Curriculum Vitae

Michael D. Haughey, P.E., CEM, HBDP, LEED AP. Principal, Silvertip Integrated Engineering Consultants

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Mr. Haughey has 41 years of experience in mechanical systems design, analysis, consulting, litigation support, energy studies, energy audits, and sustainability consulting in the field of heating, ventilation, air conditioning, plumbing, and fire protection. Specializing in energy conserving systems, Michael has provided design and project management services on a wide variety of projects.

Certifications & Licenses

Registered Professional Engineer, Colorado
ASHRAE High Performance Building Design Professional Certified (HBDP)
AEE Certified Energy Manager (CEM)
LEED ™ 2.0 Accredited Professional
Toastmasters International, ATM April 16, 1997 (member since Sept 1988)

Education

Bachelor of Science in Mechanical Engineering, University of California at Santa Barbara, 1974

Training (partial list)

ACEC: Applying Expertise as an Engineering Expert Witness, 2015
ACEC/CO: Expert Witness Practices Seminar, 2013
Revit MEP 4-day workshop, 2012, CAD-1
Attended the international annual winter conference and trade show of ASHRAE, 2011.
Thermal Imaging for Maintenance Best Practices, Fluke, Seminar, 2011
Green Building Design – A Practical Approach, Seminar, Pikes Peak Chapter ASHRAE, 2004
Forensic Estimating, Seminar, Denver Chapter of the American Society of Professional Estimators, 1998
BACnet ASHRAE Standard 135 Seminar, 1995, Setpoint Systems Corporation
The Engineer as Manager, Seminar, The University of Denver, 1985
Measuring and Improving the Efficiency of Commercial and Industrial Boilers, Institute for Boiler Efficiency Improvement, 1984
HVAC Systems, Course, University of Colorado Denver Center, 1977
Numerous professional seminars including Integrated Design, LEED (Leadership in Energy and Environmental Design), and Daylighting.
Professional development attending presentations at monthly meetings of The Rocky Mountain Chapter of ASHRAE, attending almost all meetings since late 1970's through the present.

Professional development attending presentations at monthly meetings of the Colorado Renewable Energy Society (CRES), attending most meetings since the late 1990's.
Professional development attending almost all meetings of the Colorado Chapter of the USGBC from March 2003 when I started the programs through about 2008.
Professional development attending annual technical conferences of Rocky Mountain ASHRAE, CRES, and Colorado USGBC (2003-2008).
Attendance at International annual conferences of the USGBC in 2002, 2003, 2004, 2005, 2006, 2007.
Attended the international Summer Conference of ASHRAE in 1993, 2006, 2013.

Publications

HPAC Engineering, February 2012: "Selecting a Mechanical Engineer for Green Projects"

ASHRAE Journal, "Ice Thermal Storage for Colorado School", May 2003

Awards

Silver Sage – Colorado Renewable Energy Society (CRES) 2010 Building Award in the Residential Category. Mechanical and plumbing design for co-housing project with high efficiency condensing boilers to provide heating through baseboard radiation with radiant floors as a unit upgrade option, and split-system DX for optional cooling, fire sprinklers, and kitchen hood ventilation.

Sedalia Residence, Sedalia, Colorado – Radiant and ground-coupled heat pump heating and cooling. Mechanical and plumbing design for residence using ground-coupled heat pumps to provide heating and cooling through radiant floors, energy recovery ventilator for fresh air, whole house fans for moderate weather ventilation, and supplemental fan-coils for dehumidification. Project won a McGraw-Hill Gold Hard Hat award (Sustainable Ranch House in Douglas County) in 2006.

Solar Harvest, Boulder, Colorado - The City of Boulder's First Net-Zero Energy Home, General Housing Category 2006, Colorado Renewable Energy Society. Provided mechanical engineering consulting including ventilation, heat from sunspace, and ground-coupled outside air pre-heating.

Denver Place - LEED for Existing Buildings (EB) pilot project 2004. LEED Accredited Professional for LEED for Existing Buildings (EB) pilot project under sub-contract to E-Cube, Inc. Project comprises a full city block in downtown Denver including two office towers, 34 and 23 stories each, connected by two-six level Terraces, comprising

815,000 gross square feet. Project has been awarded a LEED EB Gold rating and was the first LEED EB, and first LEED Gold, in Colorado.

