



A Passport to Global Opportunities and Transformative Collaboration

How BIM has changed the global construction industry and is set to shape its future.

Foreword

“ BSI is dedicated to promoting best practices to support transformative global collaboration for the construction industry. Working with organizations of all sizes, we help drive compliance, reduce risk and increase resilience. ”

Howard Kerr, Chief Executive, BSI

Introduction

BIM (Building Information Modelling) is transforming the construction industry – changing the way multidisciplinary project teams collaborate at every stage of the asset lifecycle to deliver significant efficiency and cost-saving benefits. As familiarity and maturity increase across the globe, BIM is set to influence a new generation of construction professionals and the high-profile projects they shape.

This report provides a snapshot of BIM successes to date and discusses its continued potential to revolutionize the global construction industry. On page four we examine how BIM processes unlock significant collaborative advantages, leading to improved problem solving and innovation.

Dubai's Roads and Transport Authority (RTA) was the first government body in the world to obtain the BSI Kitemark for BIM Asset Management (PAS 1192-3:2014, BS 1192:2007 and BS 1192-4:2014). We spoke to Wajdi Abdilrahman Mereb and Salah Abdulatif Al Dilimi to discover how RTA introduced BIM and to understand its operational impact. Find out more on page six.

Building upon the foundation set by the British 1192 series of standards, the 2019 launch of the first two parts of ISO 19650, marked an important stage in the global BIM journey. The first substantive international BIM standards, ISO 19650 are set to play an instrumental role in BIM adoption around the world and across the supply chain.

Beyond construction-specific standards, built-environment organizations of every size and scope stand to benefit from embedding standards at the heart of their strategic processes. On page eight we explain more about what this means in practical terms for both small businesses and larger corporations.

Wanda Group has taken a BIM leadership role in China since 2015, pioneering a standards-based roll-out across its development and operational strategies. Xiongyi Landson Li, BIM Principal Chief Engineer of Wanda Commercial Management Group, describes the journey to date, and what lies ahead, on page 12.

Finally, in light of the recent ISO 19650 launch there are several ways BSI can support the construction industry as it moves to wider BIM adoption and maturity levels. On page 14 we outline training and certification opportunities around BIM, construction and wider management standards ●

Andy Butterfield, Managing Director of Built Environment
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Unlocking true construction innovation, globally

One of the major reasons behind BIM's transformative impact on project planning and execution is the powerful way it drives collaboration and multidisciplinary innovation across borders. We explore the opportunity for today's supply chain.

In the early days BIM was associated mostly with 3D design. While it's true that digital visualizations and models are an important part of the BIM process, this perspective misses the wider benefits. BIM's overriding strategic advantage is in how it brings experts together, often across borders, to foster innovation.

The basis for this collaboration is high quality project information. A BIM data environment allows project stakeholders from every phase to communicate and collaborate over a digital asset from the start. Clashes, with implications right across the project lifecycle, are foreseen and revealed with accuracy before any site work has begun.

BIM provides the means to share quality information in a meaningful way and, at the same time, pools different disciplinary expertise to drive improved project outcomes. It removes traditional boundaries to creativity, leading to agile non-linear problem solving. Asset data, both current and historical, is available in the cloud for interrogation and use by all project stakeholders, 24/7.

This improved collaboration is not just via virtual means and conference calls either. Many BIM users have introduced shared physical spaces and resources for project teams to congregate. Bringing multidisciplinary experts together to overcome challenges as they arise sparks innovation, reduces delays and improves cohesion and trust. For example, Dubai's Roads and Transport Authority (RTA) opened its BIM centre in 2017. Supply chain stakeholders meet in person at the centre to coordinate project updates and reviews. It uses interactive 3D asset modelling to aid collaborative decision making and has connected experts from across the construction and operational lifecycle. Design changes or amendments which used to take weeks can now be discussed and settled at the BIM centre, contributing to average project time savings of 15%.

Launched in 2019, the international ISO 19650 series of standards is also set to boost cross-border collaboration. It covers information management across the lifecycle of a built asset to improve quality, while reducing project costs and timescales. ISO 19650 has been designed to help construction companies realize the full collaborative

benefits of information management using BIM, whether that's between engineers, owners, architects or contractors in a fully integrated project environment.

Beyond ISO 19650 a broader, standards-led, approach to business strategy and management helps large construction organizations maintain best practice structures and foundations, whilst allowing flex to accommodate innovation and change. For example, ISO 9001, the international standard for quality management, provides an ideal foundation from which to progressively increase BIM maturity. For smaller supply chain members, looking to secure bids and tenders, the adoption of standards and certification can set them apart in a competitive marketplace.

