structural
STEEL

Steel SolutionsCenter

THE MULTI-STORY RESIDENTIAL PROTOTYPE IV

Exploring Conventional Composite Framing in a
Mid-Rise Condominium Building with Parking

USING THE AISC STEEL SOLUTIONS CENTER

What's this?

This package illustrates a representative conceptual solution developed by the AISC Steel Solutions Center (SSC). The information typically received by the SSC and the conceptual solution provided in reply are both presented here. The conceptual solution also comes with continued support throughout the life of the project from the SSC and more directly, AISC's Regional Engineers.

Project Inquiries

Projects find their way to the SSC in a number of ways. Common scenarios include:

- An owner or architect is developing concepts for a new project. Interested in exploring the advantages of a structural steel framing system, they contact the SSC.
- Project bids are over-budget in another material such as concrete or wood, and a steel alternative is suggested. The architect, engineer, general contractor, or owner contacts a local steel fabricator for assistance who in turn contacts either the SSC or an AISC Regional Engineer for assistance.
- A fabricator learns about a new project in the early stages of development. They contact the owner or project architect to discuss similar steel projects and to highlight the advantages of various steel framed solutions for the project.

Developing a Solution

The AISC team and the client work together—often via conference call—to determine what can be done to move the project forward in steel. Depending on the timeframe, the SSC can provide a wide range of solutions from a simple bay framing study to a full conceptual solution. All SSC services are FREE to our clients; however, a level of commitment from the project decision maker to seriously consider the steel alternative is expected.

What do I have here?

This prototype is one example of a conceptual solution that the SSC can provide. Because it is representative of many similar structures, SSC clients often use this prototype as the first step in moving the project forward in steel.

The SSC has been involved in a broad range of projects since its inception in 2001. SSC staff can help you find innovative economical steel solutions for parking garages, office buildings, multi-story residential buildings, healthcare facilities, educational facilities, industrial structures, bridges, and other projects where structural steel can compete.


Photo courtesy of Alise O'Brien Photography


Photo courtesy of Ozark Steel

this page:
The Crescent
Clayton, MO
Constructed in 2007

Please let us know how we can assist you with your next project.

This prototype illustrates how the AISC Steel Solutions Center (SSC) can help a project decision maker evaluate a steel framed alternative.

Mid-Rise Condominium Building Challenge

It is the beginning of the week, and a general contractor from Virginia is working to improve the economics for a mid-rise condominium building with a parking garage podium in Arlington, VA. The contractor recently attended a presentation on steel-framed multi-story residential buildings by one of AISC's Regional Engineers. Interested in learning more, the contractor decides to contact the SSC.

Engaging the Resources

A conference call is arranged between the contractor, an AISC Regional Engineer, and an advisor in the SSC. A few key project parameters are discussed:

- The developer and project team are open to a steel framed structure. Speed of construction and overall cost are the main priorities.
- The developer aims to maximize available square footage by keeping the columns and walls as slender as possible.
- The contractor expresses a preference for conventional composite structural steel framing, as opposed to other floor system types.
- The contractor successfully used Building Information Modeling (BIM) for an office tower in the past, and they are interested in learning more about BIM's applicability for this multi-story residential structure. They are particularly interested in using BIM for visualization purposes and erection sequencing.
- The developer wishes to pursue LEED certification; therefore, sustainability principles must be considered.
- The contractor would like to see ballpark cost and schedule estimates for the SSC's conceptual steel solution. The Regional Engineer will contact a local steel fabricator for assistance.

Steel Conceptual Solution

After reviewing the architectural floor plans and elevations (illustrated on the following page), conventional composite structural steel framing is selected as the floor system for the conceptual solution. The AISC team agrees to provide a full conceptual solution to help the contractor and developer understand the advantages of structural steel.

The Regional Engineer informs the contractor of the many advantages of a steel-framed structure:

- A steel frame is lighter than a traditional concrete frame, resulting in reduced foundation loads and costs.
- Typically, steel-framed systems can be constructed with a cost savings of 10 percent to 20 percent over an alternative framing option.
- Steel columns can require up to 80 percent less floor space than equivalent concrete columns, allowing for increased dwelling space and more leasable square footage.
- Because structural steel members are fabricated offsite, on-site construction time and the associated labor costs are minimized.

A structural steel framing system will meet the developer's needs and will provide cost savings up front and over the life of the project. In order to illustrate the structural steel alternative, the SSC develops a full conceptual solution tailored to the project's requirements presented here on the following pages.

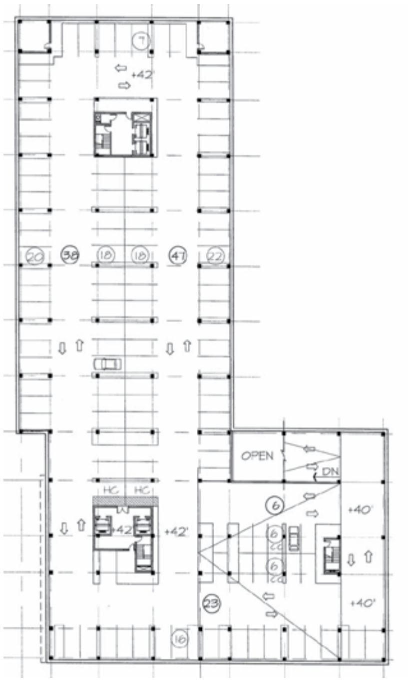

IDEAS² Awards photo: Timothy Hursley

Northeastern University's
International Village
Cambridge, MA
Completed in 2009

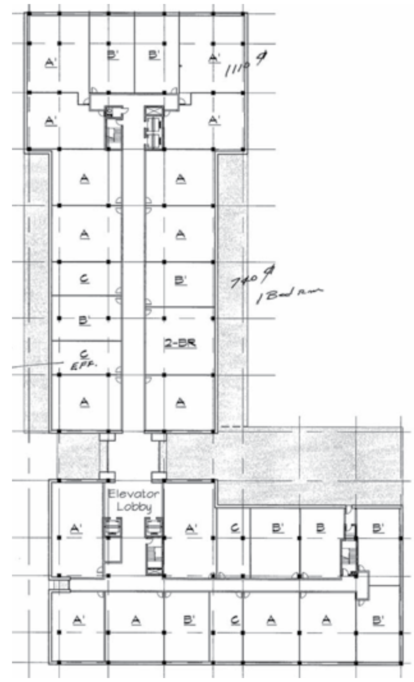
THE MULTI-STORY RESIDENTIAL PROTOTYPE IV

