# Costs and carbon

**What is 'P-DfMA' and how does it help to reduce construction costs and reduce carbon? In this article Wojciech Brożyna explains the basis of this innovative approach to construction and suggests how it could revolutionise our future construction requirements**

Platform Design, better known in the construction industry as *A Platform approach to Design for Manufacture and Assembly* or P-DfMA. It is a specific subset of DfMA, which is the general term for using prefabrication and automation applied on a project-by-project basis. P-DfMA is a solution that is designed to be used more programmatically across a range of projects or assets. Initiated by the UK Government in 2017 in its drive to cut costs for new buildings, such as schools, hospitals, offices and social housing, the construction approach takes its lead from the automotive and aerospace sectors. Defining the construction product requirements, such as internal spaces, storey height, access requirements, to name but a very few of these parameters, the aim is to standardise these requirements and begin to create a list of standard parts that creates those spaces. Doors are a very good example of this approach, available in a range of materials, sizes and hardware options, once adopted as a standard product across many projects, costs can be significantly reduced. Including offsite construction to this, whether delivering the product to the site as a kit or in a pre-constructed form, not only lowers costs but also minimises on-site labour, expedites construction on site, and reduces site defects. The same approach can be used in facades and fenestration projects.

To be fair, aluminium fenestration has seen much of its

**Wojciech Brożyna**

construction being undertaken off-site for many years, but much more can be done. Window construction can easily follow what has been done with door sets by adopting standard sizes and hardware options. Windows can be supplied to the site already glazed and installed within panel construction. Curtain wall requirements adopt an off-site unitise dconstruction approach which we know already reduces time on site by approximately 50% whilst further improving quality.

A review of five recent projects supplied by Aluprof UK shows the supply of special lengths alone has reduced material supply by an average of 27.5%. Not only does this save on costs but has a significant impact on carbon reduction. But this can go even further. Using a standard product size, profiles can be designed that work nearer to their safety limits over a given size or length which can further optimise aluminium content. Adopting a specification of a low-carbon content, usually high in recycled aluminium with low-carbon prime aluminium, further reduces carbon content of these assemblies.

It is not just about cost and carbon saving, it is about getting better buildings. From the government's own analysis under its current construction framework, for every £1 spent just 51% is retained in residual asset value. Reducing time to install on site, reducing wastage, reducing deliveries to site by adopting off-site construction, reducing on site design, all of which reduce ove rål site time and programme and all have a big impact on carbon reduction as well. Using a standard kit of parts reduces the need for bespoke designs which can go hand-in-hand to improve overall quality.

It is also an iterative process, what is learnt on one project leads to a fine tuning of the kit of parts which in turn leads to even better future construction and a continuation in the reduction of carbon. As a result, the P-DfMA approach increases productivity, whilst reducing carbon, construction time and cost.

In a world first, a major project completed under the P-DfMA is The Forge, located just south of the Thames in the city of London. The building is also the first to adopt the UK's Green Building Council's definition of a net-zero carbon building in both construction and operation. ❐

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Aluprof was invited to take an early design role in developing a unitised facade system that meets the P-DfMA specification pioneered by architects and engineers Bryden Wood. Construction was led by Sir Robert McAlpine and Mace, working together in a joint venture partnership.

Jaimie Johnston of Bryden Wood says: "The collaboration with Aluprof was fantastic. It was great to have a partner with such a depth of manufacturing experience who really understood and amplified the benefits of a platform approach. We hope that others will learn and build on the success that was achieved at The Forge and we'll start to see platforms adopted at scale."

Padraig Delaney, London regional manager for digital construction at Sir Robert McAlpine, in his role working with the construction team, sees The Forge as a model for how future projects should be delivered: "The innovation-led approach taken by Landsec has allowed us to push the boundaries with our use of technology. The more data we have, the better our decision making. It is also important we have the right tools to help us get the most from the data. By driving these digital solutions, as we have done at The Forge, we are transforming the way we will deliver future projects, identifying the value to each stakeholder and ultimately providing the best value for our clients."

Tom Cherowbrier, Aluprof's major projects manager says: "The bespoke system from Aluprof is finished in three shades of bronze anodising which will offer a sustainable finish and an aesthetic appearance for many decades to come. The new system was designed with a standard +/-15mm stack joint to accommodate the building movement, as well as an impressive non-standard stack joint for the 7th floor which had to accommodate a +20/-30mm movement. The project also has a range of external feature fins with concealed fixing to provide the building with sight-lines of 120mm and 170mm that project 125mm or 225mm from glazing line."

The unitised curtain wall system, designed in close collaboration with Bryden Wood, allowed us to develop a highly-efficient facade unit. The full-size mock-up unit was rigorously tested in our own research and innovation centre in Ogrodzona where it passed air leakage, impact, wind resistance, and water penetration tests. These units were transported on purpose designed, reusable stillages which were lifted to the floor plates for installation by specialist installers NACWL. A key feature of the stillage design was to protect the units from any stress and impact during transportation and lift. The new bespoke system was named MB-SE120 with a U value of 1.3 W($m^2$K)."