

Buildoffsite members' meeting

28 September 2022

Welcome and introduction



Dirk Vennix

Executive Director, Buildoffsite

Chief Executive, CIRIA

Agenda

- 10:30 Welcome from Dirk Vennix Executive Director Buildoffsite
- 10:40 NG Bailey introduction to carbon calculator and materiality decisions at planning and design phase
- 11:00 Materials resilience guide
- 11:20 Factory tour followed by lunch
- 12:45 Future industry outlook
- 13:00 Q&A followed by networking
- 13:20 Closing remarks

Buildoffsite

- Set up in 2004 as the voice of the industry, Buildoffsite has sought to promote, support and increase the adoption of offsite and pre-manufactured solutions for the built environment.
- Working in collaboration with our members and influencing government and key industry stakeholders, we seek to facilitate offsite solutions and deliver guidance, resulting in tangible change.
- By 'normalising' Modern Methods of Construction, Buildoffsite enables greater project delivery and strives to remove the perceived challenges to offsite adoption.

Buildoffsite members



Buildoffsite working groups enabling change

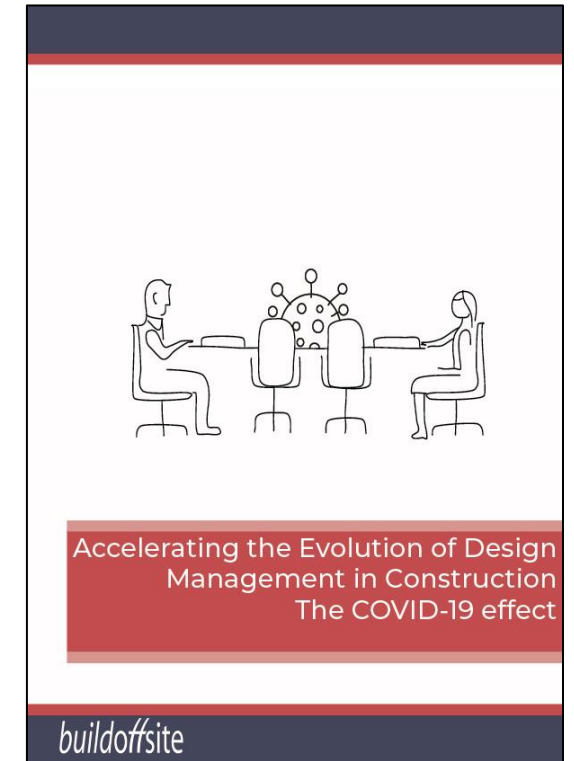
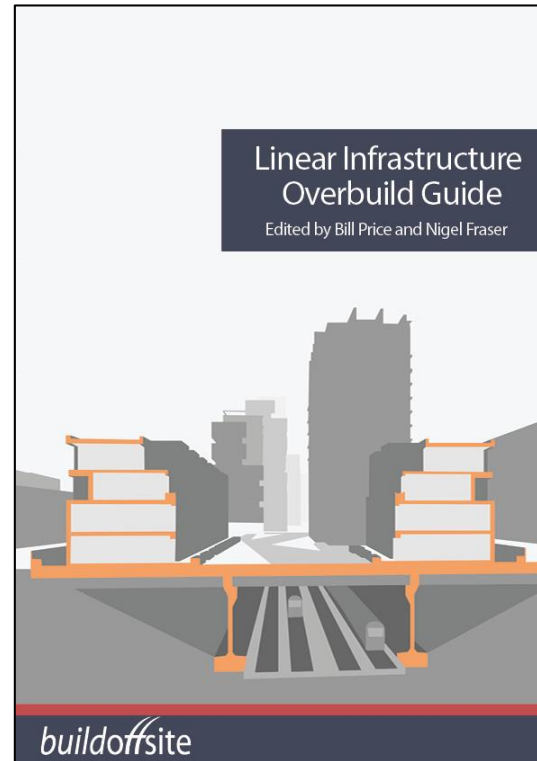
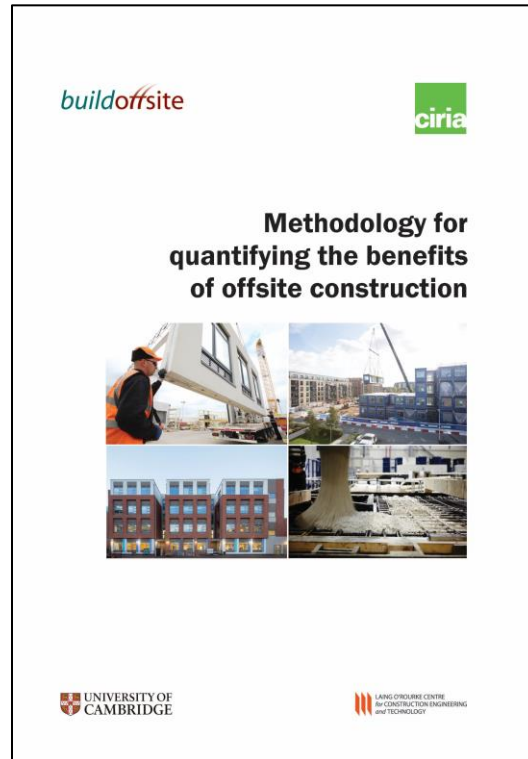
Working with Construction Leadership Council, Cabinet Office, BEIS, IPA and Government's Green Construction Board on delivering tangible change.

- Client Group
 - Led Client Design Guidance Workshop, December 2021
 - Client Group meeting in October 2022
- Social Infrastructure Group (member site visit in Q4)
- Water Infrastructure Group

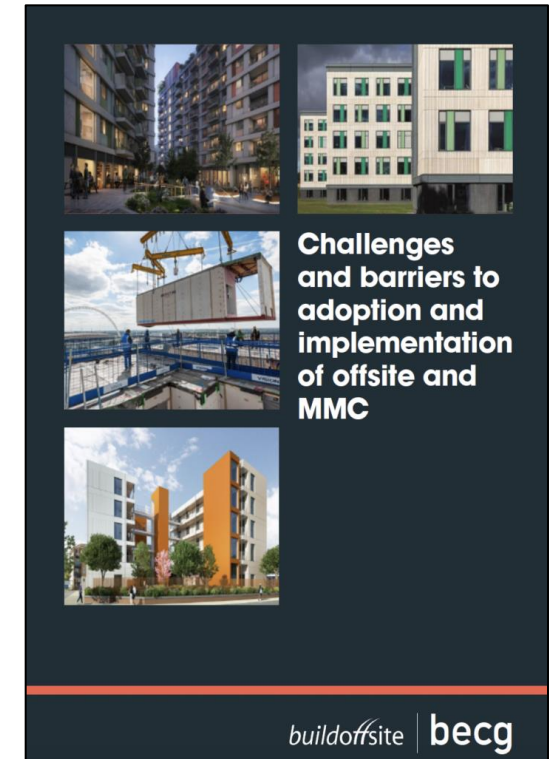
Buildoffsite working groups enabling change

- Transport Infrastructure Group
 - Published the Linear Infrastructure Overbuild Guide.
 - Offsite Show May 2022. Introduced latest guidance – particularly relevant to bridges, viaducts, multi-story car parks and infrastructure with long design life requirements.
 - Activities include three visits to HS2 precast factory and the face-to-face launch of the Linear Infrastructure Overbuild Guide (supported by TfL) in Q1.

