It doesn't have to be that way!

Part 1 of 3

Andy Johnson

In this three-part series, Andy Johnson, AISC's vice president of marketing, examines traditional project delivery methods in light of the many unknown variables that can enter into the project delivery process. He offers suggestions for how project team members can work together more effectively—especially by bringing fabricators on board in the early phases of project design.

Part 1 (January 2003) takes a close look at the different roles and responsibilities of individual project team members. Each player faces different tasks and obstacles, but it is only when team members understand each other's challenges that the group can communicate and work together effectively.

Part 2 (February 2003) examines fabricator design-assist prior to bidding in design-bid-build projects. If you're working on a design-bid-build project, get fabricators involved early in the game to assist in the design process—and avoid costly delays and change orders.

Part 3 (March 2003) looks at how to implement the design-build project delivery method. Design-build is a time- and money-saving way to design and manage a project. Bring fabricators on board at the earliest project stages to make them an integral part of the design and planning process.

Many steel-construction projects are faced with a lack of communication and understanding between the key project stakeholders. Owners, developers, architects, engineers and fabricators are often at odds with each other during different project phases as they strive to meet challenges on time and within a budget. This lack of communication often can negatively impact projects worth hundreds of millions of dollars, with substantial claims for extras and schedule delays.

Structural steel projects today have their share of claims but it doesn't have to be that way. Many have benefited from a cooperative delivery method that minimizes extras and delays, and delivers actual savings and early project completion.

THE STAKES

Stakeholders often do not have a clear understanding of each other's needs for a successful project. The only goal that is clear is the owner's: To get a project built on time and within the budget. However, it is important to look at each stakeholder's goals and obstacles.

DEVELOPER

The developer wants *predictability*. He builds a financial box that includes a contingency percentage. For his project to be viable, it must fit within this range. Unfortunately, he works with potential tenants who make unpredictable demands to lease space in a building. For example, a major retailer might expand a lease from 150,000 sq. ft to 200,000 sq. ft, with the location of the elevator bank before the expanded lease now in the middle of the jewelry department. A more common example would be a requirement to move a stairway or accommodate heavier mechanical equipment. Depending upon the stage of the project, such changes can add minimal-to-major costs.

The developer also wants the *lowest price*. He is convinced that competitive bidding is the only way to achieve it. But taking the lowest price on bid day is no guarantee that the project will be completed at bid price, especially in an unpredictable environment.

Another dilemma the developer faces is the cost of time vs. the cost of changes. The developer wants to *save time* because the interest clock is ticking. One way to save time is to push designers to get structural drawings out for bid, and to order steel from the mill. However, drawings might be issued before critical design decisions are made, which results in drawings with design "holes." Unfortunately, bidding on incomplete drawings leads to high prices that protect bidders against unknowns; or bids that are low, but subject to constant revision through the RFI process. Time "saved" on the front end often is overshadowed by time lost on the back end. Costs from extras are added as fabricators protect themselves to cover design holes. Some fabricators exclude unknowns, while others assign an allowance and exclude something else in their bid — leaving an uneven playing field. The lowest bid might omit many costs, and not all owners can discern the difference.

ARCHITECT

The architect wants *timely receipt of information* from the owner. As the clearinghouse for details from all the trades, and the compiler of costs, a lack of timely decisions or a frequently changing program makes the architect's task very difficult. To avoid job delays, the architect also needs a *well-defined road map from the engineer with the exact information about what is required for the complete structural drawings and when*. Often this is not communicated clearly.

Architects need to know sizes of structural members, beams and girders to establish overall building height. They need to know column sizes to calculate useable floor space. Façade and cladding design starts early and is affected by building height. The developer needs to know how much floor space can be let.

Once contracts are let, the architect wants, but seldom gets, a schedule of submittals for shop drawings from the contractor. This is an important resource management tool. The architect has to review masses of information. Without some idea of when the review process for significant segments of the job (e.g., structural steel) is to take place, scheduling can be a nightmare. For example, it is not unusual for drawings to arrive en masse with a requirement for a 14-day turnaround. The architect already might have to meet a deadline on another portion of the job or on another project entirely. Without advance notice, it becomes a juggling match.