All members in the supply chain can set themselves up to derive maximum benefit from BIM collaboration by prioritizing a standards strategy, to build true resilience. It's often helpful for organizations increasing their BIM maturity to consider how new processes will impact the rest of their operations – particularly those areas which might seem unrelated to BIM.

For instance, ISO 44001 provides a management system for collaborative business relationships and is suitable for construction businesses of all sizes and types working in the public or private sector. It prepares organizations to manage relationships optimally, whether the focus is on a single application between operating divisions or more complex relationships like consortia and joint ventures. In addition, ISO 55001 is a new suite of standards created to guide asset management best practise. They help construction businesses develop a proactive lifecycle asset management system, while reducing ownership risks from a cost and safety perspective.

Finally, understanding that collaboration is at the heart of everything that is transformative about BIM is crucial to fully realizing its potential from a global growth perspective. ISO 19650 is set to aid international BIM adoption and market maturity, presenting a clear opportunity, particularly for smaller supply chain organizations, to explore new territorial markets and build new collaborative relationships ●

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BIM in government: RTA (Dubai's Roads and Transport Authority)

RTA was the world's first organization to achieve full BIM Level 2 Kitemark certification against all PAS and British standards in the BIM standards suite. We spoke to Abdul Redha Abu Hassan, Executive Director, Rail Planning and Design Department and Head of the RTA BIM Committee, to find out how RTA introduced BIM, and its operational impact.



Q You formed the original committee to promote BIM to the wider RTA organization. Can you describe your early priorities and plans?

“ We knew it had the potential to drive improved project efficiency, as well as support our smart city targets. At the time, as an authority, we lacked the means to optimally share transport infrastructure project information between all necessary parties. BIM would allow all project stakeholders to collaborate digitally from the first design stages right through to post-commissioning and ongoing operations.

In order to move towards full BIM implementation, we created a phased plan to take us from gap analysis and benchmarking to roll-out, over six stages. This became our four-year roadmap and helped engage important organizational stakeholders. ”

Q What other considerations were there?

“ Conscious of the future impact of BIM internally, and on the supply chain, we began working on guidance from both perspectives, creating specific policies based on PAS 1192 documentation to help each group understand BIM. The externally-focused policy also informed our employer's information requirements (EIR) documentation.

At the time, there was a lack of BIM understanding amongst the wider government and supply chain, so standardizing on requirements and specifications was critical. ”

Q How did you test and pilot BIM processes?

“ Once the strategic and benchmarking phases were complete, we needed a high-profile pilot project for our new BIM processes and standards. After careful consideration, we selected the Route 2020 project. It encompasses a 15 km extension of the Dubai Metro Red Line to connect to the Expo 2020 site – an important area which includes the Al Maktoum International Airport.

Route 2020 presented an excellent opportunity to apply BIM principles to an integrated multidisciplinary transport project. It includes elevated and underground sections, involves seven stations, and moves through communities inhabited by 240,000 people.

We also developed a bespoke common data environment (CDE) to support both capital expenditure (capex) and operational expenditure (opex) information workflows. It allowed the whole project team to collaborate over shared data in a single, common, environment structured in accordance with BS 1192 and our BIM policies. ”



Q What did you take forward from the pilot?

“The pilot demonstrated the power of consistent design quality, and optimal model and data mobility. This was particularly important for our supply chain partners, who benefitted from accelerated feedback to streamline project workflows and coordinate on deliverables.

Overall, the pilot went well, and we took key learnings forward to the next phase of test projects – this time for different forms of transport infrastructure. We also began an ongoing series of workshops held in conjunction with BSI to familiarize contractors and consultants with the implementation of the BIM system, and the advantages of a standards-based approach. We’ve already trained hundreds of industry representatives through these sessions.

In late 2017, we opened a BIM centre, where RTA and supply chain stakeholders meet to coordinate project updates and reviews. It uses interactive 3D asset modelling to aid collaborative decision making. Ongoing data is also stored and immediately accessible throughout the project lifecycle.

”

Q How has adopting BIM impacted your operations so far, and what do you expect from the future?

“Standardizing on BIM has already brought significant value for the RTA and our supply chain from several perspectives. It’s transformed the way that multidisciplinary teams collaborate on designs.

