



COLORADO MOUNTAIN COLLEGE

Facilities Design Standards

4/21/2020

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Goal Statement

Colorado Mountain College (“CMC”) is a statutory local college district established in 1965. The district and service area cover 12,000 square miles in all or part of nine counties.

The long-standing investment from our communities allows us to keep our quality high, our tuition affordable and our access wide open. Eleven world-class mountain locations in central Colorado enable big-school opportunities in small, personal settings. Our unusually strong local partnerships create rich experiences for real-world learning and careers. The result? Proven student success that makes Colorado Mountain College a choice that’s uniquely smart.

CMC’s facilities are as much a resource for our students as they are for the communities we serve. Due to the nature of our facilities and the multitude of opportunities they offer, the CMC Facilities Department has established design standards that consider the importance of equipment and materials that can withstand the climate and altitude in our rocky mountain communities, but is also easy to maintain. Additionally, with CMC’s commitment to sustainability, it’s important that building materials and equipment are of the highest rating in quality to meet energy standards and help keep utility costs as low as possible.

These design standards serve as a guideline to our consultants and contractors, sharing what the CMC facilities staff has learned over time are preferred equipment and materials for our facilities both from a sense of aesthetics, maintenance, and operations. If a consultant believes they have a substitution that meets CMC’s baseline standards, the facilities staff will review those recommendations.

Applicable Standards Colorado Mountain College is under the jurisdiction of the Colorado Department of Fire Prevention and Control. Typically projects will go through the local fire department for life safety review and DFPC for code review and inspection. The Department of Regulatory Agencies is the inspection authority for plumbing and electrical. All projects should follow their guidelines and most up-to-date codes for approval.

For energy standards, CMC currently complies with the following for all new projects-

- ASHRAE Standard 55 – 2017: Thermal Environmental Conditions for Human Occupancy
- ASHRAE Standard 62.1 – 2019: Ventilation for Acceptable Indoor Air Quality
- ASHRAE 90.1 – 2019: Energy Standard for Buildings

Energy and Water Performance Goals-The following serve as design benchmarks for all energy and water performance

- Air Systems
 - Supply fan system: $>.6W/cfm$
 - Exhaust fan system: $_ W/cfm$
 - Supply side coil and filter face velocity: $<300 fpm$
- Hydronic Systems
 - Pumping system: $_19 W/gpm$
- Heating/Cooling Equipment
 - Condensing boilers: AFUE $> 95\%$
 - Air-cooled chillers: $.8 kW/ton$ at AHRI conditions

- Heat pumps: COP >4 _
- Envelope
 - Roof assembly: > R- .05_ BTU/hr/sf/deg F
 - Infiltration rate: < 0.1 cfm/sf
- Lighting Power Density Targets
 - Office: < _ W/sf ambient (use task lighting for additional illumination)
 - Classroom: < _ W/sf
- Plumbing
 - Toilets: _ Dual-flush 0.9/1.28 gpf at most 1.6gpf
 - Urinals: _ 0.125-gpf at most 1.0gpf
 - Faucets: _ 1.0 gpm at most 2.2 gpm
 - Showers 1.5 gpm at most 2.2 gpm

Design Strategies –The following are to serve as a starting place for the design of all projects. Every project is unique and may have additional requirements and standards. Due to budget considerations or the type of facility, some strategies may not need to be followed.

