Design for Fireproofing Coating Systems and the FPANZ Code of Practice for the Specification and Application of Intumescent Coatings

Nullifire® Enhancing Fire Protection

carboline® Coatings - Linings - Fireproofing

Resene GROUP

ALTEX COATINGS LIMITED

- Founded in Tauranga in 1954.
- One of the Resene Group of companies.
- Number one market share position in industrial coatings.
- Massive growth in fireproofing sales in recent years, and continuing.
- Highly committed to the fireproofing market with NZ based technical service personnel and representatives across the country and the widest range of fireproofing coatings available for the NZ market.

Altex Coatings
Head Office,Tauranga

What are Intumescent coatings?

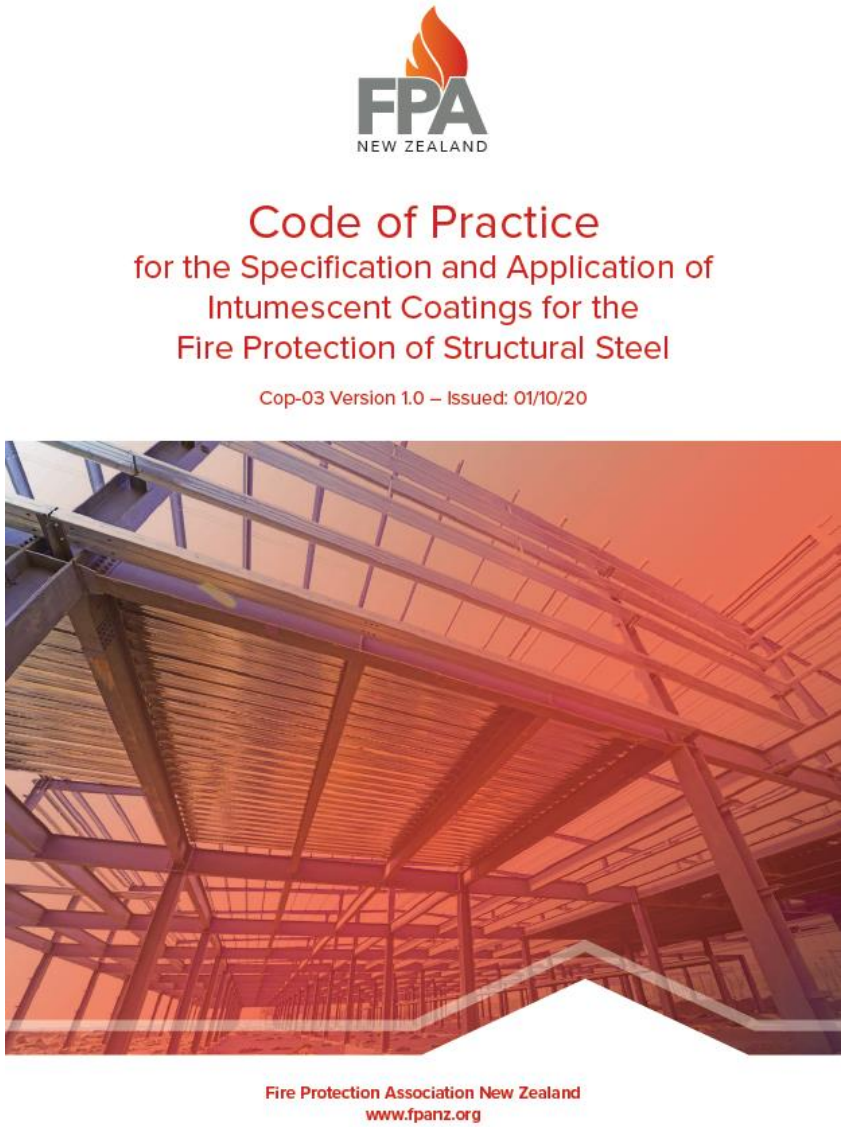
THIN FILM COATINGS THAT SWELL UPON HEATING, INCREASING IN VOLUME AND DECREASING IN DENSITY PRODUCING A CARBONACEOUS CHAR RETARDING HEAT TRANSFER TO THE UNDERLYING SUBSTRATE.

