adda

Buildability

The modern challenge

As modern building designs have become more complex, making those designs a reality means buildability (also referred to as constructability) has become one of the largest challenges facing construction projects.

To understand the extent of buildability issues in construction today, and the underlying causes, we surveyed 1200 respondents across the globe, at both the executive level and project level, on the prevalence of buildability concerns and the impacts that poor reinforcement design and detailing have on buildability.

Being the first commodity project on a building site, steel reinforcement plays a critical role in buildability. Poorly detailed designs can result in on-site clashes, fixing problems, increased waste and delays that put the project on the back foot from day one.

RESPONDENT DATA

Regional breakdown

North America
54.9%

South America
2.8%

Europe
20.6%

Asia
15.7%

Australia & NZ
6%

RESPONDENT DATA

Professional breakdown

C-Suite
41.2%

Director
9.1%

Senior Management
25.5%

Project Management
13.5%

Technical Staff
10.7%

The prevalence of buildability concerns

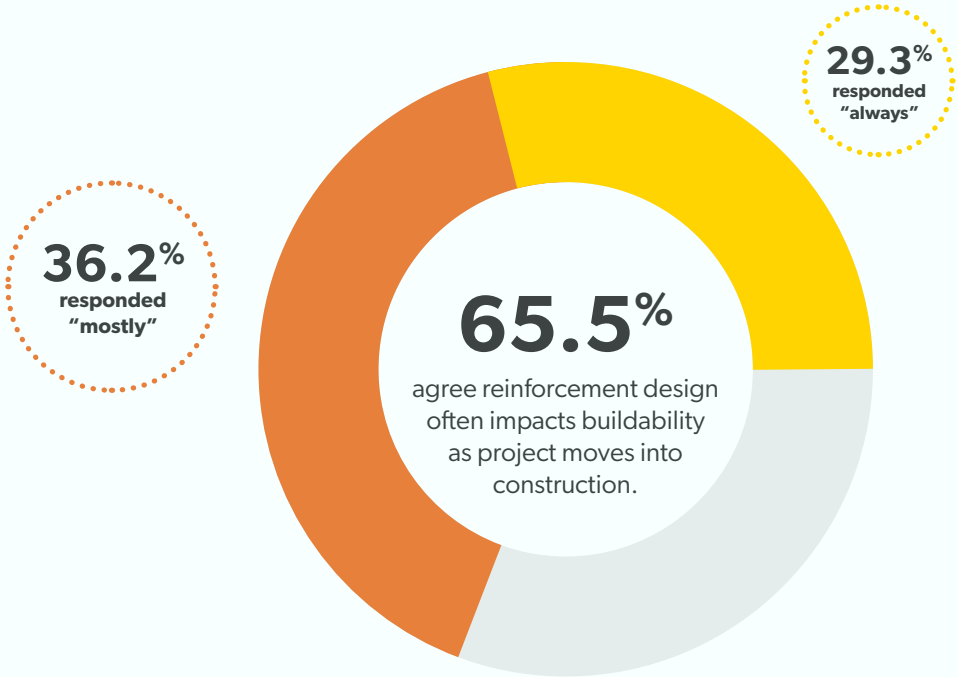
We found that the industry had a strong understanding of how buildability can impact projects, and that it is a significant concern for the industry. Nearly 80% of respondents said buildability was an issue on projects, stating that reinforcement designs are often not feasible as a built structure.

The survey results suggest a large number of projects are being held up at the reinforcement stage, requiring a review of designs to improve buildability, and impacting productivity right through the project lifecycle.

