

Colorado Construction's ACE Awards



Project of the Year (Under \$3 Million) Prime Contractor

ACE

Haselden Construction Inc. St. Stephen's Catholic Church

The new St. Stephen's Catholic Church in Glenwood Springs needed to greatly increase its capacity to serve the parish, including seating for almost 1,000 worshippers and a design for a 500-year life span. It was Haselden Construction's job to ensure this church would also stand the test of time.

While Haselden was brought on board through a competitive bid process, budget issues demanded the expertise of a construction manager/general contractor. The project was over budget, so Haselden provided value-engineering services to help reduce costs.

Haselden performed the surveying in-house, saving thousands of dollars for the archdiocese. Haselden re-engineered the elevator design, saving additional monies. However, the most significant impact to the church construction budget came from its parishioners. At last count, in-kind services and materials accounted for nearly \$1 million of the project cost.

Construction began in the winter months. The rocky terrain made it difficult to drill the 45-ft deep caissons in cold weather. In some instances, it took four days to drill a 36-in. diameter hole. The structure – a precast concrete design in conjunction with a pre-engineered steel building – presented its own challenges.

The steel building fabricator, selected and hired by the archdiocese, was assigned to Haselden. As an added risk, Haselden had the burden of erecting in the dead of winter and working with a company that had fully donated steel erection and crane time for the project.

One hundred and fourteen precast panels were delivered over a three-week span during the snowiest winter months. Weighing 14 to 20 tons each, a dozen panels on six trucks arrived on the job each day and were erected right off the trucks.

The biggest challenge facing the Haselden team was effectively coordinating the in-kind services. Many essential items not included in the budget were donated by the community – air conditioning, stained glass, art work, millwork, painting and cleaning – as well as major budget items such as the steel erection, landscaping and irrigation.

Haselden and its subcontractors lent their equipment to the parishioners working at night. After the Haselden crew left for the evening, the volunteers came to work, toiling every night, often until 4 a.m.

Haselden's superintendent, an Aurora resident, stayed at a nearby inn during the week. He would come to the church early every morning and stay with the parishioners until well after dark, helping to manage the volunteers.

Colorado Construction's ACE Awards

Silver

Gerald H. Phipps Inc.

Qwest Niwot Switch Addition

Qwest needed to substantially increase the capacity of the telephone switching facility in a Niwot residential neighborhood. The facility houses a new generation of enhanced voice and data communication services. Before any construction began, a 15-month pre-design process ensured that the new facility would meet Qwest's needs as well as neighborhood expectations of a minimal impact on the community. Qwest's strict design guidelines meant that the building had to be fire resistive construction, capable of emergency power generation and secure from intrusion.

The project involved constructing a new building around the old one, razing the entire roof and half the exterior walls while all of the existing switch equipment remained operational. The equivalent of a Class 100,000 Clean Room environment had to be maintained at all times.

The equipment inside the building was enclosed in weatherproof plastic that protected it against the elements and dust during demolition. Then, in one day, the existing pitched roof was separated from the walls and lifted off by crane, leaving the building's ceiling in place. Precast columns were immediately installed on new foundations supporting new precast beams and twin-tees inches above the old ceiling. A temporary roof covered the twin tees.

Because of the large roof required as part of the residential design, Phipps was able create attic space to locate HVAC air-handling equipment and ducts and still maintain a required 15-ft interior ceiling. The original building, minus its roof, was now enclosed.

The old ceiling and walls – from which hung critical existing pipe and electrical systems – were removed to open up the interior – done in the confined two-and-a-half-ft high "tunnels" left between the twin tee legs and the top of the old ceiling.

Extending the pipe and electrical supports to the new twin-tees was done by hand, with workers carefully punching through the old ceiling from above and adding extensions at each support, then removing the ceiling piece by piece as they went.

Bronze

R.C. Heath Construction Co.

Performance Park & Pavilion, Estes Park

The Performance Park and Pavilion in Estes Park is located on a small peninsula of land surrounded on three sides by a bow of the Big Thompson River and on the fourth by a massive cliff of ancient granite.

R.C. Heath Construction Co. constructed the park and the pavilion. Difficulties included limited access – one single-lane bridge led to the site – and site conditions. The footings for the cantilever roof required more than 70 yds of concrete each and were set at more than eight ft below grade, which reached bedrock but allowed water to infiltrate. Placing the pavilion near the rock face was dictated by audio expectations and created challenges with the pavilion erection and site preparation. All equipment and supplies were brought to the site by crane or across the bridge.

The pavilion project is an interesting mix of angles in both the steel design and the supporting structures that provided a dynamic presence but few square corners.

The park design required carefully situating of new decorative and sound control plantings while maintaining the health of existing trees and shrubbery. River banks were enhanced to control erosion and blend into the site.

The project was separated into two phases to save added expenses from winter construction and accommodate the need to spread the project into two fiscal budget years. The first phase began as a race with winter and the pavilion structure's concrete work. As winter shut down activity, the bridge received custom railings and a new alternate site entry bridge was installed, despite an 18-in. snowfall.

Phase II in the spring involved building major park structures and the new pavilion. The cantilevered roof of the structure was accomplished by setting pre-fabricated structural steel trusses using cranes in the limited space.

The natural stone work wrapped the supporting steel structures of the pavilion and blended the project with the cliff, meeting the community's expectations of hosting performances in a natural setting. The seating in the park provides a mix of grass benches and stone walks.

Colorado Construction's ACE Awards

Project of the Year (\$3-\$10 Million) General Contractor

ACE

Hensel Phelps Construction Co. CSU Microbiology Addition & Renovation

Struggling with space that was too old and too small, five departments at Colorado State University faced a grave need for new laboratories, research space and offices to conduct vital scientific work.

To remedy this, CSU and Hensel Phelps Construction Co. formed a plan and a team and began construction in January 2002 on a new 23,000-sq-ft, three-story microbiology building.

Limited government funding dictated a lean budget for the project. Hensel Phelps employed aggressive value-engineering to reduce the initial construction estimates by nearly \$150,000 without loss of function or program space. Altogether, 90 percent of 33 additional suggestions submitted by HP workers were implemented for another \$120,000 in savings. The reduced \$5.1 million contract amount was a firm testament to sound teamwork and fiscal management, especially in light of the 150 requested change orders.

Unique to this building, the entire structure was built around the strict vibration criteria dictated by the precise instruments used within the laboratories. Even the slightest vibration would render multi-million dollar machines virtually useless. Work had to be accomplished in such a manner as to maintain access to the existing facility and its functionality.

The central loading dock also had to remain accessible for the daily transfer of experiments and hazardous waste to and from campus. In addition, the existing mechanical system had to be upgraded while remaining in use.

As many of the building's occupants transferred equipment and ongoing experiments from the existing facilities to the new, the construction team worked with them to coordinate logistics. Starting construction in January 2002 gave the project team only 18 months for construction and move-in. By June 2003, 12 months before completion, the structure was ready for subcontractors to begin.

Working in unison, constructors roughed-in the building one floor at a time, starting at the bottom and working up. The complex grid of framing, mechanical, electrical and tele/data wiring formed the silhouettes for 15 research laboratories, 33 offices and two environmental cold rooms.

Following in systematic fashion, the team of builders started enclosing the addition with glass, stone, stucco, exposed steel and precast concrete accents compatible with other campus architecture.

Interwoven amid three stories of offices and laboratories, the critically unique mechanical system provides scientists with the volume of air, water, gas, chilled water, steam, deionized water, and vacuum power required for their experiments.

Silver

Swinerton Builders Libby Hall Transformation

Libby Hall is a freshman dormitory and dining facility built in 1953 at the University of Colorado - Boulder. The kitchen and cafeteria had not undergone any major renovation in its 50 years, so the space was in desperate need of a transformation. An overhaul of this magnitude typically takes about seven months – Swinerton Builders accomplished it in 17 weeks.

Work in the building could be done only when students were not occupying it, so Swinerton divided the project into three intervals – winter, spring and summer breaks. To meet the need for a new kitchen and dining facility, new mechanical and electrical systems and a new roof, workers on the project worked either double shifts or long shifts. Asbestos abatement was completed during the two-week winter break – including abatement in a four-ft by four-ft steam tunnel. Demolition occurred during the winter and spring breaks to ready the space for 12 weeks of new construction starting the day after students left campus in May.

The kitchen and dining areas on the second floor were stripped back to the concrete. Swinerton also remodeled a basement area and the first-floor student lounge, adding a food kiosk. In all, the project totaled 25,000 sq ft. One of the first demolition tasks was cutting a hole in the concrete floor so a new staircase could be built between the first and second floors. The opening cut for the new, exposed architectural staircase provided access during construction.