SAVING LIFE!

Intumescent in action…

FPANZ Code of Practice

- A collective effort between fire engineers, council body reps, intumescent suppliers, contractors and third-party inspectors to lift the game of the NZ industry to where it should be.
- Input over almost 2 years with a review period out to industry prior to release in Oct 2020.
- Brings clarity to all aspects of the process from specification through to application and final sign off.
- http://www.fireprotection.org.nz/online-resources/fpa-codes-of-practice



Fire Proofing Coatings Systems

SPECIFICATION DESIGN CONSIDERATIONS

SPEC CONSIDERATIONS FOR DESIGNING A FIREPROOFING COATING SYSTEM

Key Considerations

- Much the same as the protective coatings but adding the following:
  - Fire rating (time)
  - Surface preparation required
  - System compatibility
  - Aesthetic finish required (AESS?)
  - Cost
  - Ease of application
  - Green Star build?

- Type of intumescent being used
  - The coating system is built around the fireproofing technology to be used in the correct environment.
  - Water-borne single pack
  - Solvent-borne single pack
  - Solvent-borne two pack
  - Vermiculite or cementitious

Opus House

SPEC CONSIDERATIONS WHEN DESIGNING A COATING SYSTEM:

Environment:

- Macro environments: as described by AS/ NZS2312: 2014 and NZS 3404 map of NZ corrosivity zones.

- Micro environments: interior hidden vs exterior exposed, under bridge/non rain washed areas, quasi-immersion scenarios, chemical fallout zones

SPEC CONSIDERATIONS WHEN DESIGNING A COATING SYSTEM:

Build/site exposure

- Duration of exposure from time of steel coming site to, to erection of steel and finally to time of being clad in.

- Environment (during build): summer vs winter construction, damp condensing environments like basement carparks

ANZ Triangle Centre

FIREPROOFING OF STRUCTURAL STEEL

Intumescent coatings are <u>not</u> just "another coat of paint".

- They are a **vital design element** to maintain the structural integrity of the building allowing people to egress and firecrew to enter the building for the specified fire-rating period.

- Therefore they require special attention during system design and application to ensure a successful result.

