In 2010, Facebook, the world’s largest social media and social networking service company, announced plans to design and build its own data centers to support its growing user base. Each data center would house tens of thousands of computer servers networked together and linked to the outside world through fiber optic cables. The servers would receive information shared on Facebook and distribute it to the user’s network of friends.

Soon after making this announcement, Facebook broke ground on their first data center, in Prineville, Oregon. They next began construction on a data center in Forest City, North Carolina, followed by a data center in the Swedish city of Luleå.

In 2012, Turner Construction Company’s Global Critical Facilities (GCF) group reached out to Facebook at their headquarters in Menlo Park, California, stated Andy Heitmann, Vice President, Construction Executive, Turner Construction Company. Turner’s GCF group is responsible for pursuing and delivering data center facilities throughout the world, and their efforts to forge a relationship with Facebook proved successful. Facebook, through a Request for Qualifications (RFQ), selected Turner as Construction Manager on a future data center campus.

When Facebook decided on Altoona for their next campus (Altoona is part of the Des

Site rendering looking southwest over the Facebook Data Center in Altoona, Iowa. Altoona Building 1 is located in the upper portion of the rendering, near the center. Altoona Building 2 is at left center. Altoona Building 3 (including the Altoona Building 4A & 4B additions on the west side) is in the foreground. The buildings at upper-right (in the H configuration), at 500 Shareway Drive, are Altoona Phase 4, which are connected by the Administration Building. Visible next to Altoona Building 2 is the MidAmerican Energy Company substation. On the south side of I-80 (at upper left) is a Bass Pro Shops store.

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**CONSTRUCTION BEGINS IN ALTOONA**
When Facebook decided on Altoona for their next campus (Altoona is part of the Des

**FACEBOOK PAPILLION**

Turner Construction Company is also serving as Construction Manager on Facebook’s Papillion Campus southwest of Omaha, Nebraska, and is managing both the Altoona and Papillion projects from their Kansas City office. Turner broke ground on the first data center building at Papillion, Building 1, in Spring 2017, at the same time they started Altoona Phase 4.

Facebook’s original plans for Papillion called for two 450,000 square foot data center buildings connected by a 70,000 square foot Administration Building. In March 2018, Facebook announced that it would build four additional data center buildings in Papillion for a total of six data center buildings encompassing more than 2.6 million square feet of space.
Facebook Altoona
(continued from page 2)

Moines, Iowa, metropolitan area), they notified the GCF group, which turned to Turner’s Kansas City office in early 2013 for construction management services. Turner began construction on the first building at Altoona in the summer of 2013.

Altoona is currently one of 15 Facebook data center locations. In addition to the four locations mentioned, Facebook’s data centers include Fort Worth, Texas; Clonmel, Ireland; Los Lunas, New Mexico; Odense, Denmark; Papillion, Nebraska (which Turner is also building); New Albany, Ohio (which Turner is building as well); Henrico, Virginia; Eagle Mountain, Utah; Newton, Georgia; Huntsville, Alabama; and Singapore.

The Altoona Campus
The Facebook Altoona Data Center’s impressively large gray buildings are north of (and visible from) Interstate 80. The buildings are each approximately one-quarter mile long and 42-feet high. The distance from the ground floor to the first deck is 24 feet. The distance from the first deck to the mechanical penthouse deck is another 18 feet. Each of the five buildings contains four data halls.

The buildings have rammed aggregate piers, standard foundations, structural steel framing, slab-on-grade concrete, slab-on-metal decking for the penthouse floor, and a concrete roof. The buildings also have a LEED®-scored (Leadership in Energy and Environmental Design) white reflective modified bitumen roofing membrane.