Since most of the work occurred on the second floor and the only access was the staircase, Swinerton removed part of the window system to create ingress. A crane hauled in equipment and materials, including a 26-ft long dishwasher. The challenge was maneuvering the equipment under a concrete tie-in beam from the roof, then through the opening while avoiding a radiator.

In converting a 1950's building to today's standards, all new, above-ceiling infrastructure was needed for mechanical, electrical and telecom systems. The success of the design was contingent upon obtaining a minimum eight-ft height for the new ceilings. Before installation of ductwork, sprinklers, pipes and cables into space designed for 50-year-old technology, Swinerton directed pre-planning meetings to develop drawings that detailed the systems above the ceiling.

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Each system had its own drawing and dimensioned routing, and the pages were then overlaid to ensure that each piece of equipment fit in the field as planned on paper.

Bronze

J.E. Dunn Construction Cheyenne Mountain Zoo African Rift Valley Exhibit

The Cheyenne Mountain Zoo houses more than 600 animals and has the number one giraffe breeding program in the world. Situated on 146 acres – 70 of which are developed – and at an elevation of 6,800 ft, it is the only mountain zoo in the United States. Increased attendance had encouraged the zoo to take dramatic measures to reconstruct and modernize its facilities.

The African Rift Valley is the signature exhibit at the zoo, spotlighting the park's world-renowned giraffe herd. It features a boardwalk, safari lodge, view tower, baobab tree and a giraffe-holding building. Careful consideration was given to material selections, replicating what would be found in the Rift Valley.

The boardwalk meanders through the entire exhibit at a maximum five percent grade and provides access to an activity station where kids of all ages can visit. It features eucalyptus railings and stamped concrete walkways. The lodge and 46-ft view tower feature hand-selected poles from Montana.

The new giraffe-holding building is a state-of-the-art facility with an interior height of 52 ft and features 16-ft giraffe doors. The floor in the day room is a Mondo Flooring System, the same system used in the 1996 Summer Olympics in Atlanta. It reduces knee abrasions and decreases slip hazards.

Designed for low maintenance, the giraffe building features a masonry skin and interior and has an unlimited lifetime warranty on the roof. Additionally, the lower level of the building accommodates holding areas for other featured animals at the exhibit.

A replica of a 900-year old baobab tree, indigenous to the Africa Rift Valley in Kenya, introduces zoo visitors to conservation issues through a unique audiovisual experience. Through the efforts of five artists and craftsman working full time, a realistic replica was created that incorporates natural features such as a termite mound at the base and a mud bank. Also augmenting the realistic nature of the baobab tree replica is its function – the underside of the tree serves as a den for Red River Hogs.

Project of the Year (\$10-\$20 Million) General Contractor

ACE

Hensel Phelps Construction Co. Tabor Center Redevelopment Project

Seventeen years after the Tabor Center's debut, Hensel Phelps rejuvenated the property in 18 months while keeping the mall doors open for business.

Tabor's alteration depended upon a complete change to revise flow patterns, transform elevator and escalator service, upgrade mechanical systems, develop new features and finishes and give the facade a fresh vitality.

Functional public circulation through Tabor also had to be overhauled. The existing vertical transportation system did not adequately handle the increased public traffic, so two high-tech high-speed signature glass elevators with a glass hoistway were built to link the 1,700 sq ft of underground parking with three levels of retail space.

A disconnect existed between the flow of traffic from Tabor's office tower to the shops, requiring exiting the building, using an alternate entrance or traveling up a series of escalators through a busy food court and back down a different set of escalators. That access was fixed, during which the design and construction team also tackled an ambitious plan to reposition the 34-story tower's main electrical control room and install a pass-through in its old location. All electrical equipment was moved 20 ft away and housed in half the previous space.

The most distinct drawback to be remedied was that Tabor retailing didn't have direct storefront access from the 16th Street Mall. Most tenants were secluded deep within the large shopping area without the advantage of mall window box displays. Five large tenant spaces, a three-story open air grand entrance and a similarly significant secondary entrance were incorporated into the reconstruction of the curtain-walled exterior façade.

Three stories of previously unused space were converted into an additional 23,000 sq ft of retail and food court area. The extra footage also allowed for doubling the width of original corridors and permitted the 545-seat food-court dining to be reconfigured, including an outdoor seating area for 78.

Overall, demolition and reconstruction throughout the project were risky and time consuming. Stringent demolition sequencing limited the amount of productive activity that could take place at any time for modification and upgrades for the structural steel. With businesses conducting normal operations, and residential tenants living adjacent to the site, demolition hours became tightly compacted between 7 a.m. and 11 a.m.

Colorado Construction's ACE Awards

Silver

JED/BDI

Bruce Randolph Middle School

Bruce Randolph Middle School features a two-story, masonry and steel-frame building with a brick and masonry exterior accented with five brightly colored turquoise penthouses and two cantilevered canopies. Designed with an emphasis on math and science, the school can accommodate upwards of 900 students housed in 50 modern classrooms, including six state-of-the-art science labs fitted with fume hoods and full-body showers. Also included are computer labs with high-speed data connections and facilities for both the visual and performing arts that incorporate a full sound system.

Efficient use of space is exemplified through the creation of a "cafetorium" that doubles as a cafeteria or auditorium as needed. A 10-acre sports complex features baseball and softball fields, basketball courts and football and soccer fields that will be used not only by students, but also by the Denver Police Department in its sponsorship of community sports groups.

The colorful canopies on the east and west sides utilize a unique, cantilevered construction that acts as a shield against mid-day heat and offers boosted energy efficiency during the warmest part of the day. For ease of maintenance and durability, a quarry-tiled floor in the entryway leads to a 10-ft-wide grand staircase.

To make room for the new middle school, the nearby old Nabisco factory was removed. A particularly interesting challenge was the demolition of an old brick smokestack rising approximately 130 ft and measuring 12 ft at its base. Bringing the smoke stack down under closely controlled conditions was a primary concern. Having discussed many options, the safest method was determined to be partial removal of materials at the base of the stack in a fashion leaving what resembled the three legs of a three-legged chair. A cable was then run through two openings at the base and, in effect, two of the 'legs' were pulled out from under the smokestack, causing it to fall in place.

The Bruce Randolph Middle School is the first project in the history of Denver Public Schools to use construction management as the delivery method.

Bronze

GE Johnson Construction Co.

The Sanctuary Golf Clubhouse

The Sanctuary Golf Clubhouse provides space for charitable organizations to hold fundraising events in a fashionable atmosphere. Thus, the quality of the construction and interior design was set at a very high standard.

With three buildings on the drawing table – the clubhouse at 26,000 sq ft, the open-air banquet pavilion at 4,300 sq ft and the cart barn at 5,100 sq ft – construction of the \$13 million facility began in August 2002 and was completed in June 2003.

The three-story clubhouse was the main focus of the project. The lower level houses administrative offices, storage and a mechanical room. The lower level also encloses the full-time caretaker's apartment and the men's and women's locker rooms. The locker rooms provide access to the underground "grotto" tunnel with the waterfall. The grotto enables guests to reach their golf carts and drive to the first tee.

The main level consists of two private dining rooms, a lobby/living room, boardroom, pro shop and a mixed grill/bar. This level also features the full-service kitchen. The Sanctuary can provide up to 250-person sit-down meals or up to 300-person buffet-style meals. It also has a veranda where guests can enjoy the panoramic views while dining.

The upper level consists of owner Dave Liniger's private lounge. Highlights of this room, other than the secret entrance, include a 55-in. plasma TV, a high-end sound system and a wet bar.

A unique challenge to the Clubhouse was the dry hydrant fire protection system. During a fire, water is pulled from a pond located about 1,600 ft downhill from the project.

When a fire is detected, a signal is sent to an irrigation control valve, which shuts off the irrigation flow to the golf course and dedicates it all to the fire line. Three irrigation pumps powered by their own generator activate and pump the water to the fire control room. From there, the water is sent through the sprinkler piping.

Colorado Construction's ACE Awards

Project of the Year (\$20-\$40 Million) General Contractor

ACE

Gerald H. Phipps Inc.

Space Odyssey, West Atrium & Gates Planetarium at the Denver Museum of Nature & Science

When the Denver Museum of Nature and Science embarked on the largest construction project in its 103-year history, it set some very lofty goals: a new one-of-a-kind, state-of-the-art, all-digital Gates Planetarium; a new three-story atrium complete with enormous celestial rings and a star viewing terrace; opening the west side of the facility to more light; make moving around inside the museum easier; and add new heating and cooling equipment of Titanic proportions.