Acute Services, Christchurch

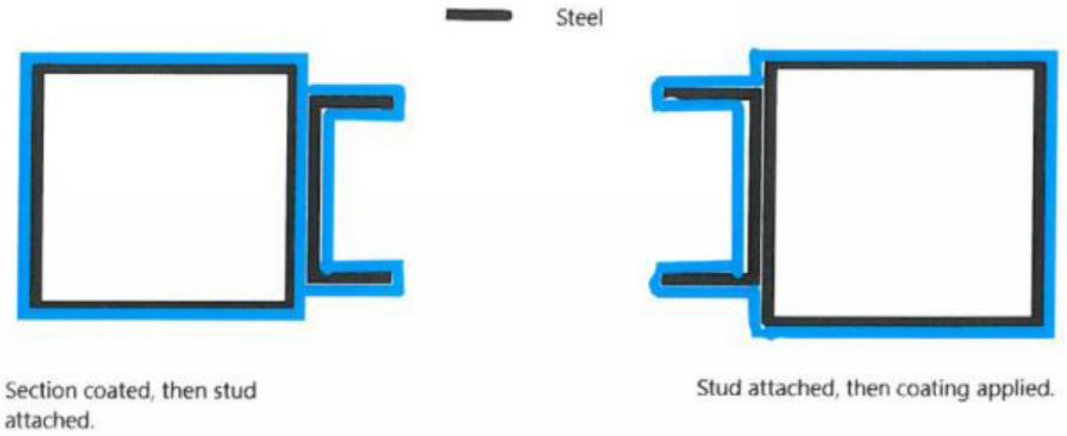
Fire Proofing Coatings Systems

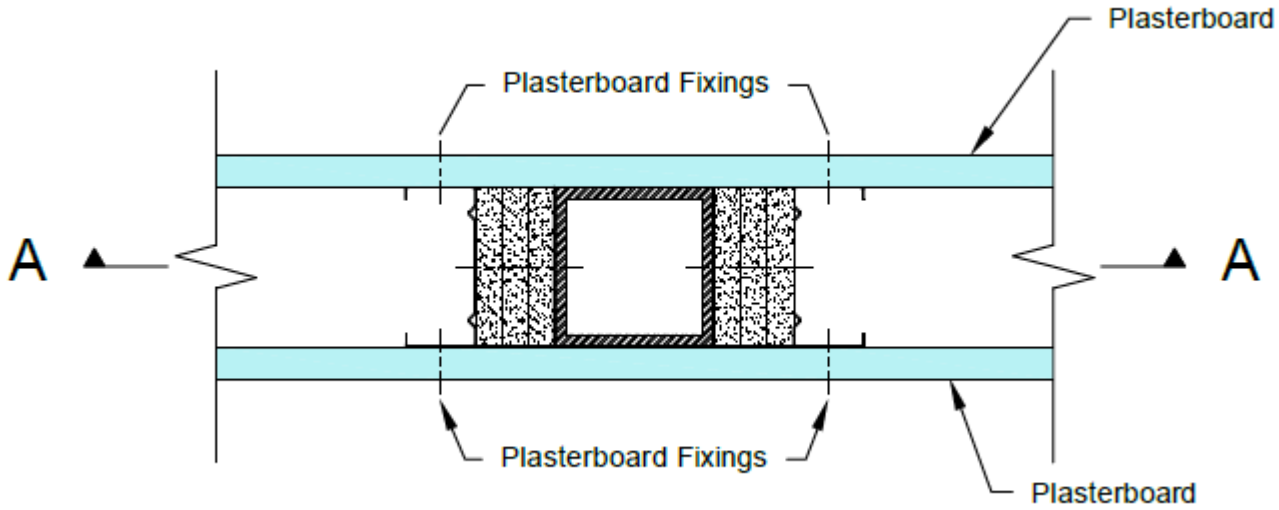
COMMON QUESTIONS

WHAT IS KOSHER FOR ATTACHING FRAMING TO FIRE RATED STEELWORK?

Unless proven by test by an accredited lab, a stand off distance must be created to enable the expansion of the intumescent coating to occur. This can be achieved by:

- “Z” clips
- Metal track stud fixing
- Use of calcium silicate boarding to act a packers





WHAT ARE THE ALLOWANCES FOR FIXING ATTACHMENTS TO FIRE RATED STEELWORK FOR SERVICES?

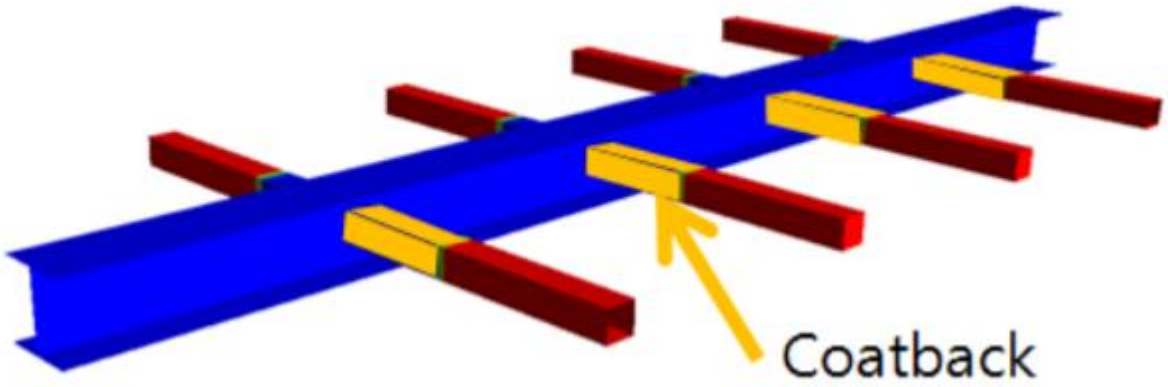
Various further questions arise:

- How big and how frequent are the attachments?
- Spacing of attachments?

