Built on a site that was once considered one of the worst parking lots in downtown Denver by a local industry blogger, ***SkyHouse Denver changed the city's skyline and uptown neighborhood in just 18 months.*** While a speed-to-market approach drives any multifamily development, lean construction methods applied by the joint venture of Swinerton Builders and Batson-Cook Construction shaved approximately 10 weeks from a traditional schedule to build SkyHouse Denver.

"We had activities dialed in by 15-minute intervals. The superintendent didn't need a watch to know what time it was. He knew the time by what work was being done wherever he walked on site." Adam Lulay, Swinerton Senior Project Manager

The 26-story, cast-in-place mixed use tower features 354 apartments with 9-foot ceilings, and 6,900 square feet of ground-level retail, plus 484 parking stalls in a separate structure. Located at the intersection of 18th and Broadway streets and conceived as affordable luxury to attract both Millennial and empty-nest renters, the project namesake top level provides a club room with roof-top swimming pool demonstration kitchen, and fitness center.

The SkyHouse concept comes from Atlanta-based developers Novare and Batson-Cook. Being their first foray developing outside of the Southeast

SkyHouse Denver takes its place at 18th & Broadway as part of the city's skyline

(Denver's project is the 14th SkyHouse completed and 17th developed to date), they realized the need for a partner with ***expertise in local building conditions, knowledge of Denver's rigorous building codes and inspections, and relationships with quality subcontractors*** for excavation, structure and MEP trades capable of building at such a fast pace through lean and prefabrication. Swinerton joint ventured with Batson-Cook Construction to build SkyHouse Denver. Both firms share a longevity of more than 100 years as well as many other cultural aspects which made for a successful general contractor partnership.

Swinerton led in trade selections by hiring subcontractors committed to dedicating top-notch resources for the condensed preconstruction phase to actively participate in ***pull planning and last planner sessions.*** Subcontractor selection also focused on a firm's ability to deliver field resources committed to building high quality and meeting the construction schedule in a market with a significant skilled workforce deficit.

Since the design had been built previously, there were several lean construction lessons already known about the prototypical design created by architectural firm Smallwood, Reynolds, Stewart & Stewart. However, several aspects of lean methodology required augmenting to accommodate Denver's rigorous building codes, weather and soil conditions which are different than those found in the southeastern United States.

Lean strategies applied to the design over time have created a structure with similar floor plans and efficiency duplications from unit to unit. MEP prefabrication and small-batch section concrete deck pours enabled three-day turn-arounds for typical floors 7 - 21, which is 40% faster than the industry standard of five days. ***This pace resulted in topping out the 26-story structure within eight months of Notice To Proceed.***

Topping out of 26 stories took eight months thanks to three-day turn-arounds for typical floors

SkyHouse Denver is bordered by the famed and historic Brown Palace Hotel, the 1887-built Trinity United Methodist Church, and butts against the 52-story Wells Fargo Center. With such close neighbors, the project management team met with representatives from these properties during preconstruction to discuss schedule and logistics plans. To alleviate our neighbors' concerns, we placed crack gauges on the Wells Fargo building adjacent to the site to watch for any damage done to its foundation by excavating activities. For the Brown Palace and its guests, we mitigated noise on the west side of the SkyHouse project during early morning hours to lessen noise and visual impacts from precast welding activities. During construction milestone celebrations, ministers from the Methodist church attended ground breaking and topping out ceremonies to offer up blessings for the safety of construction workers.

Pedestrians, vehicle traffic and several community events, such as the 2015 Super Bowl parade for the Denver Broncos, all impacted just-in-time deliveries, staging, crane picks, safety and logistics more so than the average urban build. The team proactively addressed these conditions through pull-planning sessions with multiple subcontractors during both preconstruction and construction.

Challenging logistics with Lincoln Street to the east, 18th Avenue to the north, and Broadway on the west, with neighbors of the Wells Fargo Center, the Brown Palace Hotel, and Trinity United Methodist Church

Yet, before any of this smart, lean construction could start, ***the ruins of two hotels had to be removed***. In 1984, the historic Cosmopolitan Hotel and Hotel Metropole were imploded and covered by a parking lot. Based on the geotechnical report findings, the original plan called for excavation to 5 feet below grade for foundation installation. ***During excavation, asbestos, massive amounts of debris and 19th century flagstone foundation structural components were found, requiring excavation down to 25 feet below grade*** so that caissons could be poured to the right depths, followed by 15,000 cy yards of clean import material. ***While this unanticipated condition pushed the initial schedule back two months, the regular application of lean processes returned the project to its original duration which was completed with zero environmental and health citations.***

The excavation depth also warranted a change from a precast parking structure to cast-in-place. ***CIP created schedule efficiencies with the parking structure built in two halves with the help of a luffer crane.***

Excavation requirements impacted the structure type of the stand-alone parking structure

By building a CIP structure, this approached enabled the team to get a jump on the half that contained the elevators which always seems to impact the schedule.

