C-PROBE® LOCem®

PRODUCTS & SERVICES FOR
SUSTAINABLE WHOLE LIFE PERFORMANCE OF STRUCTURES

Our Vision:

To provide durable structures, managed from corrosion that are accountable for their service life

Technology Development Path

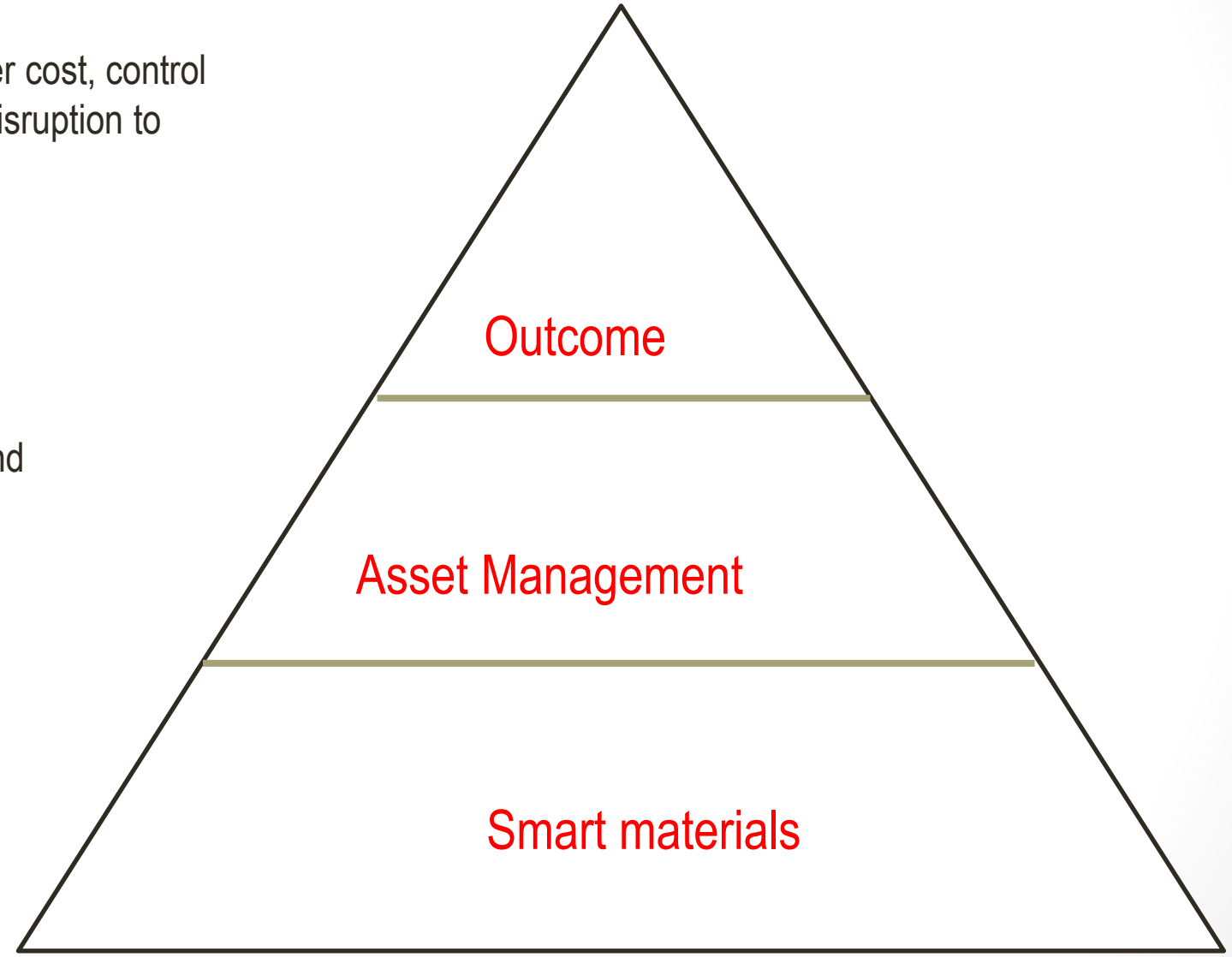
- Embeddable monitoring devices with 30year track record)
- Open network electronic systems and integration with IoT control and monitoring units
- Remote internet accessible data, control and reporting
- Low carbon mortars and concrete (AACM)
- Low carbon anode mortars and concrete (AACM)
- EN1504 repair, protection and strengthening solutions
- PAS8820 New build solutions
- Optimised bond performance and resilience
- Service life (SL) predictability and online SL tracking

Futureproofing construction with technology:
Whole Life Sustainability Plan

Low maintenance, lower cost, control of asset's future, less disruption to society, positive legacy

Control performance and provide proving data

Provide low carbon smart sustainable materials



Brand development

LoCem® brand for AACM geopolymer low carbon binder formulations as basis of product development

Restoration:

- C-Puck® I,II,II (patch and rod) – galvanic anodes with *LoCem®* CPM conductive packing mortar
- Carro+® - galvanic/ impressed combination anode with *LoCem®* CPM and reinforced concrete anode mortar
- +point®, +chase, +shot - impressed current anode mortars for heritage masonry façades and reinforced concrete structures.
- *LoCem® repairs and fire resistant concretes*

New Construction:

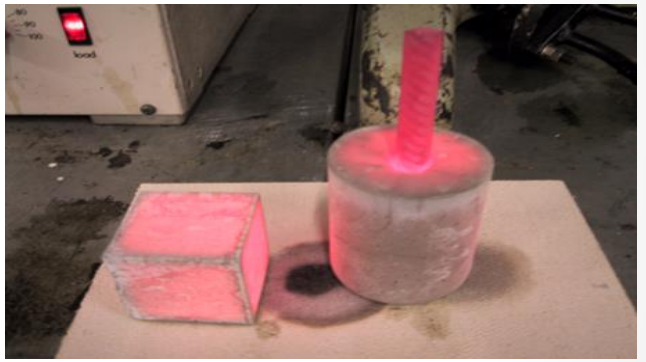
- WoWSmart® Life Management for new build and reconstruction applications (patent filed in UK, EC, USA, Canada and Australia)

Benefits of LoCem® AACM concrete

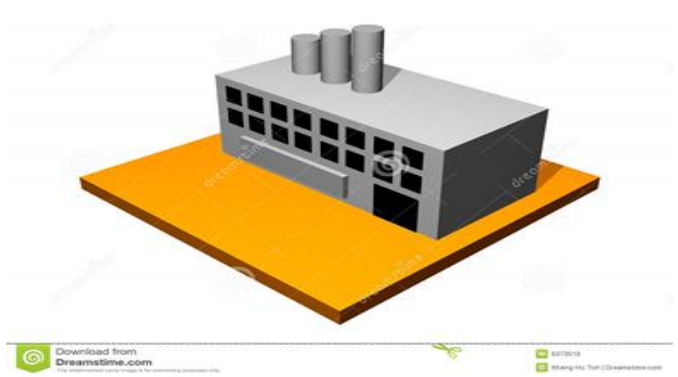
- **Manufacturing in St Helens:**
  - Low carbon, low energy manufacturing process
  - Uses recycled and industrial waste materials with room temperature blending (no heat)
  - Yields >80% reduction in CO_{2e} compared to oPc
- **Construction:**
  - Build conventionally (onsite & offsite)
  - Different hardening chemistry gives improved durability features
  - Matching strengths and workability to oPc concretes
  - Low or no shrinkage
  - Low water required
- **In use:**
  - High fire resistance (>1200C/ 5hrs) – BS EN1363-1
  - High resistance to chemical and environmental impact
  - Control against effects of accelerants causing future disrepair
  - Predictable corrosion controllability
  - Integrate with OPC through precasting of ICCP "layer"
  - Significant extension to service life
  - Options for tracking service life to ensure compliance through monitoring and control of durabili