Facebook Altoona Designers
Altoona Building 1 and Altoona Building 2
MEP Designer: Alfa Tech
Architect: Sheehan Partners, Ltd.
Structural: Peoples Associates
Civil: Miller & Associates

Altoona Building 3
• Bridging Document
(Design-Build all under Turner after Bridging Documents)
MEP Designer: Alfa Tech
Architect: Sheehan Partners, Ltd.
Structural: Peoples Associates
Civil: Miller & Associates
• Final Design
Electrical Design: Cupertino Electric
Mechanical Design: Waldinger
Architect: Sheehan Partners, Ltd.
Structural: Peoples Associates
Civil: Miller & Associates

Altoona Building 4A
MEP Designer: Alfa Tech
Architect: Sheehan Partners, Ltd.
Structural: Peoples Associates
Civil: Miller & Associates

Altoona Building 2 & 3 are located northeast of Altoona Building 1. Work on Altoona Building 2 was started in Spring 2014 and completed in Fall 2015. Work on Altoona Building 3 was started in Summer 2015 and completed in Spring 2017.

Contiguous to Altoona Building 3 on the west are two additions: Altoona Building 4A (containing about 40,000 square feet) and 4B (about 35,000 square feet). The additions function as a data cold storage facility.

Work on Altoona Building 4 was started in 2016 and completed in Summer 2017.

Since it does not serve live production data, the cold storage facility does not have redundant electrical systems. Each of the five data hall buildings has emergency backup generators for redundant power.

In the spring of 2017, Facebook announced an additional building known as Phase 4. Altoona Phase 4 is on the northwest portion of the campus and is connected by a 50,000 square foot Administration Building, which contains offices, conference rooms, support areas and a cafeteria. Work on Phase 4 of the data center (continued on next page)

The individual insulated precast concrete wall panels were set up, welded, grouted, and caulked in place. The panels are each 10’ wide and from 22’ to 27’ high. At the penthouse level are insulated metal wall panels. The dark rectilinear bands along the upper portion of the buildings are intake and exhaust louvers.

The Altoona Data Center is supported by 100 percent renewable wind energy including energy from MidAmerican Energy Company’s Wellsburg, Iowa, wind farm. The use of renewable energy is part of Facebook’s commitment to building data centers that use resources efficiently and responsibly.

The facility uses outside air which is filtered through an extensive system to keep its servers at the optimum temperature.

“Facebook’s data centers are custom built from the ground up to be energy efficient, including their servers,” noted Andy. “Their servers are custom made to use less energy and operate at higher temperatures, which helps reduce mechanical cooling needs.”

Altoona Building 1 is 1,284 feet long and contains 476,000 square feet. Turner began with the core and shell. Once this work was about 50 percent complete, they were released to begin work on the remainder of the building. Building 1 was completed in November 2014.

Facebook Altoona Designers
Altoona Building 4B
MEP Designer: ESD (Environmental Systems Design, Inc.)
Architect: Sheehan Partners, Ltd.
Structural: Peoples Associates
Civil: Miller & Associates

Turner Construction Company’s Key Supervisory Personnel for Altoona Phase 4
Andy Heitmann, Vice President, Site Manager
Richard Ach, Project Executive
Josh Jones, LEED® AP, General Superintendent
Barry Determan, Project Manager of Engineering
Jeremy Southerland, Project Manager of MEP
Bryan Schmidt, MEP Project Superintendent
Robert Levy, VDC/BIM Manager
Justin Dentino, QA/QC Manager
Tyan Tingey, LEAN/Scheduling Manager
Tomaara Rand, EH&S Manager

The above are part of a team of 59 total Turner staff members working on Altoona Phase 4.

Turner construction company, Inc.

East elevation, Altoona Phase 4. The Administration Building is at center. Altoona Building 1 is partially visible at far left.

Subcontractor Members of The Builders’ Association Performing Work on Facebook Altoona
Allied Construction Services, Inc.
Doherty Steel, Inc.
Flynn Midwest, LP
George J. Shaw Construction Co.
Turner SPD (Special Projects Division)
Facebook Altoona
(continued from page 3)

will continue in 2019.

Work on Building 4B was started in Summer 2018. When Altoona Phase 4 and 4B are completed, the campus will contain a total of about 2.5 million square feet of space and be home to over 300 people.

