Critical **Thinking**

April 2020

HDR | Hurley Palmer Flatt Group

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Contents

The Carbon Spa: Time to De-Carbonise and Revitalise

By Paul Scriven, Divisional Director, HDR | Hurley Palmer Flatt

Building owners and developers need to think seriously about how they manage their properties if they are to stay ahead of Government sustainability targets, says HDR | Hurley Palmer Flatt Divisional Director, Paul Scriven, who is looking at how de-carbonisation is impacting the United Kingdom (UK).

At the very least, the extremes in weather that we have witnessed across the globe over the last few months have concentrated the mind. The bushfires in Australia and record levels of flooding closer to home in the UK, have made everyone sit up and pay attention to the problem of climate change.

In the UK, the Government has stepped up to the climate challenge with a raft of measures intended to help reduce our carbon footprint. The impact the building and construction sector has on global carbon emissions are huge. According to the United Nations Environmental Programme 2019 Global Status Report for Buildings and Construction, the sector accounts for as much as 39% of energy-related carbon dioxide (CO_2) emissions. A staggering measure that has attracted the attention of both Government and industry.

Targets set under the Climate Change Act in 2008 to reduce net carbon emissions by 80% before 2050 were upped in 2019 to a 'Net Zero' goal across the same timescale. It is currently understood there are to be closely monitored milestones every decade so that some indication of the progress that is being made can be measured.

Those targets are likely to prove challenging, both for the wider UK but also building owners and developers. Challenging but not unattainable. We have made good progress since those initial targets were set in 2008 and although meeting the latest Net Zero goal will be much tougher, we are more than capable of doing so.

Behind those tougher targets is the development of several new levels of policy, legislation and regulation (PLR) that will help the UK hit its environmental commitments. Despite many of them aiming towards the same goal of energy efficiency and decarbonisation, the raft of legislation features several implementation dates and performance deadlines that could influence the ownership, architectural style, design and use of buildings.

It is an area where our Energy and Sustainability Division has plenty of expertise. Successfully navigating a route through the technical challenges of new and evolving environmental and sustainability-based legislation is what they do.

With new Building Regulations 'Part L:2020 Conservation of Fuel and Power' as well as 'Part F: Ventilation', due to be implemented later this year (Q3/Q4), and the next generation of the Energy Performance of Buildings Directive (EPBD) drafted into UK law, is likely to prove to be a year of change if all pushes ahead and irrespective of Covid-19.

The EPBD underlines the aim for all new buildings to be so energy efficient that they can be rated 'Nearly Zero-Energy Buildings' (NZEB). It also calls for steps to be in place that ensure existing buildings are refurbished to similarly high standards.

Even the type and method of production of energy used to heat, light, ventilate and cool our buildings is under scrutiny with demands to significantly reduce carbon emissions per unit of electricity generated. With regulatory requirements currently using an electricity carbon factor of 0.519kg/CO_2/kWh, decarbonisation of the grid is already approximately half of this with a target of becoming a fifth of that level at just 0.1kg/CO_2/kWh by 2030.

Meeting these new efficiency targets will be challenging for building owners and developers, particularly with those that have buildings in design or in the first stages of construction. We have a tremendous amount of expertise within the team that can work through those challenges to provide a solution that works for everyone.

With further guidance and improvement goals set to be introduced - including moves to ban gas supplies to all new homes from 2025, revised Transitional Arrangements being considered and the development of the Future Homes Standard - the path to carbon zero can be confusing for clients and professional design teams too.

Large scale developments can have build-out programmes stretching beyond a decade. With all these different timescales for improvement, there are question marks for all stakeholders. How does the Government get the best out of these improvement changes? How do authorities identify that buildings or dwellings have been built to the required standards? For effectiveness, the Government and authorities would prefer to work on the basis of individual completions rather than give an entire phase or site-wide development the 'all clear' - but that could prove problematic for some developers and contractors. We are finding this is where all our industry knowledge and experience comes into play as 'Added Value' to help clients make informed choices which are right for them and their project(s).