Buildoffsite guidance 2015 – 2021



Buildoffsite guidance 2015 – 2021



Buildoffsite guidance 2022 – 2023

- Achieving sustainable resilience in new precast concrete structures – May 2022
- Offsite construction – concept design and delivery – launch webinar 30 November 2022
- Client Group proposals:
 - Specifying for Performance
 - IP Management Guide
- Contributions to:
 - Sustainability Supply Chain School Social Value project
- Partner dissemination
 - CIH Design platform and Transport Logistics



Facilitating standards in MMC

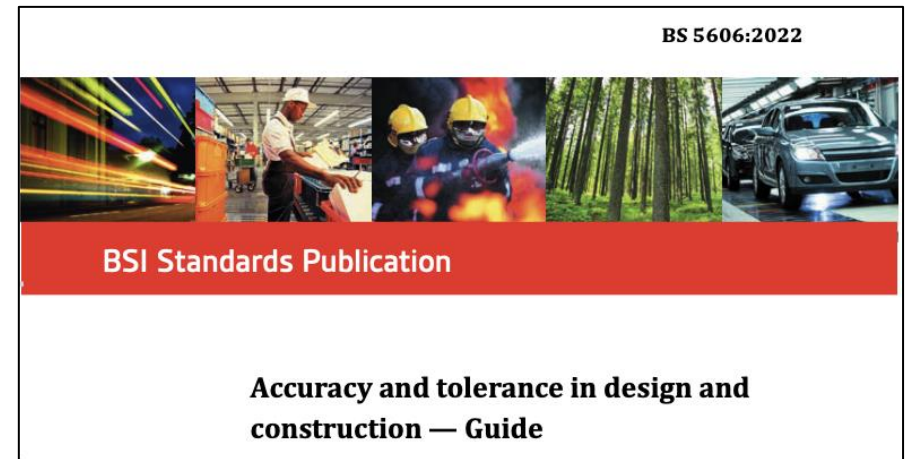
Buildoffsite is a Nominating Organisation for BSI committees

Currently BSI committee memberships:

- CB/301 Offsite and Modern Methods of Construction
 - ISO/TC 59/SC 19 "Prefabricated building"
- B/558/1 Circular economy in the Construction Sector
 - CEN/TC 350/SC 1 "Circular Economy in the Construction Sector"

Standards drafting panels:

- BS 5606:2022 – published
 - Accuracy and tolerance in design and construction – Guide
 - Now contains MMC and offsite content
- BS8895 in progress
 - Designing and implementing for material efficiency in building projects – part 4 plus consolidation of parts 1-3



Buildoffsite events 2022

12 January

Offsite construction:
concept design and
delivery

Client workshop

25 January

Offsite construction:
concept design and
delivery

Supplier workshop

2 February

Buildoffsite
members' meeting

9 February

R&D in the offsite
sector – financial
reward for innovation

Webinar

23 March

MMC's impact from
design to whole life
cycle

**2nd annual virtual
conference**

3-5 May

Offsite Show 2022



Buildoffsite events 2022

26 May

BOPAS Plus launch
and ModPods
International

Site visit

16 June

Preserving embodied
CO₂e with resilience
management
systems

Webinar

14 September

HS2 precast factory,
Colne Valley

Site visit | 1st group

27-28 September

Buildoffsite
members' meeting
and NG Bailey
factory, Bradford

Site visit

4 October

Offsite construction
risk management

Webinar

4-6 October

UK Construction
Week

6 October

Customer Side
Leakage

Workshop

12 October

HS2 precast factory,
Colne Valley

Site visit | 2nd group

Buildoffsite events 2022

4 November

November Networks
– Bringing together
the voice of the
Newbies to life

Workshop

30 November

Offsite construction –
concept design and
delivery

Publication preview

16 November

HS2 precast factory,
Colne Valley

**Site visit | 3rd
group**

6 December

Net zero carbon in construction

Webinar featuring

Achieving sustainable resilience in new
precast concrete structures

Publication launch

23 November

Timber construction
(for reduced carbon)

Webinar

23-24 November

Social Infrastructure
Networking Dinner
followed by factory
tour with Stelling
Properties,
Winchester

Factory visit

For further information



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buildoffsite

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NG Bailey introduction to carbon calculator and materiality decisions at planning and design phase



Graeme Brady

Engineering Manager
NG Bailey



Mark Griffin

Offsite Integration Manager
NG Bailey

Sustainability introduction

Introductions



Graeme Brady
Engineering Manager



Mark Griffin
Offsite Integration Manager

Health & Safety/housekeeping for today

Mission Statement



There is nothing more important than the safety, health and well-being of our stakeholders.

Safety First & Foremost represents a collective mission to continuously improve our existing culture of respect, fairness and excellence in everything that we do and everywhere that we do it.



OUR TARGET: ZERO RIDDORS



Fire Alarm



Toilets



PPE



Do not touch



Importance of following instructions



NG Bailey

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Safety Share – Traditional Construction vs Manufacturing

2020/21 HSE statistics

123 Workers killed in the work place in 2020/21(RIDDOR)
29 fatalities were from FALLS FROM HEIGHT
30 workers killed in construction
(36% higher than any other sector)

NG Bailey industry leading Accident Frequency Rate (AFR) = 0.02

NG Bailey Offsite AFR = 0

Over 1.5m hours worked RIDDOR free this year

NG Bailey DfMA and Manufacturing approach

- Removes people and activity from the hazards on a construction site
- Prefabricated service modules significantly reduce working at height.
- Mitigate risk of persons and objects falling from height.