Outcome:

low operational costs, built to last, risk controlled



C-Probe Current AACM Capability

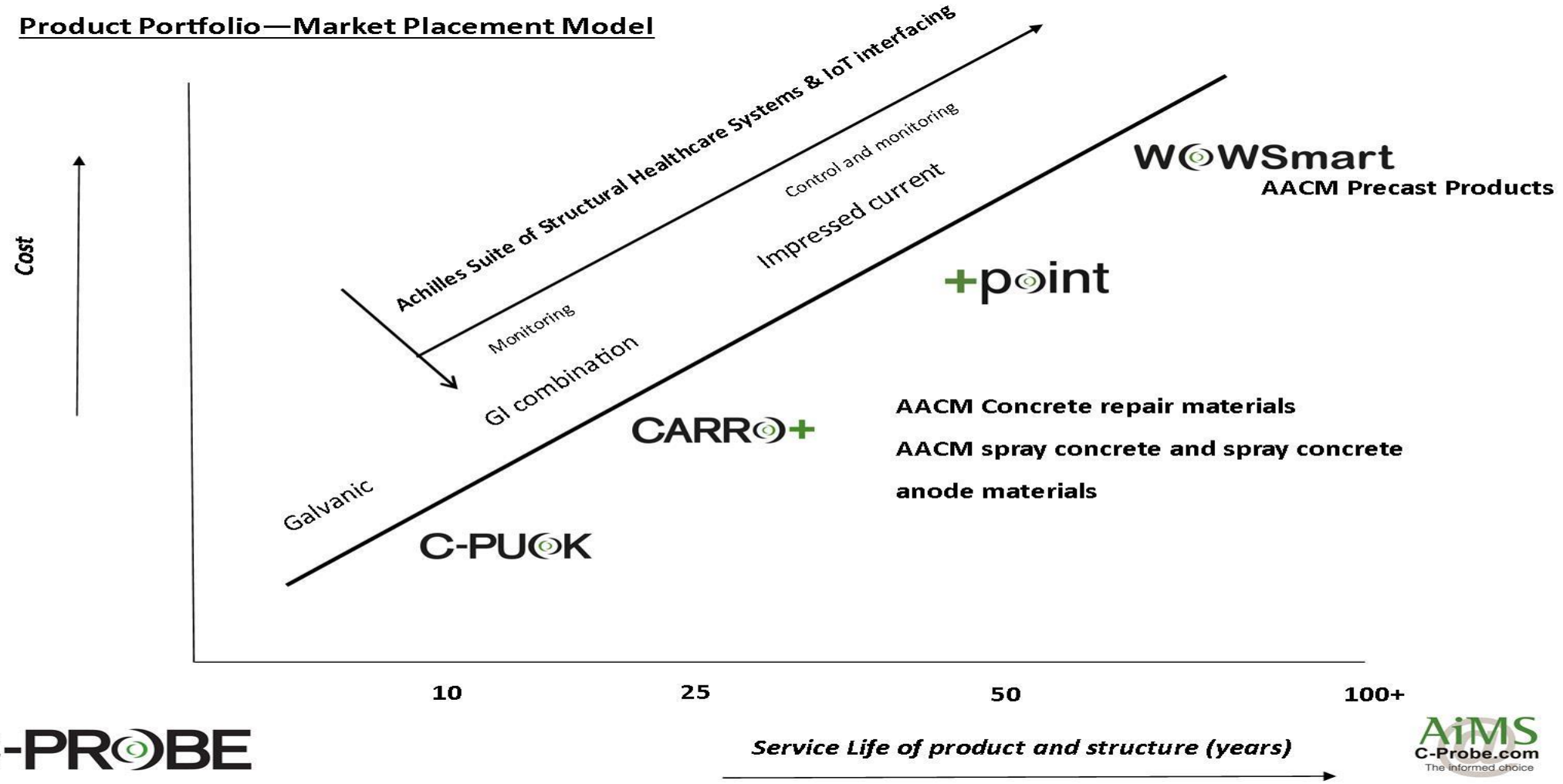


St Helens production

Palletised or Big bag packaging

On site mixing for AACM geopolymer materials

Product Portfolio—Market Placement Model

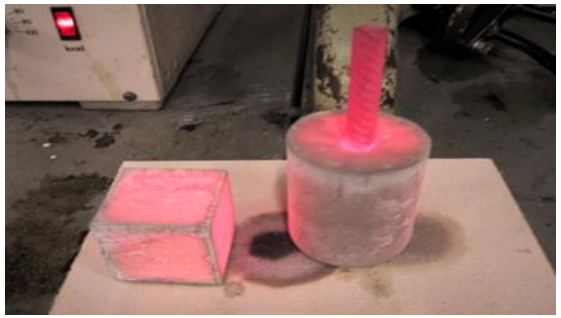


C-PROBE

AiMS C-Probe.com The informed choice

Restoration of Existing Structures

LOCem® **Repairs; Fire; Sprayed concrete**



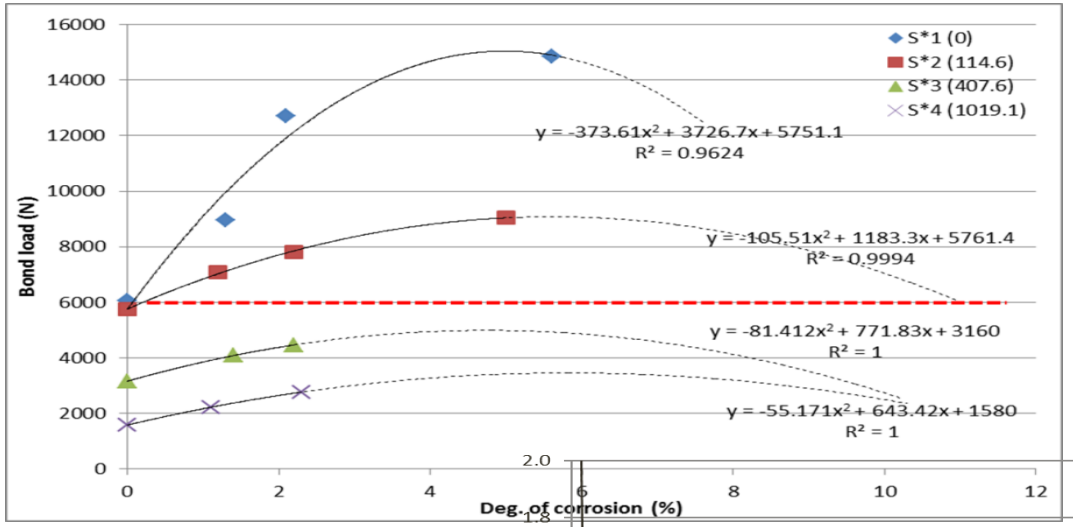
buildoffsite
MARQUE
CHAS Accredited Contractor www.chas.gov.uk
AiMS C-Probe.com The informed choice

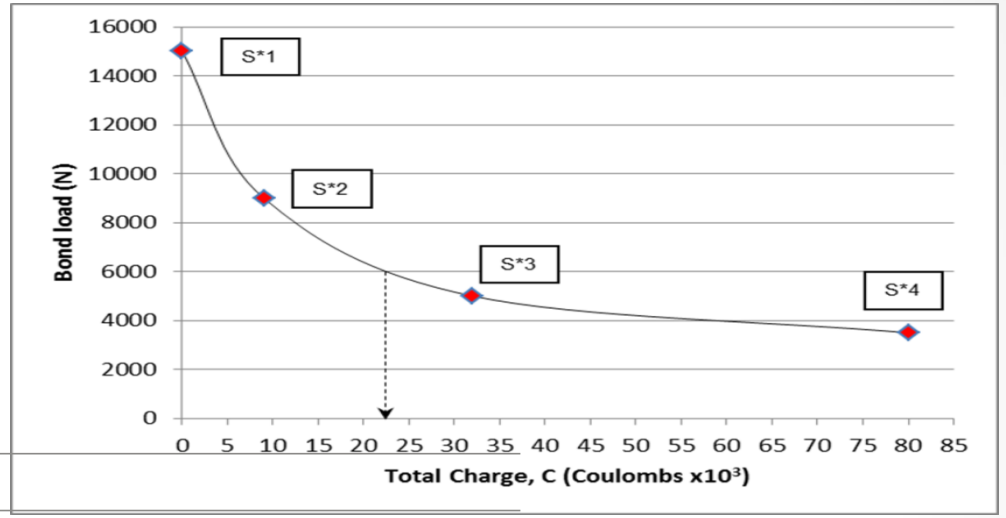
Applications with LoCem® AACM build materials