Information received from the General Contractor

Preliminary Schematic Architectural Drawings



Parking Layout

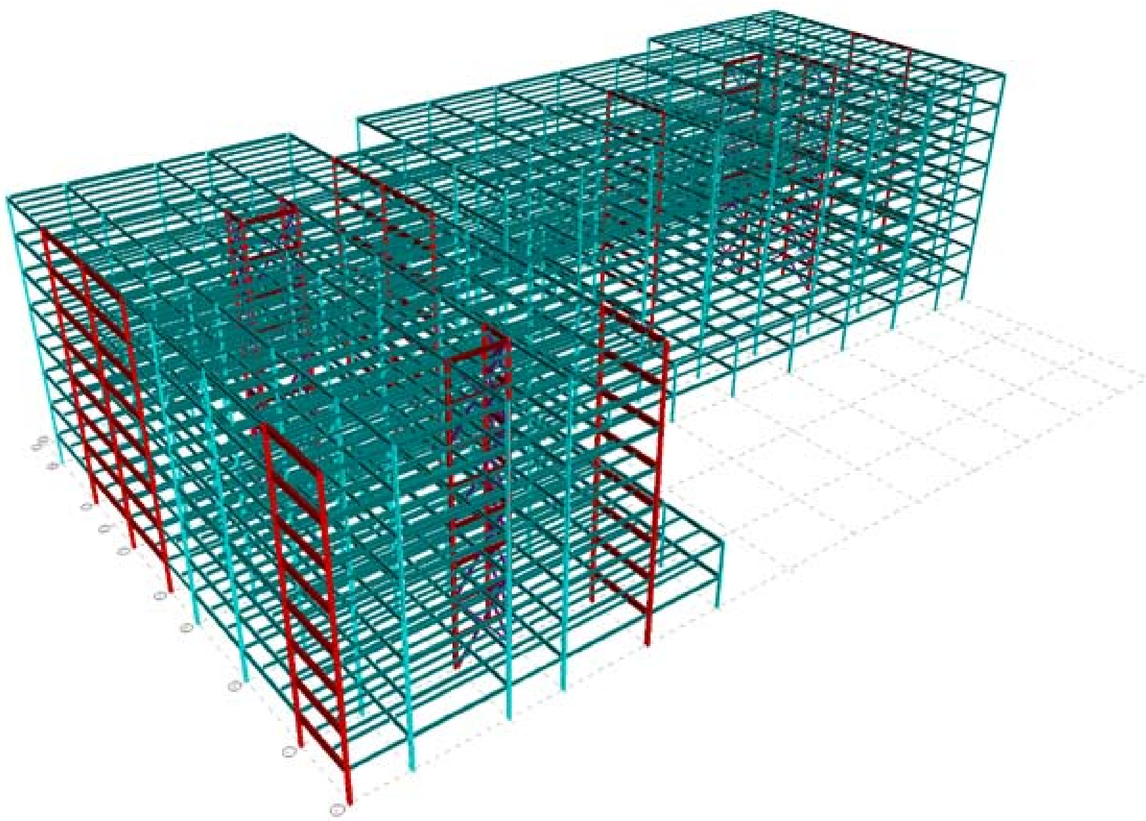


Residential Unit Layout

Entrance Perspective

THE MULTI-STORY RESIDENTIAL PROTOTYPE IV

Basic SSC Conceptual Framing Model



This Package includes:

Comments on the Provided Solution
Steel Quantity Takeoff
Building Code Criteria
Garage Floor Framing Plan (Levels 2-3)
Condo Floor Framing Plan (Levels 4-8)
Roof Framing Plan
Column and Frame Layout Plan
Column Schedule
Moment Frame Elevations
Braced Frame Elevations

COMMENTS ON PROVIDED SOLUTION

Project Location: Arlington, VA
Prepared for: General Contracting Firm

Prepared by: SSC Advisor
Regional Engineer: Mid-Atlantic Regional Engineer

The information contained in this document is not intended as a basis for the structural design of any project. Rather, it is a conceptual approach to a project that demonstrates the viability of the steel system for project requirements, budget, and schedule.

1) The steel quantities and geometry of this investigation are provided on the Floor Framing Plans, the Column and Frame Layout Plan, the Column Schedule, and the Frame Elevations on the following pages.
2) The design criteria per the 2006 International Building Code is summarized and included in the Building Code Criteria page.
3) Conventional composite steel framing was selected for this study. The steel framing suports a stay-in-place metal deck and concrete topping.
4) The floor framing for the garage levels is a 3 inch noncomposite metal deck with 3 inch normal weight concrete topping (6 inch total slab depth).
5) The floor framing for the condo levels is a 2 inch composite metal deck with 4½ inches normal weight concrete topping (6½ inch total slab depth).
6) A 1½ inch metal roof deck was used for the roof level.
7) Lateral loads are resisted by concentrically braced steel frames and steel moment frames. Lateral frame member sizes are shown in the Frame Elevations page.
8) Sustainable design principles are being considered. Contributions for the structural steel systems for recycled content have been addressed in this packet. Further information on steel sustainability can be found at www.aisc.org/sustainability.

STEEL QUANTITY TAKEOFF

Project Location: Arlington, VA
Prepared for: General Contracting Firm

Prepared by: SSC Advisor
Regional Engineer: Mid-Atlantic Regional Engineer

Suspended Steel Floor Areas:

354,650 ft^2 [total area]	102,340 ft^2 [Garage floors]
	210,260 ft^2 [Condo floors]
	42,050 ft^2 [Roof]

Estimated Steel Quantities:

Gravity Columns				
	W12's	167 tons	0.94 psf	265 pieces
Gravity Beams				
	Wide Flange	856 tons	4.8 psf	2,104 pieces
	28,320 studs			
		993 beams cambered between 0.75 in. and 2.0 in.		
Lateral Frames				
	Beams	129 tons	0.73 psf	208 pieces
	Columns	161 tons	0.91 psf	208 pieces
	Braces (HSS)	29 tons	0.16 psf	112 pieces
Steel not indicated in sketches				
	5%	67 tons	0.38 psf	
		1,409 tons	**7.9 psf**	**2,897 pieces**

– The quantities are based on centerline dimensions.
– Steel not indicated in sketches accounts for framing not included in the estimate such as framing for openings or various members eliminated for simplification. It does not include connection material, slab edge material or façade attachments.

Material Specification

Wide flange shapes are A992, Gr. 50
Rectangular and square HSS sections are A500 Gr. B

INTERNATIONAL BUILDING CODE 2006

Project Location: Arlington, VA
Prepared for: General Contracting Firm

Prepared by: SSC Advisor
Regional Engineer: Mid-Atlantic Regional Engineer

This investigation is based on the following criteria. The Steel Solutions Center does not assert that these are the criteria that apply to this project. The criteria are chosen based on the project location and the widely adopted model building code, the 2006 International Building Code (IBC). Requirements by local and state jurisdictions have not been considered. If actual project criteria differ significantly from those listed, the results presented may no longer be valid.

