

# BUILT BRAUN TOUGH

## High-Tech Theater Celebrates the New Ford F-150

BY MARY E. KREMPOSKY, ASSOCIATE EDITOR

PHOTOS COURTESY OF BRAUN CONSTRUCTION

Henry Ford's invention of the first moving assembly line in 1913 set the pace for manufacturing in the 20th Century. Fast forward a hundred years and Ford Motor Company has once again set the bar with yet another industry-shaking innovation: The Ford F-150's military-grade, aluminum alloy truck body and bed, offering drivers a stronger but lighter and more fuel-efficient vehicle. Built at the iconic Rouge plant in Dearborn, the F-150's body completely embodies the high-tech, efficient and more sustainable direction of 21st Century manufacturing.

Called the world's most revolutionary truck, the F-150 takes center stage in the re-invented Manufacturing Innovation Theater, one of two theaters in the Rouge Factory Tour 2.0. This circular theater is Station Two in a five-part grand tour of the Rouge, courtesy of The Henry Ford - America's ultimate history museum drawing visitors from across the country and around the globe.

The Henry Ford enlisted the services of Braun Construction Group, Inc., Farmington Hills, and Harley Ellis Devereaux, Southfield, to renovate the 30,000-square-foot theater in only three months – right in time for the release of the new 2015 Ford F-150. Meeting this tight

timeline was also important because the theater's show is a type of "prequel" to the actual tour of the factory, itself. "The theater is the highlight of the pre-factory tour," said Harley Ellis Devereaux's Project Manager Ronald P. Zuhorski, AIA, LEED AP, BD + C. "Because the theater creates the largest impression on visitors outside of the factory walk, it was paramount to get the theater back on line in order to fully serve visitors."

Henry Ford would have been proud of the project team's blistering pace of production. For efficiency, Braun began demolishing a portion of the theater's seating platform, while Harley Ellis prepared the structural and seating drawings. Taking a cue from its manufacturing client, Zuhorski calls this stream-lined process "just-in-time design delivery."

Both firms coordinated their efforts with BRC Imagination Arts, a theatrical presentation company based in Los Angeles, California. Thanks to BRC's mastery of high-tech illusion, the theater's technology doesn't just tell visitors the story of the truck's development and production. It actually seems to build the truck right before the audience's eyes through the use of laser lights, 3D



Thanks to Braun Construction Group, Harley Ellis Devereaux and BRC Imagination Arts, the Manufacturing Innovation Theater re-creates the development and production of the Ford F-150, the world's most revolutionary truck because of its military-grade, aluminum alloy truck body and bed.

projection mapping and other state-of-the-art special effects, as well as a truck model and two, six-foot-tall robots. "It is probably one of the top three projects of which I was most proud to be involved," said Braun Superintendent and Project Engineer Chad Prohitt.

All three firms worked together with the precision of an actual assembly plant. Post-show, visitors can walk the catwalks above the actual plant floor to watch workers assemble this 21st Century truck - and to catch a glimpse of a robot lifting and installing truck windshields. This contemporary factory would be unrecognizable to those who worked the world's very first assembly line set in motion on Dec. 1, 1913 at Ford Motor Company's Highland Park Plant.

### LIGHTS, CAMERA, ACTION

Working to beat the clock, the subcontractors were a vital part of production. "We had great subcontractors that we knew had the capability to perform at high levels to complete the project," said Prohitt. "They understood the urgency of the project's time frame,

and they were willing to do whatever it took to make sure we hit the completion date - all without question and without delay. They worked very well together, and were an intelligent group of individuals."

And from the architectural standpoint, the project flowed more quickly because Harley Ellis was the original designer of the theater and the entire Visitor Center. In fact, the same individuals returned to renovate the theater under Shaun Rihacek, the lead architect of both the original and the current project. "When it came to modifying the theater, Shaun had intimate knowledge of the space," said Zuhorski.