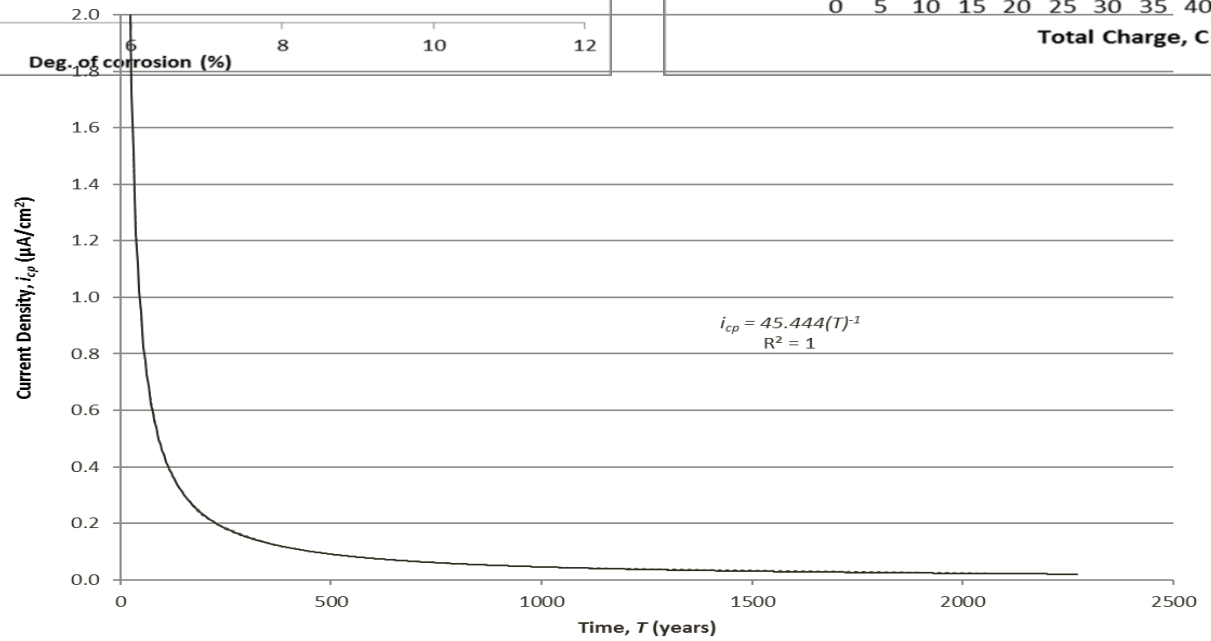
1. Ready-mix slab & ramp
2. AACM precast tunnel segments
3. Sprayed AACM fireproof and ICCP +shot linings
4. Bridge U-beam – ongoing WoWSmart® installation

Achilles
Corrosion Services

Designing for ‘indefinite’ service life

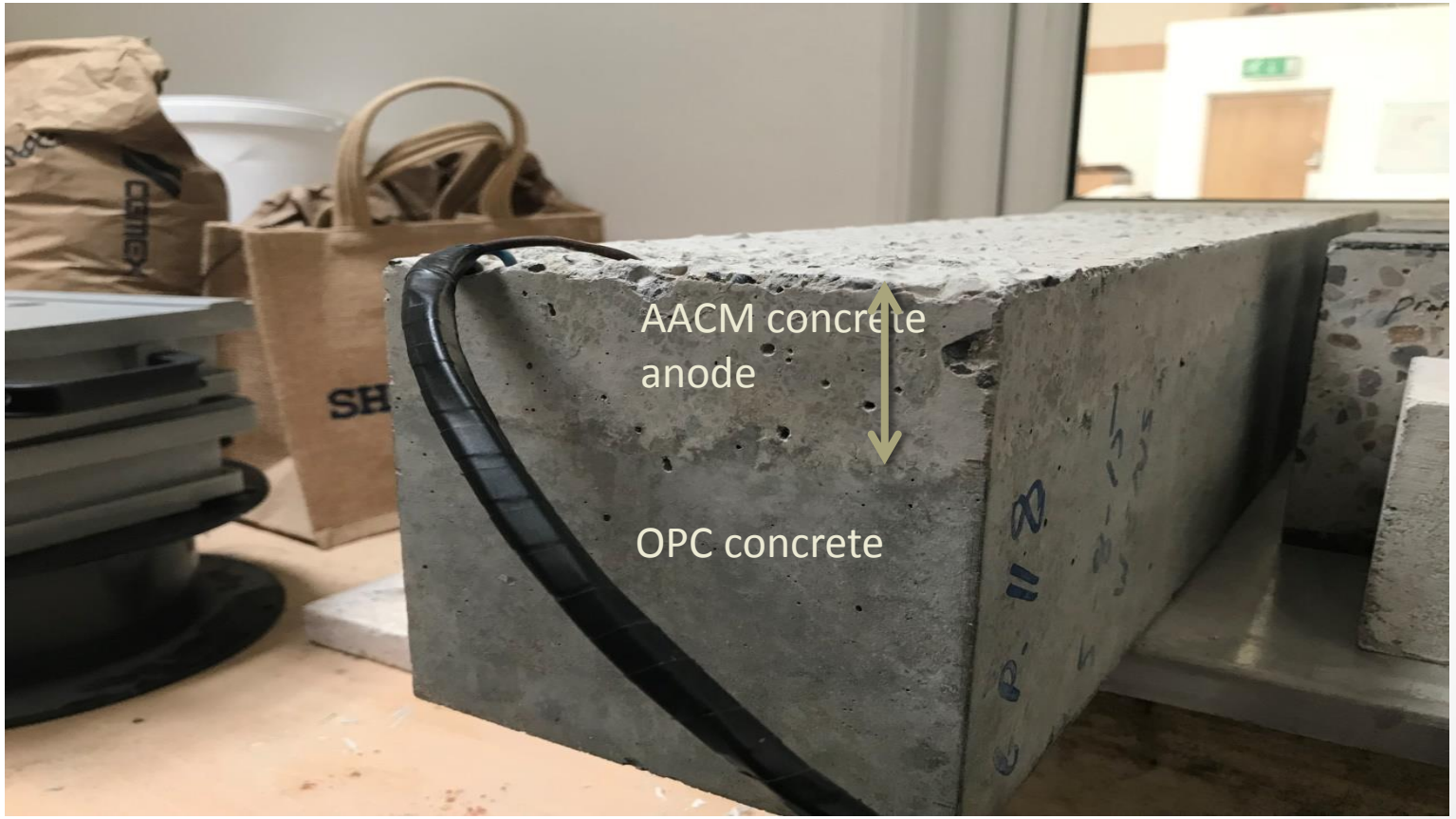




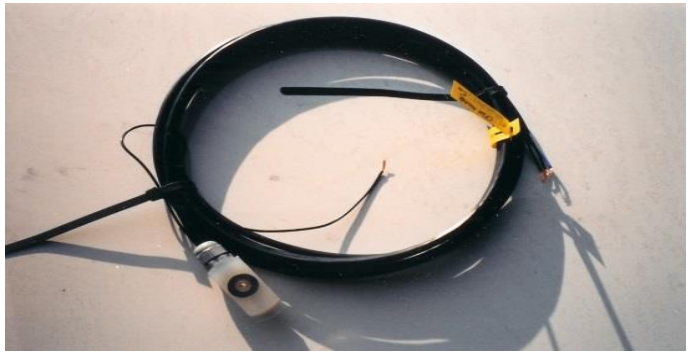


How do we achieve futureproofing in concrete form?