Lean creates and maintains a high level of safety, efficiency and accuracy in production. During labor pull-planning sessions, subcontractors forecasted their labor needs. Typically a trade partner started out with a high number of workers, but then ***realized how efficient they were performing by applying lean practices, and actually cut labor numbers on site while hitting the same production value.*** And with fewer workers on a tight, congested site, safety increased as well. SkyHouse hosted more than 100 workers during the national Safety Week observation with a stand down meeting to celebrate safety successes and provide training on fall protection which remains the industry's top safety hazard.

Adding to the mindset of lean practices increasing production, once interior construction began, we installed QR bar codes at every level. Since workers had to scan the QR code with a smart phone to a special application at the beginning and end of each shift, ***the app allowed team management to compare actual progress to scheduled progress***. These analytics also tied into the quality control, punchlist and inspection plans, and were linked to other trades in the schedule so that one trade could not start work until another trade's work was finished and approved by management. A third-party quality inspector hired by the developers visited the

Rigid quality control and assurances practices were tracked through a QR bar code at every level during building construction and finish installation which resulted in spectacular quality

site two times per month to measure building components to the inch to ensure standardize measurements and maximize quality. ***Re-work decreased and production increased as crews became more familiar with quality standards, resulting in a high level of efficiency and accuracy, contributing to the team meeting the 18-month schedule.***

With competition remaining high for affordable luxury living in downtown Denver, SkyHouse Denver provides several key amenities and energy-efficient systems to fit the lifestyle of the urban dweller.

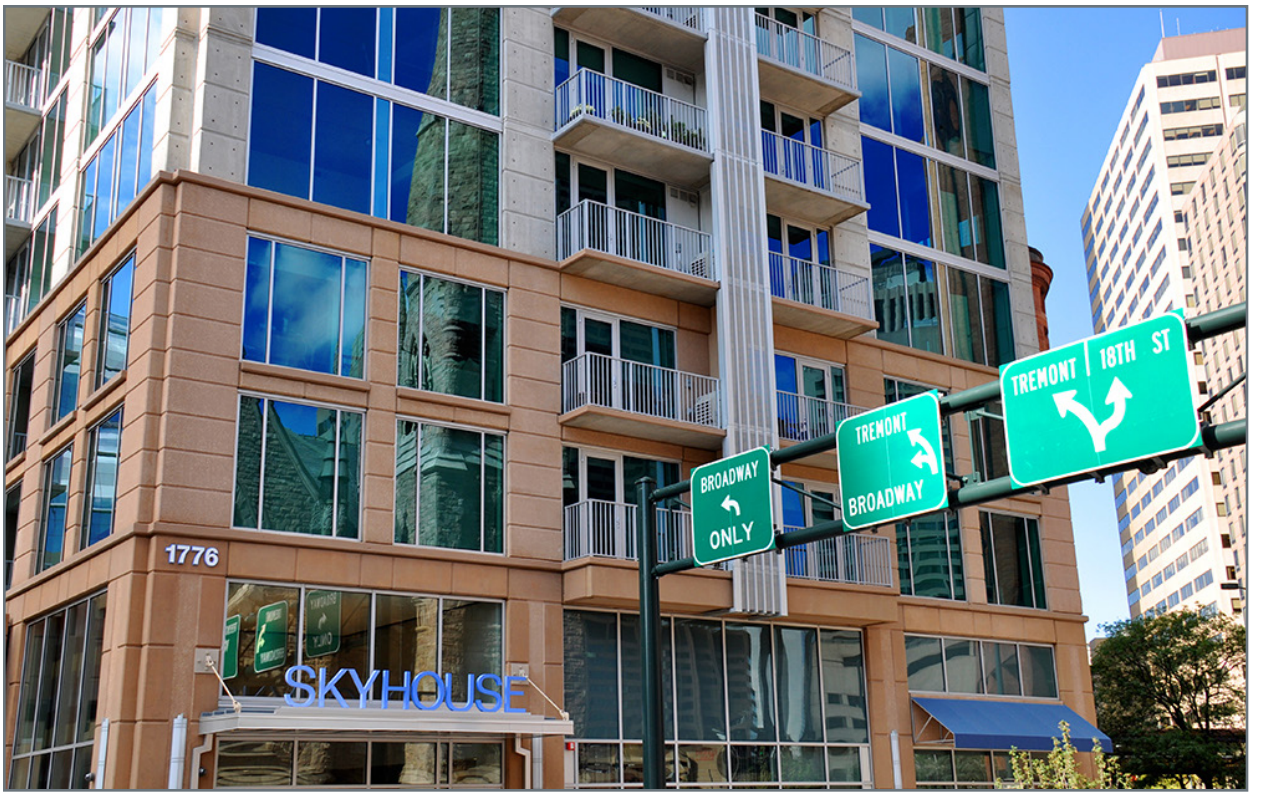
The property offers vehicle charging stations, bike storage and repair area, a dog walk area, and a dog washing station. The sustainable building is built to Energy Star standards.

