Estimating and Reporting Carbon for Capital Projects

Estimating | Cost Management | Change | Engineering
Equipment & Materials | Procurement | Invoice | Contracts
Field Progress | Docs | Integrator | Dashboards

Andrew Langridge

Director of Business Development
ARES Software UK Limited
alangridge@aresprism.com

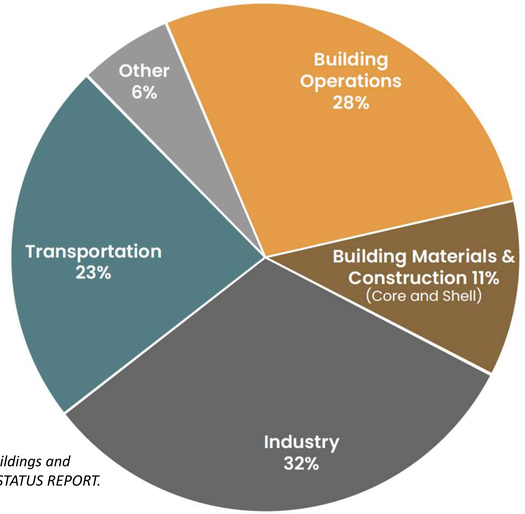
Visiting Professor University of Bath

100 Seconds To Midnight

Why Is That Important To Us?

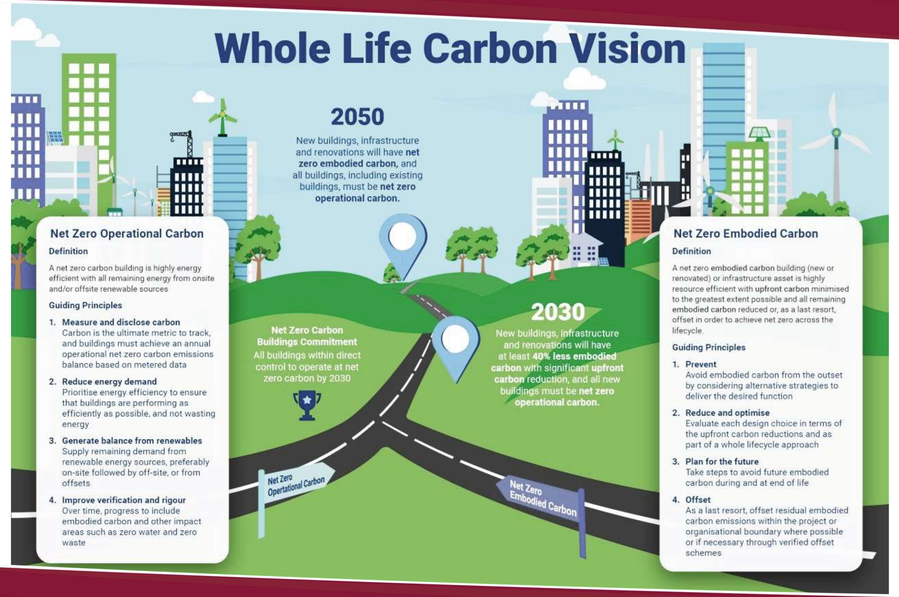
Global construction accounts for about 38% of total global emissions, with buildings equivalent to the size of Paris being built every week.

CO2 By Sector



Source: Global Alliance for Buildings and Constructions. 2018 GLOBAL STATUS REPORT.

Whole Life Carbon Vision



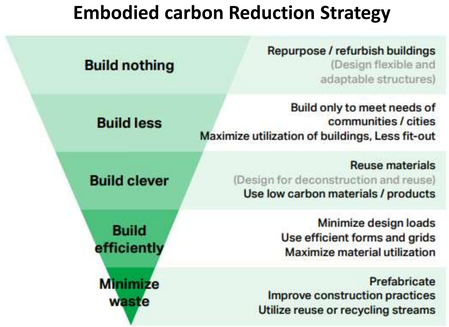
Source: World Green Building Council

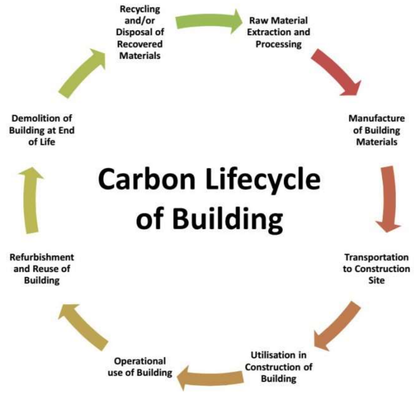
ARES PRISM

Project Controls EXPO London, UK

Multiple Climate Change Initiatives

More Countries Passing Net Zero Legislation





Source: World Business Council for Sustainable Development

Standards – PAS 2080

Following the Infrastructure Carbon Review in 2013 it was identified that infrastructure is responsible for over 50% of the UK's carbon emissions therefore PAS 2080 was designed to specifically address the management of carbon in infrastructure.