WOWSmart

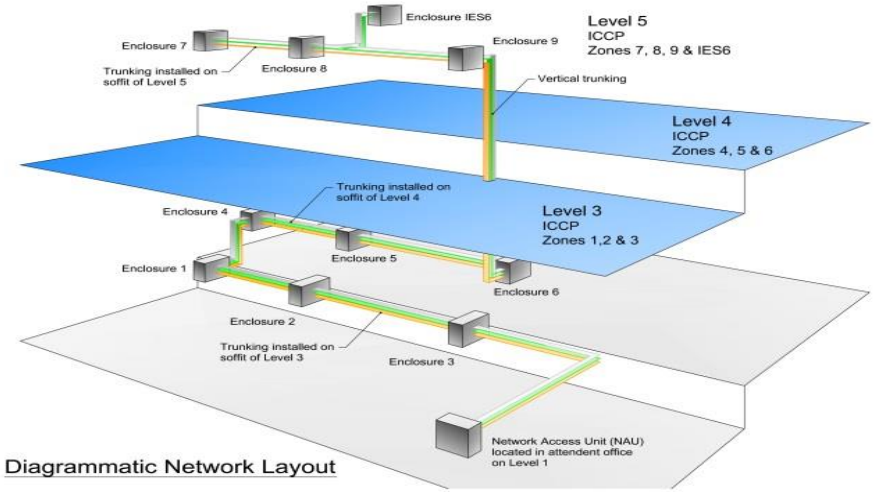


Digital systems approach

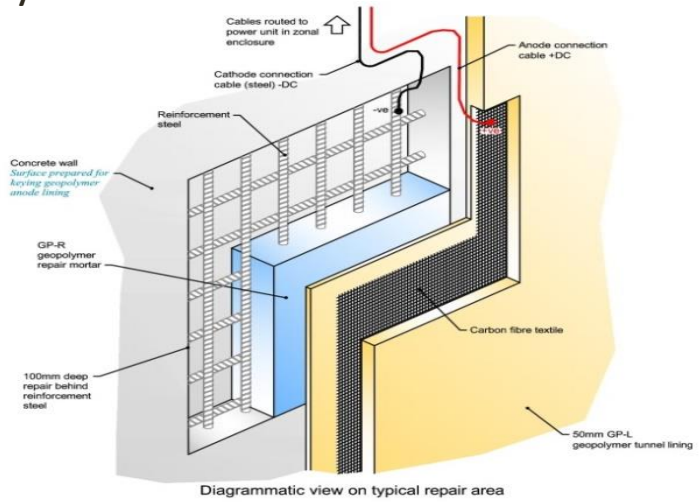


Embedded monitoring

AACMs with corrosion mitigation capability

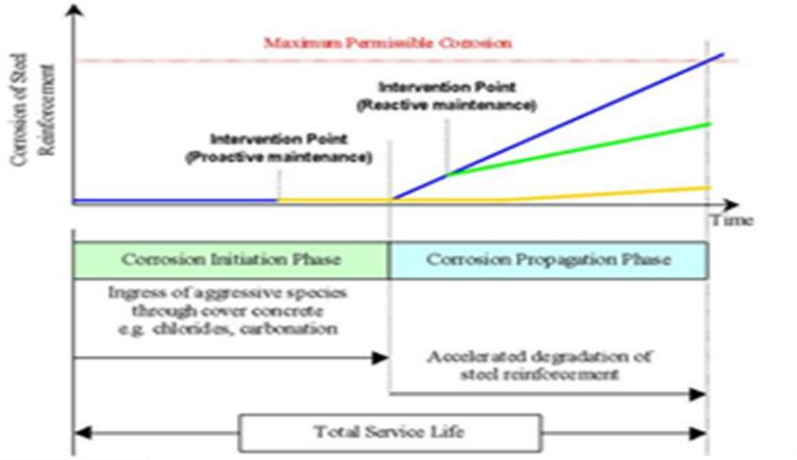


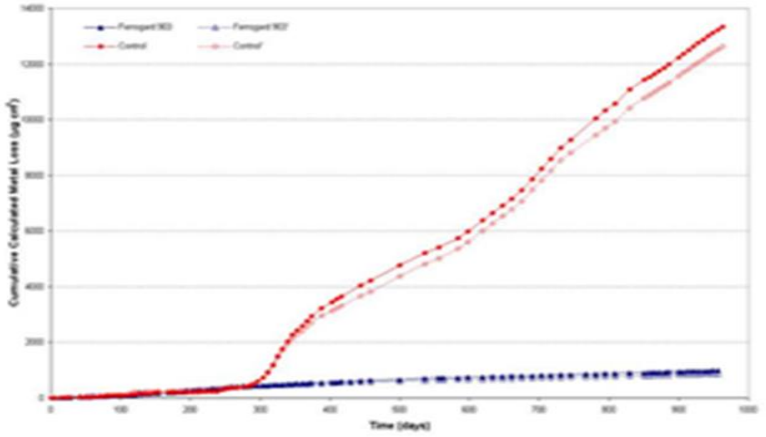
Remote Service life tracking and control

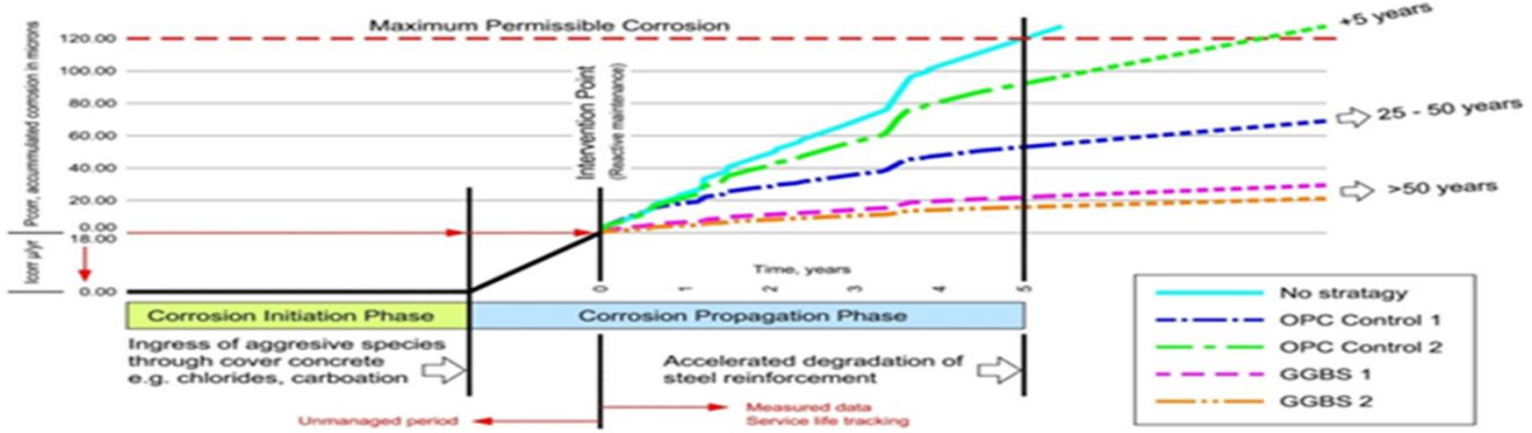


System installed by contractor

EMBEDDED PERFORMANCE MONITORING







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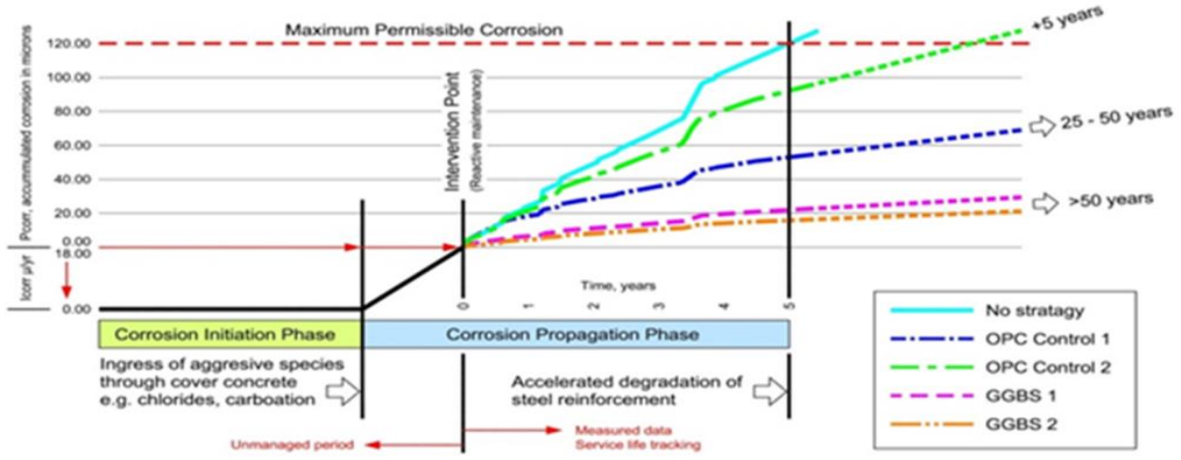


ONLINE SERVICE LIFE TRACKING WITH CORROSION RATE MONITORING

Next step – a digital engineering tool to add controllable resilience from new through BIM