Poudre School District - Operations Center, Fort Collins, Colorado – Ground-source Heat pumps, heat recovery, natural ventilation, daylighting, and more. Design of ground-source heat pump system, heat-recovery ventilation, daylighting and occupancy sensors integration with mechanical, and demonstration solar photovoltaic system; Excellent Use of Renewable Energy in Buildings award from the Colorado Renewable Energy Society, 2002; Regional ASHRAE Award in 2003 for New Institutional Buildings category.

Lucile Erwin Middle School Ice Thermal Storage System, Loveland, Colorado. Design of chilled water system for a new middle school using ice thermal storage and highly innovative flexible storage and pumping system concepts. This design won the 3rd place society (international) ASHRAE award in 2003 for the New Institutional Buildings category. Evaluated cooling alternatives and local utility incentives for a new Thompson School District middle school. Energy cost savings are optimized with continuous monitoring of building kW demand and modulation and shut-off of the chiller.

Professional Affiliations

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Rocky Mountain Chapter, Director 2015-present, 1997-1999; President 1991-1992; and Past Vice President, Secretary, Treasurer, Education Chairperson. Keynote speaker at 2004 Rocky Mountain Chapter ASHRAE Annual Tech Conference.

Colorado Renewable Energy Society, Member, Board of Directors, Secretary

Rocky Mountain Association of Energy Engineers, Member

Toastmasters International, ATM, member since September 1988

Colorado Earthquake Hazard Mitigation Council (a Colorado State policy advisory group)

USGBC – Colorado: USGBC Greenbuild 2006 Colorado Host Committee Chairperson, USGBC-Colorado Board of Directors, Education Director and Programs Coordinator, started and managed the monthly technical programs.

Experience

Engineering consulting including engineering design, project management, construction surveillance, and peer review for commissioning. His areas of expertise include system analysis and troubleshooting, litigation support, energy studies and audits, design projects, and complex remodel projects. His experience includes design of HVAC, fire protection, plumbing, and energy management systems for a wide array of facilities, including institutional, commercial, industrial, and residential. His specialties include

energy projects such as ice thermal storage, indirect-direct evaporative cooling, solar systems, ground-source geothermal, displacement ventilation, and design of energy conservation measures. He has also been responsible for design and project coordination for new construction, remodel and maintenance projects while performing facilities engineering in the industrial environment. Faculty Lecturer, HVAC Design (graduate & undergraduate), CU Boulder; Faculty Lecturer, HVAC Design, CU Denver. He has coordinated the local ASHRAE chapter's HOSO (Hands On Science Outreach) program for kindergartners through sixth-graders and the NEED (National Energy Education Development) "Solar Sprint" program for sixth-grade students. Litigation support including field testing, code review, design analysis, repair design, and report writing to determine solution to space heating, cooling, water heating, and mechanical systems problems.

Presentations

Developed and presented seminars and lectures for groups such as the Rocky Mountain Chapter of ASHRAE, Pike Peak Chapter of ASHRAE, The Colorado Renewable Energy Society (CRES), World Renewable Energy Forum (WREF), CEFPI (the Council of Educational Facility Planners International), the US Green Building Council (USGBC) – Colorado Chapter, USGBC Greenbuild 2005 Technical Session, AGC (Colorado), AIA Committee on the Environment (COTE – Colorado), EPA & Denver Mayor's Office, IFMA, BOMA, BOAC, AFEC, SAME, NEBB, Industrial Hemp Research Foundation, to classes at the University of Colorado at Boulder and Colorado State University, and to other professional societies and groups. Presented the Keynote Address to the Rocky Mountain Chapter ASHRAE 2004 Annual Tech Conference. Presents seminars on various topics including Low Energy Mechanical Systems, USGBC-LEED Overview, Ground Source Heat Pumps, LEED EB, High Altitude Design, Ice Thermal Storage, Economizers, Living Buildings, Seismic Risk in Colorado, Living Buildings, Mechanical for Net-Zero Buildings, Efficient HVAC for Indoor Agriculture, Climate Change, and Sustainable Design.