79.2% of respondents agree that designs are not constructible and require realigning, **even though they meet design intent**

Responses by region

1.	Asia Pacific	**87%**
2.	North America	**83.1%**
3.	Middle East	**79%**
4.	United Kingdom	**77.9%**
5.	Europe	**71.9%**
6.	India	**70.1%**
7.	South America	**68.5%**



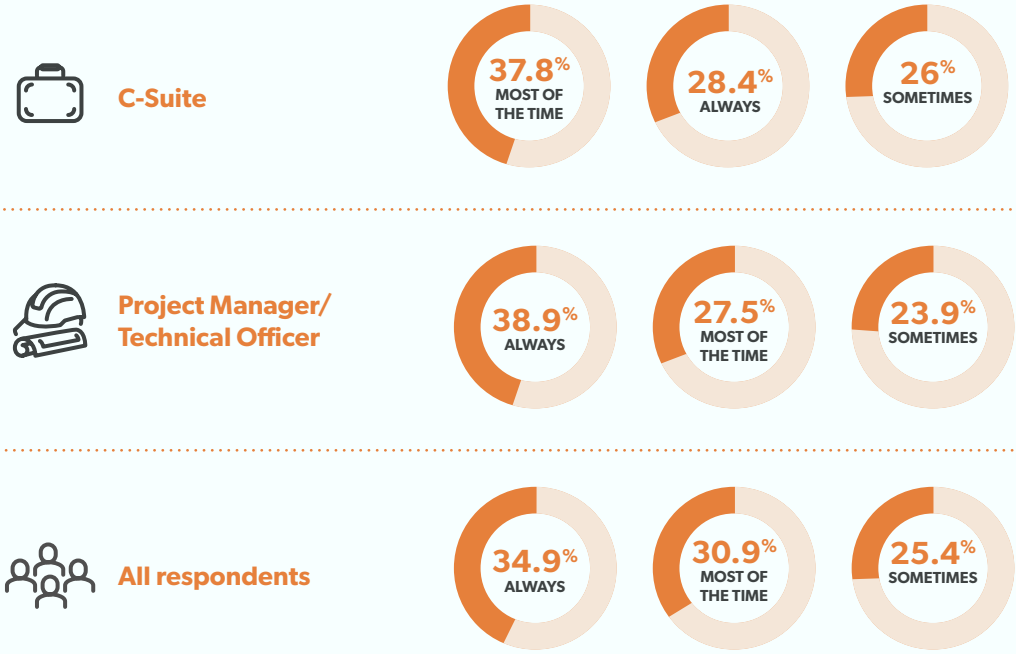
Responsibility for buildability

Despite constructability being a well-known and widespread issue, over a quarter of respondents said constructability was only 'sometimes' taken into account when considering reinforcement design.

Between the Project and Technical levels, and the C-suite, there were differences in terms of how often constructability was considered.

Top 3 responses by profession

Does your company take buildability/constructability into account when considering reinforcement design?



Which leads to the question of where the responsibility for buildability lies.

Is it with the designer who delivers according to a design intent? The constructor, or project manager who creates the intent? The executives overseeing the project? Or is it with the detailers who translate the design in to the physical rebar needed for the project?

"One thing we often notice on projects is that buildability doesn't clearly become the responsibility of a single job role. Often the project manager picks up this role, but is hampered in being able to enforce this with many stakeholders providing input and controlling their own aspects of the project, from design to delivery. This means buildability too often gets retrofitted as things go wrong, rather than being a shared KPI across the teams."

Alan Jeffreys
ADDA Founder & Chief Technology Officer

The buildability value chain

Buildability has a whole-of-project impact, including:

Structural integrity

Transport

Waste

Fixing

Steel inclusion

Where buildability matters

Planning and Design

The design concept may meet the initial brief but does not consider rebar, weight and project delivery factors. This leads to issues throughout the subsequent stages of the project.

A lack of collaboration between stakeholders results in disconnects that reveal themselves at later stages. Engaging all parties in project planning reveals important considerations earlier in the project

Production

Design has not been optimised for rebar, leading to inaccurate rebar cut and bend, wasted materials, higher emissions due to increased production and transport costs, as well as overall project delays

Rebar fixing

Material issues and inaccuracies can lead to clashes that are identified onsite and necessitate additional cuts. This increases fixing time and safety risks, and consequently, delays in project schedules.

The costs of poor buildability

Constructability has a number of direct and indirect impacts.

As well as the waste from onsite rebar offcuts, there is the cost to productivity of fixing delays, safety implications, and carbon emissions (through both steel production and transport.)

The survey found that the top two impacts of buildability are project delays due to stretched delivery times, and material waste. As expected with the growing concerns around sustainability, the environmental impacts from constructability issues were also highly recognised.