Risk prevention is always better than risk management



"If you always do what you've always done, you'll always get what you've always got."
Henry Ford



Offsite Manufacture



Experts in modularisation with a **market leading reputation**



Innovative design capability:
Design for Manufacture approach



World class manufacturing facility in West Yorkshire with BSI accreditation



Separate **hot works facility** in Drighlington



Offsite Manufacture:
1.5 million+ hours worked
RIDDOR free

OVER 11 YEARS



CN SPECIALIST
AWARDS 2022
MEP SPECIALIST
OF THE YEAR



WINNER OF HEALTH
& SAFETY AWARD



Benefits of offsite manufacture



Increased safety



Reduced programme



Cost savings



Factory quality

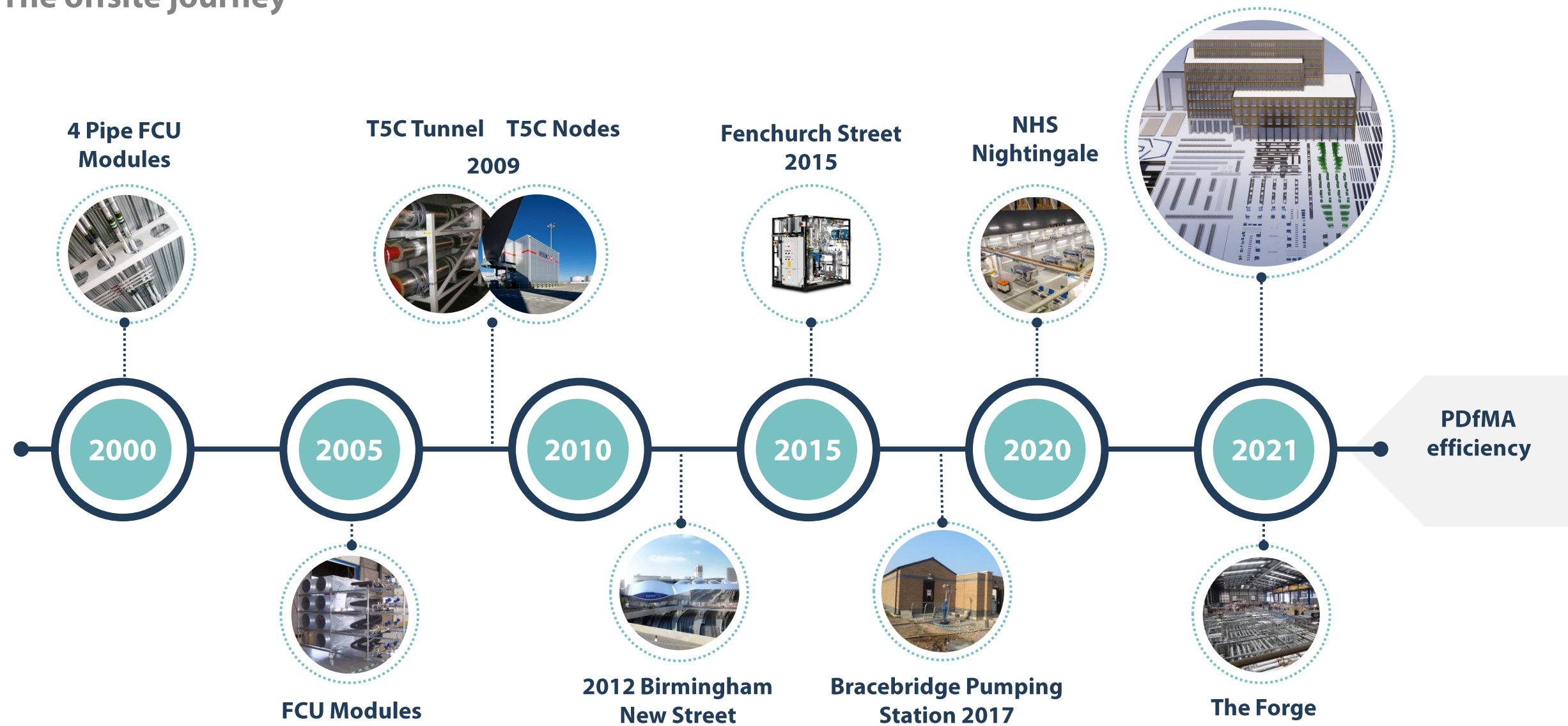


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The offsite journey



The ESG Challenge

- The UK Built Environment is currently responsible for 25% of total UK greenhouse gas emissions
- Over the last two decades, built environment emissions (excluding surface transport) have reduced by c.30%
- Business as usual (BAU) projections, informed by the existing government policy framework, indicate that the sector will fall well short of 2050 net zero targets
- The urgency to act on climate change has never been greater, and the built environment sector has a responsibility to address the climate emergency and accelerate sector decarbonisation.

NG Bailey Net Positive

“Net positive: a way of doing business that ensures we put more into society, the environment and the economy than we take out”

- Six key ambitions which underpin our ambition to become Net Positive
- Timescale for achievement is long term, 2030 and beyond
- Zero carbon agenda supported by Carbon Calculator development
- All Offsite employees received carbon conscious training.



Image 1: Net positive brand and strategy overview.

Benefits of our Offsite Approach

Modern Methods of Construction (MMC) presents opportunities to change how we deliver our projects with our focus on four key themes...

MMC through our Design for Manufacture and Assembly (DfMA) agenda offers the following benefits:



SAFER construction sites



BETTER quality, cost control and maintenance



FASTER project delivery



GREENER more sustainable solutions



GREENER

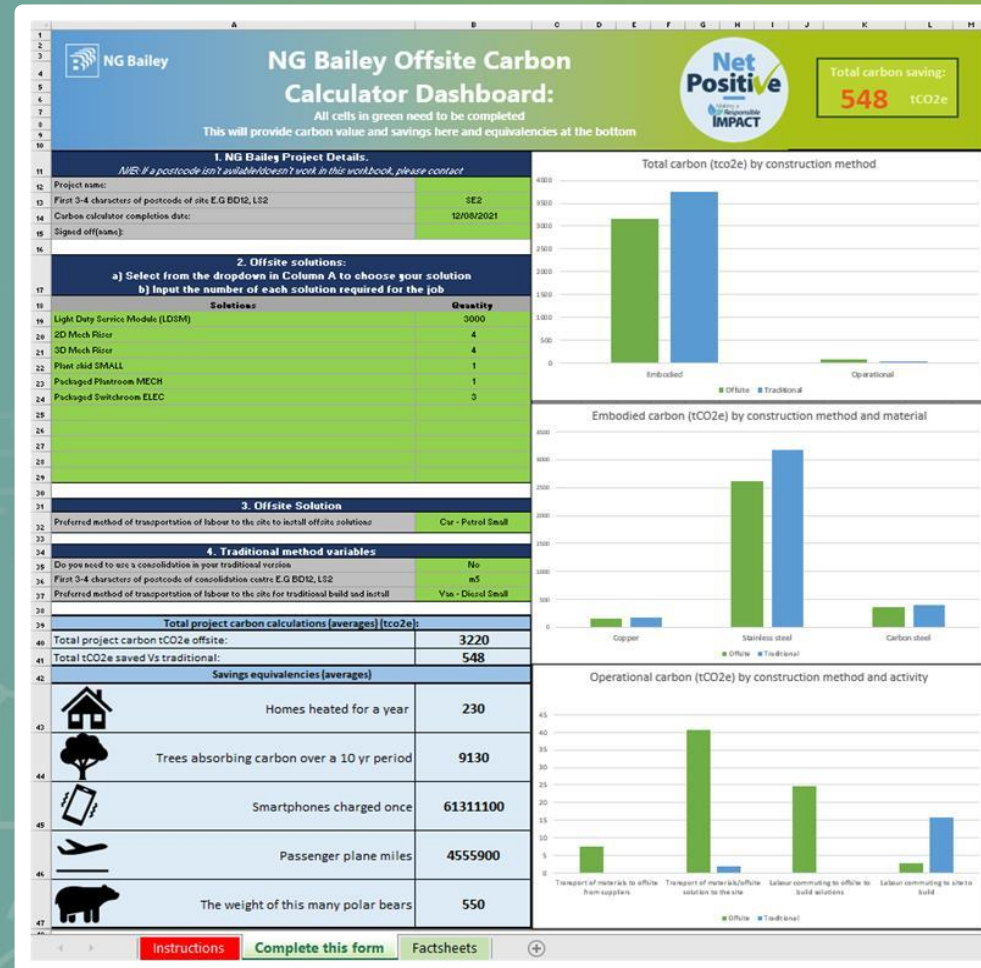
Offsite is GREENER because...



Traditional build means...

- More waste materials due to inefficiencies
- Greater carbon emissions from production processes, deliveries, and operatives' journeys to site.

Carbon Calculator



Material Selection Carbon Benefits – Example

Embodied carbon values for 50mm NB pipe

- Copper 0.3 kg CO_{2e} /m for 54mm tube
- Stainless Steel Trubore 2.0 kg CO_{2e} /m for 54mm tube
- Carbon Steel 9.0 kg CO_{2e} /m for 50mm NB tube

Pipework selection for The Forge

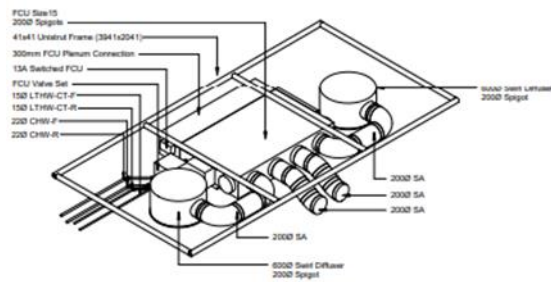
- Copper Xpress <=54mm
- Stainless Steel Trubore >=65mm