Professional History

2003-Present Silvertip Integrated Engineering Consultants, Westminster, Colorado, Owner, Principal
2001-2003 E-Cube, Inc., Boulder, Colorado, Vice President Engineering - Colorado
1992-2001 The RMH Group, Inc., Project Manager
1990-92 Gordon, Gumeson & Associates, Denver, Colorado, Senior Project Engineer
1979-90 McFall - Konkel & Kimball Consulting Engineers, Denver, Colorado, Associate
1977-79 Storage Technology Corporation, Louisville, Colorado, Facilities Engineer
1976-77 Timpte, Inc, Denver, Colorado, Engineering Designer

1975-76 Independent solar heating design and instruction
1974-75 Applied Magnetics, Inc. Santa Barbara, California, Engineering Technician

Representative Projects

Expert Witness

Resort in Telluride, Colorado. Water damage from broken pipes after a freeze event. Consultation to lawyer for owner regarding strength of litigation case.

Forensics/Litigation Support Consultation

Sub-consultant to Engineering Expert Witness - multiple projects (2003 through 2016):

- K-12 School HVAC Investigation, San Luis, Colorado. Document and cost estimate reviews relative to system capacities and other issues.
- Hospital Central Heating Plant Investigation, Santa Clarita, California. Field investigation, documentation, and document review.
- Luxury Condominium Complex, San Diego, California. Field investigation and testing of HVAC and plumbing systems for 233 unit high rise condominium building.
- Natatorium Hydrostatic Relief Valves Investigation, Pueblo, Colorado. Field investigation, test observations, and documentation.
- Residential water loss investigation. Witness and document testing of an HVAC zone valve.
- Residential high-rise building pool ventilation replacement, Denver, Colorado. Investigate ventilation options subsequent to moisture damage. Provide mechanical design for selected option.
- Assisted Living Facility Fire Protection Leak Investigation, Casper, Wyoming. Field investigation and document review.
- Aspen Residence HVAC Leak Investigation. Filed investigation and subsequent research to determine cause of HVAC leak. Write response to opposing expert opinion.
- College Classroom and Office Building. Review documents and edit document list and timeline.
- Office Building Water Heater Investigation. Observe destructive testing of expansion tank.
- Condominium Complex, Boulder, Colorado. Field investigation, systems testing using data-loggers, data analysis, and report writing for 34 unit complex. Investigation included freeze issues with fan-coils and control ussies with make-up air units.
- Assisted Living Facility, Centennial, Colorado. Field investigation, data logger data collection, and building exterior infrared photography and documentation.
- Condominiums Complex, Colorado Springs, Colorado. Investigation and response to opposing expert report regarding portions of a five building, 40 unit complex. Field observations of report issues. Investigation of HVAC, plumbing, and fire protection issues including furnace flue, OSA, and CA plus various code issues.

Office & Retail building, Golden, Colorado. Investigate overheating condensing units.

Residential high-rise building make-up air unit replacement, Denver, Colorado. Investigate make-up air unit replacement options subsequent to moisture damage. Provide mechanical design for selected option.

Residence water damage, Aspen, Colorado. Review documentation and research contributing factors to fire sprinkler system leak.

96 unit condominium project. Investigation and documentation of HVAC, fire protection, and plumbing leaks and issues.

Restaurant in shopping mall. Water leaking into space below. Investigation and report writing services regarding of source of leaks and recommendation for resolution.

Ten-story 474,525 sq. ft. hotel that included guest rooms, condominiums, employee housing, banquet facilities, restaurant, spa, laundry, retail, children's center, and support areas. Expert witness research, analysis, documentation, and report writing services.

Engineering analysis, document review, and investigation of compressed air system design and performance issues for a 176,000 sq. ft. multi-story university medical teaching facility.

Mid-rise 112 unit Condominium, Denver, Colorado - Forensics/Litigation Support. Field investigation and engineering analysis of heating and plumbing system problems. Site testing and data logging of systems temperatures and pressures. Thermal imaging of building envelope specific to frozen pipe investigation.

Middle School explosion investigation, Erie, Colorado - Forensics/Litigation Support. Field investigation, photo-documentation, testing witnessing, and engineering analysis of damage from water heater explosion.

Twelve building Townhouse Complex, Denver, Colorado - Forensics/Litigation Support. Field investigation, photo-documentation of existing conditions and code compliance issues of HVAC and plumbing systems.

