

# Are Unsafe “Fireproofing” Practices Still Being Used in Oil & Gas and Petrochemical Processing Plants?

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## Introduction

*“Decades after clear evidence of unsatisfactory performance emerged, some stakeholders still specify, supply and install an obsolete arrangement that may be inherently unsafe”*



*The pre-fire durability, explosion resistance, fire capability and reliability of the hollow encasement, “box”, design fireproofing (figure 1) is found to be inherently flawed, but remains a preferred method with some stakeholders in Asia, Middle East, Europe and the United States. Here we discuss why the design is obsolete and reasons why the practice continues*

## Introduction

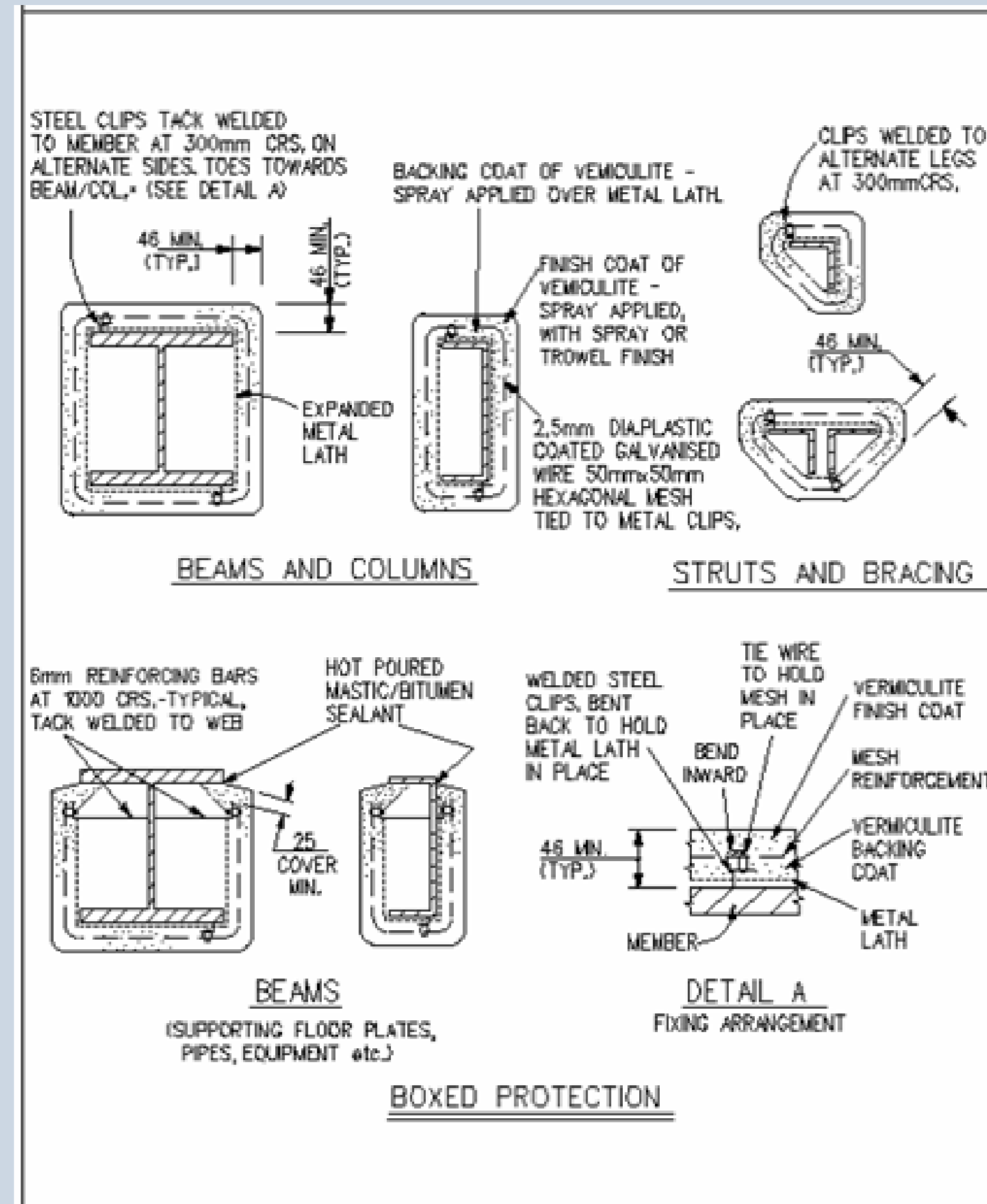


Figure 1 shows typical boxed “fireproofing” arrangement details from a project specification.