With several different layers of policy, legislation and regulation (PLR) influencing the energy efficiency and carbon footprint of our built environment, developers and designers can be left with a difficult decision. Do they risk over-specifying and absorb the potential financial impact on a development? Alternatively, do they chance a project being completed on time and avoid the repercussions of the ever-changing PLR, therefore hoping to avoid the financial burden of retrofitting at a later date?

Some enlightened – or financially capable – clients are looking into the future and beyond with their vision for their schemes and own social corporate responsibility. Some are already demanding that designers go beyond any existing regulation and anticipated future levels, to produce 'carbon negative' developments, whilst others are setting Net Zero carbon targets for 2030. Whether these sorts of high-performance projects can be delivered without the buildings becoming 'All Electric' is a moot point based on the infrastructure and fuels at hand right now.

As renewables make an increasing impact on UK electricity production and fossil fuel sources less so, the all electric building could be the next logical step for the property sector, at this moment in time. Certainly, there will be movement away from gas and gas fed Combined Heat and Power (CHP) sources.

The move toward zero-carbon needs to be understood by clients, building owners, occupiers and developers, if the UK is to make an impact on delivering a built environment that helps the country meet its environmental targets. In such a volatile marketplace so cluttered with policy, legislation and regulation that can be a very difficult task.

As consulting engineers, it is our job to ensure our clients recieve get the best advice available at the time and to this, we will continue to engage with industry and new/evolving technologies to support this optioneering and the approach of providing advice, which is right the first time.

Thanks to the experience of the HDR | Hurley Palmer Flatt team in delivering robust solutions to these challenges, they are not insurmountable and with a wide network of in-house professionals strategically located across the globe working on an array of low to zero carbon solutions we are confident that we help our Clients realise their goals, if not exceed them too. ◆

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Automation of Business Processes through Intelligent Information Management

By Floriano Ferreira, Divisional Director, HDR | Concentre Consulting

Our appetite to have information at our fingertips, is insatiable. Today we stream more, download more, and increasingly create more content to share with those in both our social and professional networks. But how much data do we generate, and how do we manage it?

Data pundits are in broad agreement that the volume of data in the digital universe will double every two years. Of all the data we have produced globally, 90% of this has been generated in the past two years alone[1].

Every Day:
- Worldwide there are 5 billion web searches;
- More than 3.6 billion humans use the internet; and
- We conduct more than half of our web searches from a mobile phone.

Every Minute:
- More than 120 professionals join LinkedIn;
- 456,000 tweets are sent; and
- Instagram users post 46,740 photos.

These examples are a sample of what we do in our daily lives but we need to question what this means for our industry. How do we compare, and most importantly, what are we doing to manage and consume this information in ways which drive optimisation, efficiencies and value?

In the current environment it has never been more important to get data management right. According to a study by IDC, up to 30% of a single workday is spent searching for information.[2]

1 Marr, Bernard. How Much Data Do We Create Every Day? The Mind-Blowing Stats Everyone Should Read. Forbes, 9 July 2018.
2 IDC: The high cost of not finding information

The Architectural, Engineering and Construction (AEC) industry play a role in data production and this is set to grow. Projects are becoming increasingly complex with more data generated and exchanged than ever before. The challenge is not just about producing data but managing it effectively, finding it and understanding it.

Another widespread challenge is that the growing amount of data is unstructured and therefore does not always present itself in a useful form. Enabling employees to quickly find information when they need it is the most compelling reason to implement an Information Management System (IMS).

Despite the growing amount of data in its business context, the AEC sector still lags behind in fully harnessing the power of utilising these concepts in its end products and daily operations. More often than not, we find organisations wrestling with a variety of challenges, such as in Figure 1.

So how do we respond to this challenge? There is not a single answer to this complex question, no silver bullet, no single technology solution, methodology, or process. The solution and correct approach are a dynamic combination of strategies, processes and technologies which can be used to capture, store, manage and deliver information to support key organisational processes through its entire lifecycle.

