works | services | supply

Innovation, Risk and Insurance – Enabling New Solutions

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Agenda

09:00 **Welcome Remarks**

09:10 **Innovation Programme and Decarbonisation Technology Accelerator by Andy Powell**

09:20 **Managing Design Risks for Basalt Reinforcement by Andy Yetton**

09:30 **Constructors' Perspective on Risk Management by Philip Ramsay**

09:40 **Insurance Risk Engineer's Perspective by Craig Charles and Thomas Konstantis from Marsh**

09:50 **Polling – Industry Insights**

10:00 **Audience Q&A Session**

10:15 **Closing Remarks and Next Steps**

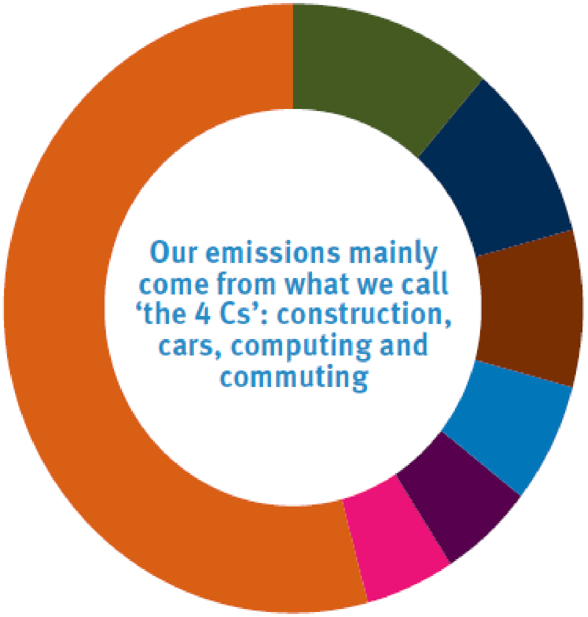
10:20 **End of Webinar**

The Environment Agency journey

71%

…of EA's carbon emissions came from construction activity in 2023

Welcome



148,000 tonnes

More than half our emissions (148,000 tonnes) come from construction

31,000 tonnes

31,000 tonnes come from our fleet (manufacture and delivery)

26,000 tonnes

26,000 other indirect emissions (such as waste and water supply and treatment)

23,000 tonnes

23,000 other direct emissions (such as our buildings, business travel and laboratories)

17,000 tonnes

17,000 tonnes from our pumping activity to alleviate flooding and drought

15,000 tonnes

15,000 tonnes can be attributed to our data, digital tools and technology, (manufacture and operation)

13,000 tonnes

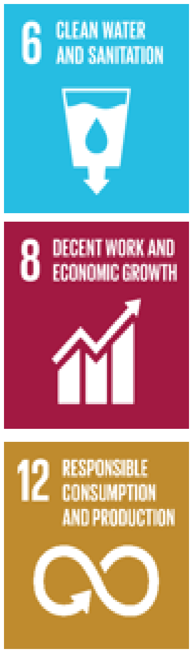
13,000 tonnes come from commuting and homeworking

Deliver net environmental gain

Responding to the climate emergency

Benefitting people and communities

Optimising our use of resources

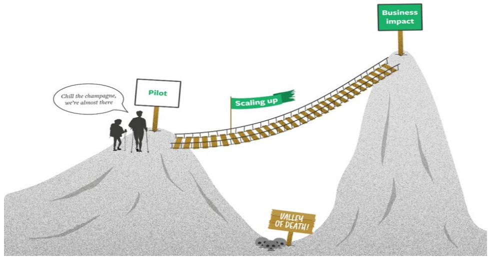


Together - we deliver the solution

Innovation Programme and Decarbonisation Technology Accelerator

Andy Powell, Environment Agency

Innovation Pilots and The Chasm



DTA | Decarbonisation Technology Accelerator

- a collaborative innovation scaling-up programme
- to realise a **20%** reduction in CO_2e in the EA’s capital programme by 2030

Accelerate

…the maturity of proven, low carbon technologies and processes

Change

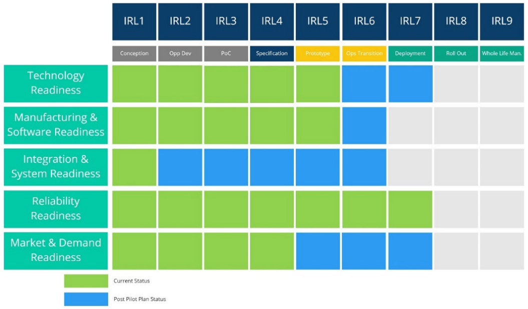
…thinking and behaviour to deliver sustainability and efficiencies where possible

