## DESIGN FOR THE EDGE NOT THE AVERAGE

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## **Standardisation vs flexibility**



### **Platform principles**



lustrialisation	The removal of unwanted variability – in how assets are conceived, designed, built and how they perform. Making an industry that looks more like the manufacturing sector to overcome growing challenges with skills, materials and predictability and increase customer and supply chain focus.				
oduct tforms	A particular strategy to strike a balance between repeatability and variability – <b>reducing complexity</b> <b>internally, while providing choice externally</b> . Includes kit of parts, associated processes and relationships, with define interfaces to variable elements to accommodate choice whilst preserving repetition.				
MA	A design approach, emphasising ease of manufacture and ease of assembly (cf design for construction)				
<b>NC</b>	Techniques aimed at reducing the need for onsite labour, including offsite manufacturing and the use of digital technologies. Can increase efficiency and quality, while reducing duration and environmental impact				

### **Designing for the average = designing for nobody**



### The Project has finished! Long live the Project!

We **love** projects. We approach each differently every time. We have an amazingly diverse industry, set up for flexibility and customisation. Great, right? Well...

## £23bn

20% of CAPEX is spent on error (GIRI)

## 700k

30% of UK construction workforce older than 50 (ONS)

## 25%

All workplace injuries in construction (ONS)

## **7**t

Waste to landfill per newbuild house (Innovate UK)

## 400/year

Suicides among construction workers (cf 30 fatalities on site) (ONS) Widespread adoption of a platform approach for social infrastructure could offer the UK public sector:

## £1.8bn

potential annual CAPEX saving

## £7.8bn

potential real GDP improvement

# Save and improve lives



### The UK Department for Education is on an iterative journey of standardisation







Standardisation of SoA and teaching spaces to suit a construction grid

Clusters of smaller spaces on simplified grids included in Gen 5 MMC guide. Piloted to target issues via traditional routes Larger spaces (halls and commons). Rationalisation of spaces using a "one size fits many" approach. Development of net zero product platform (Gen Zero).



A scalable heat decarbonisation approach, called Energy Pods



### The approach has resulted in increases in productivity and performance.

### View at portfolio level

UK school costs are benchmarked annually and published. After indexing, there is a downward trend in primary school costs by 15% since 2012. The trend indicated is attributed to the adoption of more delivery through collaborative arrangements and adopting a more cost driven and standardised approach and is despite prevailing market conditions (including HS2 demands).



### View at supplier level

The DfE's approach has provided **certainty and stability** to enable firms to improve both productivity and performance. Stability and certainty is both technical (since requirements are consistent across projects and updated on a published cycle) and commercial (since there is a clearer and more certain view of potential work and the associated procurement mechanisms).

This has allowed Bowmer + Kirkland, a construction and development group, to meet **a price-rachet of 2.5%** as part of the framework, improving **productivity performance by 14.6%** over 46 projects whilst delivering greater complexity products for the DfE, since 2018, through:

- Repeated and systemised designs that provide stability and clear constraints
- Continuous improvement of production through greater use of manufacturing approaches
- Improved strategic relationships with key suppliers, based on optimising parts for a systemised approach, enabling investment in improved solutions
- Increased design standards beyond Part L, driven by the DfE, directly increased product quality for air tightness and thermal bridging, whilst reducing cost and driving down carbon.

### GenZero is the latest stage in this iterative development







smithandwallwork engineers CUNDALL



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### Standard curriculum models provide a basis for technical design



# These are supported by massing, stacking and servicing rules, as well as kits of parts for structures, services and FF&E



**Structure**: Standard elements (timber-concrete composite, glulam, CLT)

**Services**: risers, electrical cupboards, acoustic treatment, locker recesses, future flexibility



**FF&E**: Rationalised for teaching, admin and kitchen spaces

Plant: Air handling units, plant rooms, heat generation, water storage, WC modules





## Modules can provide 6 school types and >70 configurations according to user needs and site constraints, and allow kits of parts to be generated.