The SkyHouse model is rooted in lean construction practices, from the onset of design through construction, and enabled construction of 395,000 square feet in a mere 18 months without sacrificing quality, cost, safety or community interests.

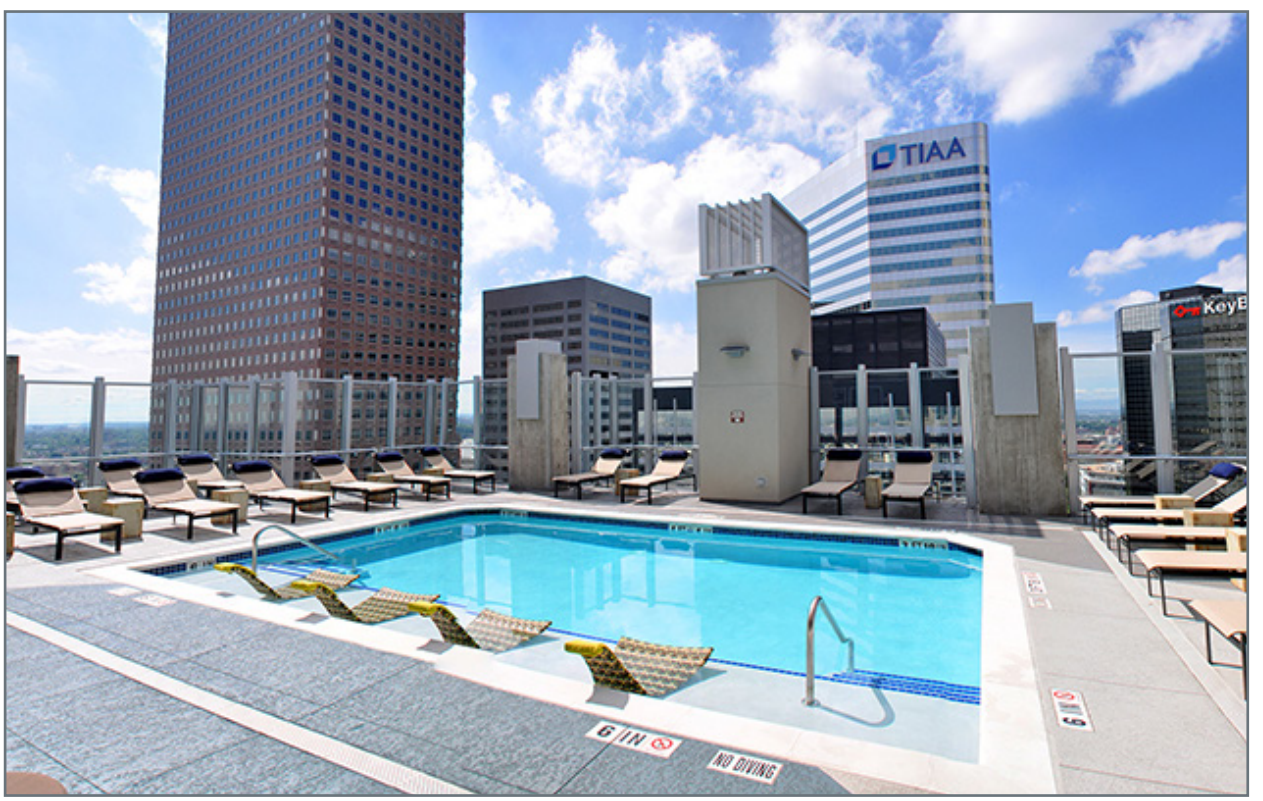
"Hiring Swinerton was the best decision we made on this project!"

Jim Borders, President of Novare

The SkyHouse Denver community is designed to attract both Millennials and empty nesters wanting to rent in an urban center



SkyHouse Denver was built on a former parking lot adjacent to some of Denver's busiest downtown streets



At 26 stories, SkyHouse Denver offers a rooftop amenity desk with pool, lounge area, exercise studio and demonstration kitchen

The top level SkyHouse provides many of the amenities renters seek in an urban luxury apartment building

Apartments range from 567 to 1,400 square feet while the lobby offers a relaxing environment for residents and visitors