Architectural Significance in Metal Buildings: An Educational Series

HARDESTY CENTER FOR DANCE EDUCATION

Broken Arrow, OK

Created in coordination with Selser Schaefer Architects (now Narrate Design)

Photo by Ralph Cole Photography

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CONTENTS

PROJECT **DETAILS**

Building: Hardesty Center for Dance Education

Location: Broken Arrow, Oklahoma

Client/Owner: Tulsa Ballet

Building Function: Support the Tulsa Ballet's growing needs for ballet training, education and outreach programs

Size: 21,000 square feet

Site: 4 acres

Budget: $4.5 million

Completion: July 2016

Architect: Selser Schaefer Architects (now Narrate Design)

Structural and Civil Engineer: Kinslow, Keith and Todd (now KKT Architects, Inc.)

Construction Contractor: Oakridge Builders (now Flintco, LLC)

Constructor/Erector: Vanguard Builders Inc.

Metal Building Systems Manufacturer: Alliance Steel Building Systems

Exterior Metal Wall Panel Cladding Manufacturer: Morin Corporation

Exterior Metal Roof Panel Cladding Manufacturer: Alliance Steel Building Systems

Exterior Cladding Installer: Vanguard Builders Inc.

Steel Roof Installer: Vanguard Builders Inc.

Sloped Roof Installer: Vanguard Builders Inc.

Photo by Ralph Cole Photography

PROJECT **DESCRIPTION**

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“Having danced and taught all over the world, I can truly say this is a state-of-the-art facility. For the level of instruction these students will receive to the amenities, you can’t help but fall in love with dance by being here.”

-Andre Reyes, Former Co-principal,
Hardesty Center for Dance Education

Photo by Ralph Cole Photography

Completed in July 2016, the Hardesty Center for Dance Education extends the reach of the Tulsa Ballet, one of the top ballet companies in North America. The center provides ballet training, education and outreach programs in Broken Arrow, OK, Tulsa's largest suburb. (1) The 21,000-square-foot center sits on four acres and features four dance studios—two large studios, a smaller studio for younger students and the Anne & Henry Zarrow Performance Studio, which doubles as a performance space for students and the Tulsa Ballet II, the second company of the Tulsa Ballet. (2,3,4) Additionally, the center houses a spacious lobby, dance store and waiting area for parents, boys' and girls' dressing areas, administrative offices and 4,000 square feet of warehouse storage space for sets and costumes. (5)

Creating Movement Out of Metal

On an unassuming suburban street, Tulsa Ballet's Hardesty Center for Dance Education rises and falls in seeming movement, like two dancers performing a classical ballet known as a pas de deux. (6) A wall stretches outwardly, evoking the moment a dancer gracefully extends a leg, rises on pointe and raises an arm. While her other leg extends behind, she leans into the arabesque as she's held fast by her partner in the classical dance duet. (7) The effect beckons those who pass by to pause and watch, as if the building is the dance, the grounds the stage and the passersby the audience.

Robert Schaefer, co-founder and former principal of Selser Schaefer Architects (now Narrate Design), and his team portrayed this iconic moment in classical ballet with the use of a metal building. "We could not have produced this effect with conventional steel framing and stayed within the budget. That never would have happened. Metal buildings allow you to create shapes that might be economically off the table otherwise," he said.

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Finding Design Inspiration

While Robert Schaefer had been enjoying Tulsa Ballet performances for more than 30 years, Selser Schaefer's co-founder and Principal Janet Selser served on the board of directors for the Tulsa Ballet and was aware of its need for a new facility. "Fundraising was underway for this new center for dance education," Schaefer said. "Janet and another architect on the board, Andy Kinslow of Kinslow, Keith and Todd [now KKT Architects], began talking about providing the architecture for the project. They agreed that our office would do the design of the building, while Andy's office would do the civil and structural engineering work."

"We'd always done pro bono work, however, this was absolutely the most ambitious gratis project we'd ever undertaken," he said. "To be able to do this building without any constraints to maintain profitability was rather freeing."

Though a ballet fan, Schaefer had never undertaken the design of a dance school before. "Because this was pro bono, we could take our time to fully immerse ourselves in the dance world," he added. He and his team worked with Tulsa Ballet's Artistic Director Marcello Angelini to understand Angelini's vision and to gain his artistic input. "Marcello is a tremendous teacher; we really learned about dance education. We attended practices of the professional company, and we saw how kids and parents moved around the studios." This gained understanding, along with Marcello's artistic vision, served as inspiration for the design.