- Plug load reduction should be prioritized to maximize energy reductions through appliance selection, scheduling, and monitoring.
- Minimizing need for heating and cooling through passive means and reducing interiors loads.
- Focus should be on load reduction before efficiency of generation. To allow for smaller HVAC.
- An energy model should be developed for new buildings to make design decisions.
- Include the services of a cost estimator for cost estimation during Schematic Design and Design Development phases.
- Include cost estimate for ASHRAE 90.1 baseline design and X% better than ASHRAE 90.1 design (or cost estimates for good, better, and best design packages).
- Life cycle cost parameters – simple payback, ROI.
- Thermal Comfort
 - Design HVAC for comfort based on ASHRAE 55 thermal comfort standard
 - Design according to ASHRAE Expanded (not Adaptive) comfort range (Increased air movement to allow for greater temperature comfort range)
- Ventilation Rate
 - Increased air movement beyond LEED standard requirement. From either 30/cfm person of fresh air or ceiling fans.
 - Consider allowing higher ventilation rates as means of cooling to allow for economizing to save cooling energy.
- HVAC
 - Separate ventilation from space conditioning.
 - Minimize friction in air and water systems.
 - Minimize reheat for space conditioning.
 - Target compressor-free cooling where possible.
 - When using chilled water for cooling, design for medium temperature systems (CHWST ~ 55F or higher).
 - Design for low temperature heating hot water (HHWST ~ 120F or lower).
 - Consider part load operation performance when sizing and selecting mechanical equipment.
 - Implement heat recovery wherever possible.

- Implement air side or water side economization wherever possible.
- Envelope
 - Consider meeting Passive House standard for envelope because of the synergy from acoustical requirements that might require a lot of these treatments anyways
 - For Glazing, ratio of Visible Light Transmittance (VLT) to Solar Heat Gain Coefficient (SHGC) must be ≥ 2 . (Note: this prohibits electro-chromatic glass, such as View Glass)
 - High performance glazing, etc.(consider target window to wall ratio?)
 - Specify high albedo roof coating.
 - Orient glazing and overhangs to prevent any direct solar gain at noon of the summer solstice.
 - Eliminate sources of thermal bridging, e.g. bare steel beams, metal window frames.
- Lighting & Daylighting
 - Daylighting controls paired with excellent building daylighting design and fixture selection, can achieve 50% or greater annual lighting energy savings along with additional cooling energy savings when properly designed.
 - Define visual comfort performance metrics to improve comfort and likely reduce artificial lighting energy.
 - Provide fine control granularity and continuous dimming capability. Dimmers shall be controlled via a 0-10VDC signal.
 - Baseline lighting design should be dimmable LED technology in offices and classrooms.
 - Maximize daylighting penetration into building core with light shelves, clerestory, transparent or translucent interior space dividers, etc.
 - Focus on light quality rather than installed light density or illumination.
 - Incorporate task lighting in offices, where possible, to reduce ambient installed lighting.
 - In general, lighting control panels are discouraged. Instead, integrate all room lighting into the room occupancy sensors and BAS. Occupancy sensors within rooms shall be manually-controlled "on" and sensor-controlled "off". Exterior lighting shall also be tied to the BAS.
- Plumbing
 - Use of high efficiency low flow fixtures to minimize water usage in the building.
- On-Site Renewable Energy
 - Solar PV on roofs/parking lots, sized for NZE building
 - Solar thermal for DHW
 - Wind turbines (if feasible)
- Commissioning and Measurement
 - Require commissioning consistent with LEED v4 Fundamental and Enhanced for HVAC, lighting, daylighting controls, plumbing, energy monitoring systems, and renewable systems.
 - Recommend Enclosure Commissioning to ensure thermal benefit of high-performance envelope.
 - Require electrical submetering for all HVAC equipment larger than 10 hp.
 - Separate lighting and plug loads on electrical panels.
 - Submeter end uses: HVAC, lighting, plugs.
 - Design is subject to peer review.
 - Measurement and verification plan and report per LEED v3.

Design Process

Follow an integrated design process to look holistically at the interaction between site, energy, and water systems. Prepare Owner's Project Requirements (OPR) and Basis of Design (BOD) documents to clarify the goals for the project and the strategies implemented to meet them. See LEED v4 Integrative Process Prerequisite and Credit methodology for more information.