We have estimated that BIM has brought cost reductions of up to 10%, with timesavings of 15% on average. Design changes or amendments which used to take weeks can now be settled in minutes at the BIM centre. Representatives from every stage of the lifecycle work together on digital models and visualizations. Clashes are now detected with 100% accuracy, as designs are progressed.

As we move to final BIM rollout and beyond, we are excited for the transformative potential of BIM. The industry still has several challenges to overcome around BIM adoption, but we are making great progress. Our supply chain engagement has raised awareness and familiarity with BIM requirements, and we are already seeing an evolution in the market.

We look forward to introducing ISO 19650 in partnership with BSI and feel it will be a very natural transition, given the strong foundation we have established over recent years.

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Standards strategy in the built environment

Construction organizations of every kind benefit from embedding standards at the heart of their strategic processes. What does this mean, however, in practical terms for both small businesses and larger corporations?

Navigating significant technical complexity, strict safety requirements and tight financial margins is nothing new for the construction industry. That's to say nothing of quality, scope creep, supply chain relationships and sustainability targets. Managing so many concurrent, and often conflicting, challenges requires resilience, confidence and agility.

By putting standards at the heart of operational decision making and multidisciplinary workflow design, built environment specialists can overcome these challenges, embrace new technologies and remain fit for the future.

The benefits of a standards-led approach to business strategy are felt by construction companies of all sizes. In the past, some smaller business owners have dismissed this approach, concluding it is only for larger, well-established organizations.

This perception is understandable in a resource-stretched SME, but the truth is that standards help small businesses just as much as larger ones and can often have a more significant impact on smaller companies. For example, they can be used to accelerate tender pre-qualification, and simplify legislative and regulatory compliance.

Standards inspire confidence, both internally and externally, to give small organizations a competitive edge. Outerspace is an award-winning 12-strong landscape architecture and urban design practice, based in London, with a portfolio ranging from the public realm to residential, educational, industrial, healthcare and beyond.

Outerspace has worked to embed standards at the foundation of its activities in recent years and has realized significant benefits. Richard Broome, Outerspace founder, comments: "Although standards have helped in several practical ways – accelerating contract bid processes and driving internal cost efficiencies for example – it's the intangible

benefits that are most powerful. The professional attitude and belief that comes with a standards-based culture is present across everything we do."

Construction supply chains are built on good communication and trust. Supply chain partners can use standards to develop and maintain these connections as well as deliver important assurances about their operations and responsibilities. In this way, standards act as a common reference point across geographical boundaries and business cultures.

The international ISO 19650 series of standards will improve opportunities across borders for small construction businesses to win contracts in new markets on a more equal basis. Closely aligned with the PAS 1192 suite of standards, ISO 19650 parts 1 and 2 cover information management across the lifecycle of a built asset. Created in response to growing international consensus around BIM's transformative potential for global construction, it helps optimize international collaboration, reduces project costs and timescales, and improves quality.

Of course, there are many other non-construction-specific standards that every built environment company can use to improve organizational efficiency – standards like BS EN ISO 9001 (quality management), BS ISO 45001 (occupational health and safety) and BS EN ISO 14001 (environmental management). Other universally applicable standards include those which focus on cybersecurity, data protection, and risk management.

Finally, certification to internationally respected standards sends a clear message to existing and potential customers and partners, as well as industry peers. It communicates a commitment to fundamental quality, resilience and innovation – regardless of where a construction organization sits in the supply chain or typical asset lifecycle ●

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Wanda Group: Taking a leadership role for BIM in China

Since 2015, Wanda Group's commercial management group has led a standards-based BIM introduction across the fast-growing business. Xiongyi Landson Li, BIM Principal & Chief Engineer of Wanda Commercial Management Group, describes the journey, and what lies ahead.



Over the last 30 years Wanda Group has developed into a world-leader in commercial property holding and management. It currently runs over 285 Wanda Plazas through its Commercial Management Group. Each Wanda Plaza integrates retail, hotels, residential, food, leisure and entertainment into a single destination.

In June 2018, Wanda Commercial Management Group became the first Chinese company to be awarded dual Kitemark certification under the BSI Kitemark for BIM Level 2 in the design and construction (PAS 1192-2) and operational phases (PAS 1192-3). This is the latest stage in our strategic BIM roll-out, putting us in an ideal position to align with the new international BIM standards.

Our BIM story began back in 2015 when the company was searching for new ways to accelerate project timescales to reach corporate development goals. After consulting several international partners and peers, it became clear BIM could help us optimize our existing structures and expertise to meet these targets.

