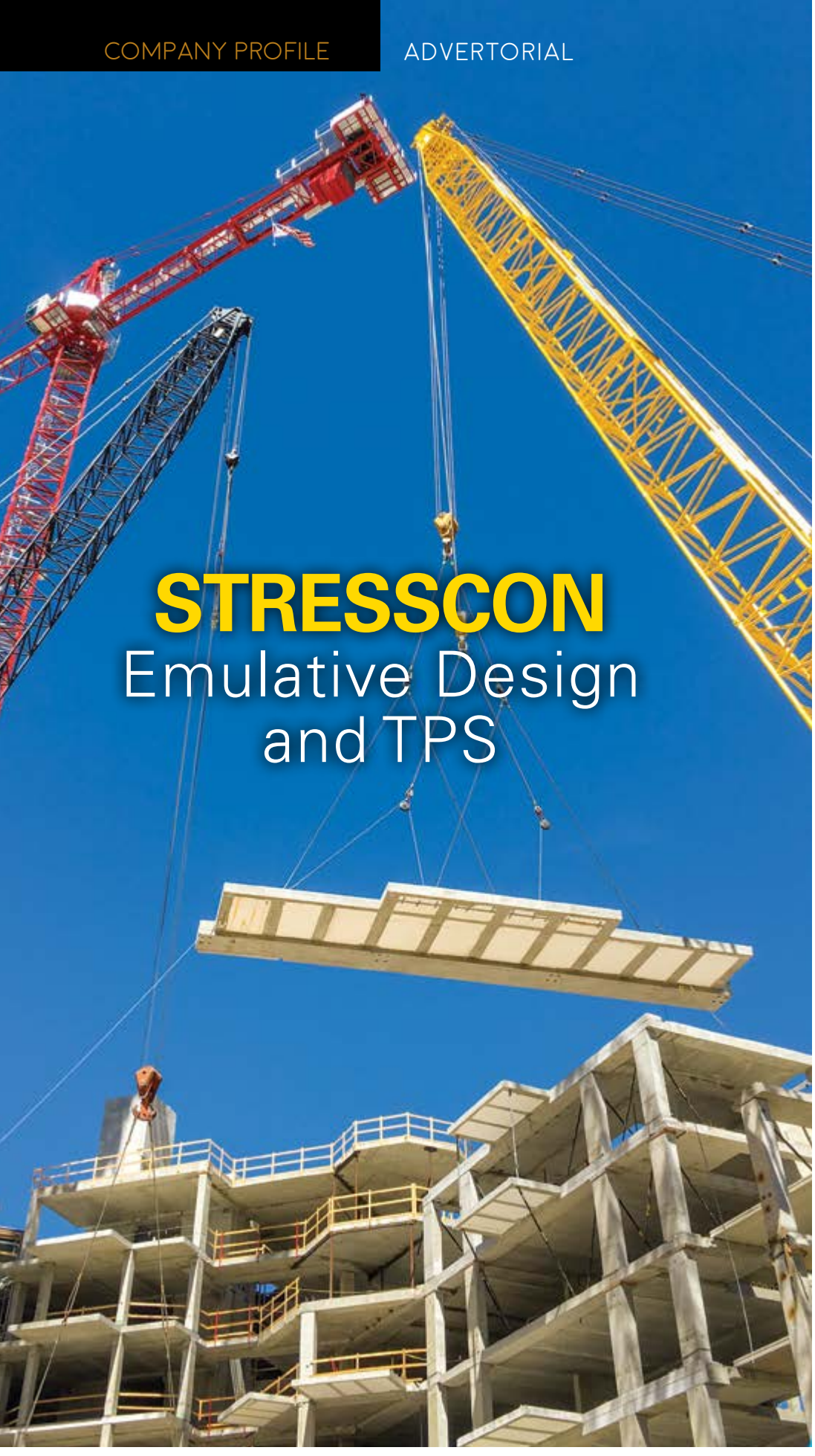

STRESSCON
Emulative Design and TPS

Stresscon Corp. recently completed a total structural precast system for the Yellowstone Club project that features emulative design and a pre-manufactured approach, allowing for a total–precast structure to be designed for a region with extreme seismic activity requirements. Stresscon participated in the construction of the exclusive and unique Yellowstone Club Village Core project in Montana's Rocky Mountains. Over a 12-month period, five total–precast structures were completed as part of an addition to this exclusive mountain club. The mixed-use space was conceived to act as the heart of this select and vibrant community, offering luxury residences, ski facilities and private ski club access, unique amenities, and a gathering space for the community.