And all without ruffling the feathers and furs or jiggling the gems in dioramas and exhibits located just inches from this 85,375 sq ft of major construction. Assure the safety and avoid inconvenience to thousands of guests and students who come to the museum every day – not your ordinary addition/renovation assignment.

The scope of the project involved demolition and removal of the old two-story, brick-faced, Bailey Lounge on the west side of the museum to be replaced by the three-story, 18,000-sq-ft Leprino Family West Atrium. The 8,000-sq-ft Gates Planetarium was completely gutted from floor to ceiling, replaced by a state-of-the-art facility capable of depicting 250,000 solar system objects and over four billion stars.

A new basement was constructed under both the planetarium and the atrium. Several existing highly sensitive dioramas and exhibits – from hummingbirds to a moose to a whale – were relocated to other areas of the facility to make way for the 13,000-sq-ft, experienced-based Space Odyssey. A new 6,000-sq-ft mechanical penthouse with four air handlers was built on top of the existing West Wing and tied to an existing penthouse via a new 116-ft suspended, enclosed pipe bridge. Existing wings of the building, built in different construction eras over the last century, had to be reinforced to handle the new loads. New walkways and entryways were built to make movement throughout the museum easier. All of this had to be accomplished while the Museum remained open, with minimal or no impact on visitors.

Throughout the entire project, dust, vibration, fumes, and noise were major concerns. Tolerance for these typically acceptable construction side effects was zero. The museum, a quiet place to begin with, is filled with priceless exhibits that include precious gems, ancient artifacts, hand-crafted works of art and highly sensitive, delicate displays of leaves, grasses and landscapes. Then there is the wildlife, with painted backgrounds on plaster walls in 95 dioramas—many of them taking years to complete.

Gerald H. Phipps found innovative answers to all of these challenges and more, in one of the most complex public renovation and addition projects the state has seen in some time.

Silver

GE Johnson Construction Co.

Aspen High School

The Aspen School District's Assets Committee knew from the start that community involvement was critical to the construction of the new high school, so it brought architects Bennett, Wagner, Grody and construction manager/general contractor GE Johnson Construction into the process when the vision was still just a dream. Working as a team, the owner's representative, the architect and GE Johnson Construction began preliminary design of the project.

Armed with details to aid in demonstrating the need for an expansion, a cost estimate with details of how the voters' money would be spent – as well as a three-dimensional model illustrating the blending of the school's old "pod" architecture with the new radial design – the team invited the community to three town meetings, seeking support and feedback.

From the start, the community supported the project because of its "no surprises" approach. Aspen citizens further supported the positive approach by the passage in November 2000 of a school bond issue exceeding \$40 million for construction of the school additions and renovations to the existing facility, which ultimately cost about \$33 million. The first task was to construct 113,700 sq ft of new space. Because the school was originally laid out using a pod theory, the new design required creative techniques to blend the old with the new. While the pod principle is not as common a design as it was in the early 1970s, the new addition took on a less round, although still curved, appeal. A radial design ties the old with the new, creating a new face and a strong presence. The new addition serves as the main entrance, complete with a grand entry staircase and skylights throughout the upper level common areas. It includes 18 new classrooms, offices, a library, a weight room and locker rooms.

A new gymnasium with an elevated running track completes the addition. But the highlight is a 128-seat lecture hall with tiered seating, a projection system, special lighting and sound, and computer hookups for each seat. Styled after university-style lecture rooms, this mini-version is one of the most popular rooms in the new school.

Project of the Year (Over \$40 Million) General Contractor

ACE

**Gerald H. Phipps Inc.
Boulder Community Foothills Hospital**

Gerald H. Phipps was chosen to raise the Boulder Community Foothills Hospital on a 48-acre site in a 100-year flood plain that had never been built upon. Also, it is the first LEED-certified hospital in the nation.

The look and feel of the facility is closer to a resort than a traditional hospital, yet it is filled with state-of-the-art equipment and accommodations. Included in the construction were a 181,249-sq-ft main hospital consisting of three stories plus a basement, a 67,124-sq-ft outpatient services building, a 10,224-sq-ft central utility plant incorporating two emergency generators, and a 2,596-sq-ft pipe and utility tunnel.

Also part of the project was an underground parking garage, the widening of Arapahoe Road, extensive drought-tolerant xeriscaping, waterproofing the 17-acre developed portion of the site, and building a levee one-half mile upstream behind condominium units and an office building.

A major league dewatering system was installed to permanently drop the water table from one or two ft down to eight or 10 ft. The system consists of eight-in. percolatable pipe buried up to 20 ft deep throughout and around the perimeter of the site. In addition, a slurry wall was installed around the perimeter down to bedrock to eliminate drawdown of the wetlands. To further control the water problem and hydrostatic pressure, all building sites were waterproofed using a seamless sprayer-applied rubber membrane called Liquid Boot®.

After the waterproofing system components were in place, more than 100,000 yds of fill, including the dirt from building basement excavations, were brought in to raise the entire 17-acre site by an average of six ft.

To be LEED certified, the project had to meet certain requirements, including:

- 50 percent of construction waste had to be recycled. Phipps recycled 1,254 tons of waste — over 60 percent.
- 75 percent of materials must contain recycled content.
- At least 20 percent of materials must be manufactured within a 500-mile radius.
- 50 percent of materials must be locally harvested.
- All interior sealants, adhesives, paints and carpet must be VOC compliant.

The project far exceeds LEED-minimum requirements.

Silver

**J.E. Dunn/BDI
General Services Administration
Building 25 Renovation**

The 375,415-sq-ft General Services Administration Building 25 was severely outdated and required a laundry list of construction items to bring it up to date – demolition of existing interior and exterior elements; asbestos abatement; lead and other remediation; excavation and grading; landscaping and irrigation; site furnishings; concrete replacement; masonry; structural steel; rough and finish carpentry; millwork; roofing and sheet metal; doors-frames-hardware; glass and glazing; window replacement; metal framing and drywall; interior finishes; casework; lab equipment; and elevators.

In addition to this major modernization effort, a 20,000-sq-ft Environmental Protection Agency crime lab needed to fit into the plan.

In a joint venture, J.E. Dunn Construction Co. and Blackinton & Decker Inc. were selected to provide CM/GC services on this extensive renovation and modernization project.

The EPA crime lab consists of 46 individual laboratories to house scientists and chemists. It accounted for approximately half of the \$10.4 million mechanical system. The labs include halar-lined and PVC lined ductwork. The extensive manifolded exhaust system – which exhausts approximately 45 fume hoods – utilizes hepa filters and high-end fiberglass, strobic-style exhaust fans. In addition, the facility includes specialized high-purity water, compressed air, acid neutralization and laboratory gas systems.

To protect expensive laboratory equipment and testing of evidence, EPA chose to add a gaseous fire suppression system in addition to leak detectors and sensitive temperature-recording data systems.

The EPA has strict requirements about environmentally conscious design. In fact, many of the program requirements for LEED were developed from EPA standards. Some specific environmental design features include: lavatories on a night set back, unoccupied mode that reduce air flow and conserve energy; heat recovery systems for the entire building; system automation with HVAC and lighting sensors throughout the building and independently controlled labs; use of natural light and low-e glass windows; use of existing masonry walls and concrete floors; and maintaining the basic steel structure.

Colorado Construction's ACE Awards

Bronze Saunders Construction Inc. University of Denver College of Law

Built to last 300 years, the \$48 million, four-story University of Denver College of Law building is the newest landmark on campus.

Doubling as a speakers' forum, the two-story foyer is large enough to host campus-wide events. The hallways branching out from the foyer lead students to 14 state-of-the-art classrooms where every seat accommodates power and data connections. Throughout the building, 31 individual and group study rooms are intermixed with faculty offices. Distinctive interior finishes include fine oak millwork intermixed with limestone accents, exposed concrete and quarry tile flooring. A special feature of the 245,000-sq-ft building is the five-story central light well that filters natural light into the center of the building an average of 300 days per year.

The heavily reinforced, cast-in-place concrete structure utilizes more than 21,000 cu yds of concrete and 5.3 million lbs of reinforcing steel. Additionally, 100,000 lbs of copper sheeting were used to construct the approximately one-acre roof.

The building incorporates 12,000 cu ft of hand-carved limestone made up of more than 5,230 pieces and shapes. Special arrangements were made with an Indiana quarry to deliver the pre-carved stones to the jobsite one truckload per week to coincide with the erection of the building's skin.

During the design phase of the project, the university sold its existing law school campus, accelerating the move-in date for the College of Law by 18 months. Also, the completion of the 770-car parking garage was accelerated by nine months to increase construction parking and allow for additional storage of materials.