- Coating's suppliers will each have their recommendations for the products they supply. Seek their advice!

Where do intumescent coatings stop and start between junctions of fire and non-fire rated steelwork?

This is known as coat back distance. Unless specified, it is necessary to protect the adjoining 500mm of “unprotected” steel with an intumescent coating to limit unwanted heat transfer.



University of Auckland Science Building

WHAT HAPPENS WITH COMPOSITE FLOORING AND FIRE RATED STEELWORK?

Beam Type	Fire Resistance Required		
Composite	30-60min	90min	Over 90min
	Increase DFT by 20% or Increase Hp/A by 30% and assess DFT	Increase DFT by 30% or Increase Hp/A by 50% and assess DFT	Fill voids
Non-composite	Fill voids		

Longevity and maintenance of fire proofing systems

	Water based Intumescent	Solvent based intumescent	Hybrid Intumescent
No topcoat	C1 – life of building C2 – not suitable	C1 – life of building C2 – not suitable	C1 – life of building C2 – not suitable
Polyurethane @ 50µ DFT	C2 – up to 20 years C3 – not suitable	C2 – up to 20 years C3 – not suitable	C2 – up to 20 years C3 – up to 20 years
Polyurethane @ 150µ total DFT	C3 – not suitable C4 – not suitable	C3 – refer to Altex C4 – refer to Altex	C3 – up to 10 years C4 – up to 10 years

During the LTFMM spot repair to make good any corrosion, reinstate required intumescent DFT and repainted to replenish the protective topcoat layers.

C5 environments – only epoxy intumescents are suitable. Assumed 10 year service life.

AS2312 corrosion systems do not apply to intumescent systems for various reasons!

No matter what the protective system used - liquid coatings, duplex galvanising or thermal metal spray, you will get no more than 10 years LTFMM due to the fire proofing component and its requirements.

HOW WEATHER RESISTANT ARE INTUMESCENT COATINGS?

Effect of exposure to weather during and post construction

- In order of least resistance to most with no topcoat:
  - Waterborne, single pack and vermiculite - no tolerance!
  - Solvent borne, single pack
  - Solvent borne, two pack hybrids
  - Solvent borne, two pack epoxy

- All commonly used intumescents have limits to their weathering resistance. They must be appropriately sealed/top coated during construction as well as for post construction periods. See the difference to the right showing sections with and without our Altex Pro~Seal Intumescent Seal Coat!

Other contributing factors to choice of fire proofing:

- FRR/section DFT – high DFT's = more risk of solvent entrapment
- Light vs dark colour – single pack intumescents can easily mobilise solvents through heating up the film past point of thermoplasticity at 40°C. Compromising of single pack intumescents can occur in temps past 70 °C.
- Number of applied coats vs cost of film build per product

MAINTENANCE

EXTENDING THE LIFE AND ENSURING THE EFFICACY OF THE INTUMESCENT COATING

RECOMMENDED MAINTENANCE SCHEDULE FOR INTUMESCENT-COATED STEELWORK

- Intumescent coatings are necessary for the maintenance of structural integrity through the period represented by the fire rating.

- The long-term viability of intumescent coating reliant upon the integrity of the protective sealers/topcoats which shields it from environmental factors. It is recommended that these systems are inspected and maintained for damage to ensure the long service life intended in the specification and the safety level required to maintain a fire rating.

- Annual/programmed inspection which may be included in scheduled wash-down or similar. Thoroughly inspect all painted areas and repair areas of damage according to the original paint specification or approved equivalent.