Gravity Loads

Dead Loads	Garage=60 psf	[3 inch noncomposite metal deck with 3 inches normal weight concrete topping]
	Condo=70 psf	[2 inch composite metal deck with 4½ inches normal weight concrete topping]
	Roof=3 psf	[1½ inch metal roof deck]
Live Loads	Garage=40 psf	[includes 20 psf for partitions]
	Condo=60 psf	
	Roof=20 psf	
Superimposed Dead Loads	Typical 5 psf [Ceiling, MEP, etc.]	
Cladding Loads	Typical 350 plf	

Wind Load Parameters

Basic Wind Speed	100 mph
Wind Importance Factor, I_w	1.00
Exposure Category	B
Topographical Factor	1.00
Drift Limit	H/500

Basic Seismic-Force-Resisting System

Concentrically Braced Steel Frames and Steel Moment Frames

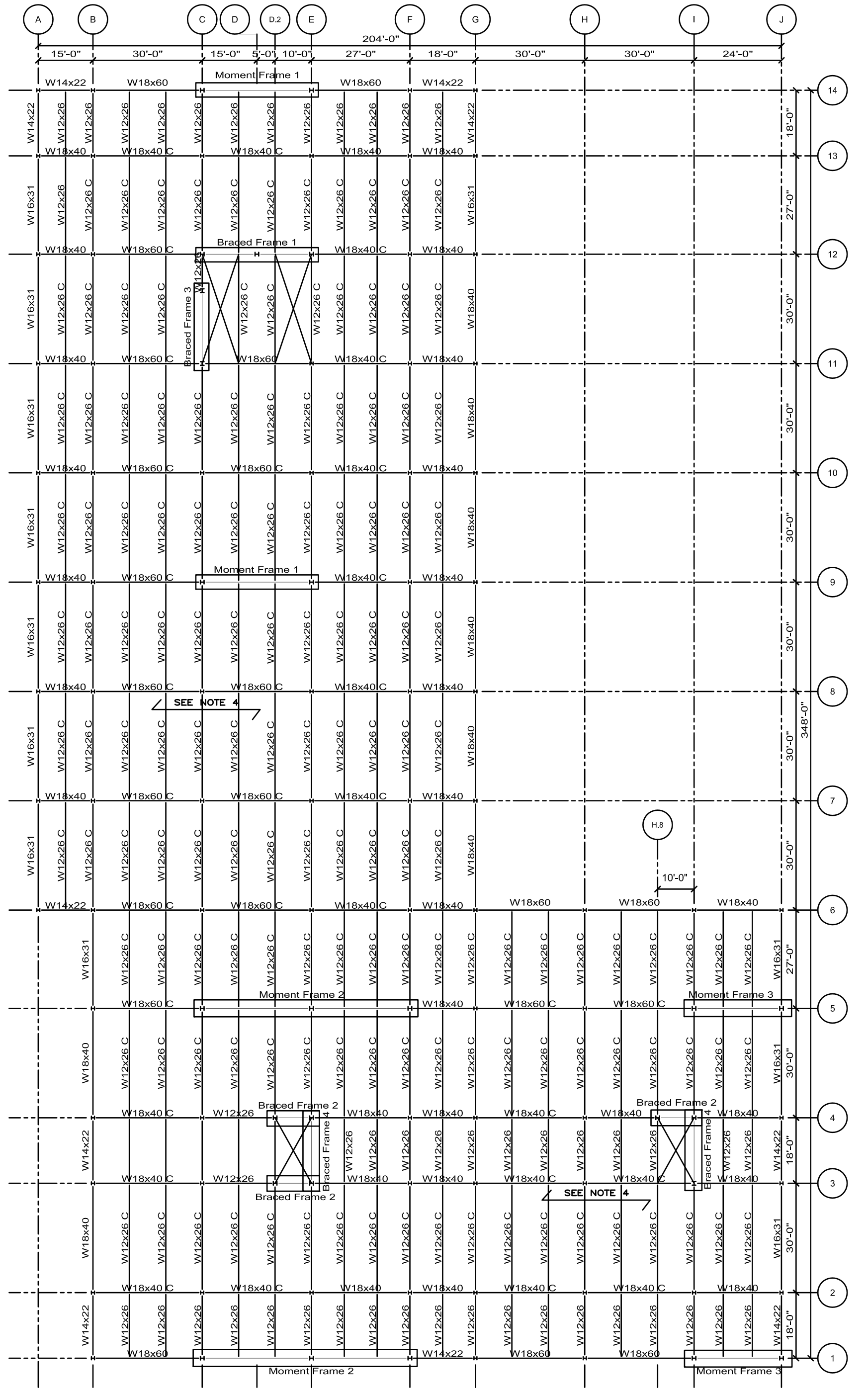
Seismic Design Parameters

Seismic Design Category	B
Seismic Importance Factor, I_E	1.00
Site Class	D
Spectral Response Acceleration at Short Periods (0.2s), S_S	0.160 g
Spectral Response Acceleration at One Second Period, S_1	0.052 g

	X-axis	Y-axis
Building Period Coefficient, C_T	0.028	0.028
Response Modification Coefficient, R	3.0	3.0
System Overstrength Factor Ω_O	3.0	3.0
Deflection Amplification Factor, C_d	3.0	3.0

Note: The requirements of the AISC *Seismic Provisions* WERE NOT used in determining the quantity estimate for this project. Whether or not the special seismic requirements must be taken into account in the design is based on the applicable building code and local requirements.