Heating, Ventilation, and Air Conditioning Energy Reduction Strategies

- The primary focus should be on reducing heating and cooling loads through passive means (e.g. optimal shading, orientation, envelope, and internal load reduction) to allow for a smaller HVAC system.
- After reduction of loads, focus should be on efficient equipment, then on-site renewable energy generation.
- Implement heat recovery wherever possible.
- Implement air side or water side economization wherever possible.
- Target compressor-free cooling where possible.
- When using chilled water for cooling, design for medium temperature systems (chilled water supply temperature of 55F or higher).
- Design for low temperature heating hot water (heating hot water temperature of 120F or lower).
- When engineering the size of a hot water reheat coil, use a minimum of 25% glycol concentration for the sizing calculation of the coil.
- CMC would like to avoid installing VAV boxes to a make-up air unit. Hot water reheat VAV systems that are installed to a make-up air unit must have a minimum of 25% glycol concentration in the hot water system.
- 100% fresh water make up to the hot water system in is not allowed. A solution feeder is required.
- Use geothermal heat pumps for low temperature heating and medium temperature cooling.
- Minimize reheat for space conditioning.
- Consider part load operation performance when sizing and selecting mechanical equipment.
- Separate ventilation from space conditioning.
- Minimize friction in air and water systems.
- Design for air handler low coil face velocity (less than 300 fpm).
- Target efficient fan systems (less than 0.6 W/cfm).
- Target efficient pumping systems (less than 19 W/gpm).
- Equipment efficiencies must meet prescriptive requirements outlined in ASHRAE 90.1-2019 (or current version) and at a minimum, whichever is more stringent:
 - Condensing boiler Annual Fuel Utilization Efficiency: at least 95%
 - Air-cooled chiller efficiency: 0.8 kW/ton or lower IPLV at AHRI conditions
 - Heat pump Coefficient of Performance: at least 3.5.

Thermal Comfort Strategies

- Provide adequate thermal comfort consistent with ASHRAE Standard 55 – 2017: Thermal Environmental Conditions for Human Occupancy (or current version). Consider increased air movement provided by ceiling fans which can expand the comfort range outlined in ASHRAE Standard 55 – 2017.

Indoor Environmental Quality Strategies

- Provide adequate ventilation consistent with local codes and ASHRAE Standard 62.1 – 2019: Ventilation for Acceptable Indoor Air Quality (or current version), whichever is more stringent.
- Consider at least 30% higher ventilation rates consistent with LEED v4 (or current version) Indoor Environmental Quality Credit: Enhanced Indoor Air Quality Strategies. This can help with increasing the availability of economizing for cooling and higher ventilation can improve control of indoor carbon dioxide levels (which can impair cognitive ability at high concentrations).
- Protect indoor air quality during construction and preoccupancy phases consistent with LEED v4 (or current version) Indoor Environmental Quality Credit: Construction Indoor Air Quality Management Plan.
- Develop and implement an indoor air quality management plan.
- Keep contaminants out of the HVAC system and out of the building.
- Prevent circulation of contaminated air.
- Maintain a clean job site.
- Sequence construction activities to reduce air quality problems.
- Install absorptive-finish materials after wet-applied materials have fully cured whenever possible.
- Remove all temporary filtration media and replace with new filters before test and balance of the equipment.
- Protect absorptive materials from moisture damage.
- Specify materials (adhesives and sealants, paints and coatings, flooring systems, composite wood) that are low-emitting and meet the thresholds consistent with LEED v4 (or current version) Indoor Environmental Quality Credit: Low-Emitting Materials methodology.
- Adhesives and sealants (at least 90% by volume for emissions, 100% for VOC content)
- Paints and coatings (at least 90% by volume for emissions, 100% for VOC content)
- Flooring systems (100%)
- Composite wood (100% not covered by other categories)
- Keep pollutants from the exterior out of buildings by using walk-off mats at entries and indoor ventilation practices that prevent hazardous fumes from being distributed within the buildings.

Envelope Strategies

- Consider meeting Passive House standard for envelope because of the synergy from acoustical requirements.
- Specify high albedo roof coating.

Lighting Strategies

- Possible daylight penetration methods include light shelves and transparent or translucent interior space dividers. Daylighting controls paired with excellent building daylighting design and fixture selection, can achieve 50% or greater annual lighting energy savings along with additional cooling energy savings when properly designed.
- Focus on light quality rather than installed light density or illumination.