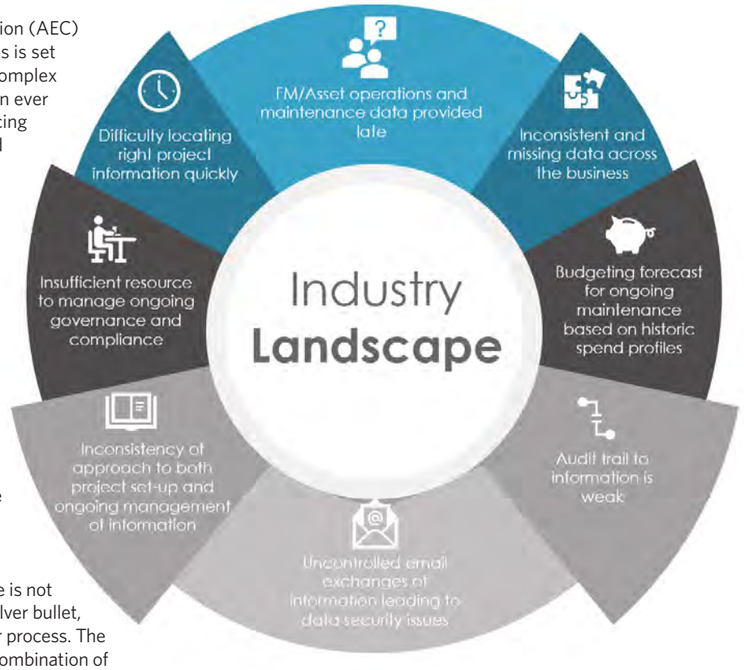


Figure 1: Organisation Challenges

Information Management (IM)

IM is more than just storing and archiving documentation. A well implemented IMS can have a multitude of practical functions and benefits including:

- Document management
- Search for documents and information
- Records management
- Digitalisation of materials with Optical Character Recognition
- Review and approval workflows / business process management
- Email management and archiving
- Collaboration
- Business data standardization
- Audits
- Reporting

Most commonly known Information Management Systems today, have built-in intuitive metadata searching capabilities. With such a system in place, an Engineer can look for information by searching for a particular file type, such as a schematic or a reflective ceiling plan, and defining the building level as well as originator. Traditionally this exercise would output multiple results, but with the search capabilities on today's platforms coupled with a robust naming structure standard, information becomes easier to find wherever it is stored.

Adoption of such an approach benefits organisations by providing quality, integrity and accuracy on all data. The benefit of this approach is realised only if the stored data is meaningful, structured and accurate. Otherwise there is little benefit in sharing it, as few will be able to find it, understand it, and most importantly, rely and trust it.

With the ongoing expansion of client requirements and expectations, there is a growing demand for good quality data. This can be attributed to the demand by organizations looking to stay ahead in their respective markets, adopting new technologies (like automation, artificial intelligence, and the Internet of Things) but the success of this digital transformation will be dependent on their ability to establish a strong data management foundation.

Lessons Learnt

Additional to market advantages, the AEC industry is also expected to positively respond to lessons learned from the understandably emotive topic that is Grenfell. These lessons focus predominantly on transparency of information and the ability to audit it. From concept through construction to occupation, it is important now more than ever, to maintain an accurate log of all information regarding an asset.

The Hackitt Report suggests that creating a digital record across a building lifecycle is a fundamental step the industry needs to take. It also identifies a need to define which type of information should be recorded and maintained but most importantly, ensures accountabilities in the production, storage and maintenance of that data.

The key to this process is understanding what is required, who it is required from and when. Mapping this interface may appear simple but when we consider the landscape of each project, or each organization, this often has a multitude

Digital Development Chain

Supporting clients to deliver effective digital management

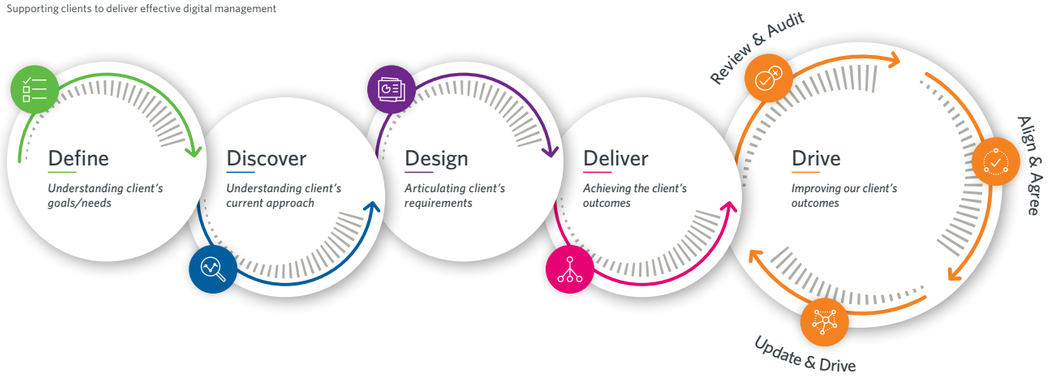


Figure 2: HDR | Concentre Consulting Digital Development Chain

of stakeholders supplying their data in their own interpreted way using their specific tools and format outputs.