The circular theater contains a 50-foot diameter seating platform surrounded by a 10-foot-wide pit forming the perimeter of this 70-foot diameter theater in the round. The first phase of this fast-paced project involved demolishing the front third of the seating platform elevated three feet above the actual floor. The demolition created space in a new stage pit area for the stars of



As part of the Rouge Factory Tour 2.0, visitors can walk the catwalks above the actual plant floor to watch workers assemble the Ford F-150 in this 21st Century factory.

the show: The two robots and the truck model.

Braun launched the project and began the five-day demolition on Sept. 2, 2014. "We had to schedule our demolition and our reinstall so that when BRC and its team of multiple show/effects contractors arrived on site, their infrastructure and components were in place and the space was dust free," said Prophitt. "That was our main goal. We started the moment we were told we could start."

Demolition was a carefully considered affair, because Braun was working without full install drawings and did not want to remove too much of the seating platform, said Prophitt. In service of the deadline, "the contractor was demolishing even as we

were laying out the seating," said Zuhorski. "Because we had to be able to tell the contractor at what point to stop demolition, it was important to get the seating and structural packages out quickly."

Harley Ellis prepared five design packages, including seating, electrical, data, structural and miscellaneous. "We custom strategized our document delivery packages instead of preparing a complete design and sending it out for bids," said Zuhorski. "We sat down with the contractor and discussed the general scope of work and identified the long material lead times. We worked on those items first and released a set of drawings. We then found out what the second longest material lead times were and released another package for those items.

"Following this approach, the contractor could get their orders in and then out to the site in the proper time," Zuhorski continued. "If we had waited until the very end to issue one big set of drawings, the project would have taken much longer. It was almost just-in-time delivery of our documents, so that they could get their materials just-in-time for installation. For example, the seats were on order while we were still designing. The contractor already had the seating platform torn apart and rebuilt, and the seats were just about to be delivered."

Harley Ellis also worked closely with BRC to meet requirements for the F-150 model's enclosed hydraulic lift table or stage slated for installation in the center of the new pit area.

"It took close coordination with the entire team, and with all eyes focused on the owner's goal of a quick turnaround time," said Zuhorski. "It all came down to coordination. That's a simple thing to say, but sometimes difficult to achieve. Harley Ellis enjoyed the collaboration on this job, and working with BRC was no exception. We worked closely together to create a seamless series of document packages between the two firms, keeping the construction flowing to the goal date."

**BEHIND THE SCENES**

Braun installed structural steel and wood decking for the new seating platform layout, even adding 25 seats to the original theater, according to Prophitt. Braun also removed vestiges of the former show infrastructure, including fog machines and some of the existing electrical, data, HVAC and piping before installing new electrical and mechanical systems. The electrical system provides the actual "star power" to the robots and the F-150 model – a white truck model, built 70 percent to scale that rises from within the box-like structure enveloping the actual lift.

Bayview Electric played a crucial role in the project. "Bayview had a large portion of the work," said Prophitt, "because the project needed electrical upgrades for the robots and the truck lift, and data upgrades were needed to operate all of the show technology."

Prophitt praises Bayview Electric and the entire subcontracting team. "Bayview and all the subcontractors looked at the project as a whole and not just their respected disciplines," said Prophitt. "Every contractor on the site took the same broad view."

For its part, Harley Ellis Devereaux designed the system to service both the show and the schedule. "Fortunately, the spaces were originally designed fairly robustly to accommodate renovations," said Zuhorski. "But the real challenge was to design efficiently with a minimal impact on, and use of, existing distribution systems, all for the purpose of shaving time off the construction durations. A detailed field investigation approach was used to

thoroughly document the actual field conditions and to work within those parameters when feasible and prudent."

For efficiency, the project team charted the best route for the electrical and compressed air systems and hunted for the optimal location for the truck lift's electrical

pumps. "The actual electrical room location posed challenges due to the distance from the theater," said Prophitt. "We tried to find a more accessible location to obtain our power and our compressed air than the originally planned location."

An empty panel located directly outside

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the theater proved to be the solution. “The panel serviced some of the former show’s effects, and when we removed the existing systems, this empty panel became available,” said Prophitt.

This solution proved ideal, because the

infrastructure into their theatrical presentation,” said Zuhorski. “BRC was very precise in what they wanted and where they wanted it. BRC had to create a very specific mirage or illusion to take the audience vicariously into the plant, itself.

existing seating platform in this area had already been demolished. (The screen shift was an unknown condition brought to light midway through the project.)