Scale

…solutions to become business-as-usual

Innovation Readiness Levels

	Testing	Optimising	Scaling-Up
Product Readiness			
Collaboration Readiness			
Commercial Readiness			

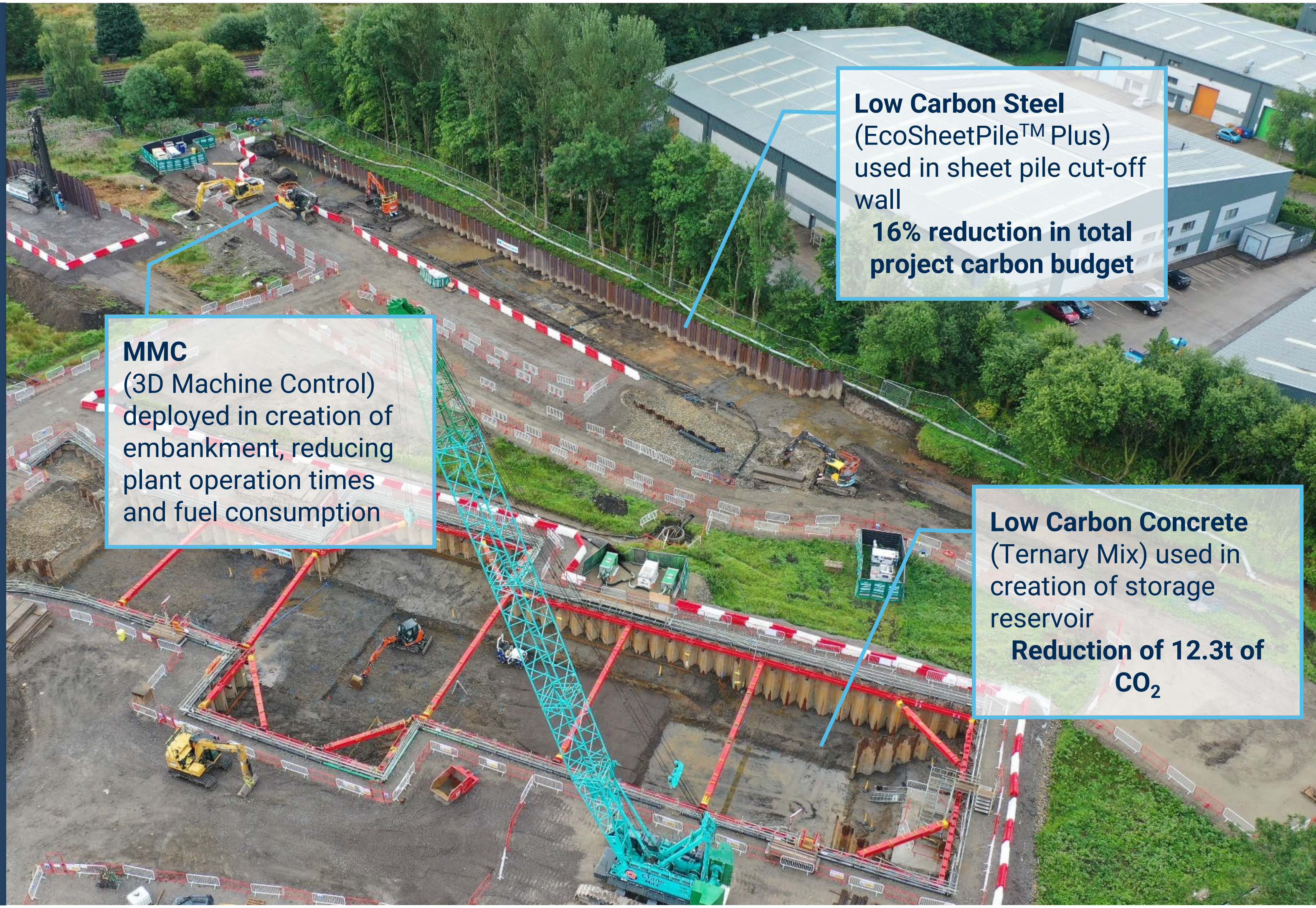


Challenge	Our Approach
Human nature to see change as risk	Tackle the risks and blockers
Diverse stakeholders, confident in established ways of working	Collaborative & inclusive
Partners focused on delivering on time and to budget	Sharing risk and support additional costs to save later

