Technical Conference

Federal Building & Fire Safety Investigation of the World Trade Center Disaster

NIST Sept 13-15th 2005

Dr Bill Allen

Innovation Director

Leighs Paints

FIRETEX®
Passive Fire Protection

Founded 1860

Leighs Today

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Manufacturer's Comments

- Reliable and robust Fire Protection Solutions
- Based on more onerous testing regimes

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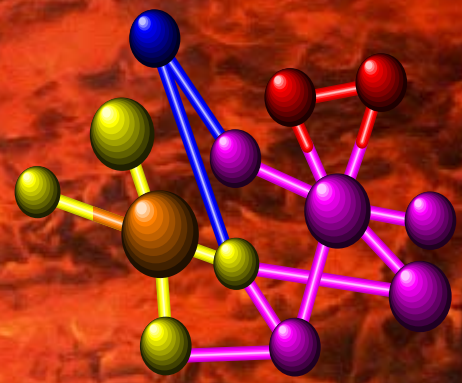
What is Intumescent Fire Protection?



- Organic Coating
- Spray applied at 20-200mil
- Excellent adhesion to steel
- Effective in real fire scenarios
- Cellulosic or Hydrocarbon
- Withstands severe explosion prior to fire
- Proven 25-Year Track Record
- Listed by UL, Lloyds, DNV etc.

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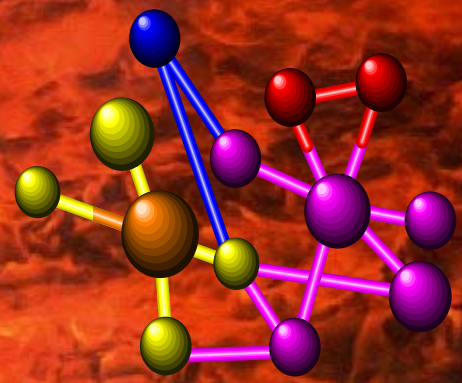
How do Intumescents Work?



- Mixture of resin binders which melt and char in a fire
- Filled with reactive pigments which produce gas
- The char expands up to 50x its original thickness
- This insulates, reducing the rate of heating of the steel
- Which in turn extends its load bearing capacity

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Column Test at UL Northbrook

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1988 Piper-Alpha North Sea

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1988 Piper-Alpha North Sea

- July 6th 1988
- World's worst ever off-shore oil disaster
- Gas leak, explosion and fire left 167 dead
- The fire was uncontrollable
- Evacuation was difficult
- What has happened since?

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Post Piper-Alpha

- Epoxy Intumescent Technology
- Developed for off-shore use
- Durable and robust
- Lloyds, DNV, UL & BAM Certified
- Blast & Jet Fire Testing of PFP
- Blast proof walls and decks

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Beyond Standard Testing Requirements

- Can we learn from Piper-Alpha?
- Similar testing for high-rise structures?
- 50kN Impact
- Explosion Testing
- Hydrocarbon Fire
- Cardington Severe Cellulosic
- Jet Fire Testing

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Intumescent Coatings are Robust

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Post 9/11 - More Rigorous Testing

- Gas Explosion Experiment
- 4 Sections – W10x88 – 5ft long
- Explosion Chamber – 15x15x32ft
- Mean peak over-pressure - 1697mbar
- Mean duration of 104msec
- No damage to any of the coatings

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Post 9/11 - More Rigorous Testing

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Post 9/11 - More Rigorous Testing

- 90min cellulosic fire protection was applied
- Explosion witnessed by Warrington Fire Research
- Sections then hydrocarbon fire tested
- Gave @ 60min protection in hydrocarbon fire
- Advantica Report No. 5539 and WFRC C128566
- Would other PFP adhere in explosions?
- Would they still provide fire protection?

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Cardington Severe Natural Fire

Figure 8

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Cardington Severe Natural Fire

- 5th Floor compartment in high-rise building
- Steel sections coated with 90min intumescent
- Fire load 40kg wood/m^2 or 720MJ/m^2
- Would have maintained load-bearing capacity for an equivalent fire severity of approximately 100mins
- Intumescents don't just work in furnaces – they work in real fires.
- Full Report in BRE No. 211576

Jet Fire Testing

- Full Scale - British Gas Test - Spadeadam

  (3kg/sec - 25m flame)

- Reduced Scale - Spadeadam - S.W.Res, Sintef,

  H.S.E. (0.3kg/sec - 1m flame)

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Fire Severity

Fire Condition	Jet Fire	H/C Fire
Approx Temp(°C)	1300	1100
Heat Flux (kWm^{-2})	300	225
Erosion	Severe	Limited

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Full Scale Jet Fire - Spadeadam

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Off-site or In-shop Application

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Off-site or In-shop Application

- More flexibility in Construction planning
- Easier Control of Solvent Emissions
- Controlled Application Thickness
- Documented QA for each steel section
- Steel is fire protected from day 1

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Transported for Site Construction

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Concluding Comments

- Following NIST Report - Building Codes should reflect new developments in Fire Safety
- Manufacturers, Approval Bodies and Design Engineers have worked together in the UK
- The result has been better products allowing safer fire-engineered solutions
- Some of these products are available now in the USA and have UL Listings
- We don’t need to re-invent the wheel

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