Understanding the Rules of the Game

With a $4.5 million budget and an ambitious design concept, the architects aligned with Alliance Steel Building Systems to understand what could be achieved with a metal building solution. "There are some guidelines in designing with metal, but once you understand the rules of the game, then off you go. There's so much freedom with this type of system; you can create innovative, high-end designs," Schaefer said.

"Selser Schaefer Architects brought us in early in the design process to make sure what they were designing was economical and feasible with our system," says Mike Mehan, senior sales executive for Alliance Steel Building Systems. "We served as their sounding board early on, and through our pre-engineering work, we offered input that economized the use of materials, getting them exactly the shape and design they wanted."

Design Priorities – Interior Space

The new building serves as a world-class center for dance, meeting three very specific functional needs.

1. **Create World-Class Dance Studios**
   Each of the center's four ballet studios features basket-woven sprung floors with a Marley (8) covering (a highly controlled cushion rebound system that protects dancer's joints), lofted ceilings, 10-foot-tall mirrors and a state-of-the-art sound system. (5) "Having danced and taught all over the world, I can truly say this is a state-of-the-art facility," said Andre Reyes, former co-principal of the Hardesty Center, in a Tulsa Ballet news release. "For the level of instruction these students will receive to the amenities, you can't help but fall in love with dance by being here." (5) The center complements Tulsa Ballet's central location in Tulsa, serving not only Broken Arrow, but also Bixby and South Tulsa.

2. **Provide a Warm, Welcoming Environment**
   A spacious lobby with a polycarbonate wall at the administrative offices gives an airy feel to the interior entrance where parents wait for students. Natural wood in a clear maple finish provides warmth as sunlight streams through windows that extend throughout the center. "Every space has access to daylight," Schaefer said. "The center is a very welcoming luminous place, and the dance studios are the most delightful rooms I've ever created. They are really lovely places to walk into."

Photos by Ralph Cole Photography

3. **Design a Flexible Performance Space**
   The performance venue, which serves as a studio 95% of the time, features unfixed, stepped seating for 160 people, which can be removed, as well as a stage, theatrical lighting and structural components to accommodate a curtain and wings. (5)

"Opening this facility has been a dream of Tulsa Ballet for a long time," Angelini said in a Tulsa Ballet news release. "It's our mission and duty to share the quality, expertise and excellence intrinsic to our organization with a larger segment of our community. Achieving this goal was impeded by lack of space…Now with a new space, and a stellar staff to match the architectural attractiveness of the site, we will be able to reach everyone, from the future prima ballerina to the little girl or boy who just wants to dance for fun."