For the Big Move, the construction team pulled one screen out of the circle and suspended it from a catwalk in the middle of the theater to protect the delicate screen. The other screens were pushed toward center stage, converging in this area from opposite sides of the theater, explained Prophitt. The suspended screen was then re-installed in an opening in the back of the theater.

The 10-year-old screens were handled with the delicacy of art glass throughout the moving process. If damaged, the lead time to obtain replacement screens would have ruined the schedule. “It was a three-month project, but it would have added fifteen plus weeks to the schedule just to get a new screen,” said Prophitt.

Harley Ellis Devereaux’s role in the Big Move was coordinating with Braun regarding the “proper attachments and loading characteristics of the walls,” said Zuhorski. “This was important, because while the screens are not exceptionally heavy, the wall is a sound wall – a double wall or pair of walls with staggered studs and some soundproofing in between. For soundproofing, we used batt insulation, and we also had some acoustical paneling on the interior to help reduce reverberation in the space. We had to keep sound from the general space from getting into the theater and we had to keep the noise being generated in the theater out of the general floor area.”

Planning the move took seven to 10 days, while the actual screen shift took two days. “The screens were moved over the weekend, and the tech crew from BRC arrived on Monday,” said Prophitt.

BRC arrived on site with seven different contractors, including tech, lighting, lift and projector personnel. Braun carved new space for the truck lift stage and its enclosure, but when the assembly arrived, it proved to be slightly larger than anticipated, leaving less than optimal room for the safety mats. “As soon as someone



The Manufacturing Innovation Theater’s production actually seems to build the truck right before the audience’s eyes through the use of laser lights, 3D projection mapping and other state-of-the-art special effects, as well as a truck model and two, six-foot-tall robots.

beginning terminus of the pumps and other electrical system components had to begin outside of the theater walls and in a non-public area. The selected area is an isolated nook at the nexus of the Manufacturing Innovation Theater and the Legacy Gallery, a display of iconic vehicles, ranging from a Model A to a sleek robin’s egg blue Thunderbird – all built at the Rouge over the course of the last 100 years. Inserted into one end of the Legacy Gallery, the theater resembles a space capsule with an exterior cladding of slanted metal panels and a beam of blue LED light girdling the entire orb.

**THE BIG MOVE**

To make the magic happen, Braun and Harley Ellis had to properly position every new electrical line, conduit and MEP system. “We had to integrate our

The illusion could have no holes.”

Both screens and projector mounts had to be altered to make this high-tech production possible. First, Braun had to move the seven existing screens lining the theater walls. A shift of 12 feet accurately aligned the center screen with the truck model and lift stage. “BRC needed the screens moved X amount of degrees or the technology wouldn’t project correctly,” said Prophitt.

The screens’ varied shapes and sizes complicated precision placement. Forget the conventional square or rectangle. The screens were shaped like trapezoids and parallelograms slanted in different directions and measuring anywhere from 20 x 14 feet to 16 x 18 feet, said Prophitt.

Ratcheting up the difficulty factor, access was limited at center stage, because the

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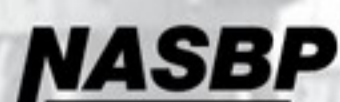
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A part of the project, Braun Construction Group renovated miscellaneous items in the Legacy Gallery, a display of iconic vehicles, ranging from a Model A to a sleek robin's egg blue Thunderbird – all built at the Rouge over the course of the last 100 years.

steps on the mat, it stops the robots and the show,” said Prophitt. “We had to shim up the front of the lift stage to insert the safety mats underneath the edge of it.”

Braun also re-positioned the existing projectors and even the air-conditioning ducts responsible for cooling the projector. “In some cases, the projector mounts had to be placed on a different interior structure due to the vibrations to the show effect fans made, causing the projectors to shake,” said Prophitt. “The images projected on the truck model would have moved with this vibration.”