STiR-APP ™

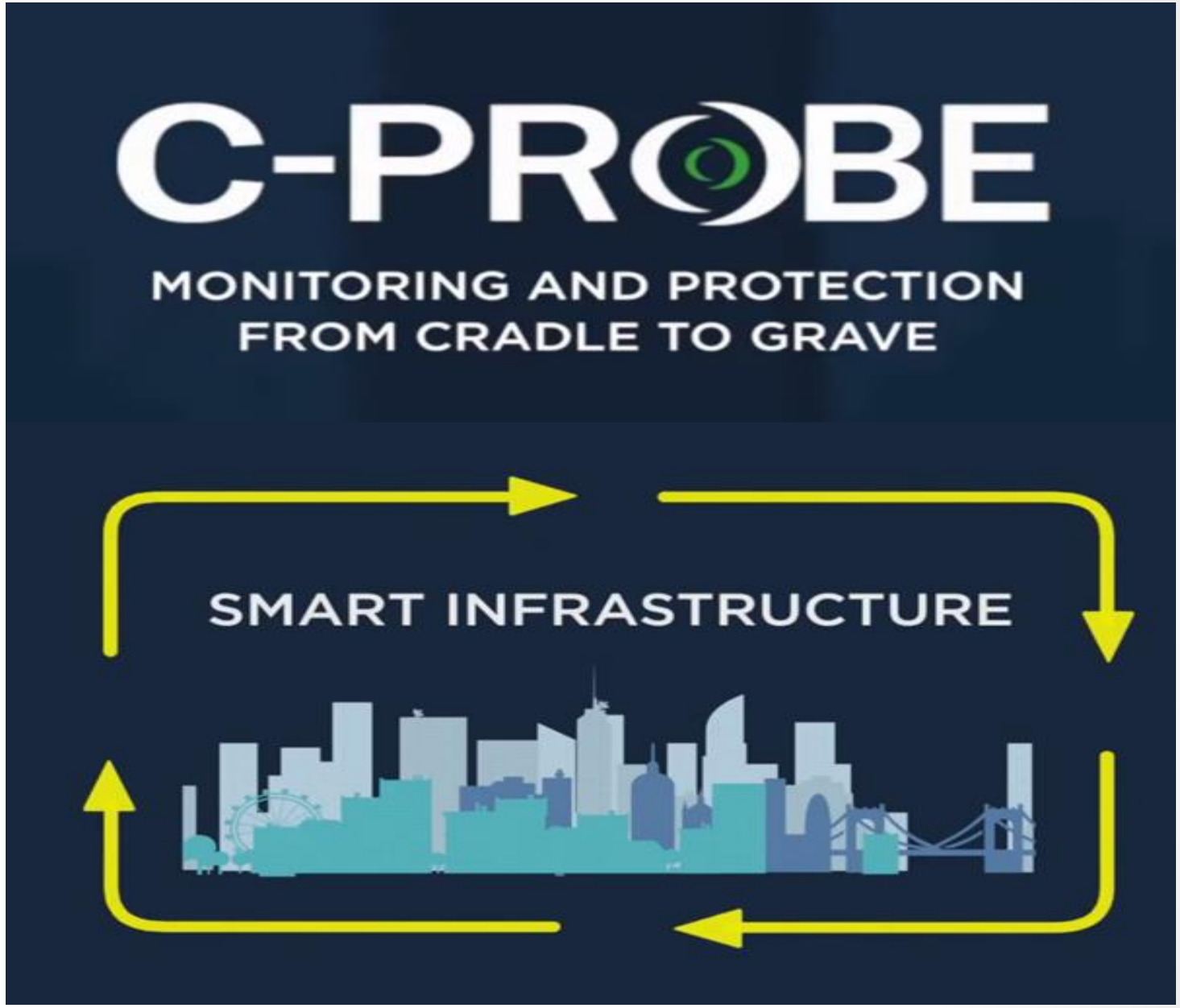
STiR-APP Smart Tracked infrastructure Resilience – Asset Protection Platform

- Collaborative development with Design Automation Systems
- Intention to align as plugin tool to BIM (Revit/ Tekla)
- Allow any engineer to be a specialist in resilience management, especially focused on corrosion control choices
- Gateway ‘FAQs’ to lead to the most robust choice for monitoring and protecting a structure to avoid future resilience problems
- Performance lead product choices with justification
- Budget formulation based on choices made
- Integrated with BIM outputs to provide access to future performance reporting once built
- Service life tracking using monitoring tools and digital platforms

Message & Conclusions

- Repair with corrosion control for existing infrastructure
- New Build with futureproofing alongside low carbon sustainability
- Multi-functional materials give significant cost savings
- Be performance lead; make innovative material choices
- Manage the data from infrastructure to track whole life performance
- Provide a measured outcome for the investment made by the asset owner whether taxpayer or private

Thank you for listening



WILLMOTT DIXON
SINCE 1852

Digital Construction and BIM – Why?

What can it bring to On- and Off-Site activities?

WILLMOTT DIXON CONSTRUCTION

A Brief History and Overview

1852 – The Start of the Journey

John Willmott founds the company following a suggestion from the **Estate Manager** where he's working

First Project is to provide labour for excavation and construction of a new well

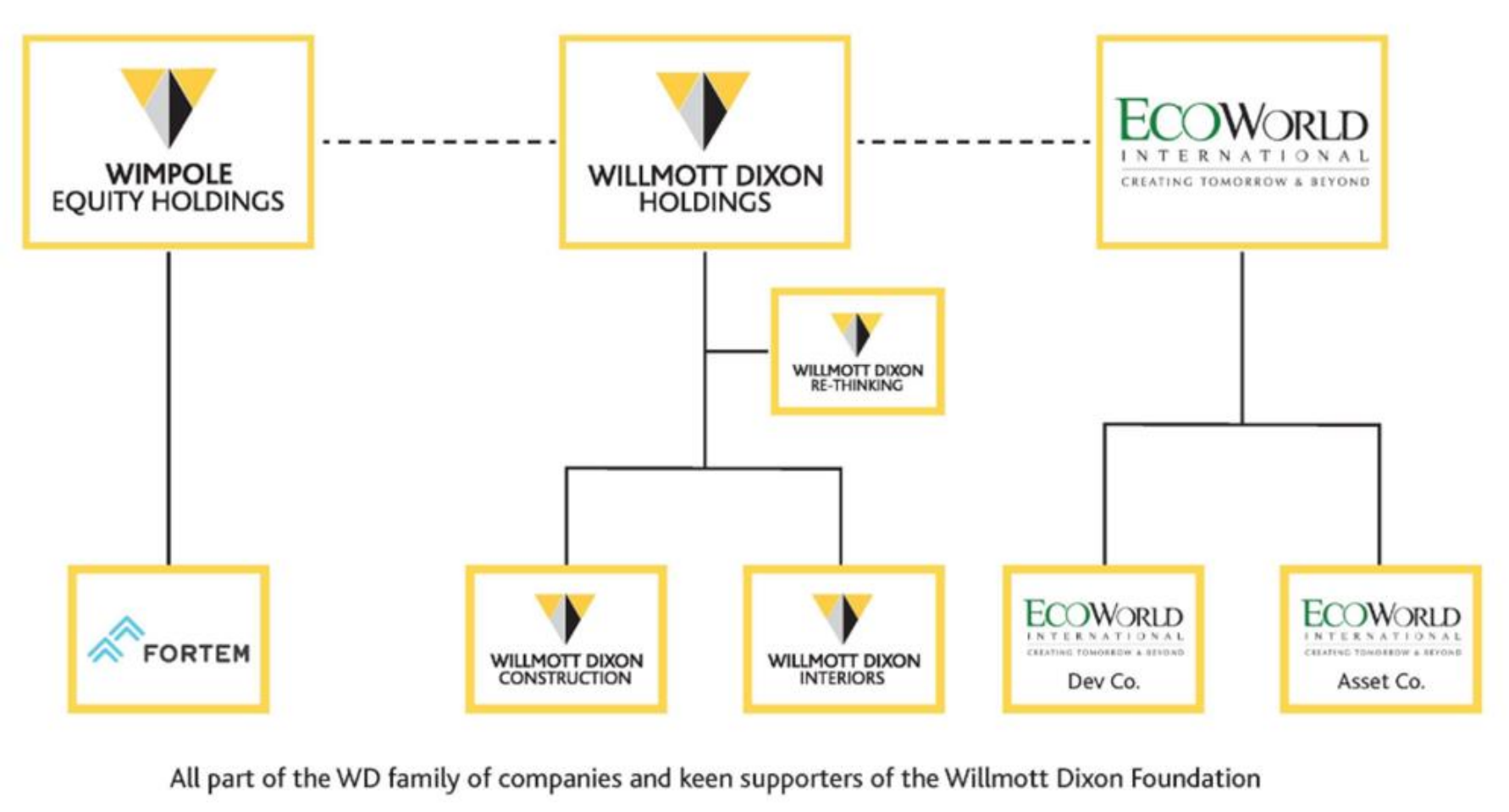
£1 contract sum

2018 – Where we are Now

Rick Willmott is the Group Chief Executive and is the **5th generation** of the Willmott family to lead

- **Privately Owned** Construction Company
- **£1.2bn+** annual turnover
- **~2,500 employees**
- **90%+** of the population within 2km of a Willmott Dixon project
- **Carbon Neutral** since 2012
- **Won the Queen's Award for Enterprise in:**
  - Sustainable Development (2014)
  - Promoting Opportunity (2018)

Group Structure



National Structure

6 Regional Offices

- **Birmingham**
  - Milton Keynes
  - Nottingham
  - Oxford
- **Cardiff**
  - Bristol
  - Exeter
- **Cobham**
  - Dartford
- **Farnborough**
- **Hitchin**
  - Chelmsford
- **Manchester**
  - Leeds
  - Newcastle

Our “Why” – Building Lives Less Ordinary

The world is filled with enough ordinary. It’s all of our responsibility to make it **extraordinary.**

That’s why every project we take on at Willmott Dixon has to **deliver a positive and memorable impact**.