Finally, the College of Law facility meets the LEED criteria for a green building, featuring several environmentally friendly attributes. As the first law school building in the nation to achieve this designation, it boasts 40 percent less total energy consumption than a comparable building and over 70 percent of the construction debris was recycled.

Project of the Year (Under \$1 Million) Subcontractor

ACE Colorado Hardscapes Inc. Village of Five Parks

The Village and Community Center at Village Homes's Village of Five Parks in Arvada includes a park, swimming pool, spray park, picnic and terrace areas and a grand staircase leading to an overlook terrace and distinctive "temple," as well as a community center building identified as "The Depot."

Concrete is the design material used to create the pathways surrounding the Community Center, the elegant pool deck, decorative wall, and The Depot floor that together make the Village of Five Parks's Village and Community Center a unique heart of the villages.

Significant time and coordination were invested in creating the high-impact Village and Community Center to make it a distinctive focal point for the surrounding community. Village Homes, the owner and developer, called on Colorado Hardscapes to work on all aspects of the village center – the unique wall at the center of Five Parks, the floors in the community center, the pool deck, spray park and sidewalks connecting it all together.

Colorado Hardscapes worked with the two designers on the project: the landscape architect, Nuszer Kopatz; and the form-liner and stone-paving designer, Artscapes. Colorado Hardscapes also managed the concrete subcontractor, Concrete Foundations.

Balancing budgets with aesthetics resulted in the use of uncolored concrete for the walls, flatwork and steps. The use of formliners, flatwork retarders and sandblasting to create different textures create the visual appeal of the hard surfaces. Complementary retaining walls, brick work, railings and landscape round out the project.

The concrete walls include custom-designed and fabricated formliners, a rustication grid pattern and selected areas of sandblasting. Concrete flatwork on sidewalks and pool deck is highlighted by banding and panels of uncolored but etched (sand finish) concrete. Cantilevered steps are installed at the changes in elevation and natural stone paving is incorporated into the concrete paving. Interior concrete overlay and staining of the concrete floor in The Depot kept the character of a train station of yesteryear.

Colorado Construction's ACE Awards

Silver

ISEC Inc.

The Sanctuary Clubhouse

In late 2002, general contractor GE Johnson Construction Co. awarded ISEC an \$800,000 contract to furnish and install the architectural woodwork and wood doors on the 22,500-sq-ft Sanctuary Golf Clubhouse. The job was one of the most expensive per-sq-ft construction projects in Colorado.

Once ISEC was selected, project teams began securing the vast amount of American Black Walnut required for the ornate interior spaces. Onsite, ISEC's millwork was held to tight tolerances. Straight clean lines, clear wood, consistent color and grain were all important factors to the owners' overall vision. ISEC had 12 weeks to get material in place before the first events.

With such a condensed schedule, there were several trades working in the same area at once. ISEC was literally putting up expensive premium grade paneling and doors as the masonry people were chipping stone for the floor just inches away. Material protection was key in avoiding unwanted touch-ups and replacement costs.

The complexity of the wood selection created challenges before construction even began in the fact that the design called for clear, dark walnut. This particular cut and clarity of walnut is very rare. Because of past decades of walnut popularity, only new-growth, small trees are used so the usable walnut has a lack of clarity.

With a smaller size tree more readily available, the desired heartwood is only four to five in. wide. Trim profiles called for on the job were 10 to 12 in. To meet this standard, ISEC crews glued up for width to maintain a consistent color and grain. The larger trim profiles had to be redesigned to incorporate an offset detail every four in. to hide the glue lines.

Throughout the 12-week period, ISEC carpenters installed more than 12,000 ln ft of trim, 2,000 sq ft of wood paneling, fixtures, bars and cabinetry.

Project of the Year (\$1-\$3 Million) Subcontractor

ACE

Encore Electric Inc.

McDATA "McFUSION" Remodel

McDATA Corp., a \$328 million company and a leader in the data storage networking industry, needed to upgrade its power system and expand the research and development center at its multi-million dollar headquarters in Broomfield. The \$1,330,525 project needed to be done quickly and efficiently. McDATA couldn't afford a time-consuming, major shutdown when so many clients rely on the data technology company to keep their systems operational not only day-by-day, but second-by-second.

McDATA chose Mortenson as its contractor and Mortenson then selected Encore Electric as its electrical partner. The project consisted of a complex critical power upgrade as well as a 50,000-sq-ft expansion and improvement of McDATA's 169,000-sq-ft research and development center. The upgrade required a 41-hour shutdown and re-commissioning of power systems critical to McDATA solutions that support its worldwide customer base. During one critical weekend, 33 pieces of distribution equipment were upgraded and re-commissioned.

The work was performed in a fully operational facility with minimal interruption to McDATA's operations. During the 41-hour shutdown Encore provided McDATA the ability to operate its data center with minimal inconvenience to its clients.

Encore had originally planned that the equipment be installed and commissioned during a 47-hour weekend shutdown. But McDATA wanted to be back in operation first thing Monday morning—Tokyo time. That translated to 4 p.m. Sunday, Colorado time, cutting the shutdown window to 41 hours. The Encore team prepared a 728-item Method of Procedure that detailed to the hour specific sequence, task, crew, location, safety procedures, pre-fabrication and material/tool requirements with 24-hour vendor support.

The MOP was displayed during the shutdown with hourly progress updates to communicate and monitor the status to everyone involved. In addition, for three consecutive days before the shutdown, Encore, Mortenson and McDATA crews performed rehearsals to find any weak points and ensure familiarity with the MOP.

Colorado Construction's ACE Awards

Silver

Delta Dry Wall Inc.

University of Denver College of Law

The fifth floor of the University of Denver College of Law is dedicated to the mechanical portion of the building, which houses all of the heating and air conditioning for the entire facility.

This particular floor was designed as an air plenum for the mechanical units, so the walls had to be built, designed and engineered to withstand the static pressure from the air movement from the mechanical units.

This was a most challenging task for Delta Dry Wall because of the size and gauge of the studs needed to meet the engineering criteria. Delta used studs ranging from six-in.-16 gauge to 12 in.-12 gauge, which required using an electric hoist to pick them because of their size and weight. The studs were welded, sheet rocked and taped to create an airtight plenum for the mechanical units.

The scope of work included the construction of the stadium seating in the classrooms and the moot courtroom. Delta subcontracted the building of the radius wall panels to T.E.A.M. Panels International of Denver, then Delta installed them in the rooms.

Crews then fastened the panels to the concrete and welded the pieces together to form different height radius walls.

The walls were then decked and concrete was poured to achieve a stadium-style seating area.

The materials to complete this project included 196,800 sq ft of interior wall framing, 123,000 sq ft of ceiling framing, 16,000 sq ft of structural wall framing on the exterior of the fourth floor and 33,000 sq ft of engineered structural framing on the fifth floor. There were more than 14,000 sheets of drywall installed on the entire project.

Bronze

LONG Building Technologies Inc.

Minoru Yasui Office Building

The original Minoru Yasui Office Building – designed as a hotel – incorporated a fan coil HVAC system with inadequate ventilation and limited outside air capability. There were no accommodations for bringing the fire-life-safety systems up to code. These systems had to be completely replaced if the building was to be re-used.

The biggest challenge was presented by the building itself. The measurement from the top of a floor to the bottom of the floor above was seven ft-six in. in most areas. For a seven-ft occupied space ceiling height to be realized, an entire mechanical system – HVAC, sprinklers, fire-life-safety and electrical – had to fit into just six inches.

There were no known construction techniques or mechanical systems that would fit the bill until LONG preconstruction systems engineers – working with BCER Engineering, ABO Copeland Architects and City of Denver personnel – recommended implementing an Invensys chilled and hot water radiant ceiling panel system. By eliminating the need for re-circulated air to meet internal loads, the LONG/Invensys system allowed designers and contractors to squeeze a wet side conveyance and distribution system into very confined and restricted spaces.

LONG provided the system expertise and the radiant panels, along with the design and installation of the Internet-enabled digital control system. Through highly sophisticated and complicated controls programming, the system alternately circulates hot and chilled water as needed through copper tubes that are mechanically bonded to the 6,000 metal ceiling tiles – 48,000 sq ft of heat transfer surface.

In addition to saving vertical space, the radiant ceiling system has many other benefits, including significantly reduced energy consumption. Two hundred horsepower from fan operation was eliminated with the new air system. The higher water temperatures that work in a radiant cooling application also allow the chillers to use far less energy.

