Steel building design and construction:

7 factors for improved project delivery

NEW MILLENNIUM
BUILDING SYSTEMS

Building a better steel experience.

Optimize the design and construction of your steel projects by addressing these key factors:

1. Point of view
2. Design
3. Cost
4. Vision
5. Specifications
6. RFI process
7. BIM

Factor 1

Point of view

1 Take the owner's point of view

When the entire team takes the owner's perspective, true collaboration extends to structural steel design

Every year, hundreds of construction management (CM) graduates flow from expanding college and trade tech construction curriculums to meet building owners' increasing demands for improved project performance and costs.

The General Services Administration (GSA), one of the largest building owners in the country, has established procedures for the federal hire of CMs. The management of construction time, cost, and quality are explicitly mandated within the contract terms of the GSA. For steel building projects, this encompasses expectations for the design and delivery of the structural steel building system that is largely composed of steel joists, deck and beams, ceiling and cladding, long-span composite floor, roofing and flooring.

However, the means to achieve these higher objectives are not made explicit by GSA.

The expectation is that a construction manager should not be bound by traditional bid-build procedures, but by whether the right companies are brought together to truly collaborate on a cost and performance optimized building: An approach that takes the project owner's point of view regarding the finished structure and the life of that structure through a building systems approach.

Taking the owner's point of view will enable all participants to be guided by a new way of thinking, planning and constructing buildings. During the important structural steel design phase, this new perspective values collaborative efforts over transactional efforts, proactive engineering over meeting standard specifications, right design over the documentation of requests for information (RFI), and the early completion of the steel detailing so that the engineer of record (EOR) can integrate it into their plan.

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Total project cost accountability from a proactive supplier's perspective

New Millennium collaborates upfront to minimize structural steel tonnage, accelerate construction timelines, and reduce total project costs.

Factor 2 Design

2

Design with a building systems approach

Collaborative design engineering of the steel structure can reduce a broad range of total project costs

Improved project design and performance are guided by the building design team's ability to think holistically, recognizing the impact that structural steel design has on the total cost and performance of the building.

More than 40% of the structural steel can consist of highly engineered steel joists and decking. Now add structural steel trusses, steel joists, joist girders and other engineered steel elements such as special profile joists. You can begin to see the collective impact steel joist, deck and beam supply can have on the cost and performance of a building project.

This impact is even greater when you consider the fact that the steel joist, deck and beam package must be engineered very early in a project. All construction activities and related investments that follow this phase of planning and design can be vitally enhanced. Including all of the trade activities that can be supported by the structural steel design.

It's time for building teams to think holistically and systematically about the structural steel phase of a project. When they do, they can improve the performance of the building, while reducing a range of costs for the construction of that building. Often, a steel building project is composed of two or more steel building systems. It is crucial that the choice, design, and engineering of these systems are guided by an analysis of the many if-then costs of the total project.

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Building Design & Construction University: Steel Joist and Metal Decking Campus

Building Design & Construction University is an online resource offering AIA credited courses and information for improved building design and construction.


Factor
3
Cost

Break the cost chain

Proactive engineering during the structural steel phase can unlock significant cost advantages

Every ton of steel removed during the structural steel design phase can cut from $800 to $1,000 dollars out of a project in material costs alone. Many costs generated during the structural steel design phase can be reduced or avoided altogether, including both supply-side costs and project-side costs.

Supply-side costs include: the warehousing of the steel for the upcoming project, the detailing hours, the manufacturing hours, the number of delivery trucks. Project-side costs include: the labor related to on-site staging, erection hours, added work and rework.

On-site erection costs are the most apparent to the project team and are often related to clashes, such as when a mechanical run conflicts with the web members of a steel joist. Clashes often manifest in rework and back charges, which are addressed by contingency fees. The fees may be based on a percentage of total project costs, with the expectation that there will be a certain percentage of costs due to unplanned structural oversights. This cost-contingency approach varies by construction management method and by individual contract, but is principally the same: At the end of a project, somebody must pay for the lack of up-front design collaboration.