River Roch 1b

Littleborough, Greater Manchester

- **£56m flood scheme**
- **Delivered by VolkerStevin & Jacobs**
- **Three low carbon solutions used on-site**



Managing Design Risks for Basalt Reinforcement

Andrew Yetton, AtkinsRéalis

Basalt Reinforcement Overview

- Basalt is a naturally occurring rock formed from the rapid cooling of lava.
- Basalt fibres are manufactured directly from basalt rock
- Basalt Fiber Reinforced Polymer (BFRP) is a high-performance composite material made by combining basalt fibres with an inert resin.
- Basalt fibres are created by melting natural basalt rock at around 1,400°C, then spinning it into thin, flexible fibres. The fibres are embedded in a resin to form lightweight yet incredibly strong bars, sheets, or meshes.
- Basalt Fiber Reinforced Polymer (BFRP) Rebar, Basalt Fiber Mesh, Basalt Chopped Fibers

Showcasing the Design Approach of “Basalt Reinforcement"

Advantages of Basalt

- Basalt is comparable in price to steel
- Non-corrosive, natural resistant so can use less cover in concrete and greater crack width limits
    - Resistant to weathering, erosion, wear, very high durability, service life 100 years?
- All external surfaces can be formed with reduced cover
- Up to 3 times higher tensile strength so great in flexure,
- 4 to 5 times lighter than steel
- Easily cut with hand tools
- Non-conductive
- Fire resistance
- Similar Thermal Expansion to Concrete
- Environmentally friendly over more traditional forms of steel reinforcement
- 74% less embodied carbon than steel

Showcasing the Design Approach of “Basalt Reinforcement"

Disadvantages

- Steel is better in shear
- High fatigue endurance in comparison to steel
- Lower modulus of elasticity
- Need to consider failure modes
- Flexure
- No current supply chain of bent BFRP bars in UK conforming to UK code BS 8666
  - Straight bars only available in UK at present
  - Production line should soon be available from UK supplying a wider range of bent bars
  - Range of bent bars available to import
- Shaped bars cannot be altered on site due inflexibility of material
  - This can cause issues if there are variations on site
    - Increased risk and skills required

Basalt Reinforcement Mesh

Basalt Reinforcement Mesh

Leveraging Standards from other Countries and Approach in Adopting Novel Solutions

- There are currently no Eurocodes covering BFPR design (at present)
    - There is a clause in BS EN 1990:2002 Clause 5.2 & Annex D based on first principles, test and calculations
- There are codes that cover the design of BFRP, but these are all international, these include;
- American Concrete Institute (ACI)
    - ACI 440.1R Guide for the Design and Construction of Structural Concrete Reinforced with FRP Bars has been used to deliver projects for the Environment Agency
    - Used frequently in bridge deck construction, pavements, foundations.
    - American Association of State Highway and Transportation Officials(AASHTO) for transportation structures.
    - Canadian National Standard (CSA/CAN)
- It is reasonable to use ACI codes etc. as established relevant good practice, in the absence of UK specific codes.
- Design approach is similar to that of steel so as an industry we shouldn't shy away from this option because of concerns around inexperience. The challenge is more understanding the mechanical properties and how we can modify the design approach:
- As long as there is sufficient technical leadership, experience, care, diligence etc. the use of US codes is acceptable (in principle)
- This approach must be agreed with the Client at the outset to ensure they are fully aware of the risk /reasoning
- Approach should be clearly set out within the Basis of Design and other supporting documentation

Approaches to Mitigating Design-Related Risks and Strategies in Ensuring Buildability

- Environment Agency currently trialling Basalt on low-risk structures
- Discussions with Bastech, Client and Contractor as early as possible,
    - Reach out and work closely with Bastech
- Bastech have shared test results with us to ensure we are using most relevant data e.g material properties, factors etc
- Very conservative in design
- Sharing lessons learned, design philosophies etc across design consultancies to ensure we're not working in silos, sharing knowledge to upskill and de-risk
- Shaped bars cannot be altered on site due inflexibility of material, can cause issues if there is variation on site
- Straight bars can be longer in length and are far lighter
- Ensure Contractor have no concerns with design, all issues are addressed early
- Despite these challenges, many contractors find that once they adapt, basalt can save time and labour—especially in corrosion-prone environments