For our customers, that means opportunities to prosper and grow.

For our communities, it means places not just to live in but to thrive in.

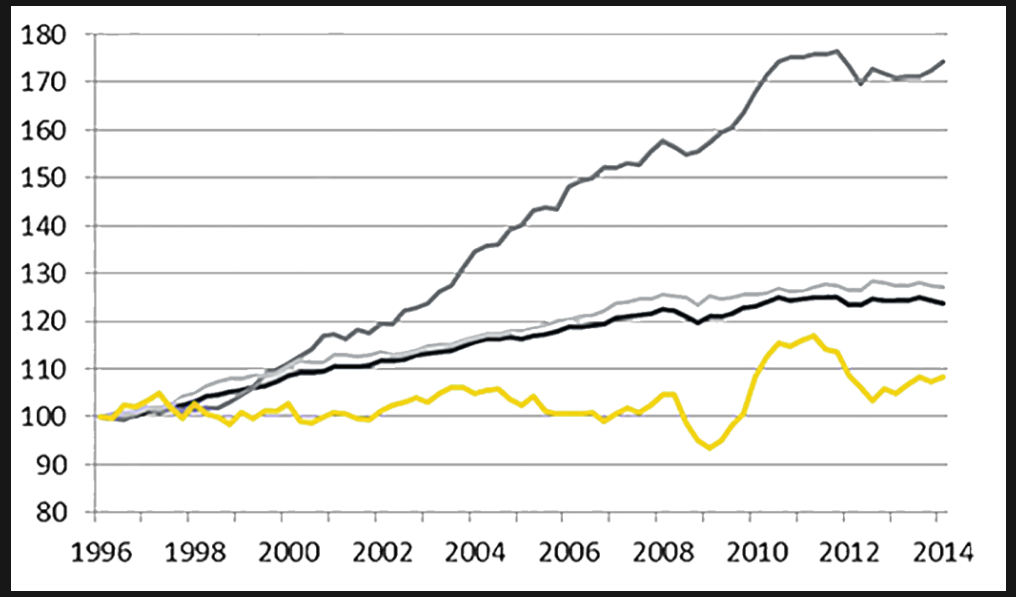
For our people, it means work that challenges, inspires and really rewards.

- Recognition that each of our Customers has **differing and unique needs**
- **Making the complicated simple** to help push the Customer’s investment further, whatever the economic climate
- Our success is built on a constant drive to understand the needs of each Customer, learn from our experiences, and **build on better**
- Building great business partnerships is like great friendships: **built on trust**

BIM and Digital Construction

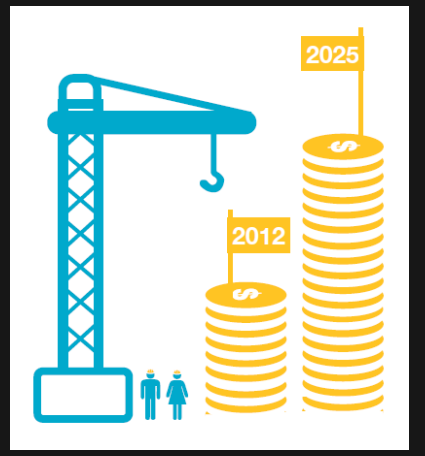
What is BIM and Digital Construction?

Why was BIM Introduced?



(EC Harris ONS 2014)

Construction contributes nearly **£90bn** to the UK Economy, 6.7% of the total



Global construction output is forecast to increase from around **$8.5 trillion** today to $12 trillion in 2025*

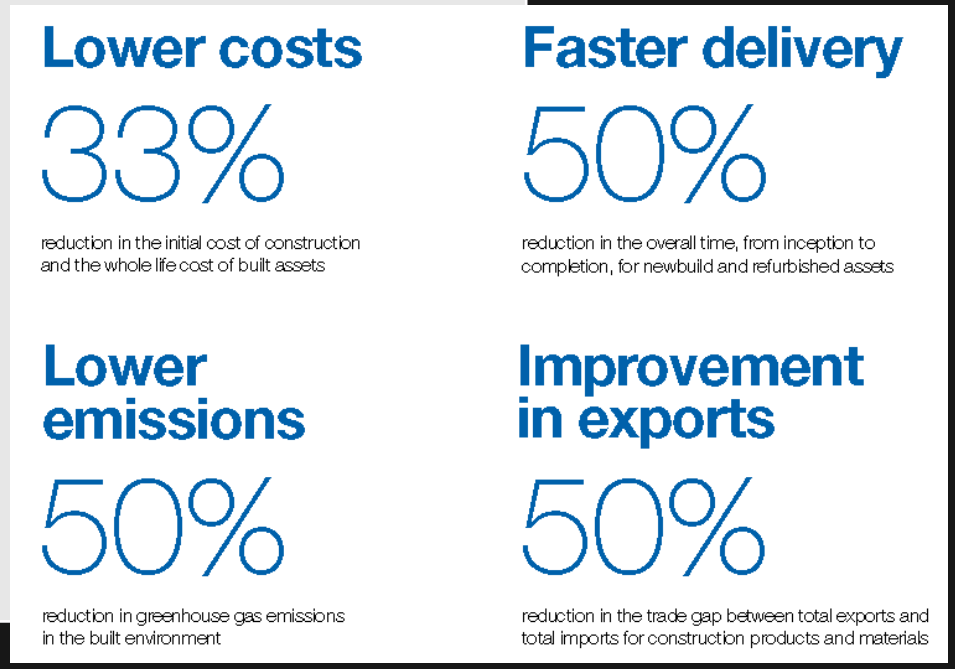
* Source: Global Construction 2025

How was BIM Pushed? – The Mandate

Part of the UK **Government Construction Strategy** published in 2011

From **April 2016 all "Centrally Procured"** projects to use BIM Level 2

Only applies to **Public Sector** works



What is BIM? – The Definition

Building Information Modelling

Better Information Management

Building Information Model

Built Infrastructure Model

Etc.

In short… There isn't an industry wide agreed definition

There is no legal definition of BIM

Government BIM Task team **disbanded** when the mandate landed

Lack of industry leadership to help provide clarity

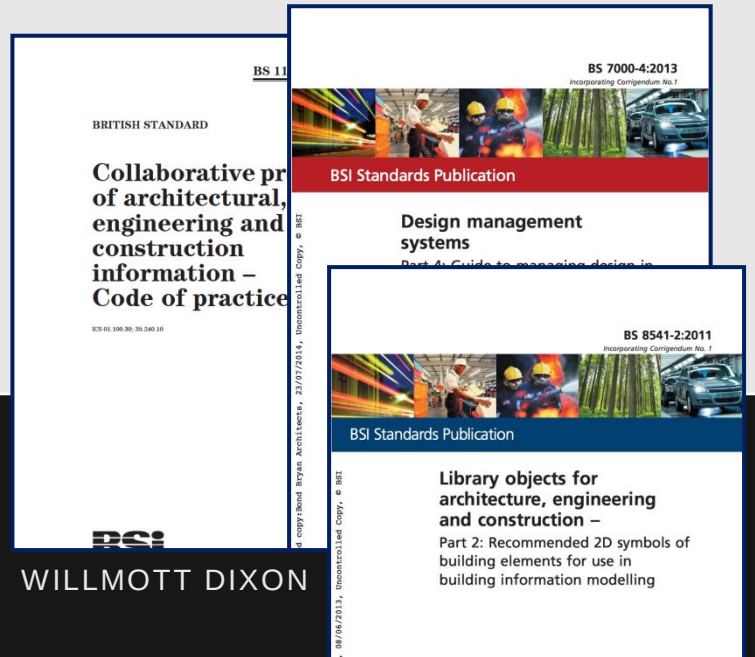
Everyone interpreted things differently

UKBIM Alliance now set up to help provide leadership

What is BIM? – The Standards

BIM Level 1

- BS1192:2007 + A2:2016
- BS8541-2:2001
- BS7000-4:2013



BIM Level 2

- BS1192:2007 + A2:2016
- PAS1192-2:2013
- PAS1192-3:2014
- BS1192-4:2014
- *PAS1192-5:2015*
- *PAS1192-6:2017*
- BS8536-1:2013
- *BS7000-4:2013*
- BIM Protocol (CIC)
- Digital Plan of Work
- Uniclass 2015
- NBS Toolkit
- *ISO 19650?*

What is Digital?