PROJECT **CHALLENGES, GOALS & OBJECTIVES**

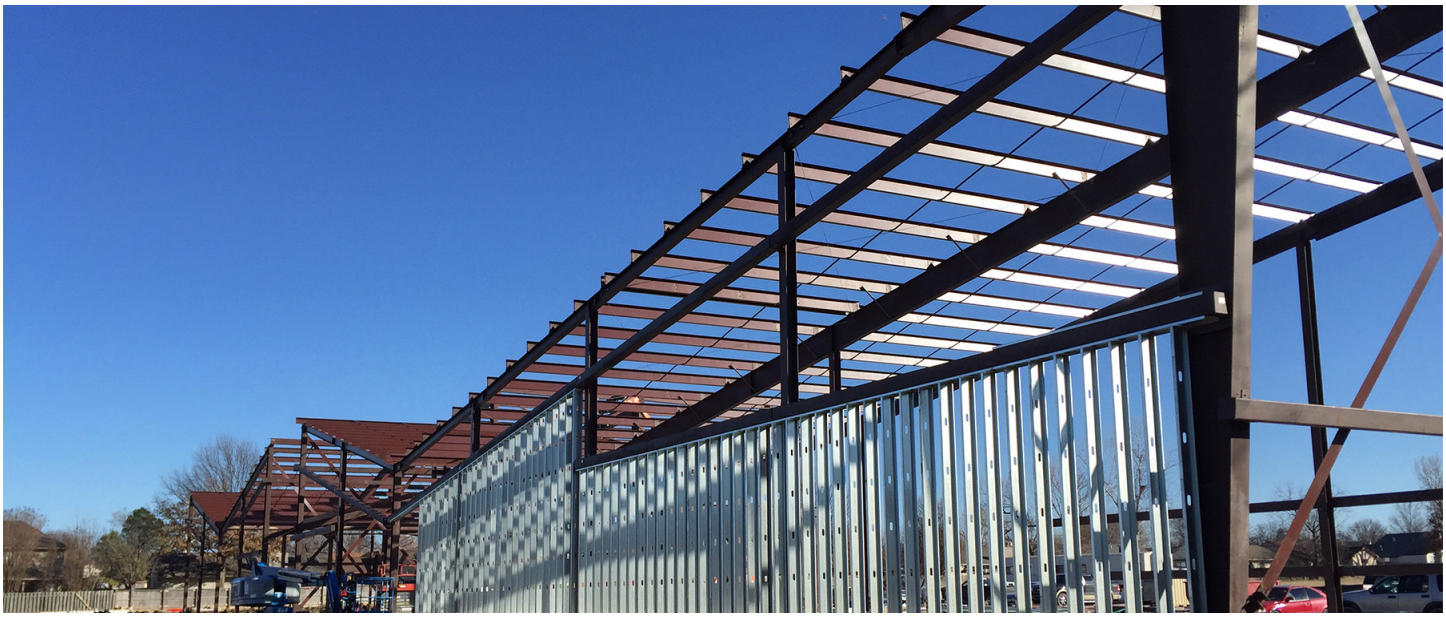


Photo by Ralph Cole Photography

Create a Leaning Wall

One of the most dramatic features—the outwardly leaning exterior wall—required an innovative modification to the framing system. "The wall leans two to three feet out of plumb," Schaefer said. To achieve that effect, Alliance designed the framing column for that exterior wall to be turned 180 degrees. "Flipping the column placed the vertical support on the inside of the building with the diagonal support facing the exterior. This allowed the exterior wall to be sloped outwardly at whatever angle was needed," Mehan said. "With a metal building, we can force the framing into a particular shape, increasing or decreasing the thickness of the steel to meet loading requirements."

Manage the Acoustics

With rooms that soar up to 32 feet tall in parts of the center, the team understood acoustical management was key, using sloped ceilings and exposed ductwork to their advantage. "Sound bounces differently on a sloped versus a flat ceiling," Schaefer said. "Exposed ductwork and lighting—every irregularity—improves acoustics."

Thick walls also benefit acoustic absorption throughout the facility. "We framed out eight-inch metal studs, which are a fairly heavy gauge. They're substantial walls that meet our loading requirements and help with the acoustical design," Schaefer said.

Reduce Sight Lines

Another unique modification centered on the support columns found throughout the building. "To reduce the footprint of the columns, we designed them to have a smaller width at the base, gradually increasing the thickness of the steel to accommodate the load as the column rises above the sight line," Mehan said. "If we had been working with conventional steel, the cost might have been two to four times that of a metal building." Further, with no interior support columns, the dance center features large clear span spaces—critical in the dance studios, and in particular, the largest studio, which can serve as a performance venue. "With a metal building, we can achieve these large spans for less money and less materials than a design that requires a structural truss system," he added.

Hide Mechanical Equipment

With a roofline that rises and falls to mimic two dancers in motion, the design team was able to creatively hide the building's eight, roof-mounted HVAC units. "We always endeavor to hide the mechanical equipment in our designs so that every side of the building is worthy of your consideration," Schaefer said. The HVAC units sit on a low-slope roof, obscured from street view but with easy access for maintenance personnel.

Keep the Building Water-Tight

"Another advantage of installing the mechanical equipment on a low-slope roof is that you're not creating perforations in the standing seam roof," Mehan said. He explained that the standing seam metal roof is more steeply angled and sits independently of the building's frame, expanding and contracting as needed. Installing the mechanical equipment on a low-slope membrane roof area positions the roof opening in the non-floating roof system, which is more likely to stay watertight long term and is more economical to build.

Further, Mehan noted that the building's valley gutter system helps to mitigate any potential drainage issues from the building's unique exterior design. "If you think about your house, all the water sheds to the outside edges, but with these grand walls, water pushes to the center of the building." The large valley gutter system prevents the accumulation of water in the valleys of the roof, channeling it toward a main gutter system. (9) "For this project, the valley gutter system is a really good method for keeping the metal building water-tight," he said.

