroleum and petrochemical processing plants. It is not a design manual. This is a guideline—a starting place and not a prescriptive set of limits; each facility should review their needs and act accordingly. Thus the title is fireproofing "practices". It seeks to share good practice which has evolved over the years. Participants in developing this third edition included representation from both producers and users of fireproofing.

By its nature fireproofing is passive property protection. Effective protection of equipment in petroleum and petrochemical plants may reasonably be expected to have a benefit in reducing risks. Where fireproofing helps control structural damage and potential incident escalation it may also benefit life safety concerns.

API 2218 is a "pool fire" standard. It uses facility configuration and equipment knowledge as a means of identifying probable liquid fuel release locations and the extent of resulting pool fires. This leads to development of "fire-scenario envelopes". This is the first step in determining fireproofing needs. The process is shown in simple form in Figure 1.

Planning for (and prevention) of all types of fire is of concern. Although infrequent, jet fires are dramatic and can cause significant damage. Consequently, Annex C provides an overview of "Jet Fire Considerations" including the extensive body of research knowledge.

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Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

Contents

Page

Figures

Tables

Fireproofing Practices in Petroleum and Petrochemical Processing Plants

1 Scope

1.1 Purpose

This recommended practice (RP) is intended to provide guidance for selecting, applying, and maintaining fireproofing systems designed to limit the extent of fire-related property loss from pool fires in the petroleum and petrochemical industries. Where comparable hazards exist, and to the extent appropriate, it may be applied to other facilities that could experience similar severe fire exposure and potential losses

1.2 Scope

This RP identifies fireproofing needs for petroleum and petrochemical plants specifically focusing on property loss protection for pool fires scenarios in on-shore processing plants.

Only passive fireproofing systems are within the scope of this recommended practice. The following are outside the scope of this RP; however this RP contains information which may be useful in these applications:

— fireproofing for LPG storage vessels (see API 2510 and API 2510A);

— fireproofing for personnel protection;

— fireproofing for buildings.

1.3 Introduction

Properly implemented fireproofing (passive fire protection) can protect against intense and prolonged heat exposure which otherwise could cause collapse of unprotected equipment, leading to the spread of burning liquids and substantial loss of property. Fireproofing may also mitigate concerns for life safety and environmental impact by reducing escalation. Fireproofing and other fire protection measures may be appropriate for fire protection where hazardous chemicals could be released with the potential for exposure of employees or persons outside the facility.

The term “fireproofing” is widely used, although strictly speaking the term is misleading since almost nothing can be made totally safe from the effects of fire exposure for an unlimited time. In effect, fireproofing “buys time” for implementation of other protective systems or response plans such as isolation and use of emergency isolation valve/ remotely-operated shutoff valve (EIV/ROSOV), unit shutdown, deployment of fire brigades or evacuation.

This RP addresses fireproofing of structural supports in process units and supports for related equipment (such as tanks, utilities and relevant off-site facilities). Fireproofing can also be used to protect instruments, emergency shutoff valves and electrical equipment that may be used to mitigate fire.

1.4 Units of Measurement

Values for measurements used in this document are generally provided in both English and SI (metric) units. To avoid implying a greater level of precision than intended, the second cited value may be rounded off to a more appropriate number. Where specific test criteria are involved an exact mathematical conversion is used.

2 Normative References

There are no Normative References for this standard. Fire protection resources of potential relevance are listed in the Bibliography by subject.

3 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1
ablative
Dissipation of heat by oxidative erosion of a heat protection layer.

3.2
active protection
Automatic or manual intervention to activate protection such as water spray systems, emergency isolation valves, process depressuring, hose streams or fire water monitors.

3.3
char
A carbonaceous residue formed during pyrolysis which can provide heat protection.

3.4
cementitious mixtures
Binders, aggregates and fibers mixed with water.

3.5
emergency isolation valves
EIV
A valve intended to provide a means of shutting off flow of a fuel (see ROSOV) with either manual or remote power operation.

3.6
endothermic fire protection
Heat activated chemical and/or physical phase change reaction resulting in heat absorption by a non-insulating heat barrier.

3.7
fire performance
Response of a material, product, or assembly in a “real world” fire as contrasted to laboratory fire test results under controlled conditions.

3.8
fireproofing
A systematic process, including design, material selection, and the application of materials, that provides a degree of fire resistance for protected substrates and assemblies.

3.9
fire resistance rating
The number of hours in a standardized test without reaching a failure criterion. (In this publication, UL 1709 or functionally equivalent test conditions are presumed for pool fires unless otherwise stated.)