- Consider lighting on the vertical plane in addition to the horizontal plane
- Consider the contrast between surfaces
- Balance direct and indirect lighting
- Balance day lighting and artificial lighting
- Incorporate LED task lighting in offices, where possible, to reduce ambient installed lighting.
- Use LED technology everywhere, as practicable.
- Follow best design practices described in the Illuminating Engineering Society (IES) Lighting Handbook

Electrical Strategies

- Reduce plug loads through appliance selection, scheduling, and monitoring.

On-Site Renewable Energy Strategies

- Renewable Energy Ready (building structure, orientation, and electrical infrastructure are able to accommodate future on-site renewable energy generation).
- Renewable energy technologies include solar photovoltaics (PV) on roofs, parking lots and grounds; solar thermal for domestic hot water; PV-Thermal for combination electricity/hot water generation; and wind turbines.
- If installing crystalline silicon PV, specify a minimum 16% efficient panel. Consider using higher efficiency panels, greater than 20%, if lifecycle cost-effective. Consider using module-level power electronics like (direct current) DC optimizers and micro-inverters to improve solar PV performance.
- Develop lifecycle costs and feasibility for on-site renewable energy generation potential and the feasibility of on-site net zero energy. Net zero energy is defined as: “One hundred percent of the project’s (electric and natural gas) energy needs must be supplied by on-site renewable energy on a net annual basis.”

Water Reduction Strategies

- Meter total potable water use for each building.
- Sub-meter irrigation and domestic hot water use.
- Target the following fixture water specification maximums:
- Lavatories: 0.35 gpm (at most 0.5 gpm per LEED v4 baseline)
- Water Closets: Dual-flush 0.9/1.28-gpf (at most 1.6 gpf per LEED v4 baseline)
- Urinals: 0.125-gpf (at most 1.0 gpf per LEED v4 baseline)
- Showers: 1.5 gpm (at most 2.5 gpm per LEED v4 baseline)
- Sinks: 1.0 gpm (at most 2.2 gpm per LEED v4 baseline)

Sustainable Sites Strategies

- Manage site runoff using low-impact development and green infrastructure consistent with LEED v4 (or current version) Sustainable Sites Credit: Rainwater Management.
- Control light pollution consistent with LEED v4 (or current version) Sustainable Sites Credit: Light Pollution Reduction.

Materials and Resources Strategies

- Divert at least 50% of construction waste consistent with LEED v4 Materials & Resources Credit: Construction and Demolition Waste Management Option 1 Path 1. Document waste diversion consistent with LEED v4 (or current version) Materials & Resources Prerequisite: Construction and Demolition Waste Management Planning.
- Consider following Path 2 with a diversion rate of 75% and four material streams.
- Materials selected for the buildings should be high quality and durable, extending the life expectancy of the buildings and optimizing the lifecycle cost of materials.
- Use locally sourced materials with a high-recycled content, as feasible.
- Do not use chlorofluorocarbon (CFC) refrigerants in new refrigeration equipment and phase out CFC refrigerants in existing equipment.

Administrative Standards

The purpose of these standards is to inform and assist the design team in the process of designing new facilities, and remodel of existing facilities, on the campuses of Colorado Mountain College.

The intentions of these standards are not to restrict the design team in their process and specifications of materials or products, but to aid the design team by providing boundaries and parameters in their design. Colorado Mountain College encourages design teams to recommend alternate methods, products and materials that may not be included in these design standards.

Any fluctuations in these standards need to be reviewed by the facilities director at Colorado Mountain College. Please provide a written description to Colorado Mountain College of any proposed deviations to these design standards.

The design team is responsible for compiling a set of code compliant (local, state, international...) construction documents and specifications that were developed by using these standards.

GENERAL BUILDING REQUIREMENTS

Storage

Defined via programming requirements with team. Goal is to limit storage for only necessary day to day activities, but centralized storage could be considered for items specific to campus operations and event management such as tables, chairs, and AV equipment. The goal is that at the end of each year, the area is cleaned out to ensure a safe and current list of stuff is there.

Spaces for storage of materials are to be incorporated in all designs. Areas such as specialty classrooms, science labs, fitness spaces, computer labs, and art labs are to have dedicated

storage rooms directly connected to each of these spaces. The size of the storage area should be based on the amount of items that will be stored.