Create Texture and Shadow

To create variations of texture and shadow on the building, the design team varied the type and placement of the exterior cladding. "We created six different pattern groups with six panels in each group," Schaefer said, explaining that each of the six panels varied in characteristics such as the spacing of the metal folds. The team then created a mock-up for the cladding installer and were on site during installation to ensure the patterns were correctly placed. "These patterns are really pleasing to the eye, creating the illusion of rivers and valleys throughout the exterior," he said, noting that the team created this illusion using regular, off-the-shelf panels to keep costs low. A midline, where the building has a break in the cladding design, serves as a visual device, helping to define the building's soaring elevation.

Additional Notes

To reduce costs, Mehan recommends staying away from custom pieces as much as possible. "There is so much you can do with standard materials made by the majority of metal building manufacturers." He cites a Texas university that selected a custom wall panel color for an engineering lab. "One of the panels got damaged by the landscaping contractor. Had the university chosen one of the many standard siding colors, the replacement panel would have cost $120. With this custom color, however, the replacement cost for just one 3-foot-by-16-foot panel was $11,000." To further reduce costs—and streamline logistics—Mehan said to stick to a single-source manufacturer. "If you're waiting on multiple manufacturers, it can affect project timing," he said.

For the Hardesty Center, Mehan recalled that engineering and drafting work took four to six weeks, while fabrication required an additional five to six weeks. Once materials arrived on site, the building was erected in about eight weeks. "A metal building goes up so much faster than a conventional building system. Every part is cut to size; everything is pre-punched," he said.

Of the hundreds of projects he's worked on over the years, Mehan can't recall another that matches the attention drawn by the Hardesty Center. "It's a landmark project, and I'm proud we had a hand in it. We've worked with larger budgets and on larger buildings, but about once a year, we still get a call about the design of that building. It's a testament to the architects' abilities to take something with a modest budget and create a landmark building that's been written up in magazines over and over again. That's pretty cool."

RELEVANCE FOR STUDENTS

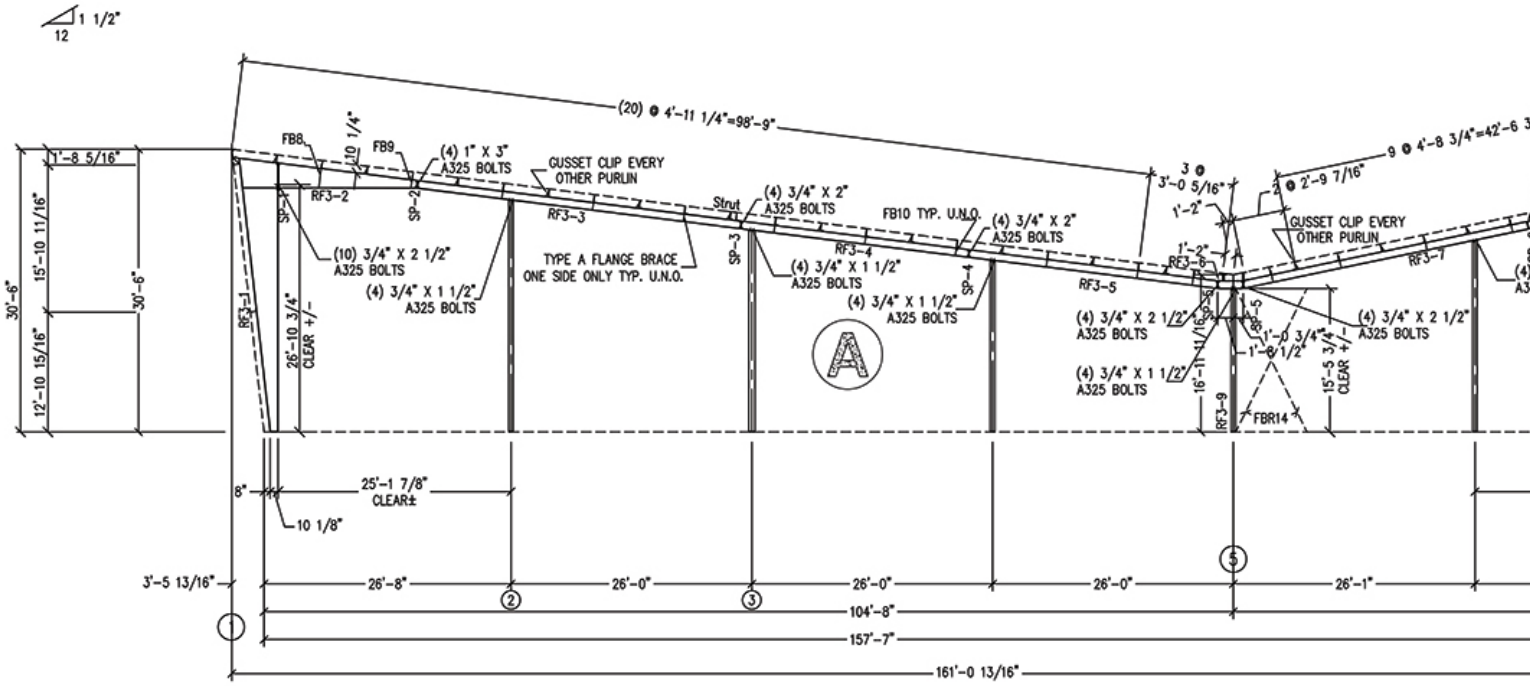
"I think there are a lot of misconceptions about metal buildings," Schaefer said. When you understand the rules of the game—what you can and can't do—you can create truly wonderful designs. All it takes is an hour-long conversation with a metal building supplier. They can talk about the most economical sizes and lengths of materials, the framing and column shapes. There are suppliers out there who only want to build barns and warehouses, and then there are companies like Alliance who are invested in creating very sophisticated designs."