Part of the HDR | Concentre Consulting's DNA is designing a client's specific roadmap, helping to navigate and ease these complexities. The duration of this journey depends on the volume of the portfolio and the size of the organisation. However, whether large or small, we are committed to achieving the best results that we can for all our clients, through the power of digital management.

Recognising that each organisation's digital journey is unique, we focus on developing a client-specific roadmap as the first step in our Digital Development Chain (Figure 3). We consider our client engagements as a true partnership, offering a strong foundation and dedication to the highest standards of service from inception throughout delivery.

For the success of both projects at a micro scale and organisations at a macro scale, it is vital to understand the system architecture to clearly identify gaps in scope and capability.

We have developed a Digital Development Chain portal, an online based tool, enabling us to assess an organisation's supply chain capability. This helps inform any gaps which may exist, and anonymously compare key supply chain member capability against that of their peers, identifying upskilling requirements. This process is also available to the organisation as a whole.

Once the requirements are identified, we tailor web-based learning modules to target the specific areas required. This enables a thorough learning journey in order to upskill the organisation successfully.

This is particularly topical in the current climate, where many of us are in lockdown. Whilst we operate in this virtual environment, the reliance on exchanging structured data efficiently is growing. We help make sure organisations and their staff, have access to the most up-to-date and relevant information at the right time. Our consultants assimilate all the key enablers of our client's projects to make sure they run as immaculately as possible and in the most transparent manner, to drive a strong digital strategy.

Out team understands that digital transformation is not just about technology but driving a cultural adjustment, placing people at the forefront of change for lasting organisational improvements. This is why we focus primarily on an organisation's people and culture so that we can re-define processes, which will be adopted to make a difference whilst embracing the correct technology. ◆

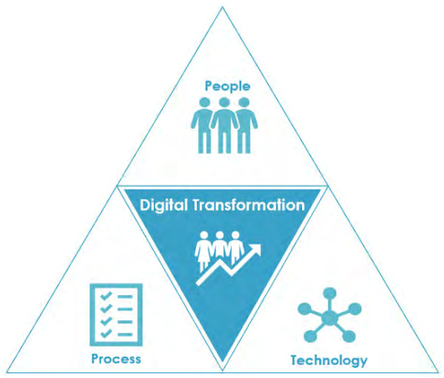


Figure 3: The Enablers of Digital Transformation

About HDR | Concentre Consulting

HDR | Concentre Consulting is a London (UK) based, leading consultancy team. We form part of the global design corporation HDR Inc. headquartered in Omaha, Nebraska. With a focus on digital transformation predominantly, but not exclusively, in the built environment, we enable our clients to obtain accurate, consistent and quality data which is easily accessible to the right stakeholders at the right time.

New Building Controls Put Climate First

By Cam Wang, Intermediate Mechanical Engineer, HDR | Hurley Palmer Flatt

Cam Wang, Intermediate Mechanical Engineer looks at controls and climate within Australia. Keeping workers comfortable in their offices with optimum heating, ventilation and air conditioning, is taking a toll on the environment. Buildings account for roughly 40 percent of the world's energy consumption.[1] However, as climate awareness increases, new building controls are aiming to reduce the effect that commercial towers have on our planet.

Take Australia, where the Government's commitment (under the Paris Climate Agreement) to reduce greenhouse gas emissions by 28 percent of the 2005 levels within the next decade, which has led to tighter building controls. These controls from the Australian Building Codes Board, relate specifically to Section J in the National Construction Code, which sets the parameters for a building's energy requirements.