For executives, material waste was even more of a concern than the survey average, with 1 in 4 nominating it as a top concern.

What are the 2 biggest issues resulting from design intent not meeting buildability requirements?

GENERAL SURVEY RESPONSE

1.	Delivery times stretched	**23.3%**
2.	Material waste	**22.8%**
3.	Cost blowouts	**16.3%**
4.	Environmental impact	**15.3%**
5.	Safety of staff on site	**10.8%**
6.	Structural integrity	**9.6%**
7.	Project morale	**2%**

EXECUTIVE LEVEL SURVEY RESPONSE

1.	Material waste	**25.3%**
2.	Delivery times stretched	**20.6%**
4.	Environmental impact	**15.7%**
3.	Cost blowouts	**15.2%**
5.	Safety of staff on site	**10.7%**
6.	Structural integrity	**10.3%**
7.	Project morale	**2.2%**

TOP RESPONSE BY REGION

North America
Material Waste

South America
Cost Blowouts

Europe
Material Waste

Asia
Delivery Times

Australia & NZ
Delivery Times

The importance of ESG (Environmental, Sustainability and Governance)

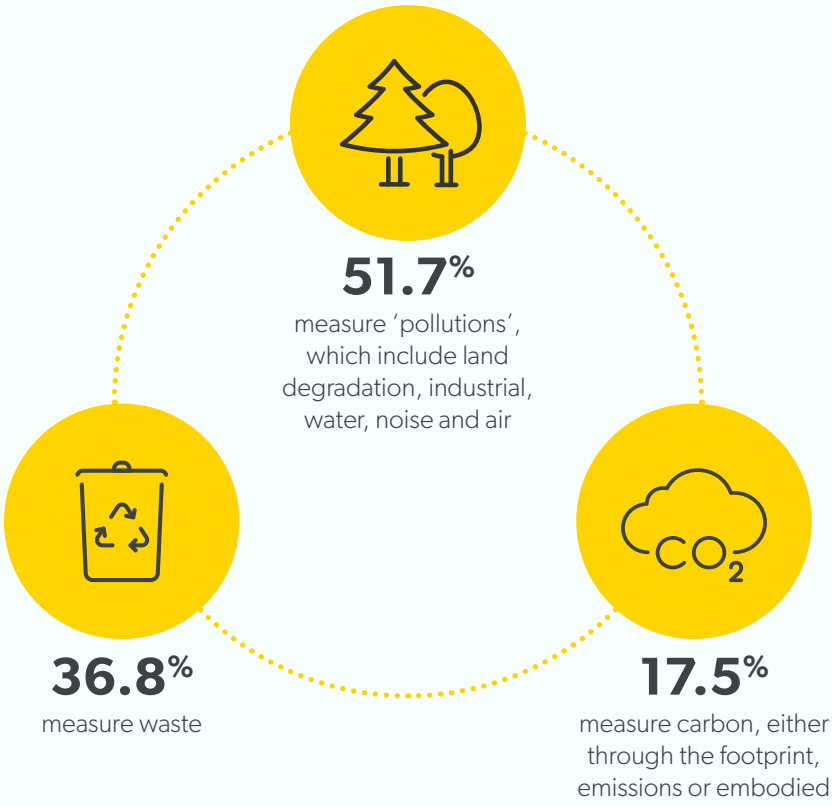
The construction industry has significant challenges in managing sustainability, both in the construction of structures and the lifecycle of buildings.

From the project construction phase, the steel supply chain required for rebar is one of the key contributors to a project's environmental impact.

In 2018, McKinsey found that every ton of steel produced in 2018 resulted in an average of 1.85 tons of carbon dioxide emissions, equating to about 8 percent of global carbon dioxide.[1]

Across the top 15 steel producing countries, the average emissions are 2 tonnes of CO2 per 1 tonne of steel.[2]

Nearly **80%** of survey respondents are measuring the environmental impacts of their projects.



1. https://www.mckinsey.com/industries/metals-and-mining/our-insights/decarbonization-challenge-for-steel
2. https://www.carbonchain.com/blog/understand-your-steel-emissions

Finding solutions

Improving buildability does not need to be difficult.