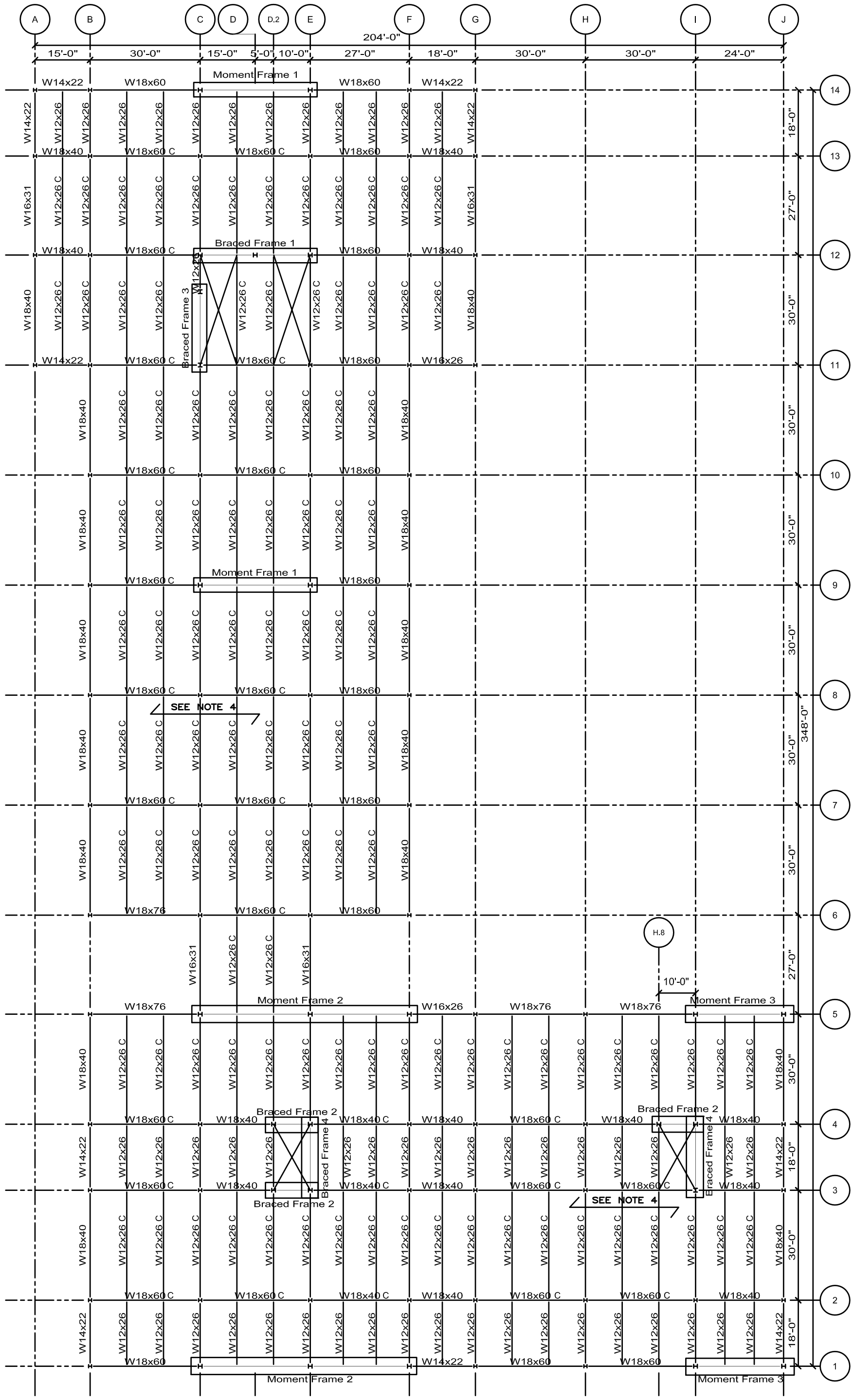
TYPICAL GARAGE FLOOR FRAMING PLAN



NOTES:
1) Each member is marked with the estimated member size and the designation for camber. If present, the designation "C" indicates an assumed camber from ¾ in. to 2 in. The estimated number of studs for each member is not indicated. A total estimated number of studs is provided in the Steel Quantity Takeoff sheet.
2) Boxes indicate lateral force resisting (moment/concentrically braced) frames. See the Column and Frame Layout Plan and the Frame Elevations for frame beam, column, and brace member sizes. The wide-flange beams are moment-connected to the columns in the moment frames. NO special base plate detail is assumed for the columns.
3) See the Column and Frame Layout Plan and the Column Schedule for gravity column sizes.
4) ⟵⟶ indicates direction of the estimated floor slab consists of 3 in. noncomposite metal deck with 3 in. of normal weight concrete topping (6 in. total slab depth) unless otherwise noted.

NOT FOR CONSTRUCTION

TYPICAL CONDO FLOOR FRAMING PLAN



NOTES:

1) Each member is marked with the estimated member size and the designation for camber. If present, the designation "C" indicates an assumed camber from ¾ in. to 2 in. The estimated number of studs for each member is not indicated. A total estimated number of studs is provided in the Steel Quantity Takeoff sheet.

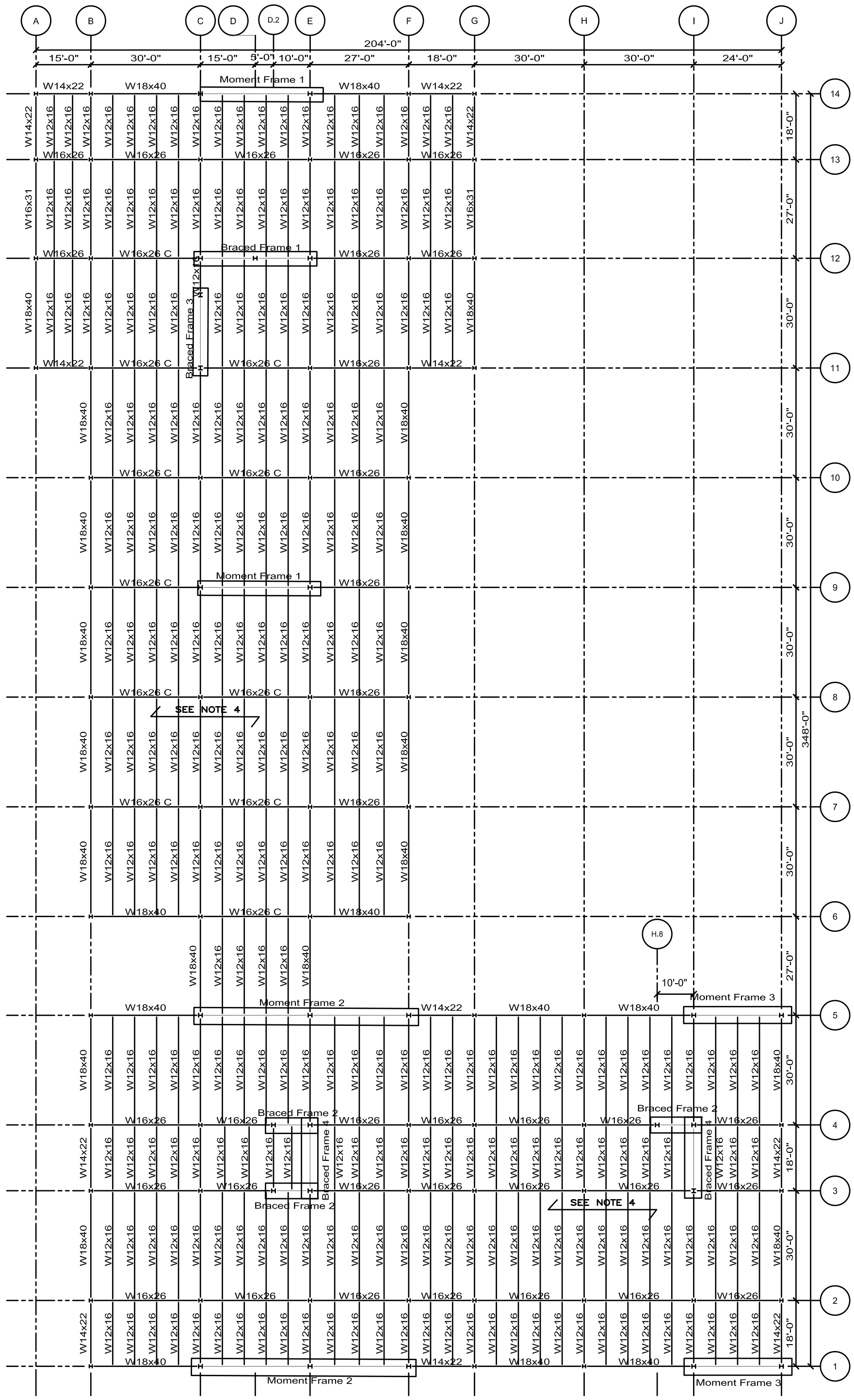
2) Boxes indicate lateral force resisting (moment/concentrically braced) frames. See the Column and Frame Layout Plan and the Frame Elevations for frame beam, column, and brace member sizes. The wide-flange beams are moment-connected to the columns in the moment frames. NO special base plate detail is assumed for the columns.

3) See the Column and Frame Layout Plan and the Column Schedule for gravity column sizes.

4) ⟵⟶ indicates direction of the estimated floor slab consists of 2 in. composite metal deck with 4½ in. of normal weight concrete topping (6½ in. total slab depth) unless otherwise noted.