The campus originally contained about 200 acres. When the parcel for Altoona Phase 4 was added, the size of the campus more than doubled, to over 400 acres.

MANAGING EFFICIENTLY

Turner managed construction of the large project by dividing field operations among superintendents responsible for various areas and scopes, stated Josh Jones, LEED® AP, General Superintendent, Turner Construction Company.

“The site superintendent is responsible for the civil work and exterior hardscapes as well as

Facebook and Turner have grown our relationship based upon trust and mutual respect. Our company cultures and values are aligned, in that we approach all projects by creating the right environment. This simply means all workers are equally respected, provided with a safe work place, and are challenged to continuously improve their processes to deliver the most efficient Data Centers.

– Mark Iammarino,
Vice President, General Manager
Turner Construction Company

Looking west into primary entrance of Altoona Building 1.
the building grades, roads and landscaping. Our MEP superintendent is responsible for the interconnections of the electrical rooms, the data hall connections to the RPPs [reactive power panels], and the components that occupy the data halls and penthouses. Another superintendent is responsible for the data hall build-outs and fit-outs, and a separate superintendent is responsible for the core, which is an early turnover space along with the penthouse that serves it.

“One of the unique challenges of the project was to build the center core first, because that is where the MPOE [main point of entry] resides,” noted Andy Heitmann. “The fiber network comes into the MPOEs and then distributes out to the data halls. Building the core first allows Facebook to perform their early work and bring in their fiber network.”

“Two superintendents handle the penthouse above the data halls. This includes insulating the mechanical equipment, framing the walls, setting the doors, completing some of the exterior wall components and expansion joints, and overseeing the MEP trades that are involved,” said Josh. “As we go through various phases of turnover, the superintendents will migrate to another building with some new areas of responsibility.

“Due to the size and magnitude of the data center and the redundancy of the systems, we really encourage our subcontractors to adopt LEAN principles and prefabricate,” he added. “We also have a site-specific rental partner that stocks equipment like boom lifts, forklifts and scissor lifts on site, reducing the need for delivery of these items from off-site.”

**Commissioning**

Within MEP is commissioning, which Andy defined as “the process of verifying that the building systems, including the MEP and life safety systems, are all operating correctly. There are five levels of commissioning, with the fifth level being Integrated Systems Testing to ensure that the facility as a whole is performing in accordance with Facebook’s project requirements. Commissioning is an intense process due to the building’s redundancies, complexity, and scale of the equipment. A building will not be turned over to Facebook until commissioning has been completed successfully.”

Turner’s work also includes two guard shacks, site lighting, road and parking improvements, site communications, security upgrades, landscaping, and over 25,000 linear feet of security fencing.

**Safety**

“Facebook’s top priority is safety,” said Josh. “As a result, our project priorities are in the following order: Build it safe, build it with quality, build it on schedule, and build it with value.” On Altoona Phase 4, Turner and its subcontractors just exceeded two million worker hours without a major lost-time incident and, through November 2018, have maintained a 1.39 safety incident rate and a lost-time incident rate of 0.09.

Turner’s Environmental Health & Safety Manager leads a full-time safety staff of seven assigned to the Altoona project. All workers receive safety orientation as part of the onboarding process. Turner also contracts directly with several on site first aid medics who are available not only to address any safety incidents, but engage the workforce in ergonomics and the prevention of injuries.

**Turner’s Workforce**

As of November 2018, Turner’s workforce on Phase 4 was represented by 21% minority workers and 6% women workers based on over 2.3 million work hours and a peak of 1,267 workers on site per day.

Additionally, Turner has achieved 11% Veteran worker representation on the project, based on the same workforce count.