ENGINEER

The structural engineer wants *timely receipt of information* from the owner and architect in order to issue complete structural drawings. The first order of business is to issue a set of drawings sufficient to allow both the fabricator to get a mill order underway and for the general contractor to initiate foundation work. The structural engineer needs the information to determine the following:

- Member sizes and spacing
- Frame type and lateral system
- General concept for connections

The specific information that is critical to the structural engineer:

- Building-grid dimensions or bay sizes
- Floor-to-floor dimensions
- Floor and roof loads (loading conditions)
- Locations and loads imposed by mechanical units
- Vibration limits due to layout requirements or type of occupancy
- Approximate location of major floor openings
- Elevations sufficiently defined so that column locations and bracing can be located
- Any exceptions to typical details
- Cladding requirements and edge-of-slab details

Rushing the mill order to save time when there is insufficient design information is counterproductive. It can result in insufficient or wrong material being ordered. Material that is short might have to be ordered later from more expensive sources to maintain schedule. Wrong material has to be replaced at someone's expense if it cannot be used elsewhere on the project.

The second order of business is to complete the structural drawings so the fabricator can produce detailed drawings for fabrication. The engineer needs the final information from the architect:

- All remaining dimensions of the floor plate, i.e., exact floor elevations and duct clearances as well as exact dimensions of openings for such things as elevator shafts, stairways and mechanical equipment
- Edge-of-slab dimensions around the building perimeter as well as around floor openings
- Dimensions and general understanding of fastening method for wall systems as well as loads involved
- Other structural requirements unique to the project, such as façades, setbacks, canopies, skylights and interstitial space.

This information often is not received in a timely and logical fashion. Sometimes the architect is occupied with other concerns or does not understand the cost and schedule implications of not providing the information. The information also might change frequently.

The engineer wants *sufficient time to complete drawings*. If required to release drawings prematurely, the engineer risks higher-than-estimated structural prices as fabricators cover themselves for unknowns and with change orders.

The structural engineer is required to give the architect and developer an engineer's estimate of what the structure will cost based on the architect's concept. For the cost to stay within the developer's financial "box," the engineer needs *an architectural design that does not get out of hand with future changes*. The engineer does not want to be in a position of conflict between owner and architect.

The engineer wants *to be recognized for the most cost-effective design*. Developers and contractors tend to judge engineers based on the weight per-sq.-ft. of their designs. This is a quick measure but not reliable, since the lightest

> Steel projects can benefit from cooperation to minimize extras and delays, while delivering true savings and early project completion.

design is not the least expensive. Steel as raw material is cheap compared to labor, and light designs generally require much more fabrication labor. Wide-flange shapes cost the same from the mill today as they did in 1985, whereas labor is a different story.

GENERAL CONTRACTOR

The general contractor wants *to complete a project with a minimum of delays and interruptions.* Contractors want to complete projects on time and in budget, but they also deserve a profit.

Contractors want *to minimize risk.* They assume a great deal of risk when executing a general contract, so predictability regarding details, construction, execution, costs and schedules is key. Troublesome and costly symptoms of fast-track schedules are change orders and extras from the steel fabricator.

General contractors want *the lowest price* from steel subcontractors to maximize their profit or competitive advantage and minimize their risk. These objectives often are incompatible. Low price is not an indicator of performance or any guarantee that the project kickoff price will be the same as the ribbon-cutting price.

STEEL FABRICATOR

Like the general contractor, the steel fabricator wants *to complete a project quickly, steadily and with a minimum of delays and interruptions.* Fabricators detail and fabricate in a shop to exacting standards. Every change and delay costs money in material and labor for rework and lost time. Fabricators must receive the same critical information as engineers, with a minimum of changes, to complete projects on time, in budget and profitably.

When fabricators are asked to bid to incomplete documents, they have three choices depending on the degree of incompleteness:

1. They can decline to bid.
2. They can load their price to cover design holes and contingencies.
3. They can bid tight in order to get the job, knowing they will have many opportunities after contract award for change orders and extras through the RFI process.

Changes after contract award can cause delays and cost increases. The magnitude of these costs surprises other stakeholders, because fabricators might take advantage of opportunities to protect themselves, or because other parties do not understand the real costs involved.

Why does it cost so much to move a stairway? The answer depends on whether the floor beams and stairs have already been detailed, and whether material is in fabrication or already on the jobsite. Unlike other construction materials, whose construction cycle begins with site forming and framing, steel's shorter construction cycle ends with site erection. The majority of the specialty work performed by the steel fabricator is off site. A small change in the drawings can result in minor or major costs depending on where the fabricator is in the shop process.★

Andy Johnson is vice president of AISC Marketing, LLC, in Chicago, IL.

For more information on how to maximize design-team communication and efficiency, don't miss Andy Johnson and John Cross' short course, "Moving up the Construction Food-Chain—From Bottom Feeder to Killer Whale" at the 2003 NASCC in Baltimore, MD.