"I'm just shy of 30 years with Alliance," Mehan said, "and when we started, we were doing a lot of shops, barns—more industrial and agricultural-style work. But over the years, we focused on hiring and training up our engineering and detailing staff to push the envelope of what can be done with metal buildings. Our professionals aren't just grabbing parts from a book. We consult with architectural firms on the front-end design process of a project to help them create unique designs while keeping the cost savings associated with a metal building system."

While in school, Schaefer recommended that students not just intern for any architecture firm, but work somewhere where they admire the work the architects are doing. "Develop a relationship with a mentor. School taught me a lot, but my mentor taught me how to be an architect," he said.

PRACTICAL APPLICATION

1. The architect created the effect of dance movement though the use of metal. Research other high-end metal buildings. Are there other designs that similarly convey movement?
2. How did the architect bring light and warmth into the building? How would you have designed the building to create a welcoming atmosphere?
3. While large, open spaces are an added benefit of a metal building, what's the potential impact on acoustics—and in particular on a performance space? What choices did the architect make to help absorb and control sound? Research other ways to engineer the acoustics in large open spaces.



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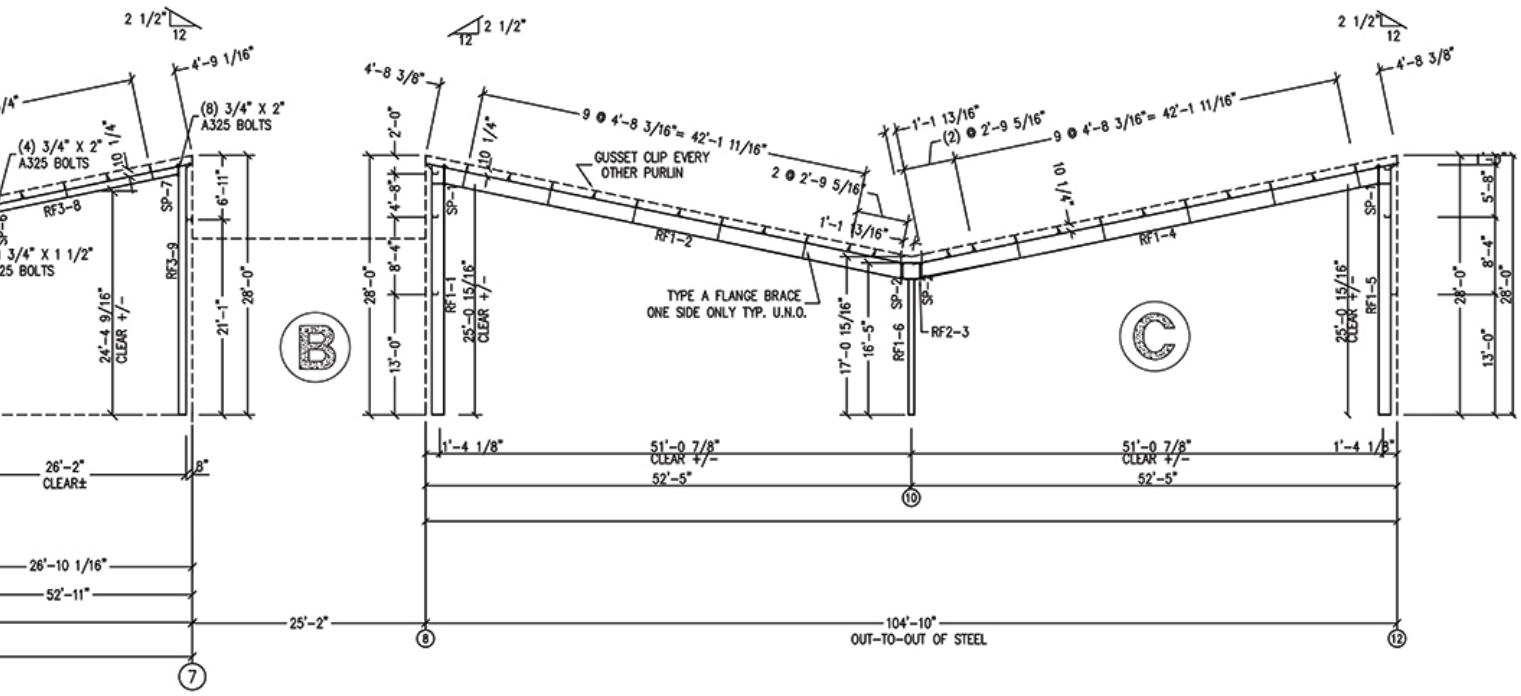
-Mike Mehan, Senior Sales Executive, Alliance Steel Building Systems

4. A metal roof sits independently from the framing of a metal building to allow for expansion and contraction. Research the degree of thermal expansion on different angles of a metal roof. Is there more expansion/contraction on a steeply angled roof versus a low-slope roof?
5. Why did the architect choose to place the mechanical equipment on the low-slope roof versus the highly angled standing seam roof? How does this help to keep the building water-tight over time?
