Modular Architectural Solutions for Safe Hydrogen Projects

May 2024





Meet us at stands A42 and B60

Agenda

- 1. Explosion and Fire Risks Hydrogen
- 2. Traditional versus modular solutions
- 3. Cost effective penetrations
- 4. Conclusions





Ignition risk for Hydrogen can be higher than for natural gas



Source: H2tools.org, Hydrogen compared with other fuels

Explosion hazard from hydrogen can be order of magnitude higher than natural gas



Source: Fire and Blast Information Group Technical Meeting 105 Proceedings, Trygve Skjold, University of Bergen

Combustion properties and density also relevant for fire and explosion safety







Source: Jet Fire test InterDam door; Engineeringtoolbox.com

Implications for the design of architectural components (walls, roof, doors, windows etc.)

Ventilate through the roof where possible. However, noise restrictions may make this impossible. Closed system introduces higher risks.

Fire ratings need to take higher risk of jet fire into account.

Higher explosion risk needs to be accounted for. Blast relief important to avoid risk of detonations and extremely high blast loads.

Concrete vs sandwich panels

	Concrete	Bolted sandwich panels
Pro's	 Proven technology High blast resistance Low material cost Modular building possible (precast) 	 Modular or prefabrication design Reusability of materials. Minimal on-site installation time and lower labour cost Flexibility: Penetrations cut out after installation of panels Light-weight
Con's	 Time consuming to erect Considerable transport required Inflexible: finalize penetrations before casting Carbon footprint Labour intensive insulation and finishing Time consuming disassembly Weight 	 Limited application for higher blast loads and low response requirements Higher cost of materials

Existing InterDam architectural products can meet the demands for Hydrogen Projects



- Jet Fire and High Heat Flux resistance
- Light-weight blast resistance
- Blast relief options
- Ease of installation, particularly penetrations
- Tested, certified and track-record in onshore and offshore applications





- External walls, roof panels, doors, windows and all related accessories
- Peak reflected overpressure 1485 mbar with 445 mbar negative blast phase
- Fire rating defined as a maximum internal temperature limit of 50°C at a pool fire heat loading of 35 kW/m² during 60 minutes.



Compressor Buildings Acoustic, Blast & Fire Resistant Panels



- External walls
- Roof panels
- Blast relief panels
- Hinged doors
- Roller-shutter door
- Internal blast pressure 0.035 barg
- Fire rating El60
- Sound insulation and absorption, 54dB total reduction



Compressor Building Acoustic Panels





Compressor Building Acoustic Panels







Installation panels.

InterDam

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G21 Fire Panel & Penetrations

External and internal G21 Fire Panel with penetrations



Roxtec Hydrogen Approach





Protecting life and assets





ISO TR 15916:2015





BSI Standards Publication

Basic considerations for the safety of hydrogen systems

bsi.

...making excellence a habit"

One-source solution



Simple & innovative solution

Frames



Sealing kit



Safety solution



Simple & innovative solution



Simple & innovative solution



Roxtec and Interdam why?

Perfect barrier



Imperfect barrier



Restored function



Conclusions

- Hydrogen introduces some novel risks when compared to natural gas
- Building with concrete is one option, but existing sandwich panels can deliver significant benefits in terms of costs and CO2-footprint
- Flexibility in placement of penetrations is one major advantage of sandwich panels
- Roxtec has an extensive range of hydrogen-safe penetrations for use in modular buildings
- Tested and certified products deliver peace of mind for our customers

Your shield in the field.

Stand A42

Stand B60