There were a number of opportunities identified by survey respondents to achieve better buildability, with improved collaboration and communications and new technology solutions, leading the way.

#1 RESPONSE
Collaboration & communication

#2 RESPONSE
Technology & software solutions

#3 RESPONSE
AI & automation

Of the three, improving collaboration was the top response. Nearly 100% said that the industry would benefit from designers, suppliers and construction firms working more closely together.

Collaboration issues also leads directly to what respondents said was the most essential aspect for delivering a project on time and budget: **Planning.**

What are the top two things essential to delivering a project on time and within budget?

Planning

Respondents said planning is the most critical requirement to project delivery.

Contractors

Contractors, suppliers and partners are the second most essential item to deliver a project effectively.

The role for technology

After improved collaboration, respondents identified technology as the second biggest opportunity to improve constructability.

Despite perceptions that the construction industry is slow to adopt new technology, respondents disagreed, and suggested there is an appetite for more construction technology to solve problems, and confidence in the ability of the industry to adopt it. Technology can also help improve collaboration between stakeholders and project planning, making it a catch-all solution to improve constructability.

Does the construction industry adopt new technology well?

38.3% Mostly

36.4% Always

20.2% Sometimes

"If we could reduce the issues around constructability, we can improve project efficiencies and productivity in a large number of impactful ways. For an industry that needs to transform its operations, we would argue that the technological tools needed to improve constructability and other aspects of the construction process already exist. So its now up to the industry to be active in adopting these solutions."

Alan Jeffreys
ADDA Founder & Chief Technology Officer

CASE STUDY

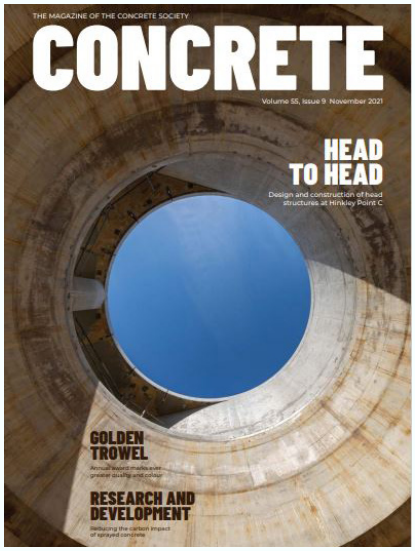
How to improve constructability on a nuclear reactor

The Hinkley Point C UK project is the one of the UK's newest nuclear plants.

Nuclear construction requires high levels of complexity, making constructability both more difficult to achieve, and even more critical.

The six concrete head structures constructed at the Hinkley Point C project are among the most, if not the most, complex, concrete structures ever constructed in the UK

Project owner Balfour Beatty used ADDA's Construct software and 3D modelling to ensure its build was executed to the highest precision.



How did this help Constructability?