Current Buzzwords:

- AI
- Digility
- Blockchain
- Smart Cities
- Internet of Things
- Big Data
- Industry 4.0
- DfMA
- The Cloud

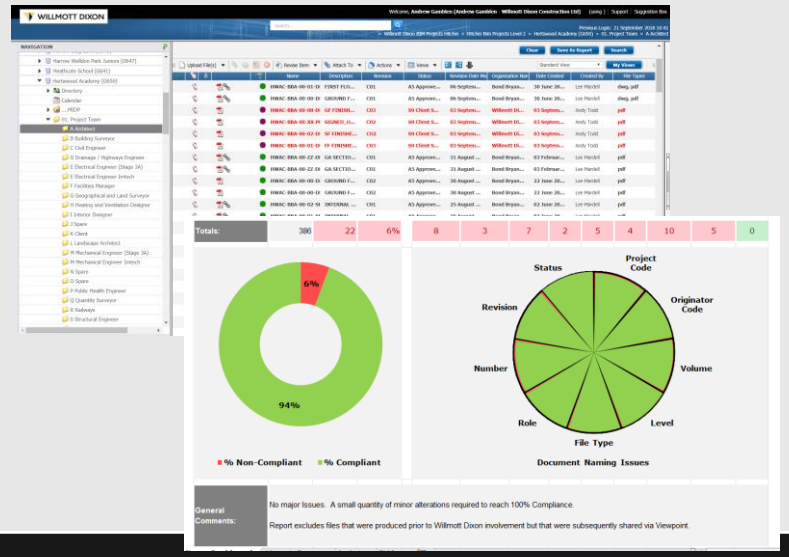
BIM v Digital

BIM

- A process backed up by standards
- Provides a Data Foundation

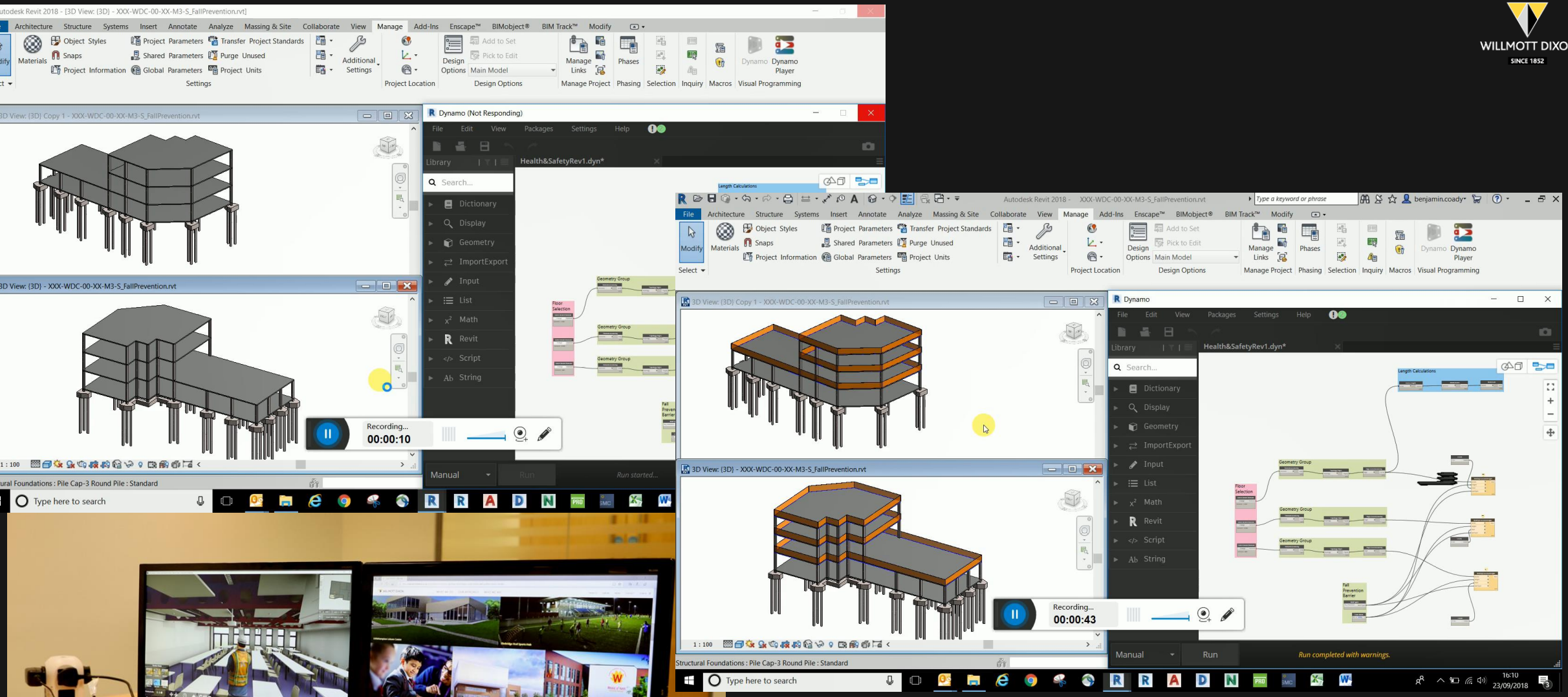
Digital

- Builds off the Data Foundation of BIM and uses Technology to provide efficiencies
- Promotes Collaboration / Mindset Change



BIM/Digital – What Have the Impacts Been?

How has BIM/Digital changed things so far?



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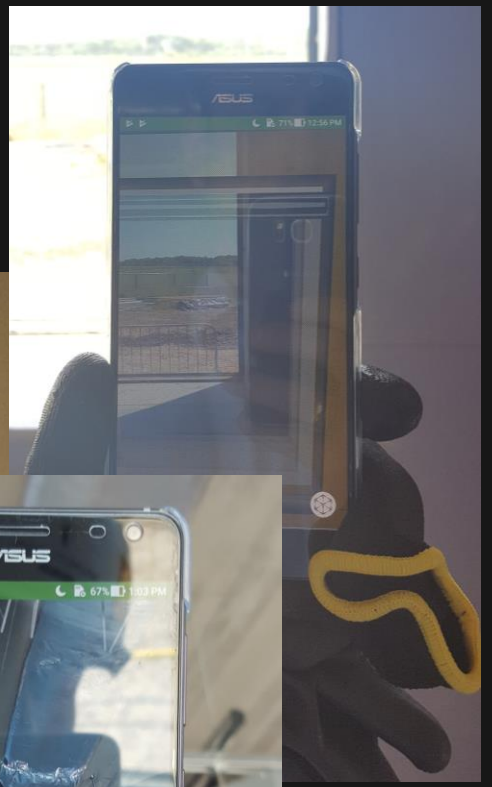