It looks at the whole life cycle of the carbon used on projects and promotes reduced carbon, reduced cost infrastructure delivery and a culture of challenge in the infrastructure value chain where innovation can be fostered.

Basics

- Cost and Carbon are not **directly** related
  - (its not a ratio)
- Whole life carbon is a function of
  - Asset delivery (Capex)
  - Asset operation (Opex)
  - Asset lifecycle (disposal, repurposing, recycling, residual)
- Carbon Net Zero **is not the same as** Zero Carbon
- We need to keep global warming under 2 degrees

The Role of Estimation

Challenge – Generate Whole Life Cost & Carbon Estimates

CAPEX (PAS 2080 A1 – A5)

- At element level allow Cost and Carbon visibility at element/component level an support
  - Material substitution to see effect on cost and carbon
  - Impact of transport for:
    - *Material*
    - *Labour*
    - *Equipment*
  - Site fuel costs
  - Support full estimate life cycle
    - *Early day / budget setting*
    - *Optioneering and design*
    - *Target cost and negotiation*

Opex and end of life (PAS 2080 B, C and D)

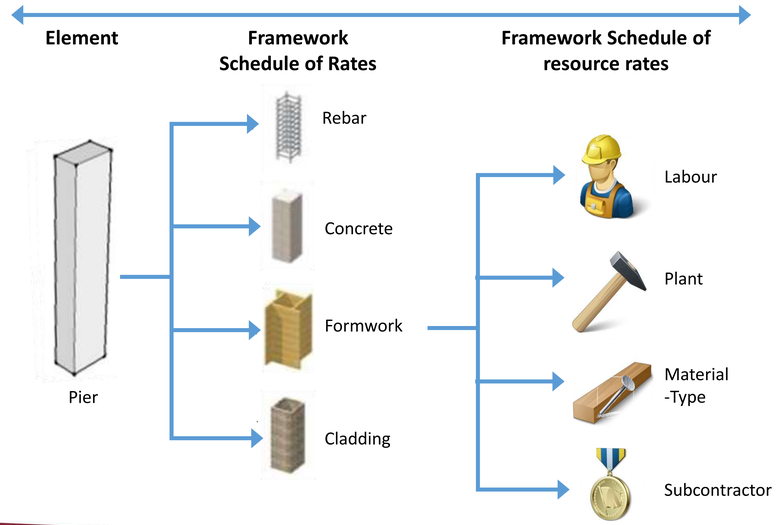
- At asset level forecast cost and carbon for:
  - Operation
  - Repair and replace
  - Demolition
  - Residue carbon
- Also look at:
  - Circular economy
  - Repurposing
  - Links to asset management
  - Condition based monitoring and maintenance

ARES PRISM

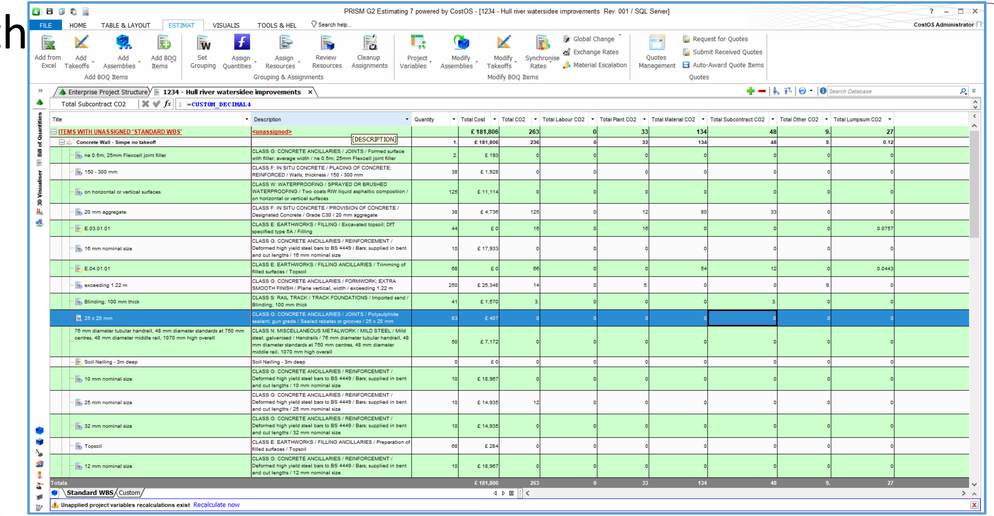
Project Controls EXPO London, UK

Carbon At Resource Level

Planning Activity Structure – Asset Screen which contains:



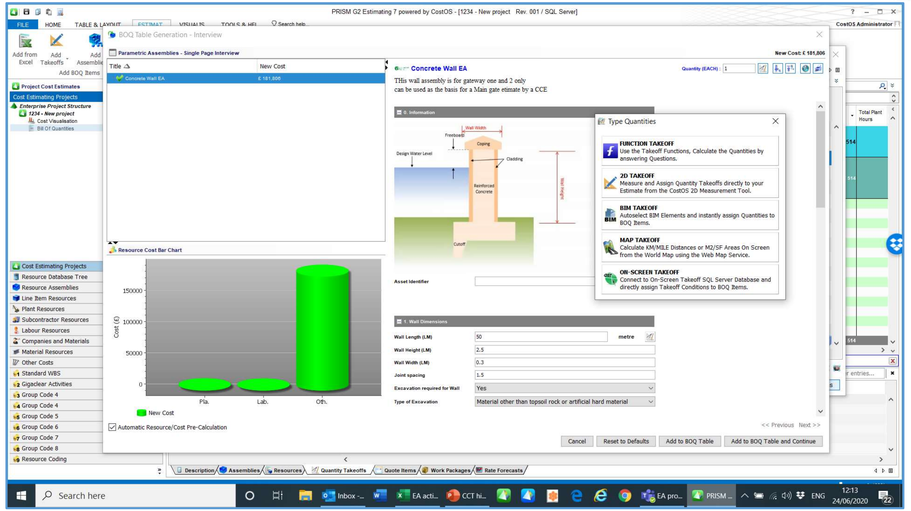
Example Bill of Quantities with Carbon



ARES PRISM

Project Controls EXPO
London, UK

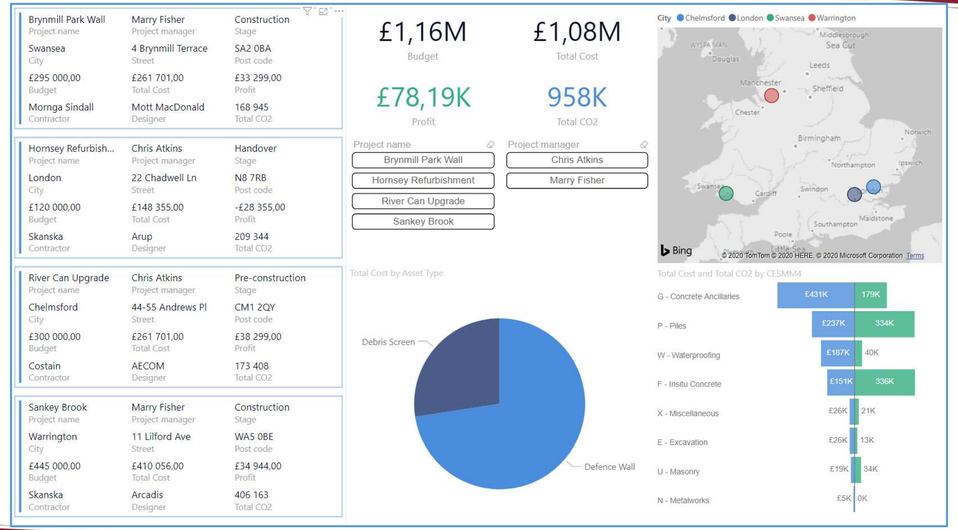
Takeoff Linked to Assemblies



ARES PRISM

Project Controls EXPO London, UK

Project by Region – Cost and Carbon

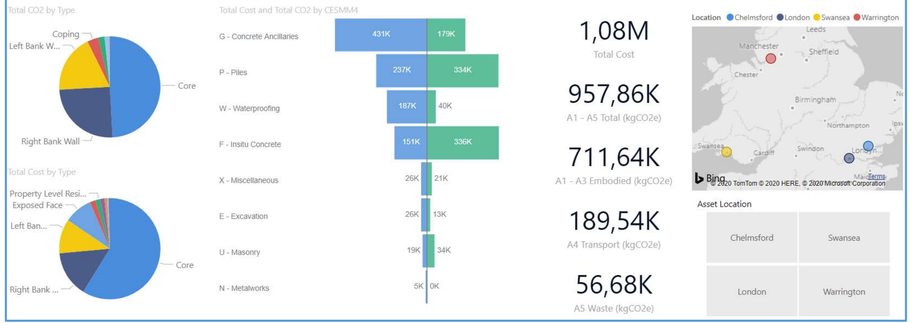


ARES PRISM

Project Controls EXPO
London, UK

Cost and Carbon by Type

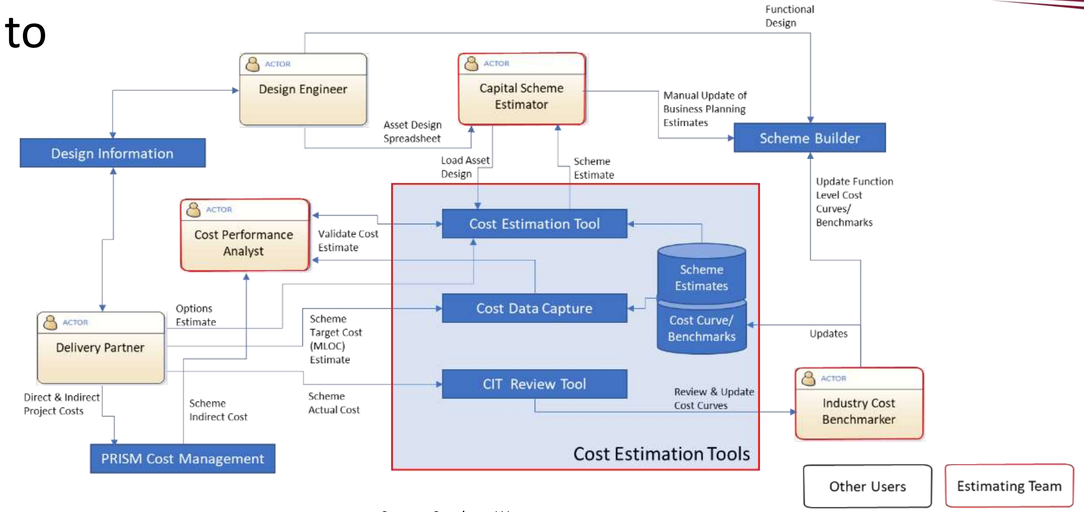
Asset Location	Asset Type	EA DRL Group	Title	Quantity	Unit	Rate	Total Cost	A1-A3	Transport (km)	A4	Wastage %	A5	Total kgCO2e
Chelmsford	Defence Wall	Core	Disposal of Excavated Material	126.58	M3	17,21	2 178,92	0,00	150	3 323,20	0,05	0,00	3 323,20
Chelmsford	Defence Wall	Core	Excavate material other than topsoil, rock or artificial hard material	126.58	M3	3,40	430,82	0,00	0	0,00	0,00	0,00	0,00
Chelmsford	Defence Wall	Core	Excavate topsoil	105.44	M3	0,62	65,49	0,00	0	0,00	0,00	0,00	0,00