As we learned more about BIM, we recognized a further long-term synergy. Wanda Group designs, builds and operates its own developments, so is uniquely positioned to embrace complete BIM project lifecycle principles, from start to finish.

Adopting BIM meant changes across all areas of our group operations, so our enterprise resource planning (ERP) platforms would need to be adjusted. We focused our 400-strong IT department on making these developments. This activity culminated in the launch of an intelligent cloud-based system named 'Zhu Yun'. This is our BIM design and build management platform, and the most significant digitization project in our history.

Zhu Yun introduced a common working environment for all project disciplines and parties – both within Wanda Group and externally. It is a fully connected system which integrates design, cost, scheduling and quality information to provide intelligence for the business. Everybody involved in a BIM project, regardless of their position in the lifecycle, collaborates within the platform using current information and updates.

Standards were also very important to the process. We used nine different BIM standards which covered specifications and quality for project designers, general contractors and supervising consultants. We also ran training courses both for our own employees and the wider supply chain, requiring all parties to achieve certification before working on a BIM project.



Persuading multidisciplinary experts to change their working habits and processes was sometimes difficult. When we first began talking to colleagues and peers about BIM, most people had not heard of it. Others were attached to rather outmoded technological approaches, and we really had to promote BIM's transformative advantages. It was important that these efforts were led from the very top of the Wanda organization, with the CEO and senior management team driving engagement across the group and supply chain.

Improved multidisciplinary collaboration and engagement at the design phase of a project means we can simulate all variables to significantly reduce the occurrence and impact of unforeseen design changes. Previously, each time a change was required to the approved design, it used to delay the project by around two weeks. The shared Intelligent Cloud environment means these changes seldom occur, and if they do occur the average delay is only a few days.

BIM has also driven benefits right across the project lifecycle. When a new Wanda Plaza is completed and operational, a further intelligent cloud-based platform named 'Hui Yun' continues to monitor all key systems – from power and water supply to HVAC and security, collecting real-time internet of things (IoT) data for analytics. Currently, 16 different operational and maintenance systems are integrated inside Hui Yun. When we reach our target of 1,000 Wanda Plazas by 2025 the system will be collecting 300 billion lines of data annually.

Automated operations management also means we can downsize typical facility staffing requirements for each new Plaza. Our BIM management platform has helped us reduce annual power consumption for each Wanda Plaza by 640,000 kWh, saving around \$100,000 in energy costs.

The information – both real time and historical – stored in our BIM management platform has greatly improved our business intelligence capabilities and allows senior management to make strategic decisions

“ Introducing BIM, and related British standards, to the wider Chinese market has helped Wanda Group maintain an industry leadership position. ”

based on big data. It has enabled us to pilot completely digital shopping plaza management using BIM and big data analysis. We expect to showcase a Wanda Plaza fully controlled by machine learning soon.

Introducing BIM, and related British standards, to the wider Chinese market has helped Wanda Group maintain an industry leadership position. We've had many visits from peers and competitors to share learnings and knowledge, and the impact has been felt across the construction market. The government has also taken a keen interest in our efforts, since BIM has very positive implications for Chinese smart city initiatives.

Looking ahead, we believe BIM is going to change the industry – right across the supply chain. There is much work to be done still, however, especially when it comes to helping the market handle the necessary ERP and IT systems integration. Wanda is now in the process of upgrading our processes and certification to meet the new ISO 19650 requirements. We are also working with BSI to explore new project-specific certification possibilities for the industry on a project-by-project basis and look forward to continuing our strong relationship for the future ●



Standards for construction and the built environment

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Salah Abdulatif Al Dilimi, Dubai RTA

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM). Information management using building information modelling. Delivery phase of the assets.
BS EN ISO 19650-2

Collaborative business relationship management systems — Requirements and framework.
ISO 44001

Data protection. Specification for a personal information management system.
BS 10012
Quality management systems. Requirements.
BS EN ISO 9001

Cyber risk and resilience. Guidance for the governing body and executive management.
BS 31111

Framework for building information modelling (BIM) guidance.
ISO/TS 12911

Series Combined Version. Asset management. Overview, principles and terminology.
BS ISO 55000

Occupational health and safety management systems — Requirements with guidance for use.
ISO 45001

Graphical symbols. Safety colours and safety signs. Registered safety signs.
BS EN ISO 7010