## Protection Techniques for Structural Steel Members

In considering LWC systems there are critical distinctions in performance between profile, box and solid fill methods of design as shown in Figure 3.

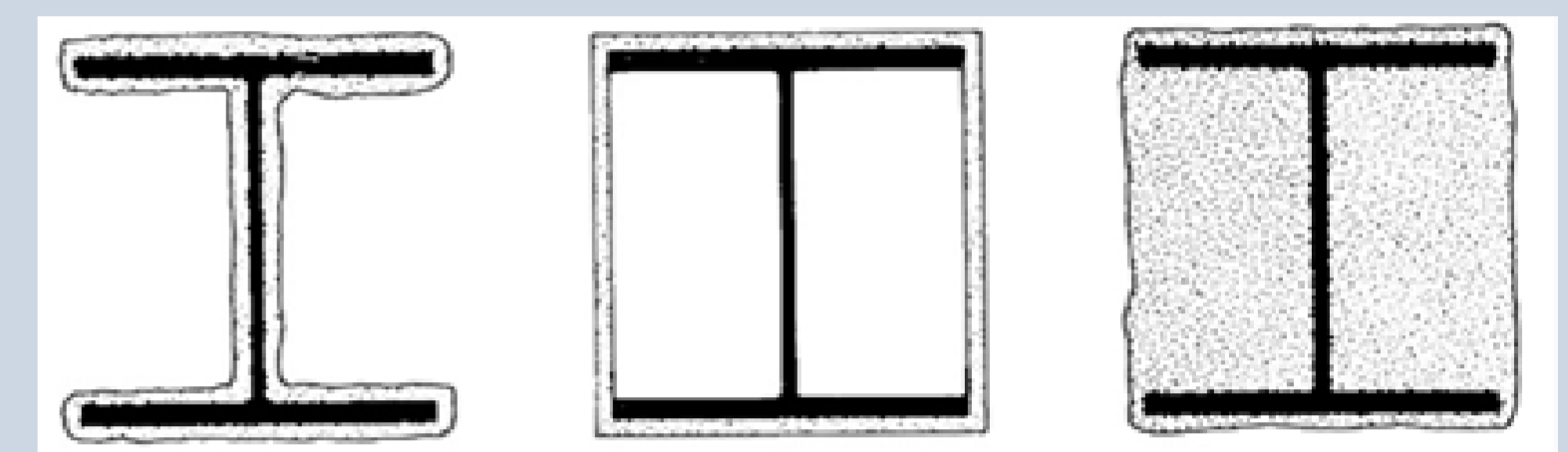


Figure 3 shows the generic design techniques for the protection of steel structures left to right; profile, boxed and solid fill (note solid fill designs are used on sections typically up to 203mm deep)

Because of a wealth of negative experience over decades in the pre-fire phase and in fire events boxed designs were effectively obsolete in external process plant in most of Asia, ME and Europe by 1983.

## Boxed Design: Problem Causes and Effects

The inherent weakness of the box design has direct effect on pre-fire durability, the whole life cost of ownership and fire event capability and reliability.

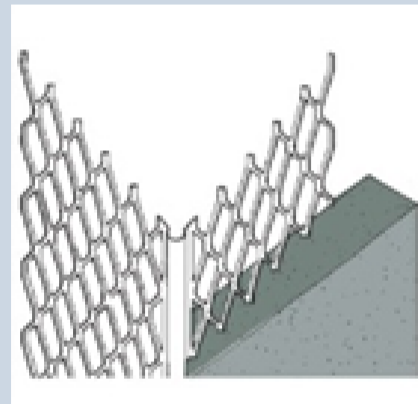


Figure 4 Galvanized steel angle bead detail

### Pre-fire Durability

A “corner bead” component (figure 4) often galvanized steel sometimes plastic nosed, open leg, wire may be proposed as an application aid to form straight, square edges in boxed designs as shown in figure 5. An angle bead detail has been found to be a particular weakness in the design. The boxed detail is particularly vulnerable to mechanical impact damage.

## Pre-fire Durability



Figure 5 shows typical anomalies; the corner angle bead has corroded, the coating is detached and mechanical damage has compromised the arrangement.