Summary

- BFRP rebar has existed as a technology in the UK for some time now.
  - Reasonable to use ACI codes etc. as established relevant good practice, in the absence of UK specific codes
  - Similar design process to steel, ensure you are aware of material properties pro's / cons
- When used in conjunction with LCC provide an opportunity to provide a sustainable, low carbon product
- Ensure you are fully working within your business BMS system, this will help manage risk and ensure we are complaint with governance.
  - Sufficient technical leadership, experience, care, diligence etc
- Making test data and case studies more centrally available and accessible, rather than tucked away on projects or with suppliers
- Contractors putting in place measures to demonstrate they have understood and can effectively manage any associated construction risks (early engagement essential), training on site management ect
- Talk to Bastech / Clients as early as possible
- Increase your awareness and knowledge

Constructors' Perspective on Risk Management

Philip Ramsay, Kier Group

Risk with implementation of untested solutions

- Product availability – particularly if scaling up innovation brought from another sector
- Potential lack of available standards to support construction specifications and methodologies
- Late changes – additional cost and time to overall project delivery
- Setting risk parameters correctly for Principal Contractor and the supply chain – Reasonable skill, workmanship, quality and defects
- Availability of skilled resource/supply chain to implement innovative solutions.
- Insurance provisions within the supply chain, insurance carve outs for novel approaches?
- It might not work... then what?

Strategies for managing uncertainties and early engagement with designers for untested innovative solutions in construction

- **Hearts and Minds – Client needs to set a collaborative commercial arrangements that allows a truly integrated supply chain approach**
- **Creating an environment to succeed with a proportionate allocation of risk**
- **'learning how to do it'… It might not be right first time. Use GIRI to pre-mortem risks and issues.**
- **Is it Innovation or just something our sector hasn't done before. How do we learn proactively from other sectors?**
- **We need to 'go early' with proposals to trial or scale up innovative approaches;**
  - ✓ Make it a scope requirement from the outset (both design and construction)
  - ✓ Commercial arrangements to <u>facilitate</u> engagement of innovators and our supply chain
  - ✓ Management of business risk for Tier one engaging new entrants.

Insurance Brokers' Perspectives

Craig Charles and Thomas Konstantis
Risk Engineering Consultant, Marsh

Risk Engineering Process

- **Involvement is desirable from early stages until completion**
- **Critical contributor at pre-placement and post-placement phases**
- **Spans all common / main types of available construction insurance**
- **Advocates on novel / innovative solutions by deciphering their technical details for increased insurers' risk appetite**
- **Aligned with typical Insurance Underwriting process, emphasizing on:**
  - ✓ Key requirements (e.g. full information disclosure)
  - ✓ Any material changes on the project's characteristics
  - ✓ Facilitation of communication between "Insured – Broker – Insurer"
  - ✓ Contractual requirements vs. Insurance market capacity & Risk Appetite
  - ✓ Delineation of project's risk profile