One of the biggest areas of focus for these controls has been the thermal efficiency of, or how much solar heat pass through and conductive heat transfer into, windows and walls. Under changes introduced last year, the two are now considered one system for assessment, whereas they were considered as separate elements previously.

The implications of joining glazing and walls

Before the code was revised in 2019, a building's glazing was assessed on each floor in each orientation. For different window orientations there were different U-value and Solar Heat Gain Co-efficient (SHGC) requirements. This is even though in practice, builders and architects usually installed just one type of glass across the building – the one with the highest thermal performance. This was permitted through a calculation methodology known as 'Deemed to Satisfy' (DTS). Wall insulation was assessed separately to window glazing.

An implication of this approach was that costly energy modelling was required to demonstrate compliance and to obtain consistent glazing materials on all orientations.

Now things have changed. Alteration to the 'Deemed to Satisfy' methodology has allowed for wall and glazing construction to be substituted from a thermal performance perspective. This means building designers can now conduct energy performance 'trade-offs' between different orientations and facades, allowing for consistent glazing on all aspects without the cost of full-energy modelling.

1 Cooper, Dean. UNEP: Energy Efficiency for Buildings. https://www.euenergycentre.org/images/unep%20info%20sheet%20-%20ee%20buildings.pdf

Glazing comes into focus in Australia's revised construction code

These new controls have been applied successfully to a state-of-the-art office building in Mascot, Sydney, where HDR | Hurley Palmer Flatt have provided full building engineering services. Located in a warm temperate climate, categorized as Climate Zone 5 (by the Australian Building Codes Board), the building was able to meet the minimum 'Deemed to Satisfy' requirements without having to build a full-energy model. It was able to use the new National Construction Code façade calculator to achieve a 72 percent window-to-wall ratio. It would only have been around 56 percent in the previous code.

Glass thickness versus glass colour

The price of glass is understood to be more sensitive to U-values rather than the solar heat gain coefficient because U-values are directly related to the thickness of glass - that is, whether it is single or double glazed. On the other hand, the solar heat gain coefficient reflects the colour of the glass.

Unless buildings have special condensation treatment requirements, such as swimming pools, builders will typically favour the more economical approach of reducing the solar heat gain coefficient over U-value to achieve energy performance compliance.

However, the previous iteration of the National Construction Code was believed to understate the importance of the solar heat gain coefficient. Even though, a window with a greater solar heat gain coefficient, rather than U-value, could restrict more heat into a building, it would not necessarily have met the minimum requirements of the National Construction Code Section J.

The impact on energy consumption

By adopting the new edition of Section J, weighted average energy consumption and greenhouse gas emissions will reduce by 23 percent and 29 percent respectively, according to a report from the Centre for International Economics.

Cost of construction

Introducing new energy efficiency measures often increases the cost of construction. As a result of changes to Australia's Construction Code, construction costs could increase by 3 to 10 percent, depending on the building archetypes and climate zones, according to analysis by independent energy management technology firm, Energy Action.

The impact of other measures, such as bigger plant rooms and ceilings to accommodate larger ductwork and HVAC units, are difficult to estimate. Under the new requirements, these measures are required to support maximum static pressure drop allowances and minimum insulation rules.

Ultimately, there is a net benefit to society. The effectiveness of the revised building codes in terms of reduced operational costs, energy consumption and greenhouse gas emissions outweigh the increased cost of constructions, according to Energy Action. ◆

Multi-Storey Warehouses: Reality or Just a Good Talking Point?

By Simon Tolan, Managing Director, HDR | Bradbrook Consulting

HDR | Bradbrook Consulting has been involved in the design and construction of industrial and warehouse buildings in the UK over the past 25 years. Fundamental design of these buildings has not really changed in this period. We have always designed single storey rectangular boxes using steel portal frames, a concrete ground slab and mass concrete foundations; and I guess we always will. Clearly this is a well-tried process and has been honed and refined to a point where we have a product that is both economic and quick to construct. There will always be further refinements, but the basic concept is fixed and is being rolled-out worldwide.

Why then would you move away from this winning concept. The answer is, where you want to provide more space than the land you have available. Where you can't expand outwards, you have to go up or down. Terraces of houses are developed into blocks of flats for this very reason.