## Fire Survivability

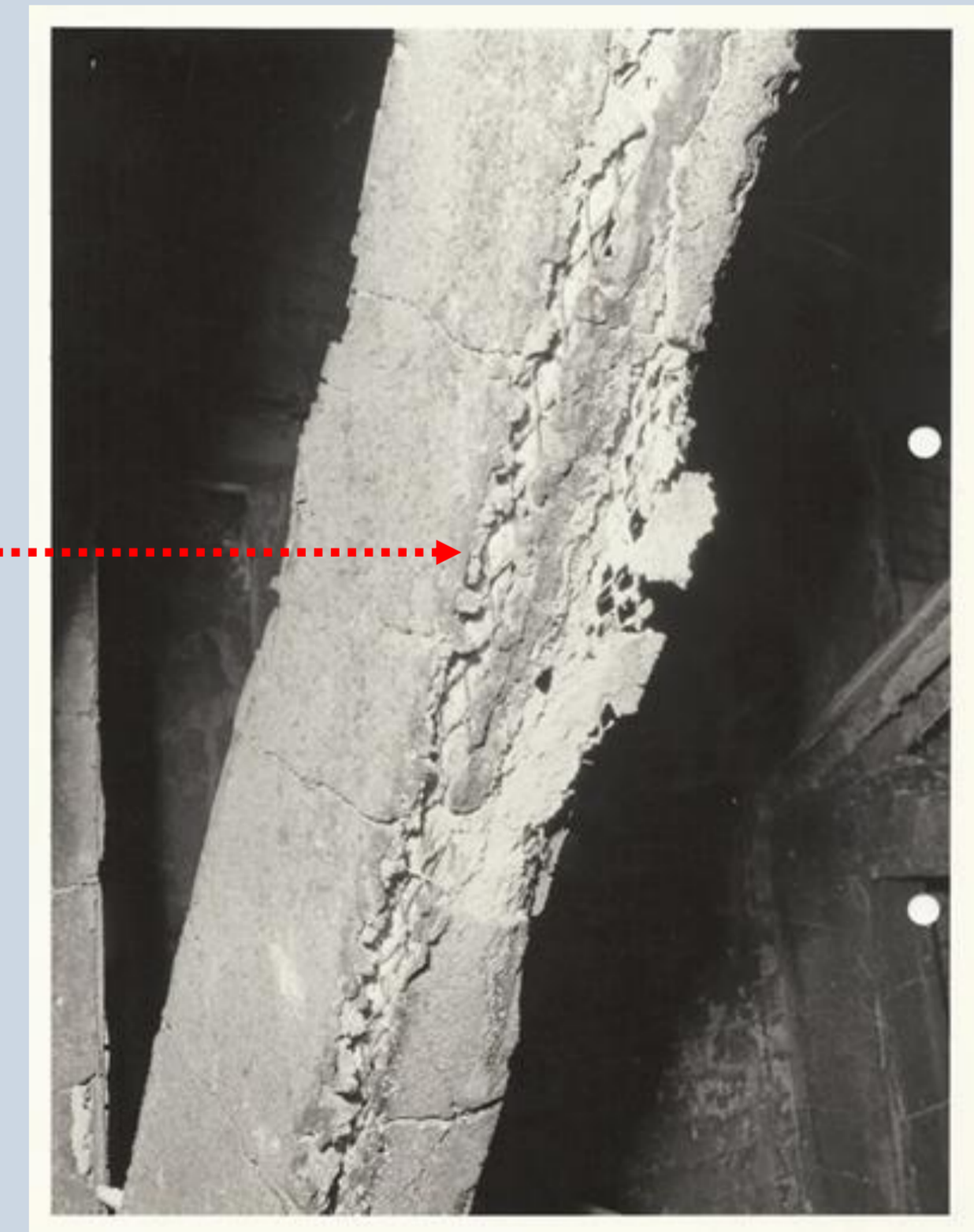


Figure 6 Premature failure of PFP due to effect of angle beads in a fire event in 1977

## Explosion Survivability

Failures of boxed designed LWC resulting from over-pressures in explosions co-incident with fire events was detailed in a ICI Guide in 1982

*‘the explosion caused the fireproofing to collapse were there was a void behind the coating, this immediately made the protection ineffective against the ensuing fire’.*

The comparative response of the designs to blast overpressures has been starkly illustrated in testing.

In the image Figure 7b the LWC on the boxed design has been destroyed, leaving the web exposed and rendering the arrangement ineffective in fire events, whereas the profile design remains intact and ready to perform its intended purpose in a fire event.

## Explosion Survivability



Figure 7a & 7b shows a blast loading response demonstration and the comparative performance of profile and boxed designs

## Concluding Remarks

Manufacturers of LWC systems have developed the materials and systems to provide fit for purpose SFRM fireproofing arrangements exclusively featuring the profile and solid fill design arrangements that have extensive track record globally and respond predictably and reliably to blast and fire events.

However.....

Inherently unsafe boxed PFP designs, though considered obsolete in the oil, gas and petrochemical industries since the 1980’s, are still being procured and installed by some operators and contractors.