Back-end contingency fees are a poor substitute for front-end structural steel planning. Early and proactive steel building systems design will assure that the many seemingly small-cost events do not add up to create an extended project timeline, a delayed move-in date, lost retail revenues, and lost occupancy income.

Actual Project Example:

Cost Area	Cost Reduction
Materials	$124,833
Transportation	$ 6,726
Product Handling	$ 1,700
Erection	$ 60,000
Total Cost Reductions	**$193,259**

Click to learn more

Online Credit-Hour Course: Progressive Steel Joist and Metal Decking Design

This AIA credited course takes a building owner's perspective on the range of cost and performance improvements that are possible when using a more design-analytical and collaborative approach to steel joist and metal decking construction. 1.0 AIA LU credit / 1.0 PDH credit


Factor 4 Vision

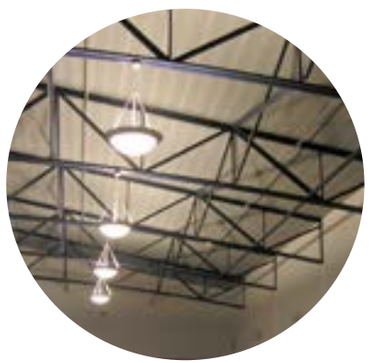
4

Focus on architectural vision

Architects need direct access to structural steel joist and deck design collaboration

Architects welcome ideas for unique rooflines and architectural distinctions that can come from the steel joist, deck and beam engineering perspective. Greater contributions from this side of the table can help the building team move to breakthroughs in steel building design.

New design possibilities abound in the area of steel joist, deck and beam supply. Ongoing investments in R&D and market research at the supplier level have supported several areas of development favoring enhanced structural steel building design.



Expanded specification tables for special profile steel joist design have enabled engineers to immediately solve unique design challenges. Built upon four basic joist profiles (gable, scissor, bowstring, arch), these tables have simplified the evaluation and specification of thousands of possibilities.

The broader availability of evolved structural steel products such as composite steel joist systems has brought more architectural options to the design table.

Innovative breakthroughs also continue to occur in the area of enhanced gravity overload safety. R&D at both the university and supplier levels has enabled a unique approach to steel roof system design. This new approach exceeds the strength requirements of the Steel Joist Institute (SJI) specifications to provide a steel joist with increased reliability and ductility at minimal additional cost.

Click to learn more

Special Profile Steel Joists

Specifying professionals can explore enhanced design possibilities with a broad range of special profile joists.

Factor 5

Specifications

5 Simplify product specification

Better tools of the trade for specifying engineers

A new generation of online steel joist and deck look-up tools are addressing the needs for faster and easier product designation. These free web-based and mobile app specification tools offer the added benefit of guiding product designations that are based on actual, load-based project requirements, with potentially significant total-project cost elimination.

Deck specification tools enable the specifier to select Allowable Strength Design (ASD) or Load and Resistance Factor Design (LRFD) methodology. Then select the deck application. Finally select deck type, gage, and yield stress. Standard gage and standard yield stress selections are presented to help reduce total project costs and timelines. Alternate gage and non-standard yield stress designations are available.

Expanded special profile steel joist specification tables are easily accessed using online joist designation tools. These tools allow the specifier to compare heavier joist options to eliminate OSHA Erection Bridging, a design decision that can remove significant labor and scheduling costs from the erection phase of the project.

K-Series and LH/DLH Series steel joist look-up tools give the specifier the option of comparing steel joist designations based on lowest weight or lowest cost calculations. Other options include using ASD or LRFD design methodology and the resulting steel joist designation expressed in either U.S. standard units or metric units of measure.

Click to learn more

Discover the easiest way to specify steel joists and steel decking

Backed by New Millennium's database of SJI 43rd Edition tables and boosted by our very own economical load tables, these tools are designed to make steel joist and metal decking specification faster and easier than ever before possible.