**Going for Gold**

Facebook Altoona is being designed and built to attain a LEED® Gold rating. The project is registered under LEED v4, the newest update to LEED. LEED v4 features new market sectors that address the unique needs of specific building types, including data centers.1 The project is currently on track to exceed by 60 or more points the number required for LEED Gold. Major LEED efforts include:

- Recycling site-wide to achieve a minimum landfill diversion rate of 75 percent;
- Air quality testing and verification;
- Sourcing of environmental products;
- Prevention of pollution related to construction activity; and
- Selection of low-emitting materials

**Virtual Design & Construction**

“Managing the project for Phase 4 VDC was challenging in terms of both the size and the complexity of the electrical systems. We had to coordinate MEP systems encompassing 1 million square feet, a process we undertook in 100,000 square foot chunks,” said Robert Levy, Turner’s VDC/BIM Project Manager.

“At several points there were from 20,000 to 30,000 clashes to review and resolve within about four weeks. It took a dependable team to accomplish this. I am very grateful for my team as this would never have been possible without their hard work and expertise.

“At a later stage in the process, we had to go back to certain areas and re-coordinate due to design changes, so we were running clash checks from three to four 100,000 square foot areas at a time. Once two of the data halls were dried in, we started to laser scan it to ensure that the BIM would match the actual construction. Laser scanning also helped to ensure that our conduit stub-ups – 90 degree bends coming from the ground – were hitting their windows, the openings in the concrete slab where equipment would eventually be placed. If they were not, it could cost hundreds of thousands of dollars and it could also cost you the schedule.

“We pulled through with excellent teamwork and communication. Virtually all Turner team members used the BIM to some extent. We used the BIM model to ensure that design changes would work out, to check for RFI constructability, and as a reference guide to

Facebook Altoona
(continued from page 5)

present at meetings.

“We also utilized drone technology on the
400 acre site. It was time-consuming for the
drone subcontractor to collect images due to the
sheer size of the site. Also, cloud servers need
time to process the orthomosaics, which are
detailed aerial views that have been
geometrically corrected so that the scale is
uniform. Due to the number of images taken by
the drone, the servers often took overnight or
longer to process.

“We used these orthomosaics for our dig
permits on site. These images had our BIM
overlaid onto them so you could see the
underground utilities. Workers could pull up
these aerial views showing underground utilities
to quickly make sure that the area where they
were going to dig or even drive cranes over
would be safe,” added Robert.

BUILDING COMMUNITY

Founded in 2004, Facebook’s mission is to
“Give people the power to build community and
bring the world closer together.” True to its
mission, Facebook has embraced the Altoona
community and provided numerous jobsite
enhancements to create an attractive work
environment for the construction teams. Turner
Construction Company has been actively
involved with Facebook in these efforts.

“Facebook has been an absolutely
outstanding partner in making the jobsite better
for our workers,” said Andy. “We have 100,000
square feet of temporary asphalt paving for
trade parking. The asphalt is a safer surface and
workers don’t have to truck through the mud to
get to the job. Facebook has made it possible to
cater in lunch so workers can enjoy a hot meal
in our seven-trailer lunch compound. These
kinds of amenities give our jobsite the
reputation as a very desirable place to work.”

As an example, the Altoona project team
participated in the Healthiest State Initiative
Annual Walk on October 3, 2018, to promote
health and wellness, commented Andy.

On September 26, 2018, Turner held their
Annual BBQ Cook-Off at the Altoona Data
Center project site. Thanks to the project team
members, the event raised $40,000 for the
National Coalition for Homeless Veterans, and
allowed for a large food donation to be made to
the Food Bank of Iowa as well.

In an effort to increase the construction
workforce, Turner was a participating partner in
the Des Moines Public School’s Construction
Camp for Girls this past June. Female students
ages 14-18 learned about a variety of career
opportunities in construction, took part in
hands-on projects, went on field trips, and heard
from industry leaders.

“The project team uses Facebook’s social
media platforms to collaborate and celebrate
events and victories like meeting project
turnover dates. These platforms also help
connect us to the surrounding community,
which aids in the recruitment of construction
workers needed to build these amazingly
innovative data centers,” said Andy. ▲