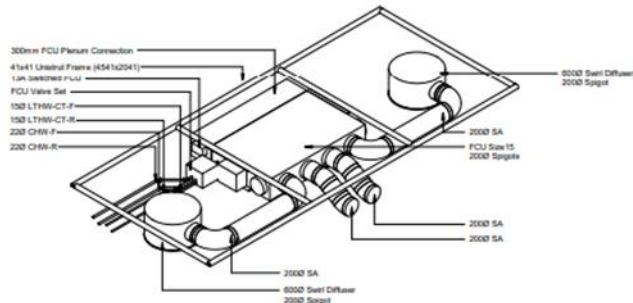
Kit of parts The Forge



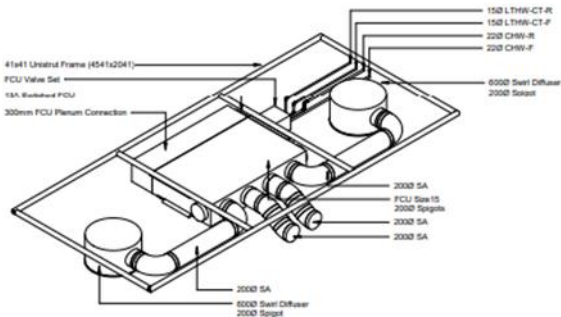
Kit of Parts



FCU Module - Type A06

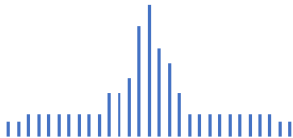


FCU Module - Type A07

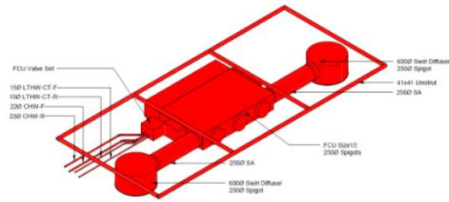


FCU Module - Type A08

Distribution of Types

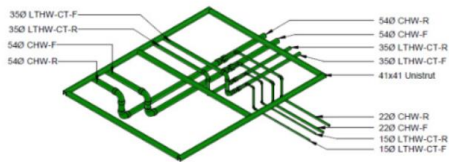


Overview - Cat A modules



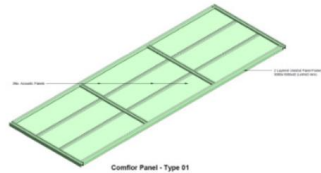
FCU modules

61 variants
378 total qty



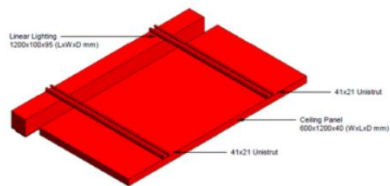
Pipework modules

50 variants
280 total qty



Comflor modules

24 variants
1,273 total qty

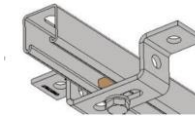


Ceiling modules

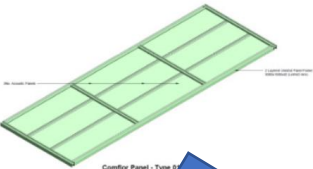
20 variants
2,594 total qty

Total modules - 4525 total qty

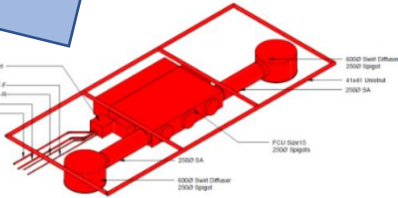
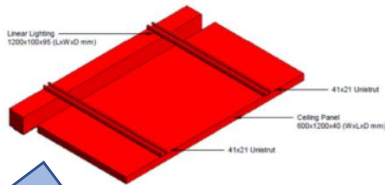
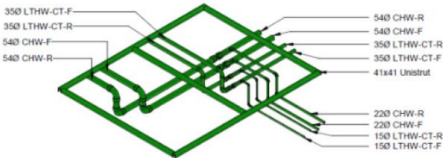
No Drill Strategy



Kit of Parts



Comfor Panel - Type 1



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Key Statistics - Kit of Parts – The Forge



At least 20,000
operative hours
removed



Reduction in waste
both onsite and
offsite



Sustainable design
considered
throughout



60% saving
in Fit out
programme
delivered in
4 months



Over 35,000 km
of vehicle
movements
saved



Materials selection
considered to
reduce embodied
carbon



Estimate
324 tCO2e
saved



NG Bailey

Contact

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Materials resilience guide



Graeme Jones

Managing Director

C-Probe Systems Limited





PRESERVATION OF EMBODIED CARBON IN THE BUILT ENVIRONMENT



7-8% of CO₂ emissions
are the result of
Portland cement production



Modern AACMs

- Recent interest in AACMs is focussed on their low carbon and high durability characteristics
- In the UK, PAS 8820:2016 provides a specification for their commercial use as alternatives to Portland cement concretes and mortars and provides guidance on testing
- PAS being reviewed and developed

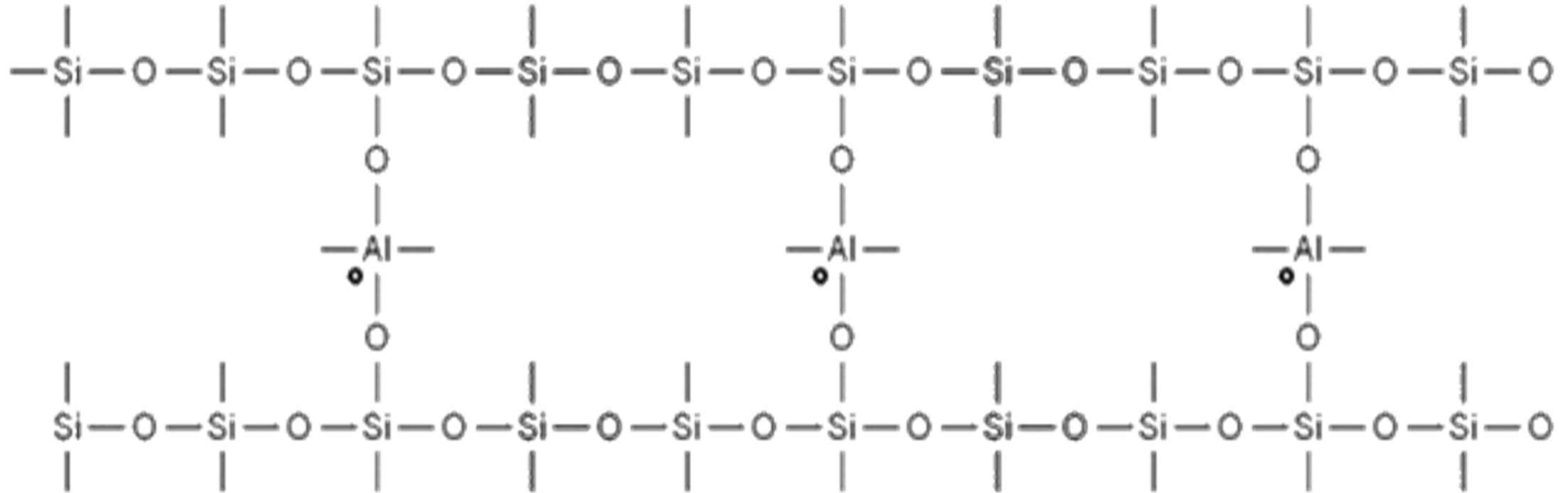


Polycondensation reaction to form aluminosilicates

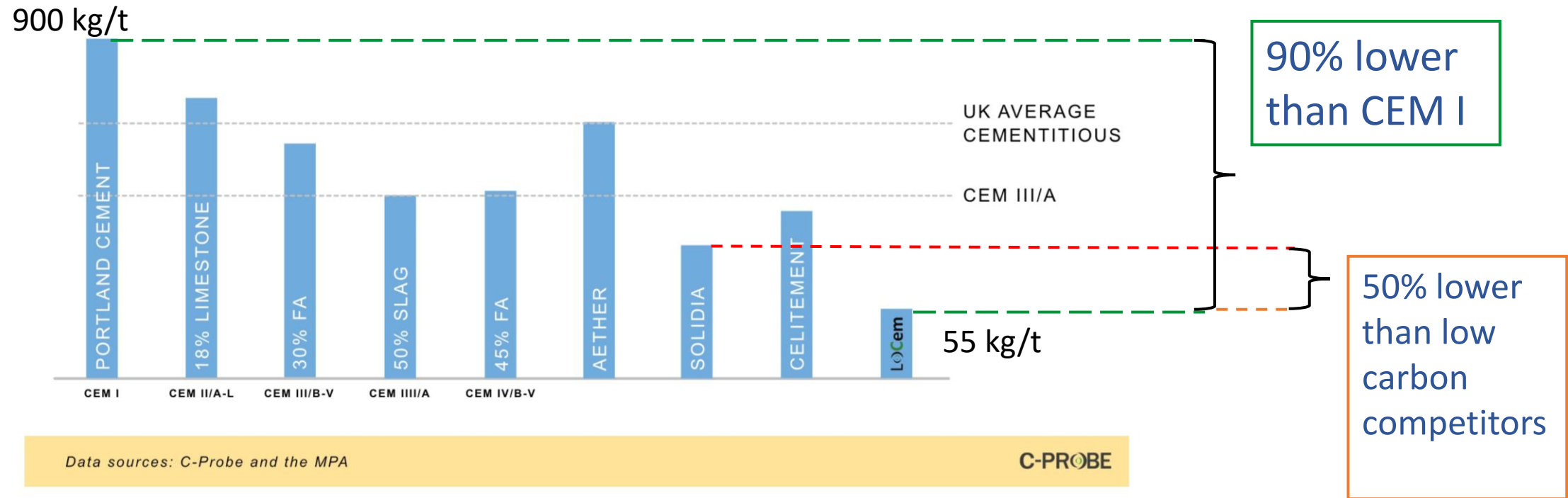
- Once mixed, and dependent upon the formulation, the Si-Al rich mix partially dissolves to form an amorphous gel.
- C-A-S-H and N-A-S-H phases
- In the presence of calcium and sodium this triggers the formation of a cross-linked framework forming a cement phase of calcium/ sodium silicate hydrates, calcium/ sodium aluminosilicate hydrates and polysialate polymeric links



