TAHOE RENO INDUSTRIAL CENTER (PURE RENO 3.0) SPARKS, NEVADA

Project Completion: 2024

Engineer of Record: 4 S.T.E.L. Engineering

General Contractor: ARCO/Murray Northern California

Developer: Pure Development



CASE STUDY

CONTINUOUS ROOF DIAPHRAGM OPENS UP SPACE, CHOICE, AND BUDGET

Faced with a perfect storm of record-high material costs, seismic and snow loads, and a need for wide open floor plans, the design-build team neutralized every obstacle by switching to Verco's high-strength steel deck and thier continuous diaphragm design. This change allowed for a design with zero expansion joints over a quarter-mile of roofline, reduced the number of braced frames by two-thirds, and transformed a code headache into a budget win.

BACKGROUND

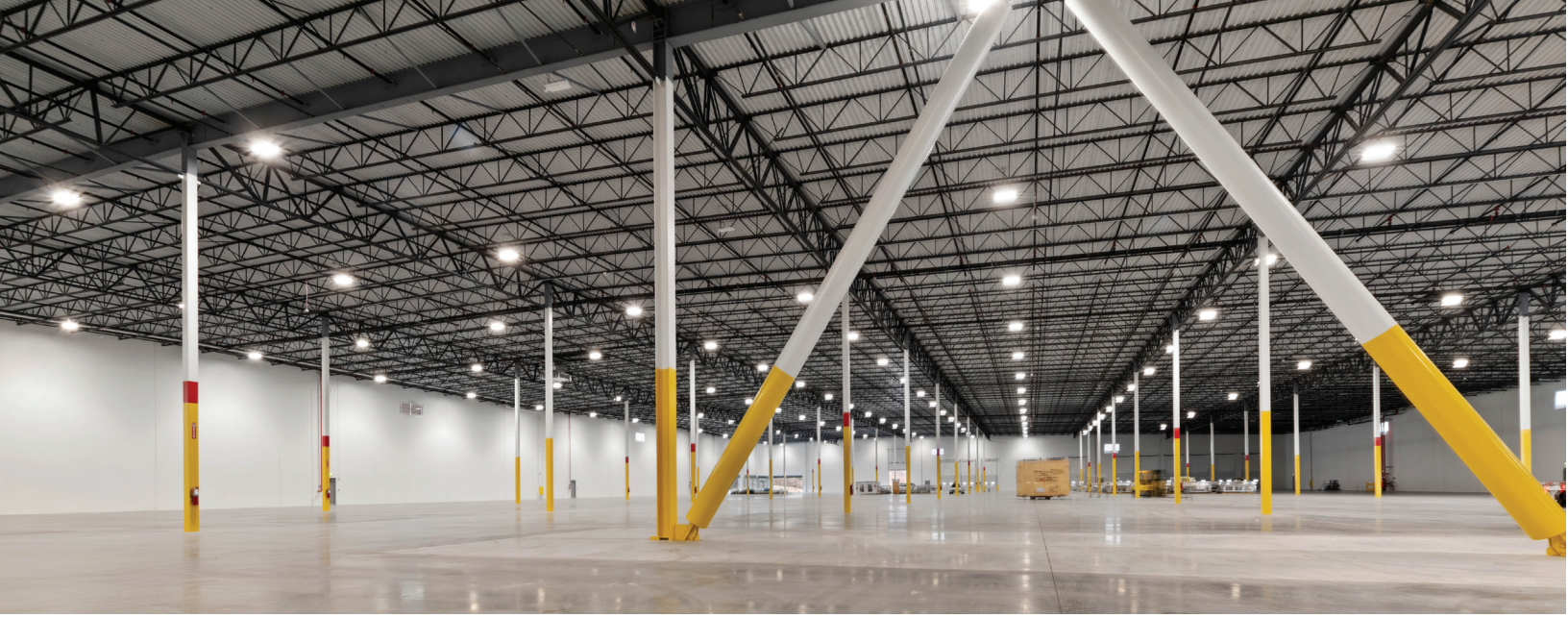
Pure Reno 3.0 is a 410,000 ft², tilt-up concrete fulfillment warehouse rising on a two-acre pad in Sparks, Nevada's Tahoe-Reno Industrial Center. Designed for long-term ownership by Pure Development for e-commerce or 3PL tenants, and delivered by ARCO/Murray's Northern California design-build team, the shell provides a 32-ft clear height. The quarter-mile roofline spans end-to-end without a single expansion joint thanks to Verco's Continuous Roof Diaphragm System.