NOT FOR CONSTRUCTION

ROOF FRAMING PLAN



NOTES:

1) Each member is marked with the estimated member size and the designation for camber. If present, the designation "C" indicates an assumed camber from ¾ in. to 2 in. The estimated number of studs for each member is not indicated. A total estimated number of studs is provided in the Steel Quantity Takeoff sheet.

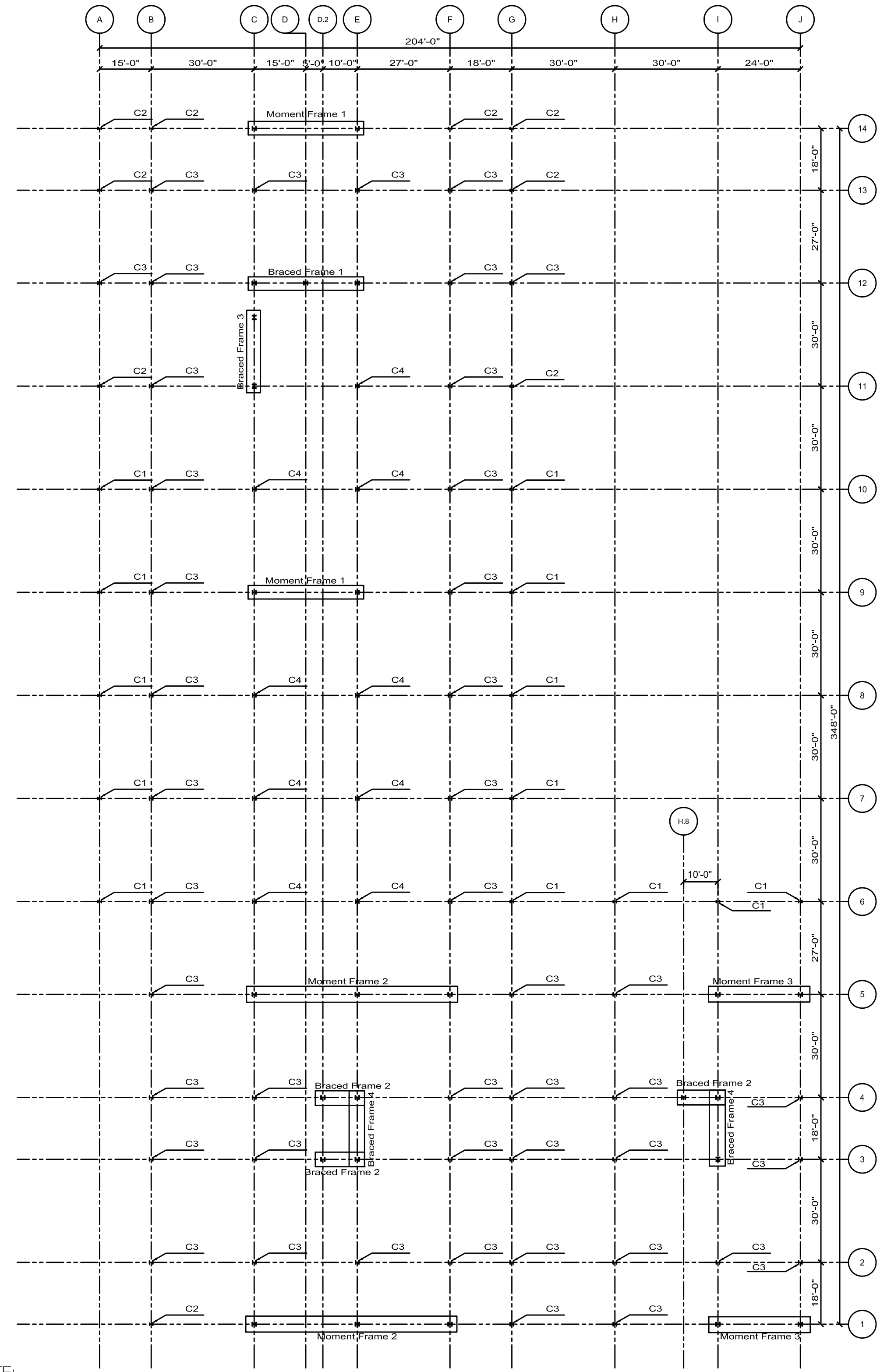
2) Boxes indicate lateral force resisting (moment/concentrically braced) frames. See the Column and Frame Layout Plan and the Frame Elevations for frame beam, column, and brace member sizes. The wide-flange beams are moment-connected to the columns in the moment frames. NO special base plate detail is assumed for the columns.

3) See the Column and Frame Layout Plan and the Column Schedule for gravity column sizes.

4) ⟵⟶ indicates direction of the estimated roof consists of 1½ in. composite metal roof deck unless otherwise noted.