Typical (Geo)Polymeric Structure for Aluminosilicate (AACM)



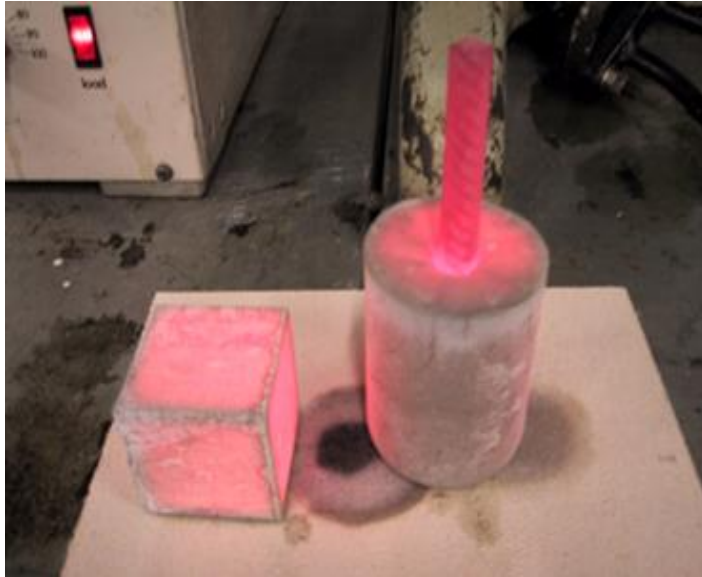
EMBODIED CARBON OF UK CEMENTS VS. ALTERNATIVES



Smart Cities Need Smart Infrastructure



Features of LōCem® our low carbon cement...



- Alkali-activated cementitious material
- Aluminosilicate inorganic geopolymer chemistry
- Looks and handles like mortar and concrete



- High thermal stability (fire to >1200C/ 5hrs; cures at -5C)
- High sulfate and acid resistance
- Alkali Silica Reaction & freeze-thaw resistance



- High flexural strengths and comparable compressive strength
- Low/ no shrinkage on hardening



- Unique anode properties for corrosion control with cathodic protection




The collapsed condo was about to begin corrosion
repairs.  - The New York Times, 2021

We Prevent This
From Happening!

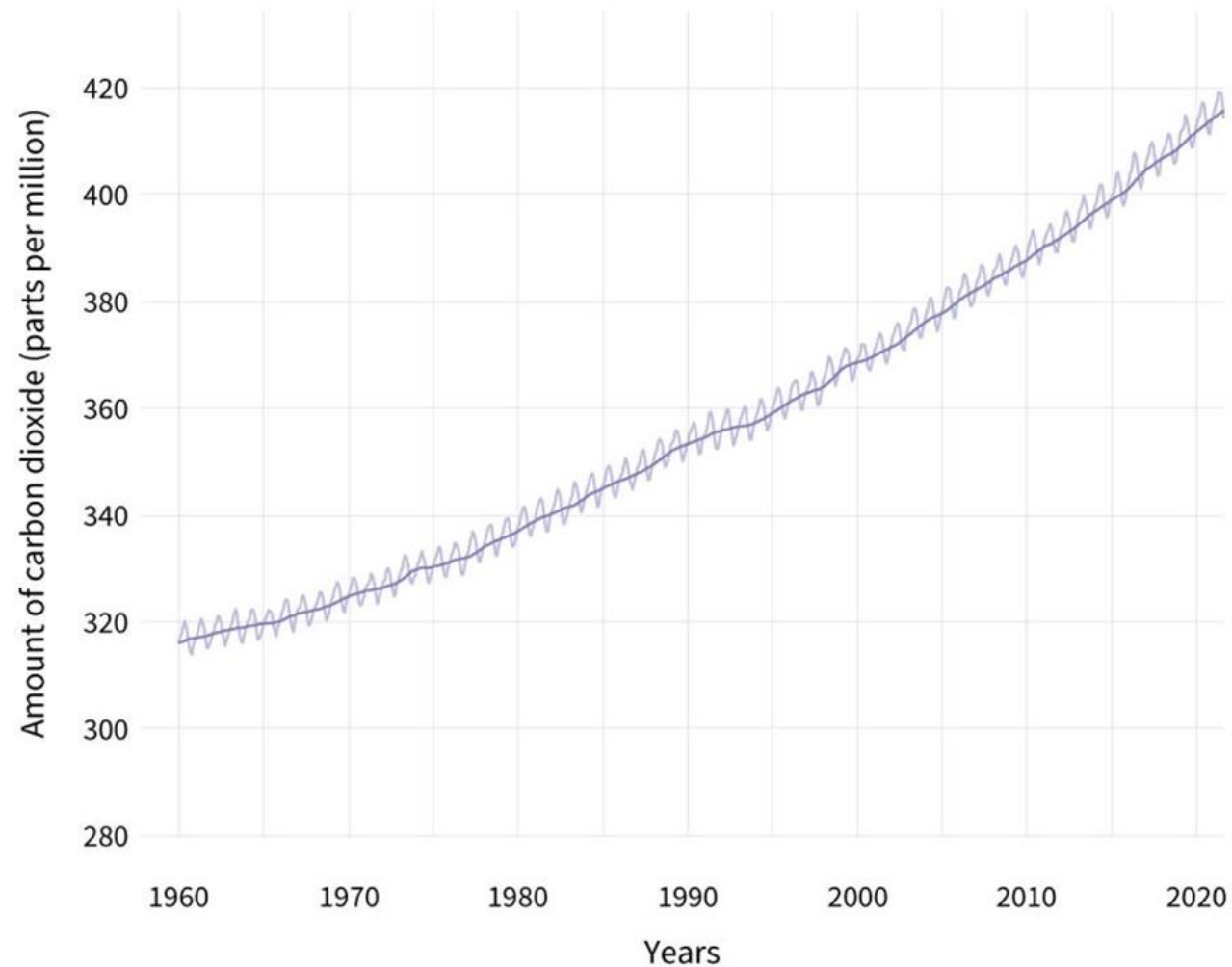
C-PR○BE





70%
of infrastructure damage is due to
CORROSION

ATMOSPHERIC CARBON DIOXIDE (1960-2021)