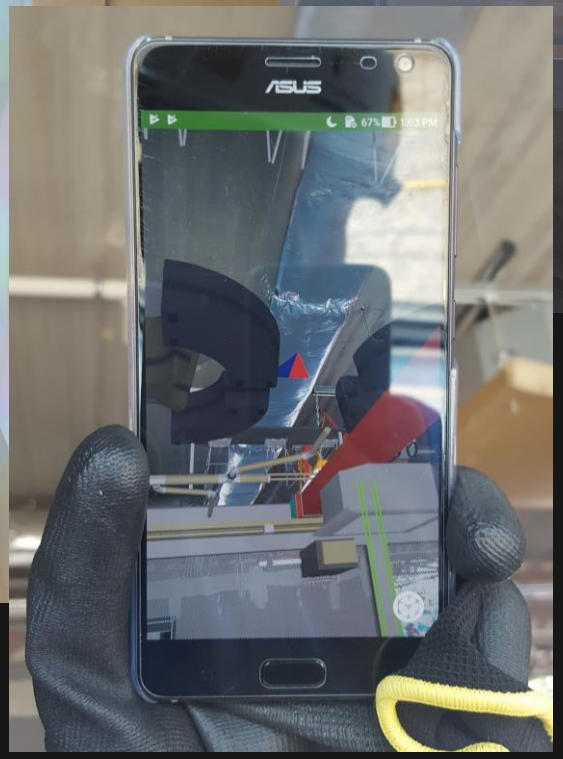

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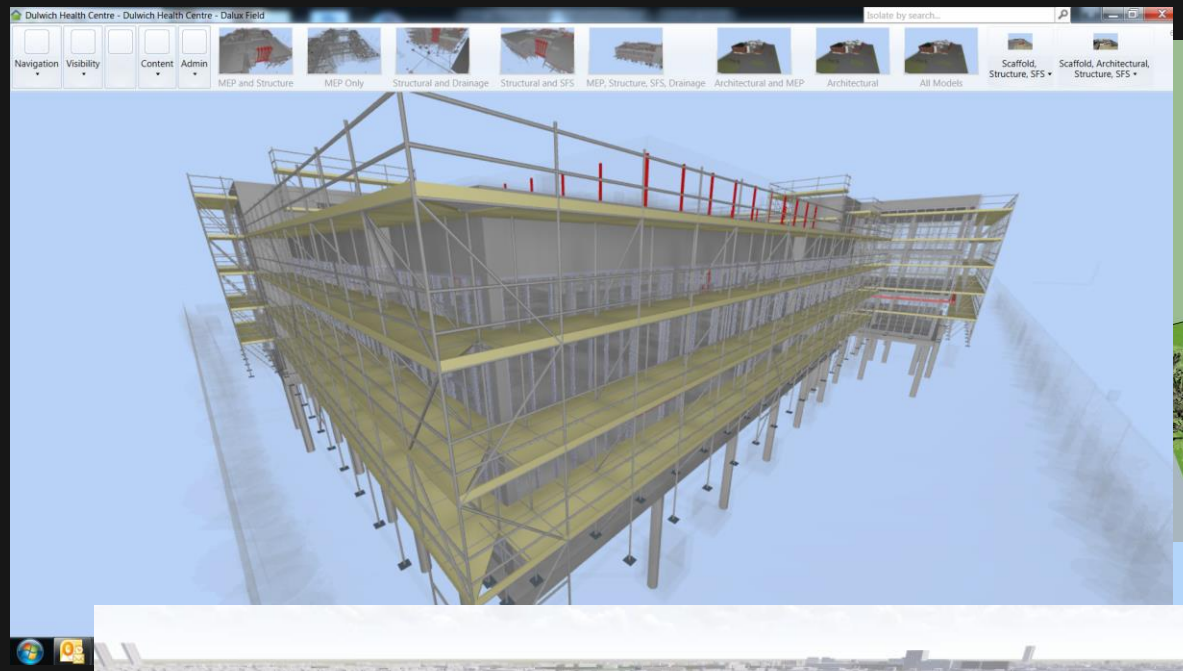


WILLMOTT DIXON

BIM/Digital – Can it Impact Off-Site?

What uses are there for Off-Site Manufacturing?

How to get BIM/Digital to Effectively Work

The Blockers

Mindset

Construction too focused on the Company rather than the Project

Software not able to speak to each other

Infrastructure (The Internet)

Hardware (Battery Life)

Ways to Overcome

Focus on the End-User

Simplicity

Speed

Has to be easier than the current way

Work primarily within current technological limitations, but investigate Ground-Breaking technologies occasionally

Where can Value be Added?

Data:

- Standardised data allowing quick access to the necessary information
- Creation of Product Libraries
- Analysis on collected data to see trends
- Using the Data to enable robotics to function

Visualisation/Quality:

- Use of Point Cloud scanners to compare completed panels/units to the design
- Virtual Tours for Customers to aid sign-off
- VR can be used for training
- AR can be used for repetitive work orders
- Construction Simulations
- RFID chips, Barcodes, QR Codes
- Using “Tracers” to overlay work onto reality

There are hundreds of other applications where value can be added

Product Libraries and Data Handover

What are Product Libraries?

- Database of products which contains specific information against each product

Why use Product Libraries?

- Reduce the time wasted collecting the same information multiple times
- Clearly see where products have been used

How does this help with Data Handover?

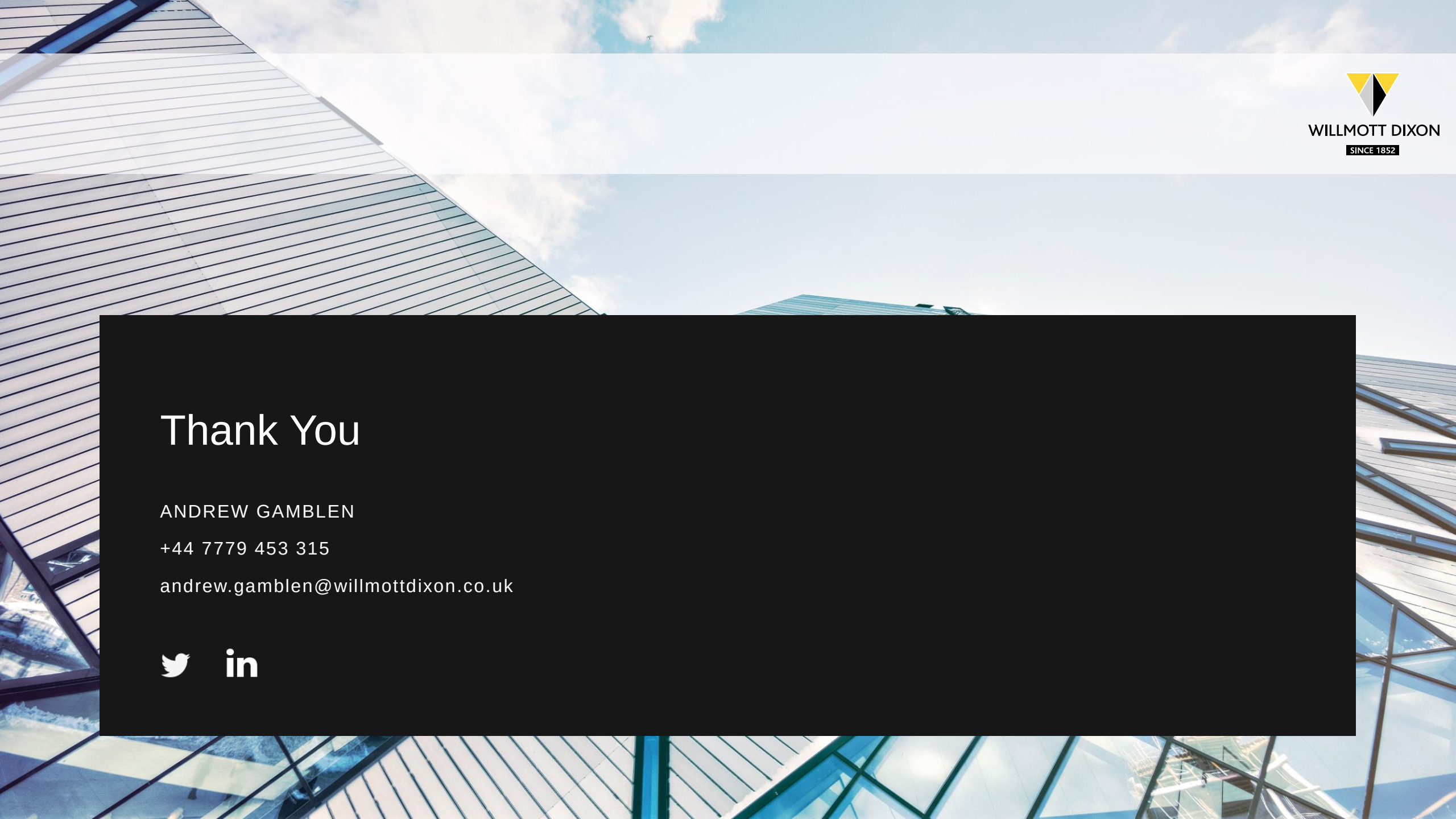
- Only need to access one location to enable provision of the requested data

How has CoBuilder helped?

- Once information on a product is entered into the system, it can be referenced again at any time
- Simplistic interface for Supply Chain to enter information
- Simple, yet complicated, system for attaching information to items in the model

How could these work for Offsite Manufacturers?

- Enables provision of an “As-Built” model containing all required information to the Customer/End-User. In a perfect world, this is your O&M.



Thank You

ANDREW GAMBLEN

+44 7779 453 315

andrew.gamblen@willmottdixon.co.uk