When student-occupied programmed spaces are deemed a higher priority than storage spaces, the design team is to incorporate a secondary cold storage building adjacent to the main educational facility being designed. The size of this cold storage building is to be determined by CMC; to be based on the amount of storage space needed.

All office areas (spaces with multiple offices) should have a minimum of one dedicated storage space for supplies.

All janitors' closets should be large enough to store restroom products for each of the restrooms located on that floor (paper towel, toilet paper, soap...). At least one janitor closet should be programmed on each floor with a central shipping/receiving loading dock area that will serve as the main distribution point to the facility.

Trash Enclosures

A trash enclosure for each new building should be incorporated into all designs. If the building is close enough to an existing facility, a shared trash enclosure can be considered if the size is appropriate for both buildings. The design of the trash enclosure should carry over from the design of the facility to which it is serving (use similar building/finish materials).

The size of the trash enclosure should be large enough to store two six-yard dumpsters and 3 recycling containers. This could be modified depending on the frequency of the local waste company's pickups. It is the responsibility of the design team to coordinate the physical size of this space with the required standards of the trash company in-charge of hauling away the garbage. Location of the trash enclosure is also to be per standards and recommendations of the garbage company in-charge of hauling away the garbage. Wherever the location of the trash enclosure is located, there is to be a direct route from the building to the enclosure by means of a paved sidewalk/parking area.

Exterior Finishes

When new buildings are built, the new design should complement the existing architecture.

All building facades are to have a minimum of two different finish materials. Colorado Mountain College encourages all design teams to ground the buildings with a heavy masonry/stone base (height of base can vary around the building). All buildings should complement their surrounding areas by adhering to local design guidelines where applicable.

Acceptable exterior materials are masonry (brick, stone, stained block – smooth/split faced), stucco, architectural metals, exposed steel. Because of maintenance issues, no exposed wood products, cementitious products or plastic products are acceptable unless properly treated and approved by the Facilities staff.

All exterior finish colors to be earth tones.

If the design team desires to include exterior finish materials not listed above, please provide a written request to Colorado Mountain College, including product information and where this material would be located.

Floor Drains

All wet area such as restrooms, janitor closets, laundry rooms, mechanical rooms, kitchens... are to have floor drains. All floors to be sloped towards the floor drains. Trap primers are not allowed.

Ceiling Types

All classroom and office spaces are to have lay-in ceiling grids. Refer to the ceiling grid section (section 09510) for acceptable sizes.

All restrooms and entry vestibules are to have hard (drywall) ceilings.

The preference is to not use "clouds" for architectural features in large room (eg: library, dining area, etc) unless the design is necessary for AV needs or accoustics. These are a major problem for ongoing maintenance.

Door Entry Location

All doors entering into classroom spaces are to be located in the rear of the space (away from the front of the room).

The design team is to avoid placing the main building entry, and secondary building entries, on the north side of any facility (due to winter conditions). Vestibules are necessary for all main building entries.

Flooring Materials

- Offices and general instruction classrooms are to have carpet flooring. No carpet pads are allowed. Carpet tiles are preferred.
- Restrooms/showers to have a tile floor finish.
- High traffic areas such as building entries, corridors, kitchens and dining areas are to have a hard maintainable flooring surface such as tile, karndean, hardwood, or stained concrete. Janitor closets and mechanical rooms are to have a sealed concrete floor finish.
- Wet labs such used for arts and sciences are to have a hard maintainable surface such as tile, VCT, or stained concrete.
- For acceptable floor finishes, refer to specific sections in division 09600.

Finish Product Selection

The design team is to keep in mind product maintenance, durability and longevity when specifying finish materials. It is not acceptable to specify materials that require an above normal amount of maintenance to keep the product from failing or deteriorating. Easily repairable or maintainable materials such as carpet squares or wall tiles are encouraged through-out the design of all projects. Whatever is specified needs to include maintenance requirements in the contractor provided operations and maintenance materials.

Accessibility must be considered as part of the design. Items such as lighting, mechanical systems, and access panels should have proper accessibility and not require special equipment.