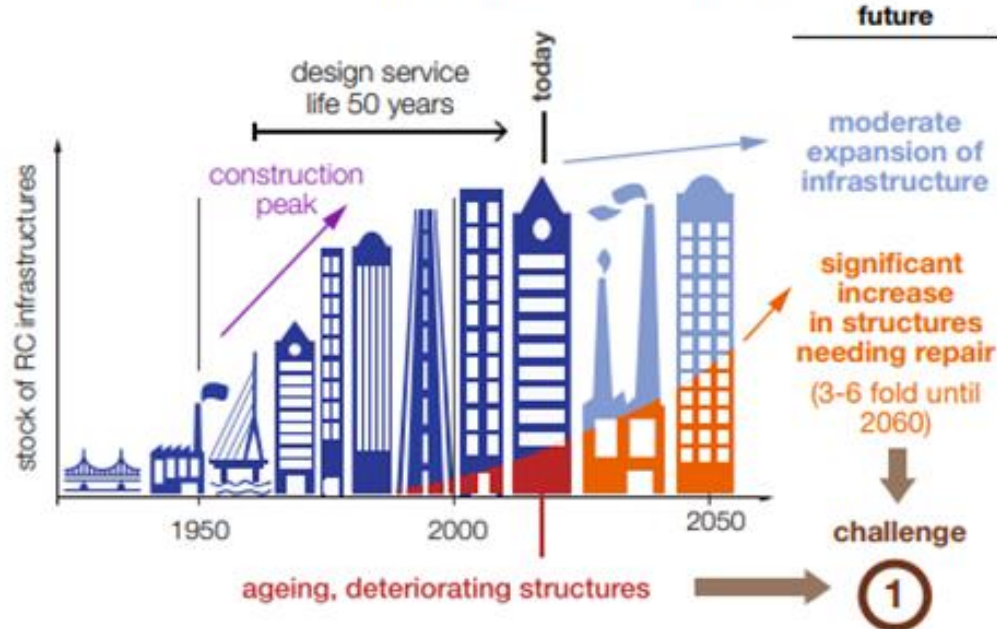
ref: climate.gov: Dr Chris Atkins, Mott MacDonald, 2022

Technological challenges

(a)

Maintaining ageing infrastructures

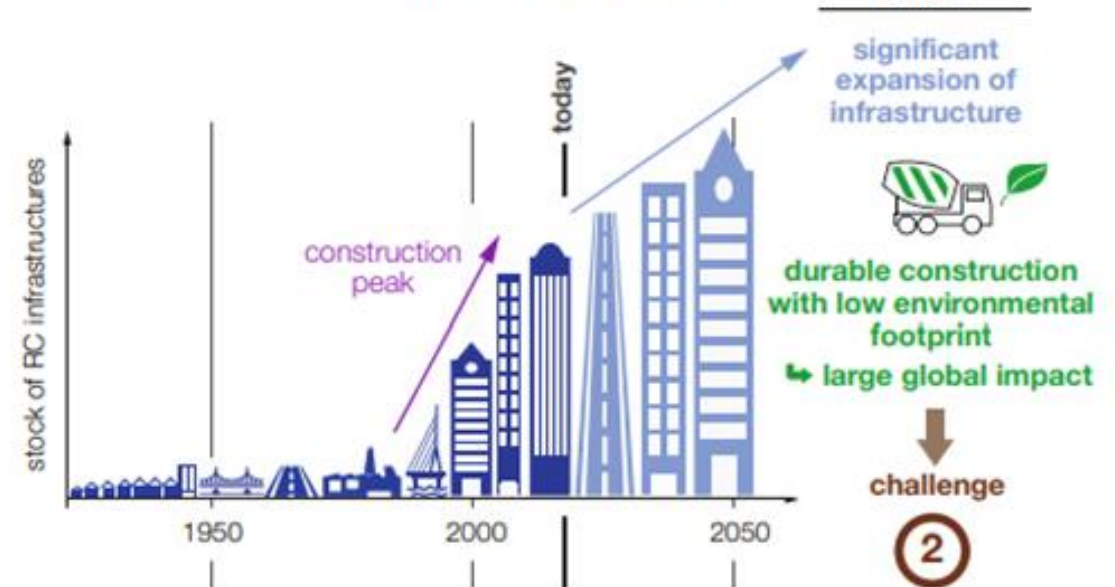
Mostly in industrialized countries



(b)