Since the radiant system handles 100 percent of the internal and skin loads, the only reason for a duct system is to provide outdoor ventilation. This is done at 20 percent of the normal air circulation rates. The building efficiently operates on 100 percent outside air. The smaller air system also translates into a lower noise level in the occupied space, another occupant-friendly benefit.

Colorado Construction's ACE Awards

Project of the Year (\$3-\$6 Million) Subcontractor

ACE

Metropolitan Glass Inc. Legacy Plaza

A key component of the 10-story, 285,000-sq-ft Legacy Plaza's impressive appearance is a 65,000-sq-ft glass wall. Metropolitan Glass was chosen to construct the wall with its serpentine shape, rarely seen in construction – a convex curve followed by a concave bend. The multi-hued, blue-green wall is punctuated by horizontal bands of aluminum. The flowing, serpentine glass wall was achieved using straight pieces of glass and aluminum. The design included opaque Spandrel glass set from the outside and vision glass set from the inside. With no external vertical capturing of the glass panels, Metropolitan Glass had to identify a system that combined installation simplicity, construction integrity and quality appearance.

A two-sided structurally glazed, vertical I-beam curtain wall system was selected for its flexibility, versatility and efficiency. The system allowed snap-on covers to be installed on the interior of the vertical mullions with the glass panels glued directly to the I-beam mullions on the exterior. Decorative horizontal exterior mullion caps were added to complete the design.

All glass and aluminum elements had to be approved and ordered before erection of the building had even begun. With no vertical capturing of glass on the exterior between panes, tolerance for error was one-eighth of an inch.

Once installation started, Metropolitan Glass developed an efficient method for transporting glass panels onto each of the floors. It built a custom-engineered, cantilevered staging platform that attached to each floor deck and extended out from the building façade.

Ten 5-ft by 5-ft glass panels – each weighing about 200 lbs and totaling one ton – were crated and placed on a dolly. The crates were then lifted onto the cantilever platform by a tower crane, rolled onto each floor and staged for installation.

Compounding the installation difficulty was the fact that the glass plane was physically beyond the edge of the floor slabs in mid-air. Complex trigonometric calculations and laser beam positioning were used to establish mullion points along the length of the undulating curtain wall.

Silver

Duro Electric Co. Cherokee Trail High School

The new Cherokee Trail High School is two-story structure with a footprint equal to approximately seven-and-a-half football fields. Built on a 51-acre site, the school includes two gymnasiums, an aquatic facility, an auditorium, a computerized music lab, two science/biology laboratory areas, administrative and staff offices, classrooms, a restaurant-quality kitchen and a "cafetorium" that doubles as the cafeteria and commons area.

Plans called for construction to begin at the center of the building and proceed out to both ends. For Duro Electric, much of the adventure at Cherokee Trail came in the form of a below-grade trench down the center of the facility. A four-ft wide sidewalk at the bottom was bordered by 30-degree slanted raw dirt embankments. From this area, Duro electricians would have to access a 22-ft high ceiling as well as crawl spaces that ranged from two ft to five ft high.

Instead of locating HVAC equipment on the roof, all mechanical equipment and electrical rooms – the building required two separate electrical service feeds – were placed in vaults located off the V-shaped trench.

Once the trench was excavated and the sidewalk installed, several 2,000- to 3,000-sq-ft mechanical and electrical rooms were built below grade. Duro had to run conduit and wiring to power equipment in the rooms and distribute power to the rest of the facility. With no ceiling in place, Duro had to address keeping snow melt and rain water out of the work areas. Wooden "dams" were built around the entrances to each of the below-grade rooms.

After installation of the precast ceiling and work on the first-level floor began, another constructability problem arose. Duro electricians had to access crawl spaces and the ceiling to install conduit and cable tray, yet no trucks or lifts could be used in the narrow walkway. Temporary wooden stairs were built on the slippery slopes to reach the crawl spaces.

To get to the ceiling, scaffolding was erected on the narrow sidewalk, with planks placed on top extending from the scaffold to the top edges of the slopes — a span of more than 20 ft.

Once the first-level floor was completed, a chalk line was used to layout the support locations, allowing Duro to penetrate the floor from above. This enabled the electricians in the confined crawl space beneath the floor to hang the right equipment in the right places and coordinate with HVAC ducts throughout the huge complex.

Cherokee Trail threw in several other obstacles for Duro, including a one-acre, 50-ft deep runoff pond for which a pump – more than 800 ft from the nearest power supply – had to be installed at the bottom. After the pond was drained, Duro electricians worked their way down a 45-degree slope to the bottom to perform the installation.

Colorado Construction's ACE Awards

Bronze

Ludvik Electric Co.

Boulder Community Hospital

Boulder Community Hospital selected Gerald H. Phipps as general contractor for the most elite and refined hospital to be built in Colorado. Phipps chose Ludvik Electric Co. as the design-assist electrical contractor.

Much of the area around the building site is in the Boulder Creek flood plain. Extensive preparation was required because the water table is two ft below the surface. After dewatering systems were established, Ludvik Electric connected sump pumps for continuous dewatering so that foundations could be installed.

The hospital campus is comprised of three separate buildings on top of a below-ground parking garage. The mechanical services are provided from a remote central utilities plant, which adjoins the hospital through an underground tunnel.

All the patient room lighting is managed by means of automated controls that can be operated by the patient at the bed pillow switch or by the attending physician. The area of neo-natal intensive care, or the NICU rooms, is provided with theatrical dimming controls that simulate night and day to allow infants to become acclimatized before their release from care.

Raceway systems were installed for security, nurse call, building automation, tele-data, Xray, CAT-scan and other sophisticated networks. Fire alarm is a state-of-the art, fully addressable, NFPA-approved system.

The hospital's electrical infrastructure is designed to allow it to operate without power for four days. This is accomplished by using dual-paralleled 1250-kw generators fuel fed from a 10,000-gal. underground fuel tank. The paralleling gear utilizes a synchronized rapid transfer scheme, which allows for a return transfer to normal power with only milliseconds interruption.

The project schedule was designed around a 20-month timetable. Construction began with only 80 percent construction drawings for a core-and-shell start, and the interior drawings were not issued until the first building was already 50 percent constructed.

The decision was made to build the three-building design vertically. This created a problem because the electrical design was structured for horizontal construction and the building that contained the main electrical distribution equipment, was constructed last.

The utility plant was substantially complete in late July when the overall load design was changed for the mechanical equipment. This was a predicament because the feeders were already buried under the building slab and redesign involved pulling the parallel feeders into the same conduits.

Project of the Year (Over \$6 Million) Subcontractor

ACE

Riviera Electric

HealthONE Sky Ridge Medical Center

The new Sky Ridge Medical Center is a prime example of the latest in electrical technology. Situated on more than 42 acres in Lone Tree, the center has seven floors, 362,000 sq ft, numerous in-patient and out-patient facilities, and is built to feel like a luxury hotel. From top to bottom, it has the most modern electrical plant, complete with redundant systems, alarms and is wired to provide diagnostics and system control from numerous stations.

The main electrical, two emergency generators and the fire alarm main are on the garden level. Outdoor electrical wiring consists of 28 four-in. conduits that run 385 ft from the powerhouse to the main distribution. Distribution is made by two 2500 KVA transformers connecting power provided by redundant loop systems from Castle Rock and Park Meadows. An automatic transfer switch chooses power on a 50-50 basis from each loop. The main service board provides power to 159 electrical panels.

The medical center has two power sources and is equipped with two 1250-kw emergency generators. Each generator links through an ASCO 24-volt DC power manager that synchronizes the power so 480V three-phase power is supplied constantly. The generators automatically activate if there is an interruption in the external power loop.

The hospital has been wired to segregate power uses in order of priority if a need for power rationing arises. The wiring and diagnostics to establish this prioritizing and power switching are significant and prioritize the life-safety branch first, followed by the critical branch, the equipment branch and the normal usage branch. During an emergency, eight automatic transfer switches distribute emergency power from the generators according to a priority of needs, conserving power for the most important loads.

Colorado Construction's ACE Awards

Silver

Trautman & Shreve Inc. Aurora Municipal Center

The new Aurora Municipal Center is 286,000 sq ft and consists of five stories with mechanical penthouses on the roof. The only access to the roof was by crane and the only way to get debris, tools and materials on and off the roof was also by crane. The penthouse facility was built up about two ft from the roof to run pipe, duct and wiring beneath the massive mechanical equipment. Also, because of the large size of the mechanical equipment, it was necessary to set the equipment in place and then build the central plant around the equipment.