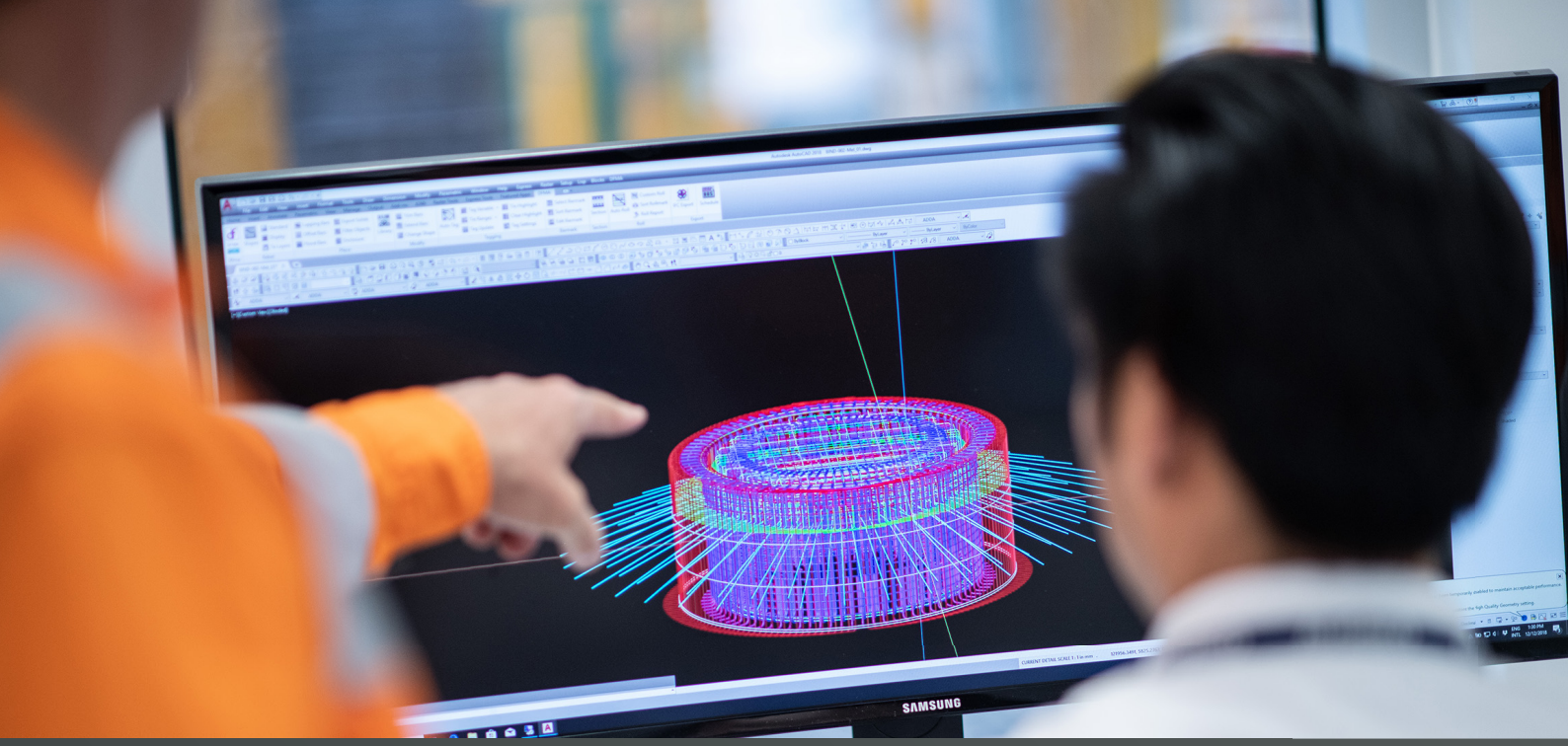
Constructability: ADDA's 3D detailing tool ADDA Construct eliminated an estimated 10,000 clashes during the detailing process before construction that otherwise would have been identified onsite. This saved a large number of potential hurdles before they became reality, and therefore improved constructability right from the outset.

Communications: The 3D models generated by ADDA facilitated greater collaboration between all stakeholders, improving the overall project planning and delivery.

Planning: The model was used as a virtual reality tool in the early stages of the project to visualise the works and upcoming sequencing. It was also used to track construction progress and ensured every bar in the heads was checked and signed off.

ADDA's models also enabled real-time project tracking during COVID protocols, with team members able to do site walk-arounds with a camera and then compare findings with the visualisations produced from ADDA, meaning fewer people were required on-site.

Is responsibility for buildability with the designer, who delivers designs to a design intent; the constructor or project manager who created the intent; the executives overseeing the project; or with the detailers who translate the design into the physical rebar needed for the project?



Finding the right tech to solve constructability

ADDA is a global leader in steel reinforcement analytics, offering world leading rebar solutions to save you time and money on your next project.

Built by reinforcers, for reinforcers, we are a tried and trusted partner for design consultancies, fabricators and construction companies.

We offer smart and industry designed solutions that improve processes for simple and complex reinforcement projects, creating efficiencies throughout the total value chain, reducing waste, saving time and money and improving safety.

ADDA modelling and analytics suite used alone, or in concert with ADDA services, enhances collaboration, speeds up projects, and assists organisations throughout the supply chain, delivering quantifiable benefits.

Our products:

adda construct

adda insight

adda estimate

adda consult

adda