NOT FOR CONSTRUCTION

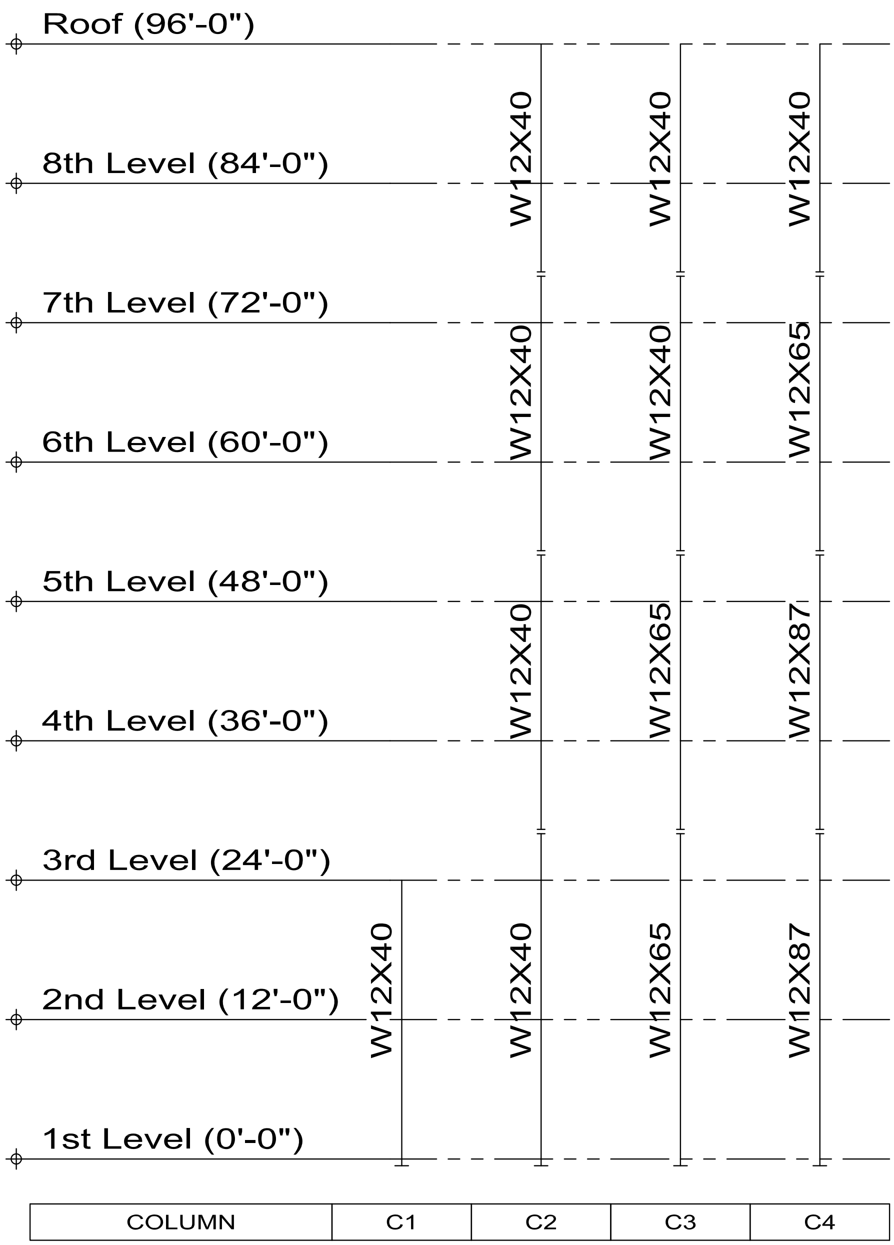
COLUMN AND FRAME LAYOUT PLAN



NOTE:
1) Boxes indicated lateral force resisting (moment/concentrically braced) frames. No special base plate detail is assumed for the columns.

NOT FOR CONSTRUCTION

COLUMN SCHEDULE



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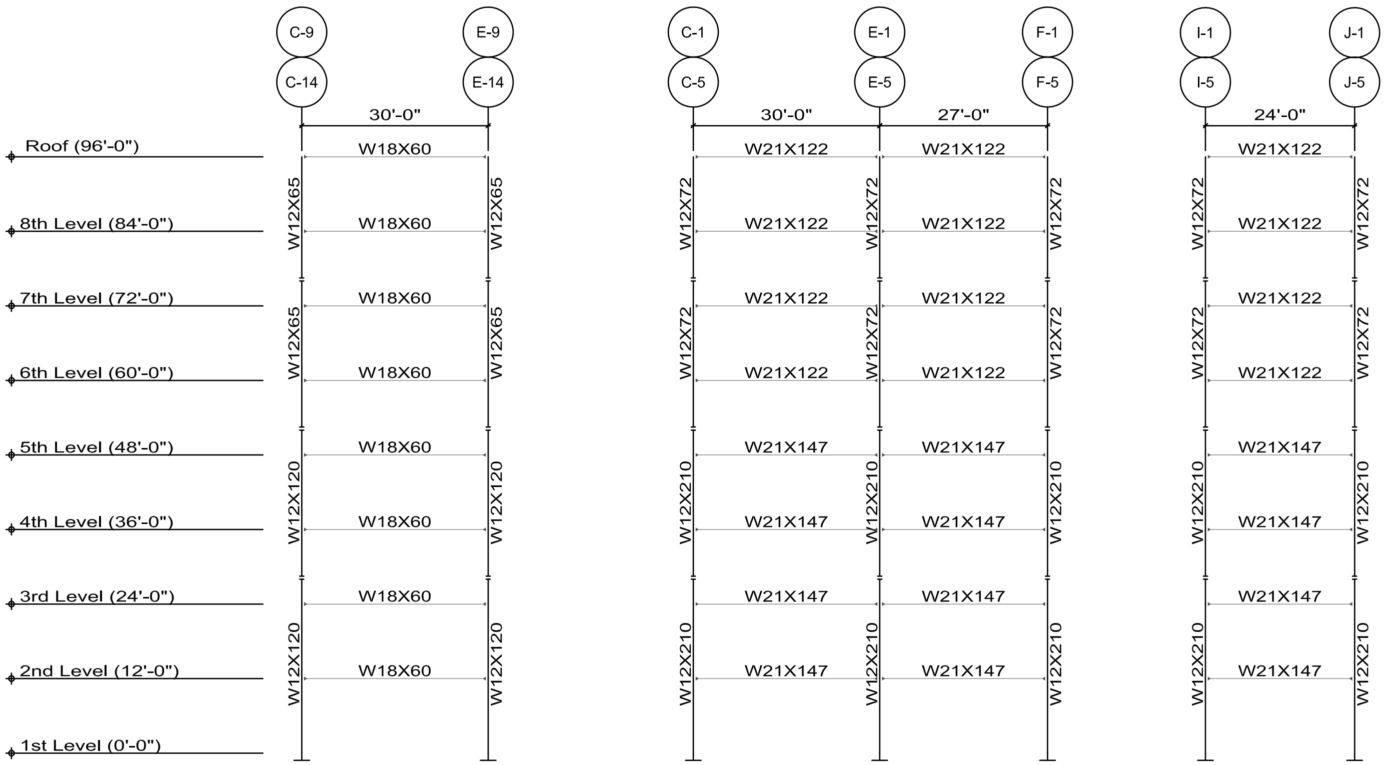
MOMENT FRAME ELEVATIONS