Designing new, sustainable infrastructures

Mostly in emerging countries



LoCem[®]: Low Carbon Cement Binders for repair, protection & build



Achilles[™]: Sensors & Control Network Electronics

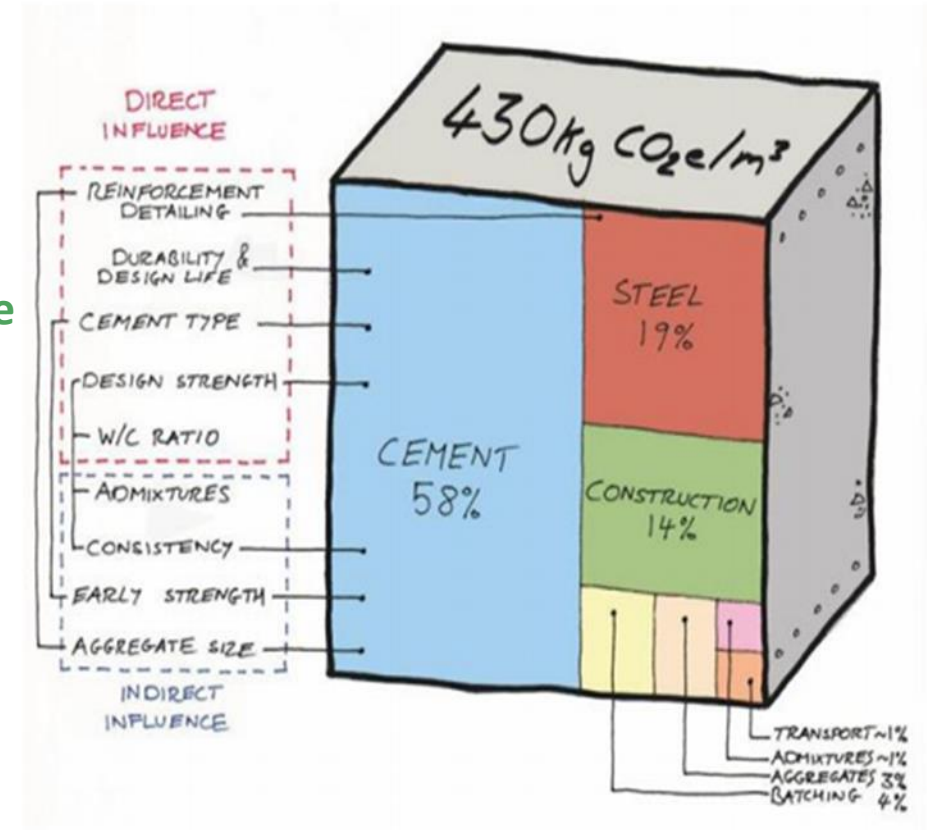
AiMS[™]: Online Performance Control & Reporting System

AiMS
C-Probe.com
The informed choice

Embodied Carbon Savings – Case Study

Example for a reinforced concrete plaza deck project in New York City:

- Footprint of 40,000sqm with 18,500sqm being removed and replaced at a depth of 600mm
- @348kg CO₂e/ m³ (81% ex steel) = loss of 3.9kte CO₂e due to the slow decision to treat early
- However, ICCP to 21,500sqm saves 5.5kte CO₂e @430kg CO₂e/ m³
- Futureproofing 40,000sqm of Plaza decks with ICCP means no further loss and preservation of 10.3kteCO₂e.
- Data and remote-control acts as assurance of performance to International standards



Smart Cities Need Smart Infrastructure



Environmental:

Repurposing industrial wastes to form AACM anode material

Build with AACM

Reduced water use in mix designs

Room temperature blending of AACM powders

Sustainable resilience of embodied carbon

Social:

Control of degradation offers sustainable legacy for the future

Avoiding future concrete repairs reduces cost and disruption

Reduced use of resources through controlled maintenance

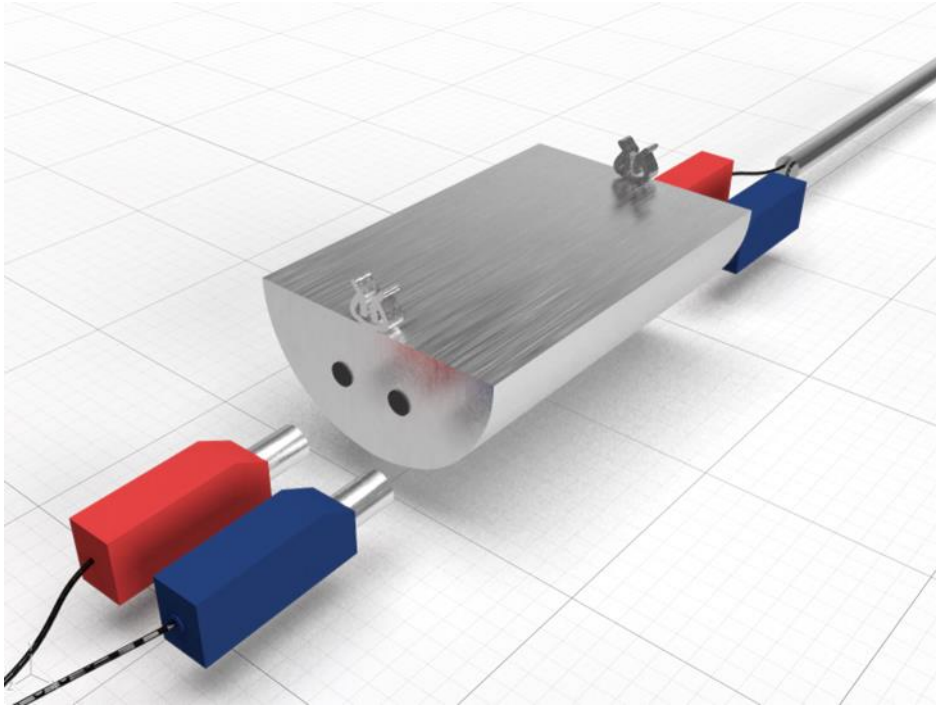
Governance:

Performance data reported through whole life tracking from embedded sensors

International Standards apply

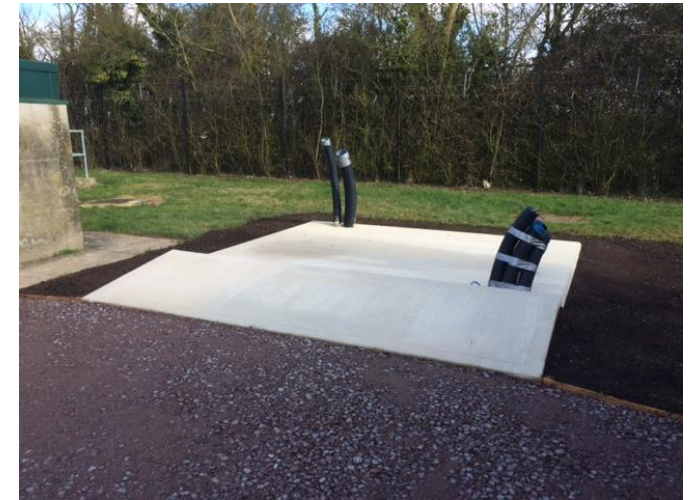
Asset value assured





modular, plug &
play anodes to
protect **new**
construction

low carbon built
LoCem[®] concrete





Repurposing Industrial Wastes

Securing Embodied Carbon



Sustainability with Futureproofing



[Click here](#) to view video.



Thank you for listening

How to get in touch:

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Factory tour and lunch

28 September 2022

Interactive discussion and Q&A



Dirk Vennix

Executive Director, Buildoffsite

Chief Executive, CIRIA

Closing remarks



Dirk Vennix

Executive Director, Buildoffsite

Chief Executive, CIRIA

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