The building is intentionally column-light, with only a single interior brace frame line, allowing future tenants to deploy very narrow-aisle racking, mezzanines, or automated material-handling equipment without structural obstacles. An economical palette of open-web steel joists and high-strength steel deck keeps the superstructure light yet code-compliant for seismic demands and mountain snow drift. By pairing off-the-shelf components with a rigorously tested diaphragm system, the project team delivered a flexible, high-bay facility that's both tenant-ready and positioned as a prime real estate asset.

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Riley Boris
Structural Engineer - ARCO/Murray, Dallas

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BALANCING SPACE, STRUCTURE, AND ECONOMICS DURING MARKET TURMOIL

The Pure Reno 3.0 project faced a perfect storm of challenging conditions that tested traditional design approaches. The warehouse needed to be both cost-effective and highly functional during one of the most difficult periods in recent construction history. "At that time you were seeing some of those projects have 18- to 24-months delays in getting the materials onto the sites," recalled the project's structural engineer of record (EOR), Dustin Rosepink, SE, President and CEO of 4 S.T.E.L. Engineering. "The challenges for this project were basically to minimize the cost of construction associated with any of those types of products."

Large warehouse projects usually require interior lateral force-resisting systems—often in the form of brace frames—to handle seismic and wind loads. However, these structural elements create significant operational challenges. "The concern with those is just always the rentable, usable, leasable space of the facility," EOR Rosepink explained. "When you put those brace frames inside the structure, it interrupts the flow and openness of the warehouse space. It has to be strategically planned with tenants, potential racking systems, and methods of using the space."

For ARCO/Murray's client, who planned to hold the building long-term, maximizing interior flexibility was paramount. For example, VNA racking aisles that are 8 to 10 feet wide need uninterrupted 400-foot runs, important for a speculative shell targeting e-commerce and 3PL tenants.

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>
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> **Structural Engineer - ARCO/Murray, Dallas**

Initial design approaches using conventional wood roof diaphragm systems would have required multiple interior brace frames—exactly what the client wanted to avoid. Rosepink explained, "Going down that route would have caused more interior brace frames to be required, which the client desired to eliminate." The building's approximately 1,200-foot length meant traditional approaches would likely require a minimum of three interior brace frames, significantly impacting the warehouse's functionality and marketability.



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ENGINEERING INNOVATION MEETS PRACTICAL APPLICATION

Verco proposed their Continuous Roof Diaphragm System, a steel deck solution capable of transferring lateral loads over extended distances without requiring intermediate expansion joints or additional interior bracing by using the ductility of the PunchLok® II System with Hilti power-actuated fasteners (PAF) to absorb thermal effects. The system uses designs which combine optimized steel deck with coordinated joist spacing to create a high-capacity diaphragm that can handle the building's structural demands. Riley Boris, Structural Engineer at ARCO/Murray's Dallas office, explained, "It allowed us to remove the expansion joints and reduce the number of brace frames. It had a superior capacity compared to traditional methodology and allowed for the diaphragm to handle the thermal expansion of the building."