Local Case History

RECENT EXAMPLES

NZ International Convention Centre

- Architects: WAM and Moller Architects
- Main Builder: Fletcher Construction
- Construction: 2016-2019
- Steel Area: 180,000m^2
- Coating Systems:
  - Basement visible steel: Carbozinc 859EZ2/Nullifire SC902/Uracryl 402
  - Interior concealed steel: Carbozinc 859EZ2/Nullifire SC902
  - Interior visible steel: Carbozinc 859EZ2/Nullifire SC902/Uracryl 402

206 Victoria St West Apartments, Auckland

- Owner: Mansons TCLM
- Main Builder: Mansons TCLM
- Constructed: 2014-2015
- Steel Area: 8,000m^2
- Coating Systems:
  - Interior hidden steel: Carboguard 504/Firetex FX2002
  - Interior visible steel: Carboguard 504/Firetex FX2002/E~Line 949
  - Exterior visible steel: Interior visible steel: Carbozinc 859EZ2/Firetex FX2002/E~Line 949 (x2 coats)

University of Auckland Science Building 202

- Owner: University of Auckland
- Architect: Architectus
- Main Builder: Fletcher Construction
- Constructed: 2014-2015
- Steel Area: 50,000m^2
- Coating Systems:
  - Interior hidden steel: Carboguard 504/Firetex FX2002
  - Interior visible steel: Carboguard 504/Firetex FX2002/Carbothane 133LH

Fonterra Corporate Office Auckland

- Owner: Goodman Group
- Architects: Jasmax
- Main Builder: Fletcher Construction
- Constructed: 2014-2016
- Steel Area: 8,000m^2
- Coating Systems:
  - Interior hidden steel: Carbozinc 859EZ2/Nullifire S707-60
  - Interior visible steel: Carbozinc 859EZ2/Nullifire S707-60/Uracryl 400 series
  - Basement visible steel: Carbozinc 859EZ2/Firetex FX2002/Chem~Bar 900
  - Exterior visible steel: Carbozinc 859EZ2/Nullifire SC902/E~Line 949 (x2 coats)

Merchant Quarter Apartments, New Lynn

- Developer: Tasman Cook
- Architects: Jasmax
- Main Builder: Kalmar Construction
- Constructed: 2013-2014
- Steel Area: 10,000+m^2
- Coating Systems:
  - Interior hidden non perimeter steel: Black steel/Southwest Type 5GP
  - Interior concealed perimeter steel: Carboguard 504/Firetex FX2002

Summerset Hobsonville (Stage 1 and 2), Summerset Ellerslie Main Building and Apartments (Stage A and B)

- Engineer: Silvester Clark
- Main Builder: Summerset Group/Dominion Construction
- Constructed: 2015-2017
- Steel Area: 60,000+m^2
- Coating Systems:
  - Interior hidden steel: Carbozinc 859EZ2/Firetex FX2003
  - Interior visible steel: Carbozinc 859EZ2/Firetex FX2003/Chem~Bar 900
  - Exterior concealed steel: Carbozinc 859EZ2/Firetex FX2003/Chem~Bar 900

Botanica Apartments, Mt Eden, Auckland

- Developer: McDougall Reidy/Hayden and Rollet
- Architect: Peddle Thorpe
- Main Builder: Hayden and Rollet
- Construction: 2015-2017
- Steel Area: 8,000m^2
- Coating Systems:
  - Interior hidden steel: Carboguard 504/Firetex FX2003
  - Basement interior visible steel: Carbozinc 859EZ2/Firetex FX2003/Chem~Bar 900
  - Exterior visible steel: Carbozinc 859EZ2/Carboguard 636/Nullifire SC902/Uracryl 404 (x2 coats)

SUMMARY

- Multiple factors must be considered in order to enhance both protective and fire proofing coating systems to achieve NZBC requirements including:
  - Material/substrate choice
  - Environments
  - Inspection and maintenance regimes to show specification has been met and maintenance done to ensure expected life is met
- Intumescent coatings are a critical ‘structural’ element of building:
  - Must be specified correctly over the correct primers, at the right thickness and have the appropriate weathering topcoats applied.
  - Fireproofing coatings are stand-alone from AS2312.
  - Must meet the required certifications/standards.
  - QA must be provided to prove that the required film builds are met to gain the FRR.
  - Inspections and maintenance a MUST to keep the fire rating of the building in place.
- FPANZ Code of Practice is a must to follow for the correct outcome to be guaranteed for your project!

New Burwood Hospital

THANK YOU FOR YOUR TIME…ANY QUESTIONS?

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Resene GROUP