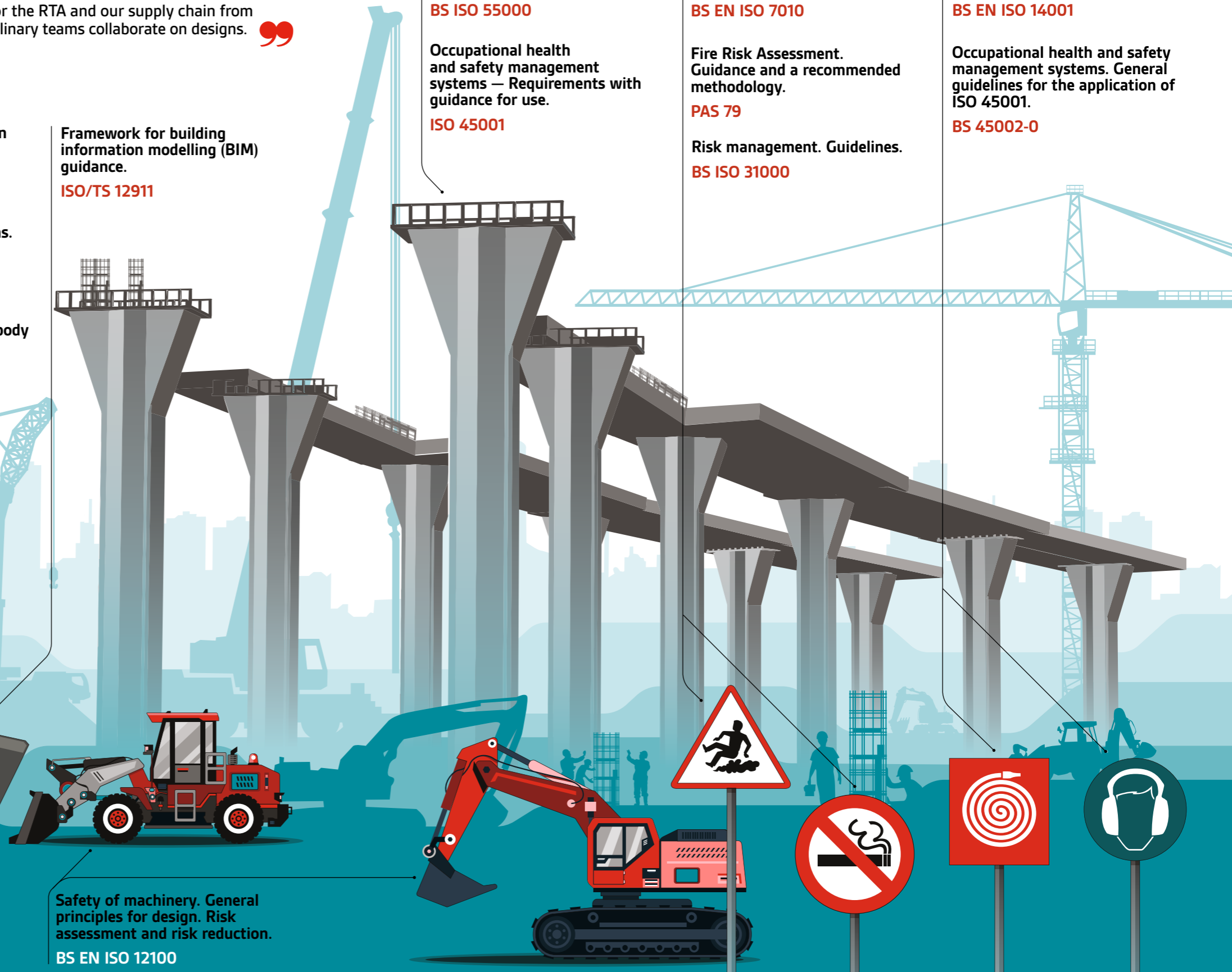
Fire Risk Assessment. Guidance and a recommended methodology.
PAS 79

Risk management. Guidelines.
BS ISO 31000

Environmental management systems. Requirements with guidance for use.
BS EN ISO 14001

Occupational health and safety management systems. General guidelines for the application of ISO 45001.
BS 45002-0

Safety of machinery. General principles for design. Risk assessment and risk reduction.
BS EN ISO 12100





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For over 100 years, we have driven best practice in business around the world. With more than 90 offices in 30 countries we reach over 86,000 clients, supporting them to develop a resilient organization.

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The BSI Kitemark, developed in collaboration with construction industry stakeholders, provides firm assurances around delivery and completion for projects and outcomes under BIM. BSI verification and certification provides reassurance of an organizations ability to use digital technologies to collaborate effectively.



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