Fourteen building Condominium Complex (128 units), Broomfield, Colorado - Forensics/Litigation Support. Field investigation, flue draft testing, photo-documentation of existing conditions and code compliance issues of HVAC and plumbing systems.

Eighteen building, 408 unit Condominium Complex, Erie, Colorado - Field investigation, photo-documentation of existing conditions and code compliance issues of HVAC and plumbing systems, and fire protection sprinkler freeze-burst issues.

Forty building, 120 unit Townhouse Complex, Greenwood Village, Colorado - Forensics/Litigation Support. Field investigation, building envelope thermography, photo-documentation of existing conditions and code compliance issues of HVAC and plumbing systems.

Twenty-seven building, approx. 102 unit Townhouse Complex, Loveland,

Colorado - Field investigation, photo-documentation of existing conditions and code compliance issues of HVAC and plumbing systems, report of findings. Flue draft and combustion testing of water heaters and furnaces.

136,000 square foot Mixed-Use Commercial and Residential Complex, Durango, Colorado - Field investigation, photo-documentation of existing conditions and code compliance issues of HVAC, fire protection, and plumbing systems, including acoustic issues involving sound transmission and hydronic turbulence-generated sound, balcony drain leaks, snowmelt leaks, and report of findings.

Sixteen Building, 58-unit, Low-Income Townhouse, Duplex, and Single Family Flat Complex, Denver, Colorado - Forensics/Litigation Support. Field investigation and engineering analysis of heating and water heater system problems. Site testing and data logging of systems temperatures, water heater flow rates and limits, CO2 and CO levels. Drawings for repairs, and report of findings.

Design, Consultation, Investigation, and Other Projects (representative list)

USDA Human Nutrition Research Laboratory Energy Study, Grand Forks, ND. Performed site investigation, testing, energy analyses, and documentation and report as a sub-consultant to E-Cube, Inc. This 79,806 gsf facility houses laboratory, office, vivarium, and volunteer studies spaces. The value of the recommended measures exceeded $1,000,000 with a return on investment (ROI) of 14.9% per year (simple payback of 6.7 years). Low / no cost measures recommended exceeded a value of sum of $280,000 with a return on investment (ROI) of 38.3% per year (simple payback of 2.6 years).

Palmer Ridge High School, Monument, Colorado – Peer review, troubleshooting, and design consultation services for 230,000 square feet, 2,600 students ground-coupled heat pump project.

Schriever Data Center troubleshooting, Colorado Springs, Colorado - Peer review and analysis of mechanical design and commissioning results of chilled water system and development of remediation design to increase capacity and reliability of a high-criticality facility.

Teller County Courthouse Boiler Replacement, Cripple Creek, Colorado. Investigation of replacement options for 110 year old steam boiler serving a 32,000 sq. ft. historic courthouse. Prime consultant and mechanical design for selected replacement option.

Teller County Jail Systems Investigation and Upgrade Design, Cripple Creek, Colorado. Investigation of control and ventilation systems; design of upgrade of HVAC control, smoke pressurization, and fire alarm interface systems.

Centennial Building System Investigation, Cripple Creek, Colorado – investigation and analysis of heating, ventilation, and controls system to improve performance, troubleshoot system problems, and provide short and long-term recommendations.

Infinite Harvest, Denver, Colorado. Analysis and design for indoor multi-level salad greens grow facility. Design included irrigation system, HVAC with desiccant

dehumidification, plumbing, and controls sequence. Separate designs for 296 sq. ft. prototype and 7,350 sq. ft. prototype. Performed monitoring and analysis in first phase for verification of plant and irrigation moisture loads.

BotanaCare, Northglenn, Colorado. Design of HVAC and plumbing for indoor grow facility. Design included analysis of lighting and plant expiration and irrigation moisture loads; provisions for dehumidification and carbon filtering of exhaust air; ventilation of under-roof space to mitigate moisture issues.

Avalon Grow Facility, Boulder, Colorado. Systems consultation to Owner.

Pinnacle Eye Care, Colorado Springs, Colorado. Sub-consultant to Owner's engineer. Field investigation of eye surgery center temperature and humidity design and control issues. Research and analysis of options. Conceptual design and report for repairs and improvements.