Multi-storey warehouses are, as the name suggests, a warehouse consisting of more than one floor, which increases the usable floor space per square metre of land. Access to the higher floors of a multi-storey warehouse is granted via two ways; ramps and/or goods lifts.

Higher utilisation rates are important in land-constrained cities such as Hong Kong, Singapore, Tokyo and Seoul. Multi-storey warehouses are therefore more common now in Asia than in the US or Europe, where more land is available.

This however may be changing and the idea of multi-storey warehouses in the UK has seriously been on the agenda for the past five years. London is the location where this will happen, as land here for warehousing is in short supply, rents are the highest and land purchase cost are rising year on year.

Several of our clients are considering the development of multi-storey warehouses. We are aware of schemes currently in design that are likely to reach site later this year. West London adjacent to Heathrow Airport, is an obvious location due to the lack of suitable sites. East London also is a preferred location with a good road network giving access to Europe.

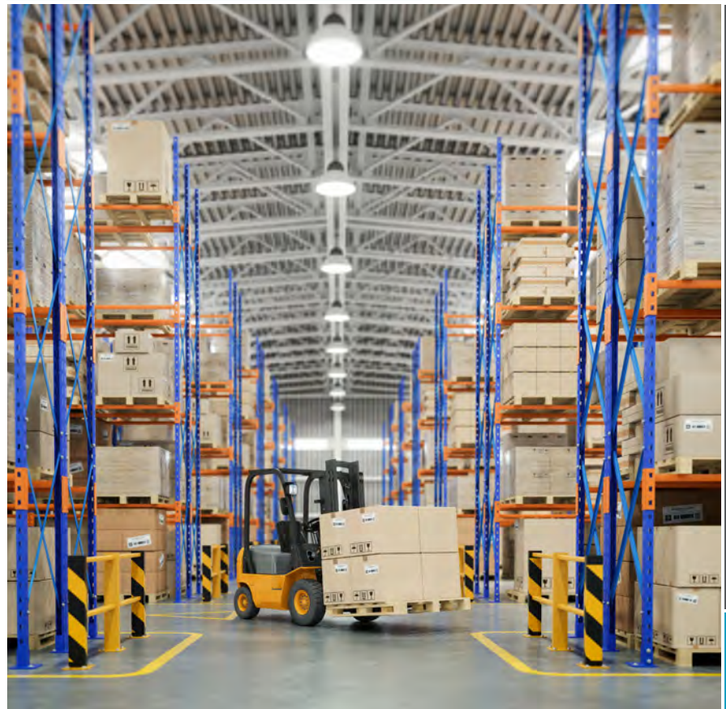
One of our key clients and a leading warehouse developer in the UK and Europe, believes that the construction of multi-storey industrial units around heavily populated conurbations in the UK is inevitable and is working up designs to implement the concept across its London portfolio. They are designing a multi-storey unit in Greater London that incorporates residential units within the development. It plans to build several multi-storey mixed-use urban logistics buildings across its London portfolio in a bid to get around the growing pressure on industrial land being taken by residential developments.

In Europe, the same client is currently developing a multi-storey facility in central Munich, Germany and a two-storey 700,000ft^2 shed in northern Paris, France.

We are aware that other developers have similar plans for multi-storey schemes with the options of basement levels and integrating residential, office and retail elements.

Our Experience

We first became involved in a multi-level warehouse-type building in 2005 with the construction of the B&Q Warehouse store in New Malden, Surrey, United Kingdom. This is a 140,000ft^2 retail store development over two levels of car parking. This is directly comparable with the concept of multi-storey warehouses. The floor loading was 35kN/m^2 with an FM2 floor tolerance. Vertical circulation of people and goods was critical with the use of ramps and cargo lifts.



We have also had recent involvement with the UK's first multi-storey-built warehouse in West London. The 240,000ft^2 unit at Heathrow Airport was constructed in 2008 but was only fully occupied in 2017. It has suffered with a number of operational issues, particularly the yard area and circulation ramps.

We are currently working on a number of multi-storey warehouses schemes in the UK and the Middle East. These include an existing historic warehouse in East London, United Kingdom. The building was an old port warehouse used to store goods off-loaded from near-by boats. The structures are inherently strong and robust, thus ideally suited to support high warehouse loadings. The floor spans between columns and walls, though are limited and require significant structural alteration to create usable areas. Vertical circulation also requires improvement with the introduction of lifts for goods.