Two 400-ton chillers weighing 19,000 lbs each were lifted and set in the chilled water room along with the associated pumps and accessories. Two 400-ton cooling towers are set outside the chilled water room while the hot water room has two boilers and the associated pumps. Each air handling unit was lifted in four pieces with sections weighing up to 30,000 lbs.

The built-up floors of the mechanical rooms are heavily reinforced with x-bracing steel to accommodate the weight of the mechanical equipment, creating tight, confined spaces. The pipe installations began under these floors after all the equipment had been set. This required the craftsmen to crawl into the two-ft openings between the x-bracing steel reinforcements to hang hangers and pull piping up to 10 in. in diameter. Piping also had to be maneuvered around four elevator shafts. Overall, almost 500 ft of chilled water and hot water piping was installed beneath the mechanical rooms.

The air plenum shafts from each unit were open to the first floor, with a drop of more than 70 ft. The air-handling units' pipe installations ran over the top and through the center of a 20-ft by 35-ft shaft.

Because of heavy roof loads, large precast concrete beams support the roof and building. The support beams between the ceiling and floor on each level allowed only a maximum 32 in. of ceiling space for the installation of duct, pipe, electrical wiring and conduit, fire protection systems, data cabling and security systems. A duct main measuring 14 in. high by 12 ft wide runs the entire length of each level, carrying the hot or chilled air to all spaces in the building. More than 2,000 ft of mechanical piping was installed on each level.

Bronze

Ludvik Electric Co. Union Plaza

Union Plaza (also called Penterra Plaza) is a mixed-use facility that includes seven stories of offices and 23 stories of residential living space; both buildings rest on a plaza covering three levels of underground parking, encompassing more than four-and-a-half acres.

The lighting is a combination of light sources suited for the plaza's many uses and environments. Lighting control is incorporated to provide safety and security for both residents and visitors.

Electrical power distribution was achieved by providing multiple services at different utility voltages. Two 4,000-amp, 120/208-volt risers were installed for residential units, one 4,000-amp, 277/480-volt and three 2,000-amp, 277/480-volt distribution switchgear lineups were provided for the offices, common mechanical equipment and other commercial power.

To provide the occupants with life-safety operations and emergency egress lighting, a 1,250-kw emergency generator was incorporated into the electrical design. Power from the emergency generator is distributed to the required life-safety components with the use of three automatic transfer switches. The switches – at 400 amps, 600 amps and 800 amps – sense that normal power has gone out and automatically switch to the generator power in less than 10 seconds. Emergency power can remain on for hours with the fuel supply incorporated in the design.

Fire detection and smoke control technology consists of everything from manual pull stations that residents can trigger to automatic detectors. Notification of an emergency is accomplished through speakers and strobes in each resident's unit and throughout the project at code-required locations. An automatic smoke control turns fans on or off, operates dampers in air shafts and exhausts the smoke out, pressurizing a smoke-free path for occupants to escape safely.

Residents use a computerized card access system for their own floors and units. It restricts access to unidentified people for spaces where they do not belong. The computer records who has entered the restricted spaces and when. Closed-circuit cameras also monitor activity at the site.

Design-Build (Under \$10 Million) Prime Contractor

ACE

**Hensel Phelps Construction Co.
Summit View Medical Commons**

Located on a parkscaped 20-acre site master-planned by Hensel Phelps, a massive curving brick wall breaks vertically into the imposing three-story, four-level building. The exterior of the 300-ton structural steel building is a striking, cost-effective mix of Colorado's own red stone, brown and burgundy brick, mushroom-tinted stucco, and stout concrete roof tiles with dark green accents. The result is a handsome structure that invites the public inside to a warm, homey atmosphere conducive to the practice of healing arts.

Inside, a vast, naturally lit foyer welcomes visitors into the pharmacy, the urgent care center or the heart of the central imaging center appointed with distinctive lighting, blends of sculptured carpet, textured wall coverings, quarry stone, architectural ceiling elements and muted acoustical comfort.

During the four-month design phase, Hensel Phelps teamed with Banner Health's medical imaging department and the design team to optimize value while satisfying extreme tolerances for the core, shell structure and the medical imaging system itself. Also, the team allowed the tenant prolonged time to select the best equipment by designing flexible mechanical and electrical services for the MRI and CAT scan areas. Plus, HP delivered even more options by building structural components outside a normal construction sequence.

This atypical mode allowed HP to put facility space in the hands of the owner/tenant for equipment testing while focusing on the remaining activities in the 12-month construction phase. Hensel Phelps delivered the entire imaging department – from concrete to paint – in 14 weeks. Banner Health was able to set up, test and calibrate each piece of medical imaging equipment before the grand opening.

Housing more than 100 medical care workers, the interior space creatively serves up curved walls, a maximum distribution of daylight through the floor plates, 10-ft ceilings, art displays and precise, high-tech diagnostics and patient care. Remaining tenant space allows for expandability along with easy access to the imaging center and high-speed image transfer via a picture archiving and communication system.

Design-Build (Over \$10 Million) Prime Contractor

ACE

**Calcon Constructors Inc.
South Denver Heart Center**

South Denver Heart Center is a work of modern art. The structure is one of the most complex buildings in the city, combining a sophisticated design with interior and exterior finishes that raise the bar for contractors and architects alike. As a progressive twist, the design team incorporated the Eastern philosophy of Feng Shui to guide the flow of energy throughout the space.

The 68,000-sq-ft facility was built with an open spine design featuring a full-length atrium built on a radius. The atrium is 55 ft high and enclosed with glass curtain walls framed with heavy, architecturally exposed structural steel. The exterior finish of the building includes sandstone, limestone, brick and copper.

The first floor of the building is compartmentalized into specific cardiac functions; exam rooms, doctor offices, and a wellness and rehab center. A 125-seat conference room with a full demonstration kitchen offers a venue for instruction and meetings. A cath lab, CT scan and MRI facility are also located on this level.

The second level is built around the atrium and houses the administration offices, massage therapy and a pilates studio. Finally, the center contains a state-of-the-art AV system that includes plasma screens tied to heart monitors in cath labs and a video recording studio, used in the conference room and demonstration kitchen.

After review of the initial design, the design team changed the layout, incorporating the Feng Shui philosophy.

Corresponding to the flow of the heart, waterfalls frame the entry vestibule. A fireplace at each end of the building provides balance and offers comfortable meeting areas for doctors, patients and visitors. During construction, the center of the corridor was changed to open up to a circular seating/garden area, representing the metaphoric "heart" of the building. A labyrinth on the exterior of the west side was created for reflection and meditation.

The architecturally exposed structural steel, coupled with the large radius spine, reduced construction tolerances and required extra attention during engineering and construction. The three-story spine separates the two halves of the building – one half straight while the other side is built on a radius with a variable pitch ranging from 5/12 to 12/12.

Colorado Construction's ACE Awards

Silver

Swinerton Builders

U.S. Northern Command/North American Aerospace Defense Command and U.S. Army Space Command Headquarters

The project entails two new headquarters buildings – one houses NORTHCOM and NORAD, the North American Aerospace Defense Command; the other building contains the U.S. Army Space Command. Both structural steel-framed buildings are two stories with basements, and are designed with current security protection systems and anti-terrorism elements. The Army Building totals more than 100,000 sq ft; NORTHCOM/NORAD encompasses 158,000 sq ft.

Emulating the space-age expression of an existing headquarters building on base, these new structures present insulated metal panel exteriors and glass curtain walls to provide a sleek and angular look. Inside, both civilians and uniformed service branch members monitor space, land and waterways for incoming threats in command centers chocked full of computer systems. In operational centers, technicians prepare machinery for missions. Top military brass discuss secret strategic plans in Special Compartment Information Facilities – rooms with sound material barriers so intensive that no sound emits from them whatsoever. Video teleconferencing rooms with plasma screen monitors facilitate real-time communications around the world.

With a fast-track design effort, excavation of the 40-acre site began four months after design started. Work on the Army Building began first. When the team was ready to dig foundations for the NORTHCOM/NORAD Building, the government requested an additional 25,000 sq ft. The team's solution was to stretch the building in two directions by adding bays on each leg of the building. The increase amplified the construction scope by 50 percent, including adding approximately one million ln ft of communication infrastructure.

The conceptual design of the grand lobby in the Army Building called for a straight-run staircase, which conflicted with the curvature of an inverted, conical skylight directly above the staircase. Through some quick sketches, a "build-design" effort in the field and a change in construction materials, the lobby now features a circular staircase, which replicates the skylight – all at a cost savings to the government and to taxpayers.

Bronze

Haselden Construction Inc.