Chelmsford	Defence Wall	Core	Formwork: plane vertical: 0.4-1.22	1 265.24	M2	38,04	48 125,65	6 199,66	300	602,32	0,05	309,98	7 111,96
Chelmsford	Defence Wall	Property Level Resilience	Gabion Wall: Placed on river bank above water level: Zinc wire mesh 80mm: random filled by hand with broken rock of cubic character: average mass 2 - 10kg: Size: 2 x 1 x 1m	33.00	EACH	169,84	5 604,65	221,43	300	7 925,39	0,05	11,07	8 157,89
Chelmsford	Defence Wall	Coping	Parapet copings	210.87	LM	30,23	6 375,10	9 137,11	175	2 045,26	0,01	91,37	11 273,74
Chelmsford	Defence Wall	Core	Placing concrete: reinforced: bases : 300 mm	126.52	M3	27,93	3 534,06	0,00	0	0,00	0,00	0,00	0,00
Chelmsford	Defence Wall	Core	Placing concrete: reinforced: walls : 250 mm	158.15	M3	33,52	5 301,09	0,00	0	0,00	0,00	0,00	0,00
Total				**24 028,91**			**15 042,26**	**1 081 812,32**	**711 639,45**	**12995**	**189 542,23**		**56 678,50**	**957 860,18**