Attic Stock

Designs teams are to specify 3% attic stock (ceiling tiles, floor/wall tiles, carpet...) for all finish materials except paint. For paint, specify only 2 gallons of attic stock per color used in the building. Storage should align with attic stock needs.

Division 1 (General Requirements)

01780 Closeout Submittals

Upon completion of the project, the design team is to provide CMC with a set of as-built drawings. CMC prefers a digital copy in pdf format. Architectural, mechanical, electrical, plumbing and structural plans should also be made available in CAD. The general contractor will review the as-built set to verify the accuracy of the drawing set.

Mechanical record drawings of the HVAC system will be laminated and displayed on the wall of the mechanical room for future reference. If the building is not designed with a mechanical room. The record drawings will be displayed on the wall of the electrical room.

As-built conditions are to be documented and recorded on the record set of drawings by the general contractor. As part of the general contractors monthly draw request, the general contractor will need to provide proof that these record documents are being updated in accordance to what is being built in the field.

For smaller basic scopes of work, if a drawing set is not required, the design team/architect/engineer is required to provide CMC with a written description of work done.

Division 2 (Site Construction)

02810 Irrigation Systems

Drip irrigation systems to extend to all trees and shrubs. All grass/turf areas to have an underground irrigation system. All irrigation systems to be connected to a time clock which is to be located in the building mechanical room.

02870 Bike Racks

All new buildings are to have bike racks included in the design. The number of bike racks is to be determined by the size of each building. The bike racks are to be located on a concrete pad off to the side of the front entry of the building. The size of the concrete pad is to be determined by the size of the bike rack(s) plus the area needed to store the bikes as well as maneuvering space for the bike to get in and out. Under sizing of this space can lead to damage of adjacent landscape area.

02900 Landscaping

Landscape design is to maximize low water consuming trees and shrubs while minimizing grass/turf areas that require high volumes of water to maintain. Small grass/turf areas for the use of outdoor classrooms and/or learning environments are encouraged in every design.

Environmental Conditions

1. Do an analysis of average precipitation based on rain and snowfall
2. Determine wind characteristics
3. Determine the hardiness zone

Landscape Zones

1. Determine zones
 - a. Quads
 - b. Walkways
 - c. Parking
 - d. Paths

Parking and Road Drainage

Water quality must be considered to the local jurisdiction's requirements. Objective is to capture water, filter and return it to the water table and to provide bio diversity to campus using planting pallet and bio swales.

1. Drainage of parking and roads are to be directed to bioswales wherever possible.
2. The shape of the bio swale is to be a trapezoid or parabolic in cross section.
3. The center of the bioswale is to be native rock and boulders with sides stabilized with vegetation capable of withstanding inundation and drought.
4. Soil in the bioswale is to be capable or amended to allow infiltration water to the water table.
5. Planting islands should be designed in parking areas if possible and allow for storm water retention and infiltration.
6. Plants that can tolerate mostly dry conditions with short periods of inundation should be used as the basis of design.

Parking Lot Design

Objective: Reduce heat buildup in the parking area to sequester carbon by parking plantings.

1. 50% of the parking area is to be covered by tree canopy.
2. Tree diameters should be less than 6" with root bases that have minimal impact on asphalt.

Roadside and Parking Landscape

Choose trees plants and grasses that fit into the hardiness zone for the campus.

Native Revegetation

Choose trees, plants and grasses native to the campus and the area it sits in.

Irrigation

1. Metering of all irrigated areas is crucial for troubleshooting and sustainability.
2. Up to date controllers, capable of multiple watering methods are preferred.
3. Addition of moisture sensors to controllers/timers is optimal.
4. See appendix B for design

Xeriscape

1. Xeriscape = Sustainable planting
2. Sod is appropriate in the right circumstances. Sod can be considered for areas that may require outdoor programming.
3. Use local plantings grown in the climate zone if applicable.
4. Use potted plants to beautify hard surfaces.
5. Collaborate with others to use planting areas as learning spaces.