Denver Museum of Nature & Science Parking Garage

Before design could begin, Haselden's first job was to build consensus among the neighborhood groups, most of whom were concerned about the garage's location. The project architect, RNL Design, worked for two days on the design in an open forum where the community could attend and provide input.

As a result, the team proposed a below-grade design, blending into the site so that it would appear as a continuation of the existing surface parking lot. The design also enabled the museum to turn 43,000 sq ft of asphalt into green space, re-establishing the historic connection between the ballfields and City Park.

The site is bordered by the museum on the south, a boiler room building on the east, 22nd Avenue on the north and a grove of trees on the west, so a typical rectangular configuration would not fit the space. The rectangular L-shaped configuration, offset in the middle, maximizes parking spaces and minimizes disruption.

A concrete post-tensioned structure was utilized to achieve a more open and well-lit environment because the system enables larger column spacing. This configuration, combined with pushing the shoring wall back in the southwest corner of the building to allow natural lighting, doubled the amount of light in the garage. The team also incorporated nine-ft spacing between parking stalls to allow more room for minivans, SUVs and other family vehicles to maneuver. The garage opening date had to coincide with the June 2003 opening of the museum's new Space Odyssey exhibit. The already tight construction schedule was shortened by one month because of delays in the permitting process. A phased bid package and permitting approach was implemented.

To save both time and money, the structure was designed around existing prefabricated metal beam forms. Starting from the excavated end of the 26-ft-deep cavity, the first slab-on-grade pour was made before excavation was complete on the opposite side. Two weeks following excavation, the first deck was poured. Using an offsite yard, enough forms were fabricated to complete four deck pours at once.

Colorado Construction's ACE Awards

Design-Build (All Projects) Subcontractor

ACE

Greiner Electric

Molly Blank Conference Center

The 35,000-sq-ft Molly Blank Conference Center at National Jewish Medical and Research Center provides essential space for conferences, education programs and other hospital events, as well as offices. With its large courtyards and a glass-encased exhibit area that encircles most of the building, this unique conference center has become the focal point for the sprawling National Jewish campus.

Greiner Electric was the design-build electrical contractor. The ownership group challenged the design team, headed up by The Weitz Co., to build an attractive meeting facility with state-of-the-art features that would endure while maintaining a very tight budget. Greiner providing the latest technology in lighting, communications and control systems for the exhibit areas, offices and conference rooms.

The 13,000-volt primary loop that serves many of the campus buildings was in the middle of the excavation area of the new building and needed to be removed and reinstalled before any digging could begin.

In addition, a 1500 KVA transformer that served the 10-story Goodman building was located in an area that the architects had selected as the main entrance to the Molly Blank building. The 3,000-amp service and the 13,000-volt primary cables powering the transformer had to be relocated approximately 100 ft away. Greiner utilized the same transformer to power the new building, eliminating the cost of a new transformer.

These two tasks necessitated the shut down of power to the entire National Jewish Campus; therefore Greiner needed to provide temporary power to the 13-building campus to ensure that medical care, critical experiments and research would not be interrupted.

Greiner also provided the telephone and high-tech data connections to all areas of the campus. During this phase of construction, the entire campus telephone/data system was shut down. The team moved 2,400 phone/data lines from their former telephone rooms throughout the campus to multiple telephone cabinets on each floor of the Molly Blank Conference Center.

ACE

Hensel Phelps Construction Co.

NCMC Emergency Department

Expansion & Renovation

Hensel Phelps faced a project sandwiched among a central plant, existing birthing center, main shipping and receiving docks, a patient wing and main vertical transportation core. Extreme noise and infection controls had to be put into place; the site was littered with underground utilities; the elevator core needed extending and another project was in progress adjacent to the main project access. Incredibly, a new helicopter landing pad was to be installed over an existing patient wing.

The new structure had to be built on top of an existing mechanical tunnel that concealed all main utilities. Caissons and foundations had to be precisely aimed to miss the tunnel, but no as-built information existed.

In the end, the utility tunnel survived, all main utilities were never interrupted, and the delicate operation was completed with no dust, minimal noise and minimal exhaust fumes. Air pressure was maintained in the construction area at all times to effectively expel fumes, dust and potential airborne diseases.

Directly above one construction area is the birthing center where 1,100 babies per year are delivered and cared for. Noise in this area was not tolerable. Nevertheless, construction requirements called for 1,500 new anchors drilled into the concrete slab serving as the floor of the maternity wing. A procedure was developed to use water-cooled drills to set anchors into concrete, reducing noise levels by more than 50 percent.

Extending the elevator core and constructing the new roof heliport was a monumental task. The poured-in-place concrete core had to be extended one floor and a machine room added to handle the new elevator between the heliport and emergency room five floors below. Existing elevator equipment in the same shaft was relocated one floor up and cables extended to allow for a secondary means of vertical transportation from the roof.

Exact procedures were spelled out and rigorously enforced to govern any and all construction activity on the roof. Dedicated hoistways and stair towers were erected, and scaffolding was erected from five floors below to build extended exterior walls over the existing elevator core. Inspections were conducted twice daily to ensure against leakage, and temporary enclosures were constructed as a secondary leak-proof guarantee.

Colorado Construction's ACE Awards

Silver

Centerre Construction Inc. Denver Federal Center, Building 67

The 14-story U.S. Bureau of Reclamation, Building 67 at the Denver Federal Center featured four sides of exposed aggregate concrete and a 30-year-old window system on which age and weather had taken its toll.

The GSA sought a design-build contractor to repair the damaged concrete skin, remove deteriorating concrete sunscreens, replace single-pane windows and incorporate minor seismic modifications to the structure. The building was fully occupied and remained in use during the renovation.

To meet the project requirements and provide the least amount of disruption to the building tenants, Centerre's solution was to perform 90 percent of the work at night, operating from eight lamp-lit swing stages suspended from the roof in extreme weather conditions. Up to 20 crew members replaced windows at night and the building was cleaned-up and weather tight for the tenants to return to work the next day.

While teams worked above, additional crews worked below. More than 1,500 storefront windows on floors three through 14 were replaced, along with over 7,000 sq ft of curtain wall on the first floor and lobby level.

Addressing the building's 480 window bays, the team of Centerre and its window subcontractor Gump Glass set two typical designs – a 13-ft-wide unit and a 18-ft-wide unit. Further preparing the installation team, a mock-up window system was constructed and used as an instruction model so the team understood step-by-step how to attack the project. This project also included the removal of 480 concrete sunshades by crane, over 4,000 concrete façade repairs, nearly 2,000 ln ft of epoxy injection and other seismic upgrades.

Centerre removed and recycled more than 941 tons of concrete, five-and-a-half tons of steel and 7,000 lbs of aluminum.

All sandblasting, epoxy injection and sunshade removal took place on the exterior of the building from multiple swing stages no matter what the weather conditions.

Bronze

Hyder Construction Inc. Vail Marriott Mountain Resort

Built in the 1960s and encumbered with an outdated design, the six-story Vail Marriott Mountain Resort was in desperate need of a makeover. The \$25 million renovation included three new penthouse condominiums, a heavy timber porte cochere, new lobby and entryway, and the complete gutting and remodeling of two buildings containing a total of 198 upscale guest rooms. Each building had to be renovated separately to accommodate the resort's reservation commitments without disrupting daily operations.

Construction of Building One began with crews working 10-hour days, six days a week to tear off the roof while remodeling took place simultaneously on the rooms below. Temporary roofs were erected and new roof structures were built with European-style turrets and timber detailing. Three luxury penthouses were added to the original scope of work and constructed on top of Building One.

Meanwhile, the building's exterior was stripped down to bare studs, rebuilt and covered with a stone masonry and stucco veneer. Balconies were added and the entire building was reinforced with structural steel down to the foundation.

As autumn leaves began to fall, construction began on Building Two. Luxury finishes for the guest rooms meant that tolerances were much higher than usual. Templates of room layouts were created from room mockups, leaving no detail to chance. Crews worked swing shifts to accommodate multiple finishes. Code violations found hiding behind 40-year-old walls threatened to slow work down, but Hyder rerouted trades to upgrade elevator shafts, plumbing, electrical, sprinkler and fire protection systems.

Same-day material deliveries were synchronized in assembly line fashion. Coordination was key so equipment use was tightly scheduled down to the half-hour. Crews came in during off-hours to use the cranes, hoists and forklifts.

Seventy guest rooms in various stages of construction – some 95 percent complete – were damaged when the weather protection collapsed from abnormal amounts of rainwater. Hyder was forced to strip wallpaper, repair dry wall, repaint and lay carpet.