Extensive coordination among the design, engineering, general contractor, and precast teams was necessary to ensure that the rigorous project requirements were met for this private community. With the precast structural components, two on-site cranes for erection and installation, a project team facilitating installation and construction, multiple trade interaction and hundreds of daily workers, the project activities had to avoid any potential disruption to the residents and visitors and meet an expedited schedule.

To meet the aggressive timeline, construction schedules facilitated a fast-track schedule through four seasons, battling extreme temperatures and weather and several severe freeze/thaw cycles. The use of off-site production of precast components limited the cast-in-place concrete requirement. It was very important that all construction work met environmental standards with little impact to the natural surroundings. All the completed structures meet or exceed the International Energy Conservation Code (IECC) guidelines, assuring the community and residents that their units meet stringent energy efficiency requirements.

Stresscon's precast scope and erection included a total of 4,565 premanufactured components, playing a primary role in the project design and construction. The precast pieces used include retaining walls, hollow-core, flat slabs, double tees, spandrels, non-insulated monolithic shear/shaft walls, columns, shallow beams, wallumns (short V–shaped wall), beams, soffit beams and bi-directional balcony slabs. In total, 16,900 yd^3 of concrete were erected over a 12-month period. Using emulative design to convert the project from cast-in-place to precast concrete reduced 24 months off the construction timeline. The precast pieces were shipped in 1,342 delivered truckloads, travelling from Colorado Springs, Colo., to Big Sky, Mont. Stresscon's largest precast piece for the project weighed approximately 86,000 pounds. Other project totals include 1,600 tons of reinforcing steel and 286 miles of prestressing strand.

The project's featured monolithic balcony slabs are a completely new Stresscon product line and required design and installation of a new custom production facility at the Colorado Springs, Colo. plant. The production of 96 unique balcony elements, many with drastically different geometry, required bi-directional pre-stressing of many members. Prestressing during casting of the primary tension member was followed by post-tensioning of the cantilevered slab in order to resolve negative moments.

These members were designed as simply supported, or multi-span beams, with a cantilevered slab member cast monolithically, perpendicular to the beams. Utilizing a coffering solution in the slab portion of the member reduced member weights and created more balance in the finished product for handling and erecting. Coffering was achieved by casting insulation into the underside of the slabs, which reduced many portions of the slab from 10 to 3 in. of concrete.

The team also worked through extremely complex framing geometry and shallow floor plates in the residential units to ensure that stringent clear height requirements were met. The team used emulative design practices to replicate floor depths of a cast-in-place solution, that often resulted in precast structural depths of 13 in. for primary load bearing elements. The shallow floor plates included all levels of framing above the two-story below-grade parking garage. This proved a unique challenge, as many of the product sections did not inherently lend themselves to this type of critical geometry, but were necessary to resolve structural system demands. Continuous beams and fixity at framing intersections was introduced to help achieve the necessary shallow heights.

To overcome framing difficulties created by fixed column locations, shallow and long-span heavily pre-stressed beams (resulting in higher cambers), and multiple locations of transfer framing beams (resulting in cumulative camber), the team took a very deliberate and proactive approach to achieve required top of precast elevations. Solutions included monitoring beam cambers in predicted problem areas and setting vertical framing elements, including columns and walls, at pre-determined elevations.

The Stresscon team worked jointly with EnCon Field Services, FDG, CEG-NM, EnCon Design, GE Johnson Construction, Jackson Contractor Group, Schmueser & Associates, Hart Howerton, Nishkian Menninger, Terracon, Earthworks, Encore Electric, Apollo Plumbing & Mechanical, True North, Sowles, Rooftop Solutions, Advanced Fireproofing, Safeway Scaffolding, SCS Drywall, Patriacca Construction, Gallegos Corporation, Paradigm, Superior Waterproofing, 4G, Western States, Sime Construction, Steel Erection, and various subconsultants and subcontractors on this impressive project.