Another new build mixed-use scheme, also in East London, United Kingdom, is 150,000ft^2 of warehouse development at ground level, three residential towers above and up to 25 stories high. Coordination of column grids between each use without the introduction of transfer slabs is an important aspect.

Addtionaly, we are working on a 400,000ft^2 multi-level hydroponics building in Dubai, United Arab Emirates that will provide fresh vegetables to the airlines. Conventional steel construction with concrete floors on four levels.

Design Considerations

In the years we have been involved with these types of buildings we have formed the following views:

Floor Loading

The specification of loading on industrial floor slabs historically was not a major issue as the magnitude of load did not have a significant impact on the structural solution or costs. Thus, it was common for floor loadings of 35-100kN/m^2 to be specified without any real thought. Often dictated by agents whose only driver was "bigger is better".

However, for multi-storey warehouses this is a critical item. As the upper floors are suspended, the floor load directly impacts the overall cost of the building and the depth of the floor structure. Very deep floor structures will mean taller expensive buildings or where restricted in height less floors. Floor loadings of 35-100kN/m^2 will, when coupled with large floor spans and tight floor tolerances, create massive and probably uneconomic building costs.

From our experience on previous schemes we are of the view that floor loadings in excess of 25kN/m^2 are probably unnecessary. In accordance with the British Standards this would give you the ability to store paper (for example) up to 10m high. Multi-storey warehouses are unlikely to have clear internal heights of over 8m and will be used primarily for pallet storage using pallet trucks and lightweight fork-lift trucks. High bay, high density racking is unlikely in these locations as product will not be static but constantly moving in and out of the warehouse.

Floor Tolerance

The specification for floor tolerance on industrial floor slabs has evolved and become stricter with the evolution of high bay racking and telescopic fork-lift trucks. Floor tolerance thus was often specified in accordance with design guide TR34 as FM2 and FM3, with flatness circa +/- 3mm.

This really isn't applicable to multi-storey warehouses due to the way the buildings are likely to be used as noted above. With low racking or pallet racking using pallet trucks and lightweight forklift trucks being used.

Restricting floor tolerance on multi-storey warehouses can only be achieved by making the floor very stiff or very deep. Both of which have significant adverse impact on cost and design.

The TR34 method of specifying flatness doesn't work with suspended floors. TR34 measures flatness directly after construction to prove compliance. Whilst suspended slabs will deflect in time and with applied storage loadings. Thus, floor flatness for multi-storey warehouses needs to be approached in a different way, with long-term deflection of the floor the critical matter.

Floor Spans

Standard warehouse buildings would have spans between 20-40m. This is easily achieved with a steel portal frame where you are only supporting light roof loads. For multi-storey warehouses though these sorts of clear spans cannot be economically achieved and would require very deep floor structures.

From our experience floor spans of 8-12m are achievable in parallel with realistic floor loadings and floor tolerances as noted above. This will result in cost-effective buildings and workable floor depths.

This option will create a grillage of columns at each floor level. Something that it is not normally accepted by warehouse tenants. However, with careful design these can be incorporated into racking lines without impacting circulation.

Steel vs. Concrete

An on-going discussion for Engineers and developers for all types of building. In the case of multi-storey warehouses, we think that steel is the correct solution with steel floor decking and a concrete topping. Steel has a better floor/span ratio and thus will result in lighter buildings and thinner floor zones. Steel is normally seen as a quicker form of construction. Cost comparisons for this type of building are normally neutral.

Vehicular Access

The West London, United Kingdom building previously mentioned provides multi-level access for HGVs. This of course provides tenants access in a manner they fully understand but does have significant drawbacks. The cost of providing a building to support a fully laden HGV of 44 tonnes was very high and would likely not be repeated in today's economic climate.

Furthermore, the movement of such large heavy vehicles in and around the building has had a detrimental impact on the structure and maintenance is an on-going issue.

Moving a large vehicle up to first floor level and above requires large ramps that are difficult to accommodate in building designs. Circular ramps can be used but are not ideal for HGV access.