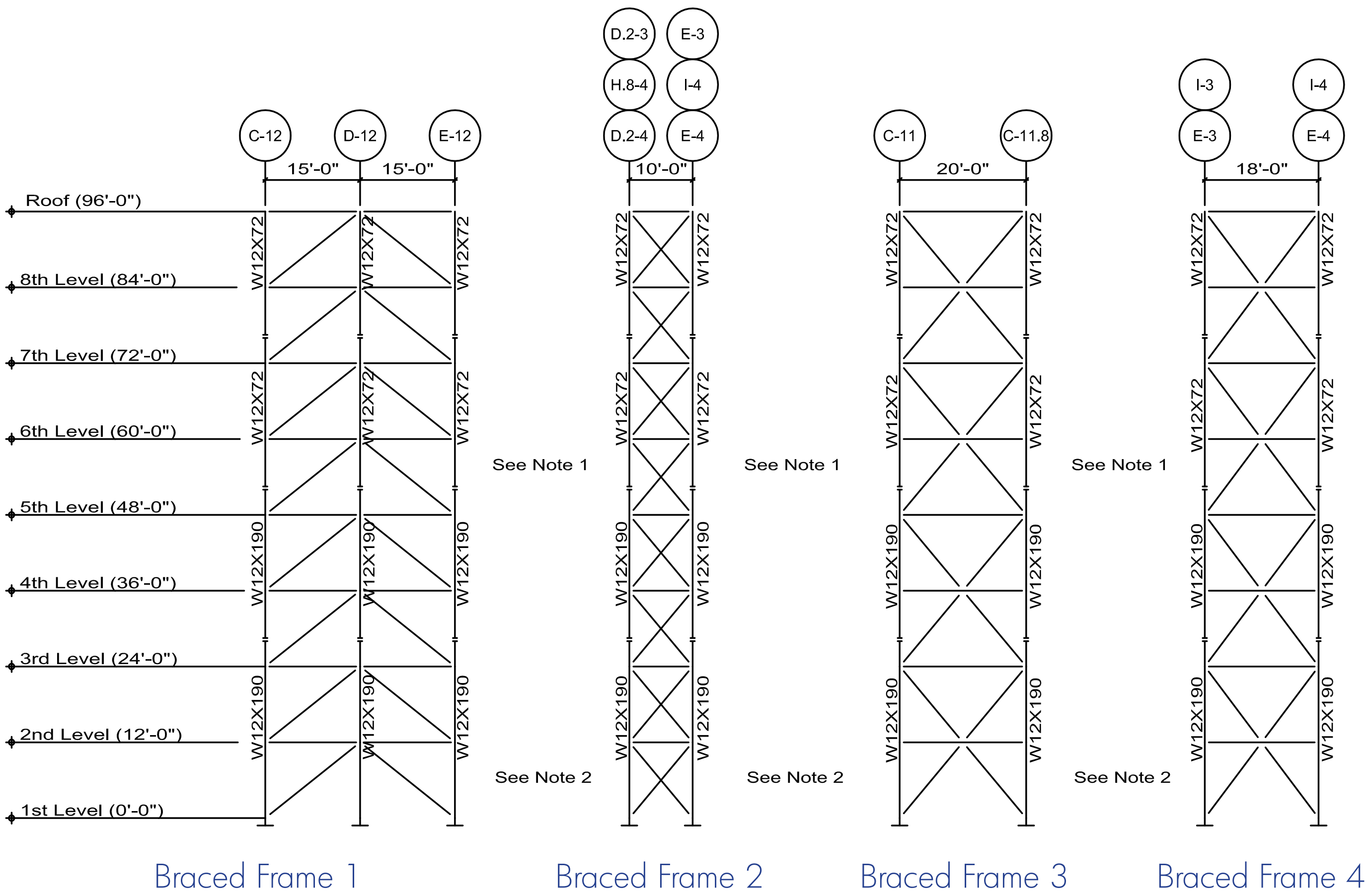


Moment Frame 1

Moment Frame 2

Moment Frame 3

NOT FOR CONSTRUCTION



NOTES:
1) All brace members are HSS6x6x¼ for top four floors unless noted otherwise.
2) All brace members are HSS8x8x½ for bottom four floors unless noted otherwise.
3) All beams are W18x60 unless noted otherwise.

NOT FOR CONSTRUCTION

STEEL AND SUSTAINABILITY

The green buildings movement is increasing at a rapid pace. More and more owners, architects, engineers and contractors are realizing the benefits of sustainable design and construction practices. Selecting structural steel as the framing system is one step toward improving the green or sustainable performance of multi-story residential facilities and other building types. There are multiple credit opportunities for structural steel under the U.S. Green Building Council's Leadership in Environmental and Energy Design (LEED®) for New Construction program. These include MR Credit 1.1: Building Reuse—Maintain Existing Walls, Floors and Roof, MR Credit 2: Construction Waste Management, MR Credit 3: Materials Reuse, MR Credit 4: Recycled Content, MR Credit 5: Regional Materials and ID Credit 1: Innovation in Design. (For more information on these credits, visit www.usgbc.org.) Structural steel also provides sustainability gains and opportunities beyond the LEED system.

Recycled Content

Steel made via the electric arc furnace process (all wide-flange members, channels and angles and some plate and hollow structural sections) has an industry-average recycled content of 93.3%.

Recycling Rate

There is an established market for steel scrap (structural and otherwise), and 98% of all structural steel is recycled at the end of a building's life.

Cradle-to-Cradle

Many materials can be recycled, but most are down-cycled to a different product. For example, concrete from a deconstructed building can be used again as road aggregate, but it can rarely be used again as aggregate for structural concrete. Steel, on the other hand, can be recycled over and over again, or "multi-cycled," without losing any of its strength or properties. This makes steel a true cradle-to-cradle product as opposed to a cradle-to-grave product. And it's not just structural steel. Steel products of all types can become steel products of all other types.

Offsite Fabrication, Onsite Erection

Steel is fabricated in highly automated facilities to strict tolerances, greatly minimizing additional work and the resulting additional labor hours and equipment required on a project site, thus lowering the steel-framed structure's environmental footprint.

Erection Schedule

The erection schedule for a steel-framed multi-story residential structure is about one-third less than that of competing framing systems. This reduced construction schedule not only lowers the steel-framed structure's environmental footprint, it also allows the steel-framed building to open earlier.

Foundations

Lighter steel-framed multi-story residential structures result in lighter foundation loads, thus decreasing the amount of material needed for the foundation.

Environmental Impact

A study conducted by independent consultants compared the environmental impact of two medical office buildings in Omaha—one framed with structural steel framed and one with concrete framed projects—and concluded that the steel building came out ahead in four of five categories: global warming potential, eutrophication potential, acidification potential and smog potential. The fact that the results in each category, including primary energy demand where steel lagged concrete by 1%, are within 10% of each other indicates that the choice of a structural framing system should not be made on the basis of the environmental impact of the materials alone. It is not just the selection of materials that is important from a sustainable perspective, but also the optimization of those materials in both the design and the actual construction process.

Early Involvement

Adopting a collaborative, integrated project delivery methodology on a steel-framed multi-story residential project means getting the fabricator involved early. An experienced fabricator can help you choose more efficient steel assemblies, saving you time, materials, and money. Collaborative design combined with a steel framing system and building information modeling (BIM) can result in a project that uses less material, which results in less labor, less cost and less environmental impact.

Flexibility

Steel framing allows for easier reconfiguration or expansion of any type of structure. This is especially important with multi-story residential structures. These buildings often require modifications such as changes in unit sizes, reconfiguration from hotel to apartment space and vice-versa, and the addition or expansion of retail, office, lobby, fitness and other types of spaces to complement the new occupancy type.

Deconstruction

Steel-framed multi story residential structures can be easily deconstructed, and members can be remanufactured into new members or reused with minimal additional fabrication work. Only 2% of all structural steel from multi-story residential projects ends up in a landfill, with 98% being recycled into new steel products.

BUILDING INFORMATION MODELING

Building Information Modeling

Building Information Modeling (BIM) is the process of generating and managing a building database in a graphic, multi-dimensional building information model (also abbreviated BIM). The BIM can be used for the entire life cycle of a building project and can contain items that include building geometry, spatial relationships, geographic information, sizes and quantities of building components, and energy system information.

The BIM process requires a great deal of advanced planning and early involvement prior to construction, which in turn helps to eliminate time-consuming design and field issues, materials savings, earlier occupation, and lower up-front costs. The BIM process and model can be advantageous in a variety of ways for almost all parties involved the construction process:

Owner

BIM allows an owner to capture facilities lifecycle data reducing maintenance cost over the lifecycle of the building.

Architect/Engineer/Detailer

The Building Information Model can provide for a more accurate steel tonnage, resulting in foundation savings. The BIM model allows design teams to view complicated configurations and connections in 3D. The BIM process also reduces requests-for-information (RFIs) and change orders by identifying collisions and interferences virtually on the model before they ever become issues in the field.

Fabricator

BIM can streamline the entire structural steel fabrication process. Today's high-tech fabrication shops can upload electronic information directly into fabrication equipment without having to convert 2D drawings into different formats. The BIM model can provide for a more accurate steel tonnage, resulting in more accurate estimating/bidding and material savings.