6. To create texture and shadow, the architect used common metal siding panels to create the illusion of rivers and valleys throughout the exterior. What are other effects that could be achieved by mixing and matching panels? Print out some examples and experiment.
7. How did the project team modify the framing to achieve the graceful lean of the wall that mimics a classical ballet movement? What was done to reduce sight lines in the dance studios? Research how a metal building is framed and the tools a modeler uses to adjust the design.



RIGID FRAME ELEVATION: FRAME LINE K

Image by Alliance Steel Building Systems

RESOURCES/RELATED READING

Related Reading

- MBMA. n.d. "Case Study: Educational Campus Facilities"
- MBMA. n.d. "MBMA-NAIMA Acoustical Performance Guide"

Video Resources

Over 50 videos highlighting metal building architecture, engineering, design and application can be accessed at www.youtube.com/mbmamedia. We recommend you begin your educational process with the following programs:

- Metal Building Systems 101
- An Introduction to Metal Building Systems
- How It's Made: Metal Building Innovations Are Revolutionizing Low-Rise Commercial Construction
- How It's Built: Metal Building Construction Raises the Bar for Low-Rise Commercial Structures
- How Do I Know a Metal Building is Right for My Project?
- Metal Building Nomenclature

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CREDITS

Managing Editor

W. Lee Shoemaker, PhD, PE
MBMA Director of Research & Engineering

Production Design & Management

TWI Publishing

Photography & Drawings

Narrate Design
Ralph Cole Photography
Alliance Steel Building Systems

Information Sources

Robert Schaefer, Co-founder and Former Principal, Selser Schaefer Architects (now Narrate Design)
Mike Mehan, Senior Sales Executive, Alliance Steel Building Systems
Marcello Angelini, Artistic Director, Tulsa Ballet
Andre Reyes, Former Co-principal, Hardesty Center for Dance Education

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