Taking this all into account and considering our views on how the building might be used, we are of the opinion that HGV access to the upper levels is not necessary and creates too many issues. The better option is to not allow any vehicular access to upper levels or restrict to vans of up to five tonnes.

What is required to maintain vertical access is good quality high load capacity goods lifts. Some redundancy is recommended on lift numbers to take account of the inevitable breakdowns and maintenance.

In Conclusion

Multi-storey warehouses are now with us and the next two to three years will see the next generation of this type of building emerge. They are likely to be in different shapes and sizes as developers assess what works best for them and the tenants.

These might be simple two storey buildings with standard HGV access for a single tenant or more likely multi-level units with van access and multi-tenanted. Some buildings, probably in central London will have basement levels.

Within these buildings we will see a variety of other uses. We are working on schemes that have residential and retail components alongside the warehouse. Other schemes that are in production, utilise existing buildings that are adapted to create the multi-level offering.

We are of the view that these buildings need to be steel framed, with realistic floor loadings and floor tolerance, spans of 8-12m and with restrictions on vehicular access. This will require some re-education of tenants but will result in an economic usable building fit for purpose. ◆

Quality Assurance Protocols in Critical Infrastructure Design

By John Hall, Director, HDR | Andrew Reid

Demand for increasingly large-scale, complicated electrical and mechanical systems has spiralled in recent years. As the world becomes increasingly technology focused, the requirement for increased electrical system complexity and reliability has become the 'Norm'.

The importance of data handling and building management systems – along with the advent of smart cities and the ever-influential internet – has seen clients become more selective and demanding about what and how critical infrastructure systems are designed and installed as well as how this is done. Such systems have become crucial to businesses, data centres, hospitals, the emergency services and governmental departments across the Country. As their integrity is imperative to the successful day-to-day running of an organisation, clients are, understandably, anxious to see that these systems are correctly designed, manufactured, installed and set to work.

We have found, however, that the level of expertise and understanding needed in the design and delivery of such systems is not always suitable to meet this demand.

Manufacturing through to installation, construction completion and commissioning are areas where faults, mistakes and mis-designs can creep into an electrical or mechanical system, and the errors can by-pass all but the most experienced engineers.

This is why HDR | Andrew Reid's clients – both longstanding and new – are increasingly asking for our experienced team to be involved at all levels of the quality assurance and commissioning process – from factory witness testing of plant and equipment, to installation and integrated system tests.

Clients are increasingly recognising the huge advantages of building and installing systems 'right the first time'. It helps reduce the potential for clashes or snags later in the process, it improves efficiency during installation and, with no re-work costs and reduced forward maintenance costs, it helps provide better value over the lifecycle of the system. Getting it right straight off, also means that there is less likely to be an installation issue that risks delaying the pivotal commissioning process.

Our expertise means that we are able to ensure that the quality of the final installation is as specified; we use our experience and quality assurance protocols to develop and ensure common test programmes are followed at a manufacturer's factory. We can then carry this process through the rest of the project, helping ensure that a client's requirements are being met, the final installation is exactly as designed and fit for purpose. By working with all members of the project team we are able to make sure the client's requirements are met.

With clients beginning to understand the advantages of having a robust quality assurance protocol in place, it is becoming more commonplace that our teams are engaged on projects earlier in the process and that they work on-site to support the installation effort long before the actual commissioning process begins.

Our engineers focus on working with the installation team to educate them, encourage pride in their work and draw a level of 'ownership' into the scheme – through from the first induction to the last shift onsite. By setting benchmarks,d helping educate and improve skills across the site team, the quality of any installation will be improved. With HDR | Andrew Reid's skilled and experienced QA specialists and engineers, as well as the rigorous checking protocols put in place, clients can be assured that the installation will stand up to even the closest of scrutiny.

Increasingly we are being asked to start the quality assurance and quality control process much earlier on in the construction cycle. We don't make design decisions – we are part of the issue-resolution process. We want to be able to unveil any problems as early as possible during construction. The early resolution of issues ensures that by the time a project needs to power up, we are in a great position to move forward. This helps us save time and money, and deliver high-quality outcomes. It is that assurance of quality that we are happy to put our name to. ◆

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