Erector

Erection considerations can be handled before the foundation has been poured. Representations of construction equipment can be placed on the model to allow the erection team to evaluate site conditions and site scheduling. And with collisions and interferences evaluated on the model, time-consuming field modifications and repairs are almost eliminated. Therefore, using the BIM process results in a compressed schedule and faster erection time.

Specialty Contractor

The BIM process enhances scheduling of all subcontractors on the project. With BIM, the subcontractors will know which phase of their work can begin, and the conditions of the construction site they can expect prior to the start of their work. Also, collisions between systems (MEP, HVAC, specialty equipment, etc.) and the structural steel can be evaluated prior to construction, almost eliminating field re-routes or fixes; resulting in a compressed schedule and faster erection time.

CIS/2

The structural steel industry has been a leader in BIM in the United States. The American Institute of Steel Construction helped drive the advance of BIM by endorsing CIMSteel Integration Standards/Version 2 (CIS/2) as the open standard for data exchange in structural steel design. CIS/2 is the specification providing the building product model for structural steel and format for electronic data interchange among software applications dealing with steel design, analysis, and manufacturing. To learn more about BIM and CIS/2 log onto www.aisc.org/cis2.

Photo courtesy of Magnusson Klemencic Associates

Further Support

The contractor receives the completed conceptual solution the following week. The solution provides a conceptual representation of a structural steel framing solution for the mid-rise condo and parking project.

In addition, the Regional Engineer contacts a local AISC member fabricator for ballpark cost and schedule estimates based on the conceptual solution. The contractor uses this information to further evaluate the steel-framed system against other options.

Putting the contractor in touch with the steel fabricator also enables open communication about current structural steel supply, expected lead times, suggestions for economical framing and connection design, BIM capabilities, and project management strategies to optimize the project's budget and schedule.

Photo courtesy of J.H. Findorff & Sons, Inc.

The Aberdeen Apartments
Madison, WI
Constructed in 2004

Delivering the Message!

With the SSC's conceptual solution and fabricator's cost and schedule estimates in hand, the contractor arranges a meeting with the developer, architect, structural engineer, AISC Regional Engineer, and the member fabricator to present their findings, which include:

- Reduced erection schedule—about a third less than competing systems
- Cost savings due to lighter foundation loads
- Earlier revenue generation due to reduced construction schedule
- Increased design openness and flexibility
- Various sustainable benefits including locally available materials with a high recycled content that can be easily expanded or deconstructed in the future with little to no negative environmental impact

The developer, contractor, and design team are impressed with the structural steel solution compared to competing materials. They are now convinced that structural steel is the material of choice for their project. The fabricator has demonstrated the value of his early involvement in the project, and he may have the opportunity to become part of the construction team. All parties involved are reassured knowing that the SSC will provide a high level of service throughout the life of their project. They voice their agreement that—"there is always a solution in steel!"

Postscript:

Yes, this is just a fictional account. But what happens in this story is repeated in the SSC on a daily basis. Project decision makers reach out to AISC Regional Engineers and the SSC for new ideas to solve their project challenges. The SSC has worked with mills, service centers, fabrication shops, engineering and architecture offices, general contractors, developers, owners, and code officials, just to name a few. The SSC provides tools that help demonstrate and communicate the benefits of steel-framed construction. The SSC provides a win-win outcome for everyone involved—and best of all, it is a free service!

What should you do next?

Now that you've reviewed this prototype conceptual solution, ask yourself if this system might be beneficial for your next project. Contact your local steel fabricator, AISC Regional Engineer, or the SSC directly to discuss what benefits a structural steel solution can provide to your next project.

There's always a solution in steel.

Multi-Story Residential Structures in Steel

DePaul University's Fullerton Residences
Chicago, IL

STUDENT RESIDENCES

Stretching nearly the length of a city block, the steel and glass Fullerton Student Residences stands prominently amid the traditional brick and stone buildings on the campus of Chicago's DePaul University. Located in the middle of an urban, up-scale North Side neighborhood, the 262,775-gsf privatized student housing facility was developed by locally based Smithfield Properties. The developer is offering the residences' 160 four-bedroom loft-style apartment units to DePaul students under an agreement with the university.

Aesthetic appeal. Experienced in developing structural steel industrial buildings, Smithfield sought to bring a modern, expressed steel aesthetic to the Fullerton project. "We went with a loft look on the project, with exposed ceilings, metal decks, and painted steel," says Smithfield project manager Brian Bezanis.

Designed by local architectural firm Antunovich Associates, distinctive, 24-in.-deep steel spandrel beams form a series of colonnades that line the avenue in front of the building. The use of steel and glass help mask the size of the building, says Antunovich project architect Scot Ferguson. "It's a very large building, but it doesn't seem as massive as it would have with brick and stone."

Steel also enabled the design team to provide "a very open structure" in contrast to the punch windows often associated with concrete student housing structures, says Garret Browne, S.E., senior associate with the Chicago office of structural engineering firm Thornton-Tomasetti.

Maintenance/Durability/Flexibility. The maintenance and durability afforded by structural steel are benefits to the project that will continue to pay dividends, according to the developer. "Dorms take a beating, but steel and metal aren't going anywhere," says Bezanis.

The ability to run ducts through web penetrations in the steel allowed ductwork to be placed higher up toward the ceiling than with other framing systems, says Ferguson. "Steel was actually more flexible than concrete would have been," he says.

Schedule. Early coordination between the design team and the fabricator, Merrill Iron & Steel Inc., Schofield, WI, enabled the steel to be painted and all penetrations to be made to accommodate mechanical and electrical ductwork and piping while the steel was in the fabrication shop. This enabled construction to take place quickly in the field, says Ferguson.

The project was completed in April 2006, several months ahead of its scheduled summer completion. "It was a good project in terms of price and schedule," says Ferguson. "The developer is happy with the finished product."

Photo: Antunovich Associates

Innovation in steel expression. The aesthetic appeal of architecturally exposed structural steel was maximized by limiting the amount of steel that required the application of spray-on fire protection. Only primary beams and columns located at the 30-ft bay widths required such protection. No. 8 reinforcing steel was inserted into the flutes of a thicker-than-normal 7.5-in. concrete-slab-on-metal-deck system, strengthening the deck so that the intermediate beams at the 10-ft spacings acted only as secondary supports and required no additional fire protection.

"We chose steel because of the speed of construction, the price, and the look."

–Brian Bezanis
Project Manager
Smithfield Properties

Location: Chicago, IL

Client: Smithfield Properties

Completion date: Spring 2006

Gross square feet: 262,775

Number of stories: 5 (street-level retail and parking; four floors of student housing)

Number of units: 160

Number of beds: 580

Architect: Antunovich Associates

Structural engineer: Thornton-Tomasetti

General contractor: Smithfield Construction Group

Fabricator: Merrill Iron & Steel Inc.

Detailer: Merrill Iron & Steel Inc.

MID-RISE CONDOMINIUM BUILDING CHALLENGE RESULTS


Photo courtesy of Geiger & Peters

Photo courtesy of Schmidt Associates


left and below:
3 Mass Condominiums
Indianapolis, Indiana
Constructed in 2009

Steel SolutionsCenter
Your connection to ideas + answers

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