Followed Roadmap – Distinct Stages – Key Points

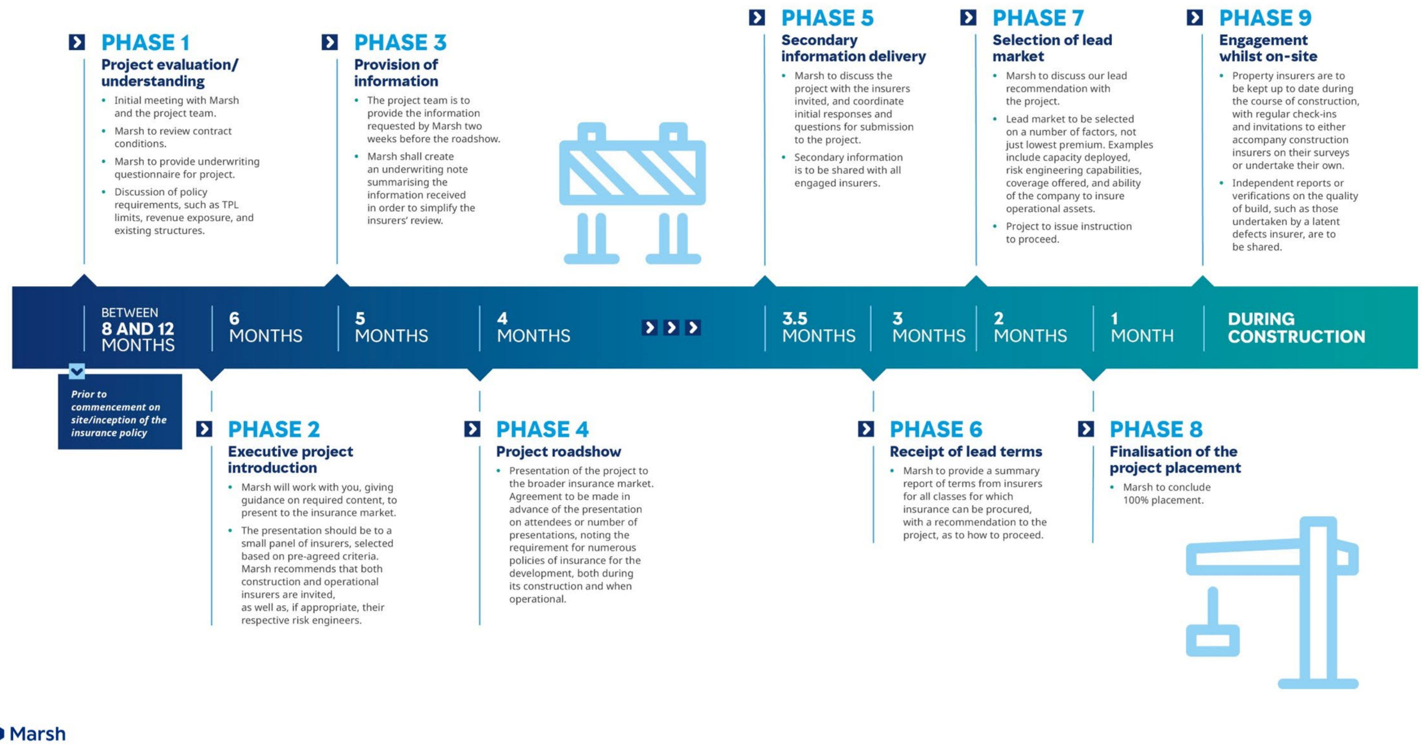
- **Before the placement of the Insurance Policy**
  - ✓ Information request followed by Q&A session / clarification rounds
  - ✓ Execution of Probable Maximum Loss Studies (PML)
  - ✓ Preparation of comprehensive Underwriting Summary Reports
- **After Insurance placement and until project completion**
  - ✓ Risk Engineering Survey Plan / Loss Control Recommendations
  - ✓ Project progress monitoring / DSU
- **Key Pivotal Points – Issues faced on projects**
  - ✓ Knowledge sharing and lessons learnt
  - ✓ Collaborative relationship / keep everyone informed
  - ✓ Apply First Principle / Communicate
  - ✓ International insurance market trends / Loss ratios
  - ✓ Natural Hazards Exposure / Tools (Munich Re Location Risk Intelligence)
  - ✓ Best Practice Guidelines / Standards / Legislations

Technical Standards / Best Practice Guidelines

- **Harmonized and aligned usage with clear priorities and objectives**
- **Cover a wide range of technical matters and project types**
- **Many have been prepared / endorsed by CIREG, which liaises with professional and statutory organizations to develop effective controls, guidelines and codes of practice for risk management of construction works**
  - The CIREG Guide to Managing Flood Risk during Construction
  - Managing Escape of Water Risk on Construction Sites (FPA - The Joint Code of Practice on the Prevention and Management of Escape of Water on Construction Sites and Buildings Undergoing Renovation)
  - The Code of Practice for Risk Management of Tunnel Works
  - ‘Fire Prevention on Construction Sites - The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation
- **Strong Industry relationships**

Process for approaching / adopting novel solutions

- Clear and concise timeline
- Distinct phases with transparent scope and objectives
- Incorporates Risk Engineering input and feedback to all stages



Question and Answers

Closing remarks

- The best in the construction sector **are delivering** lower carbon solutions
- The best in the construction sector **are seeking** to make even greater improvements
- **Together** (with mutual understanding) we can drive Net Zero
- **Share and listen** to each others' challenges
- **Active Collaboration**

Useful Links

- The latest Innovation Supplement magazine. It includes innovation case studies relevant to todays webinar.

- ICE Training: carbon management in infrastructure.

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