6 Factor RFI process

6

End the RFI go-around

The request for information (RFI) cycle is a poor substitute for early design collaboration

A recent survey of 192 construction professionals found that 32% of respondents said that the structural steel drawings from the engineer of record (EOR) were seldom complete; 46% said the resulting RFI process was either very often required or always required.

Incomplete drawings and prolonged RFI cycles have long been characteristic of traditional bid-build project delivery. Unlike more evolved methods, the traditional bid-build process has pushed potentially important joist, deck and beam design engineering considerations downstream, away from the building team's early design discussions. This has effectively tended to discourage design contributions from the steel joist and deck engineering company, which has been given access to the project based not on engineering ideas, but on being the lowest qualified bid to produce a steel package with drawings that may be significantly incomplete.

The traditional bid-build approach has burdened all sides with incomplete structural drawings and an RFI process that is largely transactional, inefficiently prolonged, and too often used to document and defend attempts at communication, rather than to foster genuine collaboration.

A further example of the inefficiency of traditional bid-build project delivery is in the area of structural steel joist and deck detailing. Detailing can often create delays that are overlooked on a traditional bid-build project. But when the joist and deck company is brought in early to contribute to the design of the project, the company can help the EOR complete drawings and integrate these into the plan, instead of trying to backfill. This provides for a more constructive and efficient design flow.

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Online Credit-Hour Course: Design-Build Approach to Steel Joists and Metal Decking

This course outlines a range of project cost and performance improvements achievable using the design-build approach to steel joist and metal deck design. 1.0 AIA LU credit / 1.0 PDH credit.

Factor

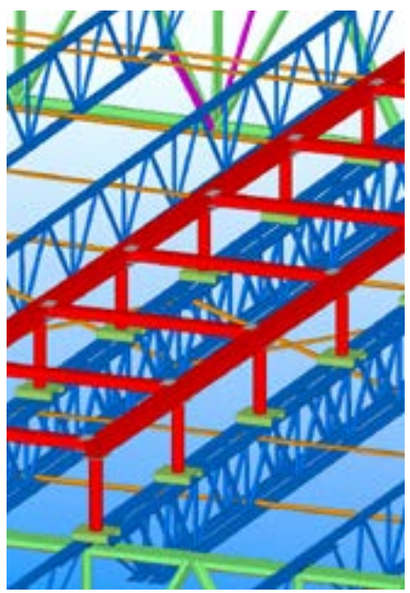
7

BIM

Use BIM when it's needed most

The benefits of BIM are best realized when introduced at the steel building systems design phase

A McGraw-Hill Construction study found that industry-wide adoption of building information modeling (BIM) or BIM related tools in the United States grew from 28% in 2007 to 71% in 2012.*



The study indicated an interesting trend regarding the frequency and perceived value of model sharing processes, specifically in regard to design collaboration at the trade level, including steel joist and deck supply. The study found that the frequency of model sharing between architects, engineers and contractors was more than two times higher than the frequency of model sharing between these participants and trade contractors such as steel joist, deck and beam suppliers. Yet the use of BIM at the trade level was the only area where the perceived value of BIM exceeded the frequency of its use.

On this point, the study found widespread agreement across BIM users and non-users that BIM would be the most valuable were it used in support of collaboration at the trade level, including steel joist, deck and beam design. The reasons for this are as follows:

- Reduced number and need for information requests
- Improved communication between all parties
- Improved accuracy of construction documents
- Reduced field coordination problems
- Shorter time drafting and more time designing
- Reduced construction costs

Click to learn more

3D BIM-Based Steel Joist Design

Since early 2010, New Millennium's industry-leading Dynamic Joist® BIM component has enhanced design collaboration in real-world projects throughout the US.

***McGraw-Hill Construction Study**

SmartMarketReport: The Business Value of BIM in North America, 2012 (pdf)

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