Park Towers, Residential High-Rise Building, Denver, Colorado. Sub-consultant to Owner's engineer. Field investigation and analysis of existing systems including piping capacities. Review of contractor pump and control replacement proposal. Recommendations for condenser water systems modification.

Hotel, Glenwood Springs, Colorado. Sub-consultant to Owner's engineer. Investigate options for heating and snow melt systems replacement utilizing water from hot spring. Schematic design of system replacement.

Urban Thai Restaurant, Boulder, Colorado. Mechanical and plumbing design for restaurant tenant finish at the Hyatt in Boulder.

Edible Arrangements – Brighton. Mechanical and plumbing design for restaurant facility.

Yogurt Shop, Denver, Colorado. Mechanical and plumbing design for downtown yogurt shop.

Cornerstone Montessori School Sunroom. HVAC design for sunroom addition to school.

Silver Sage Consultation, Boulder, Colorado. Consultation regarding boiler replacement and systems upgrades.

Coors Field Reserve Study, Denver, Colorado. Sub-consultant to Owner's engineer. Field investigation, documentation, and conceptual budget development for long-term and annual maintenance and capital improvements.

Market Square Reserve Study. Sub-consultant to Owner's engineer. Conceptual budget development for long-term and annual maintenance and capital improvements and pre-rating of annual costs amongst tenants.

Equinix LA4 Data Center, Los Angeles, California – review of LEED submittal documents

Lucille Erwin Middle School Chilled Water Plant, Loveland, Colorado - chilled water/ice thermal storage system serving a large middle school (honors (3rd place) society (international) ASHRAE award, 2003 for New Institutional Buildings category)

Poudre School District, Facility Service Center, Ft. Collins, Colorado – design of ground-source heat pump system, heat-recovery ventilation, daylighting and occupancy sensors integration with mechanical, and demonstration solar photovoltaic system

(Excellent Use of Renewable Energy in Buildings award from the Colorado Renewable Energy Society, 2002); Regional ASHRAE Award in 2003 for New Institutional Buildings category.

Lakeside Animal Hospital, Golden, Colorado – mechanical and plumbing design for a full-service veterinary clinic.

Net-Zero Existing Residences Renovation Studies – Co-authored two studies for Golden, Colorado. The first detailed a road map for attaining net-zero energy in existing residences in Golden. The Second study produced a guide for Golden homeowners considering energy upgrades and used two fictional families to illustrate the choices.

Golden Cemetery Sustainable, Historical Office – Golden, Colorado. Mechanical and plumbing design for small office including ground-source heat pumps system that we tested and verified performance at 18.7 EER and 6.1 COP in October, 4.6 COP in April, 23.5 EER in July.

Sedalia Residence, Sedalia, Colorado – Project won 2006 McGraw-Hill Gold Hard Hat Award for Sustainable Design. Radiant and ground-coupled heat pump heating and cooling. Mechanical and plumbing design for residence using ground-coupled heat pumps to provide heating and cooling through radiant floors, energy recovery ventilator for fresh air, whole house fans for moderate weather ventilation, and supplemental fan-coils for dehumidification.

Silver Sage Village, Boulder, Colorado – Radiant heating, domestic solar hot water, and DX cooling. Mechanical and plumbing design for co-housing project with high efficiency condensing boilers to provide heating through baseboard radiation with radiant floors as a unit upgrade option, and split-system DX for optional cooling. 2010 Colorado Renewable Energy Society Building Award in the Residential Building category.

Shambhala Mountain Center – Rigden Lodge, Red Feather Lakes, Colorado – Radiant heating and domestic solar hot water. Mechanical and plumbing design for meditation, dormitory, and multi-purpose project with high efficiency condensing boilers to provide heating through baseboard radiation with radiant floors in specific areas.

Century Elementary School, Aurora, Colorado – Renovation of HVAC system. Mechanical design for 50,000 sq. ft. elementary school HVAC system renovation and upgrade.

Harvest House, Boulder, Colorado – Net Zero Energy Home Consultation. Mechanical consultation for a net-zero energy home in Boulder Colorado. Mechanical and plumbing design for residence using ground-coupled heat pumps to provide heating and cooling through radiant floors, energy recovery ventilator for fresh air, whole house fans for moderate weather ventilation, and supplemental fan-coils for dehumidification.