Critical to the design team's acceptance was the system's rigorous third-party validation. "We had the IAPMO report with the continuous length diaphragm provisions sent over from Verco," Boris recalled. "We went through that and had a few meetings with both them, our internal engineering team, and some of our California engineering partners to ensure everyone was on the same page." For EOR Rosepink, this validation was crucial: "The top thing that always helps with the extra confidence is just the third-party approvals, that third-party approval of their documentation showing that they've done the testing and engineering justification behind it always gives us the extra confidence to specify and trust that product."

The work required extensive collaboration between all parties to achieve optimal performance and constructability. "There was an interactive process with Verco to help us maximize the roof joist spacing, which then minimizes the joist quantity and minimizes the cost," according to Rosepink. The team weighed deck thickness against joist spacing, considering both material costs and field installation needs. "We had to balance going all the way to continuous diaphragm analysis versus possibly still having some interior brace frames," Rosepink noted. "We decided to go with one line of brace frames on the interior with the roof decking, for good performance with a deck thickness that was convenient for the contractor."

PARTNERSHIP DELIVERS OPTIMIZED RESULTS

ARCO/Murray's early partnership with Verco proved strategically valuable. "Having a partner up front allows us to get more aggressive, efficient structural design right off the bat," said Ryan Enneking, Director of Operations for ARCO/Murray's Northern California office. "It helps us from a schedule standpoint of not getting through a structural design, realizing that it's too conservative, and then having to go back to the drawing board." This proactive approach prevented the costly cycle of redesign and re-permitting that often occurs when value engineering opportunities are identified late in the design process.

Verco provided extensive engineering support beyond simple product supply throughout the project. The team helped optimize the interplay between deck gauge selection, joist spacing, and connection details to achieve the most cost-effective solution. "They were always able to answer questions and provide guidance that allowed us to have high confidence in their product and the method of going forward with it," said EOR Rosepink.

The Nevada location required careful coordination of seismic, wind, and snow loads. "When it comes to snow load, there's drift that gets put on the parapets," ARCO/Murray's Enneking noted. The team worked to optimize parapet heights and joist spacing at end walls to manage these complex load interactions while maintaining architectural requirements. As Boris explained, "Verco helped us out with looking at whether it makes sense to upsize the deck gauge in these areas or add joists and tighten the spacing, since there's a lot of different ways you can engineer around it."

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RESULTS: OPENING UP SPACE AND INDUSTRY CHOICE

The Continuous Roof Diaphragm System successfully helped reduce the building's interior bracing requirements from multiple frames to a single brace frame, a dramatic improvement in space utilization. While the steel deck system carried a premium over traditional wood diaphragm materials (although less where insulation is legally required to be installed for worker comfort), the overall project economics were still compelling. Rosepink asserts, "By switching to the steel deck that had a higher capacity, we were able to limit the number of brace frames. It let us use fewer brace frames, so the overall cost came down."

After more than a year of operation, the building continues to perform as designed. "We haven't had an issue to date that I know of when we implement the Continuous Diaphragm approach to any of these buildings," Enneking reported. Rosepink added that "everything went very smoothly and definitely met our goals and expectations." There have been zero roof leaks at expansion joints because none exist.

The space optimization delivered tangible benefits for tenant attraction and building operations. "Reducing those frames makes the space more usable," Boris noted. "The clients like it better. It's easier to find tenants." Enneking emphasizes the aesthetic and operational improvements: "It's got a much cleaner look and just looks nicer in general. Operates a bit better." These benefits translate directly into improved building value and tenant satisfaction for long-term hold strategies.

The success will influence future project approaches across the industry. "This is something we want to do more of," Rosepink confirmed. 4 S.T.E.L. Engineering is now recommending the Continuous Roof Diaphragm System for other large-scale projects, including million-square-foot distribution centers.

The project shows how advanced diaphragm technology can fundamentally change the economics and functionality of large warehouse design, moving beyond traditional bracing-intensive approaches while maintaining or improving structural performance. For structural engineers and architects facing similar challenges, the project establishes a new benchmark that simultaneously addresses space utilization, cost control, and performance requirements in seismically active regions.

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