Another surprise came when an enormous porte cochere was added to the design. Hyder procured timber from British Columbia, flew to Oregon to fabricate the trusses, and built the structure – complete with a 6,000-sq-ft roof and tongue-and-groove ceiling – in time for the hotel's holiday rush.

The entire lobby and registration area was moved three separate times to accommodate work and keep the public safe. Hyder reconfigured stairways, erected temporary walls and emergency doors, and built a passageway underneath the building to route guests and staff through the hotel.

Colorado Construction's ACE Awards

Meeting the Challenge of a Difficult Job-Subcontractor

ACE

Trautman & Shreve Inc. Denver Health Western Addition and Central Plant Expansion

The four-story, 143,000-sq-ft Denver Health Western Addition added 110 beds, including a new intensive care unit. Before the addition could become a reality, a major update and expansion needed to happen. The steam and oxygen supply in the existing utility plant and the chilled water plant inside the hospital could not meet the demands of the new addition. Therefore, an expansion was needed to double the size of the plant for the steam supply and add new chillers to supply chilled water to the existing hospital, the new addition and allow for future expansion.

Linking the buildings meant Trautman & Shreve had to install underground utility piping for more than a block by traversing a maze of existing utilities buried for more than 100 years. A meticulous pot holing procedure was used where 10 holes measuring 10-ft-by-10-ft-by-10-ft deep were mostly hand dug throughout the area to locate all the utilities. More than 30 different utilities varying in size and depth were located and documented.

The next challenge was to maneuver and install pipe that was up to 18 in. diameter throughout the labyrinth. Each pipe length weighed 2,000 lbs and was set in place by a crane and manual labor to move the piece through the maze into place. To meet NFPA 99 and hospital standards for medical gas installations, the clean oxygen piping was installed under a continuous nitrogen purge.

The construction of the plant expansion was fast track and scheduled for completion in just three months. Located in the basement of this building are the pumps, steam specialties, heat exchanger and the associated piping. Almost 1,000 ft of 18- to 20-in. diameter piping was squeezed into the 25-ft by 90-ft, 2,250-sq-ft basement.

During mechanical coordination, it was discovered that overhead doors installed for chiller maintenance were too small, but since construction was fast track, this setback was discovered after two doors were completed. Work was stopped on a third door being installed for a future chiller.

The chiller was set in backwards so once turned, it would be facing the correct direction. Tracks were built to level the floor around concrete pads. With chains around steel columns, the chiller was pulled through the opening, then turned. The chains were moved and tied to another steel column and pulled forward.

Snaked throughout Western Addition is more than 77,000 ft or almost 15 miles, of piping. A medical gas distribution center is also in the basement, which ensures that all medical gases, oxygen, medical air and vacuum systems are filtered clean and de-humidified before being distributed throughout the hospital to 572 locations.

Silver

Ludvik Electric Co. NORAD

Construction of the NORAD project, under way in August 2000, included two buildings – the U.S. Army Space Command and the North American Aerospace Defense Command/U.S. Space Command Headquarters. The initial plan was to unite military space forces into a campus for the Army, Air Force and Unified Combatant Command at one central site.

Both structural steel-framed buildings were two stories with basements. The Army Building totals more than 100,000 sq ft and the U.S. Space Command Building consists of 158,000 sq ft. Site development included lighting, security and a substantial duct-bank and manhole systems for communications with primary distribution extending from the existing utilities on base.

The NORAD job was progressing when a new mission was given to US Space Command after the 9/11 events. An additional 25,000 sq ft was to be added to the NORAD building, even though design was 90 percent complete and the holes for the foundations were being dug.

Along with the 25,000-sq-ft increase, there would be tens of thousands of feet of fiber optic cable added to the already complicated communication scope. There were chases and overhead clearances to comply with while providing for the number one priority, the Protected Distribution Systems that consists of red and black separation and the communication conveyance systems, raceways and infrastructure for the building.

Ludvik also had to work through tunnels bored under existing roads and sidewalks, installing the communication ductbank. This ductbank was filled with 12-in. round steel sleeves that contained multiple four-in. conduits. These sleeves were then pumped full of concrete slurry to eliminate any movement in the conduits and alleviate any possible eavesdropping on the Protected Communication Systems.

One of Ludvik's most difficult tasks was the above-ceiling areas, allowing only three and four ft to the deck. These were full of mechanical equipment that had to be coordinated with electrical equipment, including 14,500 ft of cable tray, four million ft of electrical wire, rigid conduit and cable network for the data and communications systems.

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Ludvik's contract also required that they install 15KV primary services to double-ended substations for redundancy, which included two 1,500 KVA transformers and two 3,300 KVA transformers. Ludvik provided three 1500-kw generators for all critical electronic systems to operate indefinitely, based on fuel quantity.

Bronze
Dynalectric Co.
St. Joseph Hospital Emergency Generator
& Electrical Distribution Upgrade

Exempla St. Joseph Hospital is one of the oldest and most respected hospitals in metropolitan Denver. With the age of its systems ranging from three to 60 years old, the integrity of the electrical infrastructure was under scrutiny. Upgrading the landmark health care facility required Dynalectric Co. to investigate the existing electrical infrastructure, install a new emergency power generation system in a new four-mw powerhouse and replace the electrical distribution system in piecemeal fashion, without impacting employees, patients and visitors, or interrupting normal hospital operations.

Much of the documentation of the existing infrastructure was either missing, incomplete or questionable. There were no record drawings indicating the controls or safety devices of much of the existing equipment and there were questions as to the accuracy of the overall electrical circuitry. Dynalectric investigated the existing electrical system and recorded conduit size, wire size, length of run and panel and device information throughout the one million-sq-ft hospital before work began.

A temporary power generation plan included the removal of four existing generators and feeders while maintaining the emergency loads throughout construction and installation of the new powerhouse and generators. The temporary power generation plan was carried out by setting a two-mw generator and temporary rooftop switchgear along with feeders to the transfer switches that powered equipment for life safety, critical and emergency power systems.

Ceilings were low, existing mechanical and water piping crowded the ceilings, floor space was limited and the building structures would not support the anticipated load of all the future feeders and busduct. To circumvent the height constraints, – and because the new switchgear had a compressed design that limited the space for terminations and conduit entrance areas – vaults were constructed under the equipment and the conduit feeders were installed underground.

All drilling work was conducted between 6 and 7 a.m., and when more than one hour was required to perform the work, crews were rescheduled during off-hours with approval from the surgical department. Additionally, crews continually had to stop work, reassign workers and reschedule activities when emergency surgical procedures were necessary.

Contribution to the Community

ACE
Saunders Construction Inc.
and Trautman & Shreve Inc.
The Edge Ice Arena

Through the collaborative efforts of the Youth Sports Authority and the Foothills Park and Recreation District, the desire to create a community ice arena aimed at enhancing the lives of area youth became a reality this year. A recreational campus setting was selected as the optimal location for The Edge, and a community plan was created for a three-facility complex consisting of The Edge, a recreation center and a community and wellness center.

Saunders Construction, Trautman & Shreve and other subcontractors teamed together to volunteer time, reduce fees and assist in collecting funds to build this state-of-the-art facility. Close to \$400,000 was donated to the cause by the contractors and material suppliers involved in the project. The \$7.9 million facility was funded with lease/purchase financing and did not utilize tax dollars for its construction or its operation.

The 81,000-sq-ft, year-round facility sits atop a hill overlooking the community it serves. The fast-track schedule guaranteed completion of the design-build facility in just nine months. The two-story structure is supported on cast-in-place concrete spread footings and enclosed with precast concrete walls and double-tee roof panels.

The lower level embraces two side-by-side, NHL-sized ice surfaces separated by eight team locker rooms, skate rental, a concessions area, an open party area and public lockers. Main access to the facility is through the upper level entrance.

Administrative offices, coaches' offices, and a full service pro-shop are housed on this level as well. Past the information desk at the entry to the facility, a spacious hallway provides access to bleachers on both sides. The bleacher system, capable of seating more than 500 spectators, has infra-red seat heating. The hockey-proof finishes, including rubber skate flooring, assures the facility will withstand years of use and abuse.

To meet the specific needs of The Edge, several specialized systems were designed with conservation in mind. A 210-ton ammonia refrigeration system with three 100-hp motors was designed for ease of rink operations and to help conserve natural resources. High-efficiency piping under the rink floor circulates recycled brine to create the ice.

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A recovery pit, located between the two rinks, collects ice and water from both Zambonis after each rink cleaning and recycles the product through the system for future use. Two HVAC ventilation units were installed on the roof to ensure that temperature and humidity remain constant for ideal ice conditions. A special natural gas system was installed to allow the Zambonis to refill each night, preparing them for the next day's events.