Denver Place, Denver, Colorado - LEED Accredited Professional for LEED for Existing Buildings (EB) pilot project. Denver place achieved the first LEED EB in Colorado as well as the difficult-to-achieve Gold Certification. Project comprises a full city block in downtown Denver including two office towers, 34 and 23 stories each, connected by

two-six level Terraces, comprising 815,000 gross square feet plus underground parking for a total of 1.3 million sq. ft.

Araj Courthouse, Denver, Colorado – troubleshooting consultation of the displacement ventilation system during construction for this new US GSA courthouse, designed to achieve at least a Silver LEED certification. Building systems include displacement ventilation, high-efficiency lighting/controls, photovoltaics, and district heating and cooling.

Memorial Sloan-Kettering Cancer Center, New Research Building, New York, New York – a new 692,000 sq. ft., three-phase, 23 story, biomedical and chemistry research facility. Provided design review and commissioning planning services toward LEED rating including additional commissioning as defined by the USGBC

Energy Efficiency Training – provided seminars to contractors as part of the New York State Energy Research and Development Authority (NYSERDA) project to transform key elements of the market for commercial heating, ventilation, and air conditioning (HVAC) equipment and related energy-efficiency services.

Northwestern Memorial Hospital, Galter/Feinberg Pavilion, central chilled water optimization study, with the intention of discovering areas in which the current operation of the central plant could be streamlined in terms of reduction in annual energy costs and improved environmental conditions, and to help NMH staff address concerns and issues with plant performance.

New Prentice Women's Hospital (NPWH), Chicago, Illinois – peer review of the mechanical systems in this 910,000 square foot, 17 story growth project for the Northwestern Memorial Hospital Women's Program

Sandia National Labs JCEL and Central Utility Plant Design Review

USDA Grand Forks, ND – Facility evaluation, troubleshooting, and energy audit/analysis report

Bacon Elementary School, Ft. Collins, Colorado – peer review and commissioning consultation for this 93,000 square foot sustainable design school. The systems include ice thermal storage.

Eaton Elementary School, Eaton, Colorado - peer review and commissioning consultation for new elementary school. The systems include ice thermal storage.

Windsor High School, Windsor, Colorado - peer review and commissioning consultation for remodel and expansion to 98,000 sq. ft. of existing high school

Centennial High School, Ft. Collins, Colorado - peer review and commissioning consultation for remodel and expansion of existing high school with 16,376 GSF Activities Building and 25,717 GSF Administration Building

City of Denver Recreation Centers and Police Stations – peer review for Rude, Montclair, and Ashland Recreation Centers and Police Stations #2 and #3. Systems included displacement ventilation.

KUTV, Salt Lake City, Utah – energy audit for PacifiCorp of TV station and studios

Key Bank, Salt Lake City, Utah – energy audit for PacifiCorp of high-rise bank building in downtown salt Lake City

Crossroads Plaza, Salt Lake City, Utah - energy audit for PacifiCorp of regional shopping mall

Numerous energy audits for PacifiCorp including BYU-salt Lake Center; Honeywell manufacturing plant; QC review of Matson Fruit energy audit

Design assistance, energy analysis, and commissioning services for numerous schools including Poudre School District - Zach Elementary School, 2003 elementary School, Centennial High School, Weld County School District, Windsor High School; Eaton School District, Eaton Elementary School

Plaza Tower, Denver, Colorado – energy analysis and systems design for energy conserving measures, downtown high-rise building

Plaza Tower and Denver Place, Denver, Colorado – Re-Commissioning and energy analysis for two downtown high-rise buildings

David Skaggs Research Center, Boulder, Colorado – chilled water systems analysis and concept designs for improvement and remediation; hydronic economizer (flat plate) system design

Poudre School District Prototype Elementary School, Fort Collins, Colorado - energy-efficient HVAC concepts for design competition

Naropa University, Nalanda Hall, Boulder, Colorado - project management and mechanical design for three-story, 20,000 sf classroom/administrative building using a combination of passive and sustainable design features for heating, cooling, and ventilation

Fairview High School Remodel/Addition, Boulder, Colorado - mechanical design for upgrade of 25,000 sf plus 28,000 sf addition using indirect evaporative cooling in a VAV system coupled with a DX second stage to serve a new library, gym, and renovated science lab area, integrated daylighting with mechanical design