**THE BIG HOIST**

Installing the 4,500-pound robots was one of the final steps. Because the seating platform could not support the weight of the robots, Braun enlisted the services of Barton Malow Company to set up a hoist-like crane on the two walkways spanning the perimeter pit from each of the two entry doors to the

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seating platform. According to Prophitt, the crane lifted each robot through the door and set it down into the theater's main stage pit without bearing any load on the seating platform.

Braun conducted this complex work within this "space capsule" of a theater while both the Legacy Gallery and Legacy Theater remained open. Braun delivered materials through the wide open spaces of the Legacy Gallery and conducted infrastructure work in the Gallery's outer fringes. "The Tour didn't open until 9 am, so our crew began work at 5:30 am in the open areas of the Gallery," said Prophitt. "The main challenge, however, was trying to keep intrigued patrons out of the Manufacturing Innovation Theater during our work."

The Henry Ford did shut down the Legacy Theater for the last month of the project, while the project team redid the screens, altered the lighting, added 20 to 25 seats and slightly revised the tech portion of the show. A part of the project even called for renovating miscellaneous items in the Legacy Gallery itself, as well as adding some signage and lighting to the plant catwalk overlooking the actual factory floor.

**TAKE A BOW**

Even as Braun worked to complete this laser-filled show, Ford was busy renovating the actual plant and ramping up production

of the F-150. Today, visitors can enjoy both the show and the plant, thanks to the efforts of Braun Construction Group, Harley Ellis Devereaux, BRC Imagination Arts, a host of dedicated trade contractors, The Henry Ford and Ford Motor Company.

Having delivered the theater on schedule, both Prophitt and Zuhorski enjoy viewing the show with family and friends. Prophitt's parents have seen the production, and even his young toddler watched the jaw-dropping, futuristic, nine-minute production with eyes wide open. In watching both current and retired UAW members enjoy the presentation, Prophitt felt another surge of pride in having been a part of it all.

Beyond the show itself, the Manufacturing Innovation Theater and Legacy Gallery are both unique venues for special events and presentations, including Ford Motor Company's announcement of a new hiring surge in fall 2014.

The entire project was a well-coordinated production assembled by a talented team of design, construction, theatrical presentation, and museum professionals. "The Henry Ford is one of the best clients I have ever worked with," declared Prophitt. "It wouldn't have worked without good design teams working together with an exceptional client who understood the process, and high-quality subcontractors that at the end of the day made it all happen."

The project was successful and enjoyable for both project participants and for visitors glued to their seats during this technologically sophisticated show. "I enjoyed working with the people from Ford, BRC and Braun," said Zuhorski. "It was just a successful, fun project. It is part of the fun things we get to do as designers."

Beyond the show, the product it celebrates and whose story it tells has been an equal success. Ford's all-new aluminum-based F-150 was named winner of the 2015 North American Truck of the Year at the past North American International Auto Show. Zuhorski encourages everyone to stop by The Henry Ford Rouge Factory Tour 2.0 to see the show, the plant and the new Ford F-150. Zuhorski is clearly enthusiastic: "The technology, sounds, lights and other effects presented will stimulate all the senses and amaze visitors at the sophistication of today's automotive industry." ❖

**THE FOLLOWING PARTICIPANTS CONTRIBUTED TO THE PROJECT:**

- Concrete Foundations – B&B Concrete Placement, Inc., Romulus
- Structural Steel – Service Iron Works, Inc., South Lyon
- Rough Carpentry – Turner Brooks, Madison Heights
- Glass and Glazing – Modern Mirror & Glass Co., Roseville
- Resilient & Carpet Flooring – Action Floors, Livonia
- Painting and Wall Covering – Duross Painting Company, Warren
- Storage Shelving – Industrial Fence, Detroit
- Rigging – Barton Malow Company, Southfield
- Multiple Seating – American Seating, Grand Rapids
- Special Construction – Bluewater Technologies, Southfield
- Fire Protection – Dynamic Fire Protection, Inc., Newport
- Plumbing – Hoyt, Brumm & Link, Inc., Ferndale
- HVAC – Ventcon, Inc., Allen Park
- Electrical – Bayview Electric Company, LLC, Redford Township, Detroit

*The construction manager provided the list of participants in the Construction Highlight.*

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