ARES PRISM

Project Controls EXPO
London, UK

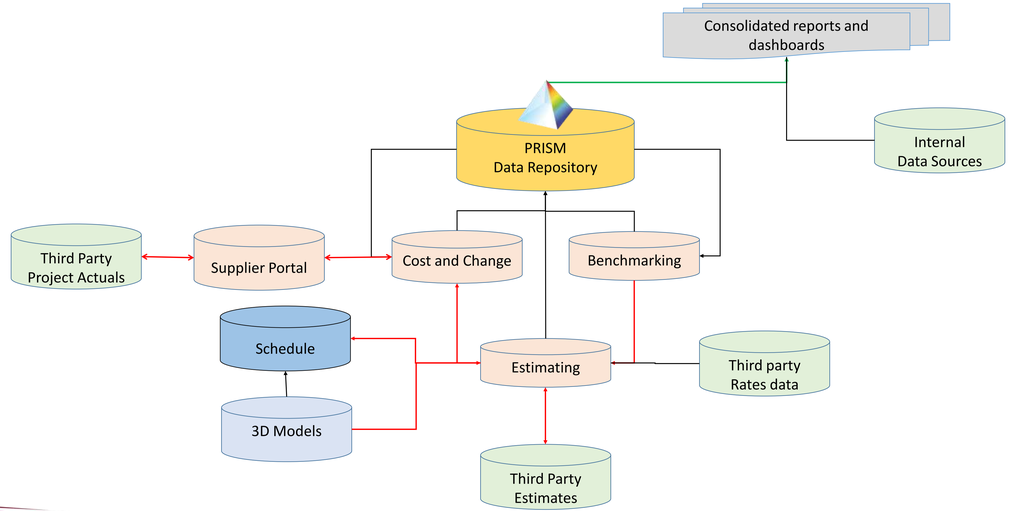
Carbon is Natural Extension to Cost Intelligence