Heritage and Sunset Middle Schools Energy Improvements, Longmont, Colorado - engineering support services for design and construction administration of energy conservation measures including refurbishment of existing rooftop units (replacement of existing motors and addition of VFDs to the supply fan motors) and revision of the temperature control sequence

Loveland High School, Ventilation System Upgrade, Colorado - design for new rooftop ventilation system using custom equipment to replace existing interior unit ventilator system, including roof-mounted ductwork in weathertight enclosures due to lack of interior space for ductwork

Oak Creek High School Addition and Remodel, Colorado - HVAC, plumbing, and fire protection design of new addition including expansion and conversion of coal-fired boiler plant to steam from hot water

Thompson Valley High School Air Conditioning Addition, Loveland, Colorado - chilled water/ice thermal energy storage system for cooling of classrooms, library, cafeteria, and shop areas

Numerous Energy Audits following State of Colorado Guidelines - Juchem Elementary School, Lawrence Elementary School, Lakewood Senior High School, Columbine Senior High School, Fremont Elementary School, Sierra Elementary School, Green Mountain Elementary School, and the Science and Industrial Arts Building and Richardson Hall, both at Adams State College

Clayton College Remodel, Denver, Colorado - project management and design for HVAC and plumbing as part of complete kitchen remodel to add ventilation hoods, make-up air, and plumbing to meet codes and demands of expanded use

Colorado Mountain College Multipurpose Building, Steamboat Springs - HVAC design involving VAV air handling system with direct evaporative cooling and compact high-efficiency boilers, as well as plumbing and fire protection for 44,000 sf building housing classrooms, offices, laboratory, and auditorium spaces

University of Northern Colorado Ross Hall Addition and Remodel, Greeley - renovation and upgrade of 84,000 sf science building and 15,000 laboratory addition; project included VAV indirect-direct evaporative cooling system, heat recovery and VAV exhaust system, VAV hood exhaust, and room pressurization control; heat provided by high-temperature hot water converted to low-temperature water distributed via fan-powered VAV boxes

Colorado School of Mines, Ben Parker Student Center Retrofit, Golden - kitchen HVAC, plumbing, and fire protection design and student annex ventilation troubleshooting

Colorado School of Mines, Stratton Hall Renovation, Golden - steam-to-heat hot water conversion, baseboard radiation, and VAV air conditioning in conjunction with air-cooled chiller for 23,000 sf building

Community College of Aurora, Colorado - HVAC, plumbing, and fire protection for administrative, lecture, and arts buildings, including computer and science laboratories, faculty and administrative space, student lounge, cafeteria, lecture hall, classrooms, music, drama, and art spaces, student greenhouse, medical center, and smoking lounge

UCHSC Fitzsimons Campus Redevelopment, Steam and Chilled Water Study, Aurora, Colorado – life cycle study of steam plant, chilled water plant, and distribution alternatives for redevelopment of the Army Medical Center including 5,000,000 sf of relocated and new University of Colorado Health Sciences Center facilities

Denver Athletic Club Addition, Colorado - plumbing and fire protection design for addition comprised of 100-meter pool, game courts, lockers, exercise room, and snack bar; project included an air-cooled chiller and a boiler plant

Fort Logan Mental Health Center, Children's Cottages Heating System Replacement, Denver, Colorado - hot water radiant heating system

University of Southern Colorado Library Building, Colorado Springs - energy retrofit design including EMCS upgrades and lighting modifications

University of Denver Campus Energy Audit, Colorado - review of utility systems serving 12 campus buildings with design recommendations

Auraria Higher Education Center Energy Audit, Denver, Colorado - identification and development of energy conservation measures including central chilled water campus distribution

LDS Temple Complex Expansion New Central Plant, Salt Lake City, Utah - cost analysis, systems alternatives study, and chiller system design for 4,800 ton central plant, plus future ice storage (3,000 tons)

Church of Jesus Christ of Latter-day Saints, Central Steam and Chilled Water Plant, Salt Lake City, Utah – design of the chilled water system and development of seismic restraint requirements

Church of Jesus Christ of Latter-day Saints, Library and Museum Chilled Water Tie-in, Salt Lake City, Utah – replacement of existing chillers with heat exchangers and pumps with VFDs, and design for interconnecting piping to the new central chilled water loop