#### Constrained (urban) site



#### Unconstrained (rural) site



#### Custom kits





General teaching

Support spaces

spaces

Large



Staff &

admin

Prep & stores

## This provides high certainty of improved outcomes – education, energy, cost, cost and programme certainty – whilst remaining flexible.





#### Procure Frameworks Adoption by **Building Notes** The Oxford Method **NHS Systems** Harness system HBNs defining the DGH and An integrated system for Departments were Standard rooms and Wave 1 schemes approach departments, including design design, production and assembled like Lego in a components for cost Integrated approach First hospitals using and cost information, clusters, construction data aimed at "harness" of engineering savings, including single included CUBITH, MDB, H2.0 services and comms with services, SoA and calculation reducing design and rooms, 4-bed bays, ADB, DBS, CAPRICODE. methods. Accelerated design construction time, used for over strict modular coordination consult/exam, mental health, Legacy of activity focus, 30 schemes and exported. and assemblies. 70 with confidence. and emergency rooms... A,B,C sheets. planned, 2 completed. 8 10 2 6 4 1974 2015 1948 1961 1962 1963 1964 1965 1966 1967 1968 1969 2023 3 5 9 11 **NHS** founded **Best Buy standard** Standard **Nucleus hospitals** Hospital 2.0 A hospital plan for Inspired by Harness and Best An integrated systems No centrally planned, hospitals **England and Wales** departments

managed or agreed hospital definitions or standards

## Series of DGHs serving

defined populations. Cemented departments and bed numbers as key units.

"Adequate" two storey buildings with reduced spaces and simple construction methods (RAAC) with natural light and ventilation.

Continued development of standard departments

Buy, the system used stackable cruciform templates for hospitals but neglected population-service links; 130 built.

approach to hospital planning, design and delivery.

# Nucleus hospitals provided an integrated approach to affordable healthcare, with key principles baked into the system.



### Deployment of Nucleus was well developed with combined clinical, technical and commercial tools.

Clinical departments in multiples of 1000m<sup>2</sup>

Service and industrial areas in multiples of 29m<sup>2</sup> 3m wide hospital street, vertical elements and energy sources and plant rooms (roof level)



Typical Nucleus hospital could provide 2 storeys, 250 beds, 12 clinical areas and 72 modules of support for £6m (1976 prices\*).



#### Design materials were supported by the CAPRICODE commercial system

Whole hospital policies and design briefs; coordinated room data (layouts, equipment); guidance on communication zone.

1:50 engineering drawings for all services, elemental costs; load norms; lighting and

1:200 key line and fire drawings; 1:50 drawings for Group 1&2 equipment; specification notes.

ventilation at 1:200.

Cost plan; departmental costs; SoA; examples including on costs

#### Options for expansion and phasing



Planned misuse of like spaces



Addition of more accommodation



Change of use of (e.g.) admin space



#### Standard example layout (2

Inpatient unit

inpatient uni



Flows



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Typical 4-bed bay

Typical consult/exam room





Designed around user, workforce and location needs, and compliance. Easy to configure for a range of sites. Maximise natural light, flexibility and adaptability.



System engineered for rapid construction, using repeatable, off-the-shelf compliant modules.



Sustainably manufactured and cost-effective demountable system with multiple uses. Net zero compatible - low footprint due to energy performance, low impact on the site, and ease of construction, clever transportation and storage.

### Large-scale programmes can require supply chain interventions. A platform approach provides better data to support decisions.



#### Outputs (illustrative)



#### Profiled demand of systems, items, skills



#### Geographic heatmap over time



### There are huge opportunities to be gained for getting this right, and designing for the edge not the average.

### Know why you're doing it and what's important

Engage stakeholders Focus on key drivers Find the edges Embed drivers

## Get commonality right

Learn from the past Accommodate variability Expect departures, abnormals and change. Technical and commercial work together

## Think carefully about deployment

Engage early with designers, suppliers and users Embed continuous improvement in data, systems and processes





Today's standardization...is the necessary foundation on which tomorrow's improvements will be based.

If you think "standardization" as the best you know today, but which is to be improved tomorrow – you get somewhere.

But if you think of standards as confining, then progress stops.

Henry Ford