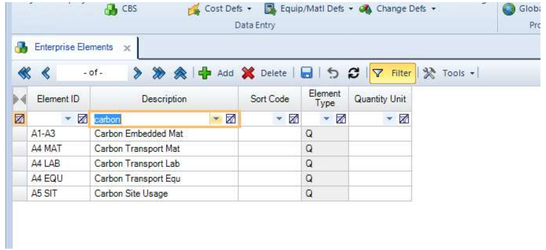
Source: Southern Water

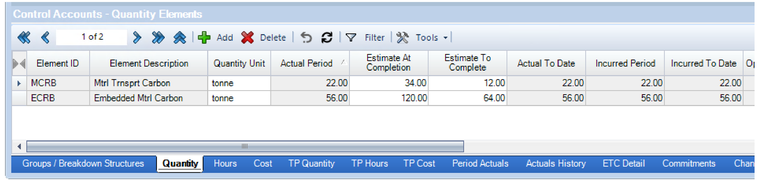
The Role of Project Controls

Common Data Environment



Capture Actual Carbon and Cost





Carbon Tracking From Cradle to Grave

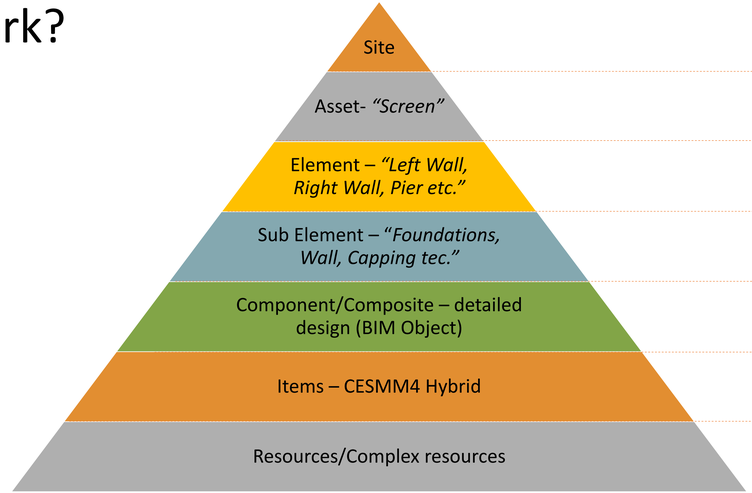
Reporting Period	Lead Organisation	Category	Material	BUDGET	Functional unit	Embodied Carbon Budget Utilisation	Embodied Carbon Actual Utilisation	Variance
March 2021	Narnia Inspections	Plastics	ABS pipe - 168.3 mm outer dia., 7.7 mm thick	178	m	11859.462 kgCO2e	11859.462 kgCO2e	0.00
April 2021	Narnia Inspections	Plastics	ABS pipe - 168.3 mm outer dia., 7.7 mm thick	72	m	4790.538 kgCO2e	4790.538 kgCO2e	0.00
May 2021	Parent Company	Metals	Aluminium bar	171	kg	5053.904 kgCO2e	4913.6 kgCO2e	-140.30
June 2021	Parent Company	Metals	Aluminium bar	329	kg	9734.848 kgCO2e	9464.304 kgCO2e	-270.54
July 2021	Parent Company	Metals	Aluminium bar	508	kg	15037.984 kgCO2e	14620.328 kgCO2e	-417.66
August 2021	Parent Company	Metals	Aluminium bar	454	kg	13444.32 kgCO2e	13071.064 kgCO2e	-373.26
September 2021	Parent Company	Metals	Aluminium bar	262	kg	7743.064 kgCO2e	7527.872 kgCO2e	-215.19
October 2021	Parent Company	Metals	Aluminium bar	77	kg	2265.88 kgCO2e	2202.832 kgCO2e	-63.05
May 2021	Parent Company	Metals	Aluminium extruded	40	kg	1171.296 kgCO2e	390.432 kgCO2e	-780.86
June 2021	Parent Company	Metals	Aluminium extruded	77	kg	2255.862 kgCO2e	751.758 kgCO2e	-1,504.10

The Role of Benchmarking

Key Strengths of Benchmarking

- Integrated with Estimating and Cost Management
  - Estimate to estimate
  - Estimate + scope change to actuals
- Import external data to benchmark against
  - Multiple benchmarking portfolios
  - Multiple coding capability
- Normalise using indices, location factors, currency conversion
- Generate cost analyses, benchmarks and plot charts
- Feed new benchmarks back into the cost and carbon intelligence environment to improve

Where Can We Benchmark?

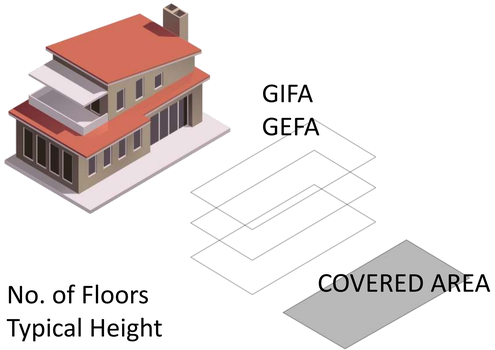


Enterprise Project Structure - Project
Assembly within A Project
Element within Assembly
Sub Element dependant on Element within Assembly
3D Takeoff (2D and GIS Takeoff optional)
Line Item Resources
Resource Libraries

ARES PRISM

Project Controls EXPO London, UK

Project Level Attributes



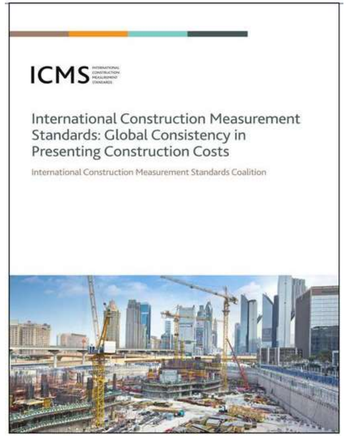
Functional type : Residential
Nature: New Build
Grade: Medium Quality
Environmental Grade: B, Status: Targeted

Principal Design Features
Structural (predominant): concrete
External walls (predominant): brick/block
Environmental control: air conditioning
Degree of prefabrication: less than 25%

Project Complexity
Shape (on plan): rectangular
Design: simple
Method of working

ICMS at COP 26

ICMS is an international standard created to provide organizations with a consistent means of grouping, classifying, and reporting construction and infrastructure project costs. The standards provide categorizations for all the costs associated with a project and is meant to provide consistency across countries and locations.



Already Receiving Recognition

BCIA Awards 2021 – Finalists for Innovation Projects

Summary

- We all recognise we have a problem
- We, the Project Controls profession, are in a position to facilitate a change within our industries
- We don’t know all the answers but that should not distract us from starting
- We MUST combine Cost and Carbon in all conversations

Any Questions?

Meet the ARES PRISM team at
Stand 10