SNOW

Snow storage for plowing of roads, parking lots and sidewalks

1. Sidewalks need to be accessible for equipment to remove snow. Minimum of eight feet in width is the standard, but five foot wide sidewalks are acceptable in certain circumstances. Confer with the Facilities department for approval.
2. Roofing-Initial design should include adequate snow fence and heat tape to address known areas.
3. Roof design should minimize the possibility of ice dams and valleys when possible. If unavoidable, heat tape must be designed to address these areas.
4. Rough-in for heat tape: electrical panels need to be sized for this potential addition if it cannot be part of the base design.
5. Structural design must be able to address snow on eaves if snow fence is added at a later date.
6. Hardscape and mechanical systems need to be built far enough away from the building to allow for roof snow slide areas.

Division 3 (Concrete)

03120 Cast-in-Place Concrete

All sidewalks around the new facilities and parking areas to be a minimum of 5' in width 8' sidewalks are preferred near major entrances. Rebar should be included with the pour to minimize slab cracking and soil heaving. Additionally, design area for snow clearance and storage. Exterior light poles should be placed just off the walkways to minimize damage during snow removal.

Division 4 (Masonry)

04200 Masonry Units

Concrete block and brick veneers are acceptable exterior finishes. Standard gray concrete block finish is not acceptable; all block to be either colored or stained. Colors to be earth tones.

04400 Stone

Stone veneers are also an acceptable exterior finish. Block type and color to be approved by CMC.

Division 5 (Metal)

None

Division 6 (Woods and Plastics)

06066 Plastic Laminates

Laminated countertops are not permitted in wet areas such as restrooms/bathrooms, kitchen, etc.

Laminated countertops are allowed at work surfaces in offices, reception areas or general instruction classrooms. Squared edges preferred in most locations unless approved by Facilities Management.

06415 Countertops

Solid surface countertops are to be used at all wet locations such as restrooms/bathrooms and kitchens.

Specialty countertops found in science classrooms are REQUIRED (such as epoxy or phenolic resin).

Division 7 (Thermal and Moisture Protection)

07210 Building Insulation

Interior perimeter walls of all offices, classroom, labs, conference rooms, and restrooms spaces to be filled with sound batt insulation (R-11 minimum) to minimize the transfer of sound between spaces.

07211 Foam In-Place Building Insulation

Foam insulation that contains CFC's is prohibited from use.

07411 Metal Roof Panels

All sloped roofs are to be finished with a mechanically fastened standing seam roof.

07412 Metal Wall Panels

Architectural metal panels are encouraged for use as an accent finish material.

07464 Vinyl Siding

Prohibited from use on all buildings

07466 Fiber Cement Siding

Prohibited from use on all buildings

07469 Wood Siding

Prohibited from use on all buildings. Wood is allowed to be used for fascia and soffit materials in select locations and approved by Facilities Management.

07533 Adhered EPDM Roofing System

Allowed at flat roof locations (60 mil glue down) where there is **no** mechanical/service equipment located.

Ballasted EPDM roofs are not allowed. Roof pavers are not allowed.

07545 Adhered TPO Roofing System

Allowed at flat roof locations (60 mil glue down) where there is **no** mechanical/service equipment located.

Ballasted TPO roofs are not allowed. No roof pavers allowed.

07550 Modified Bituminous Membrane Roofing

To be used at all flat roofs where there is mechanical/service equipment located.

Allowable types:

- Hot asphalt
- Odorless cold adhesive (Green Loc 100% VOC free)
- Cold applied (lower odor asphalt)
- Coal tar (hot or cold applied)
- Energy Star Ratings (top cap sheet white)
- Flood and gravel surfacing
- Vegetative (flowers, grasses, sedum material)

07710 Manufactured Roof Specialties

Sloped roofs are to have gutters and downspouts designed to take water away from the building. Downspouts are to be connected to underground storm sewer lines or be connected to underground pipe that daylight away from the building. Gutters and downspouts to be lined with heat tape to a distance no less than four feet underground.

07720 Roof Accessories

Snow guards/fences to be used at all sloped roofs above building entries or public sidewalks.

07724 Roof Hatches

Minimum size of 36" x 36" to be used.

At the top of steel wall mounted ladders extending up to the roof hatch, specify a retractable Ladder-Up safety post system (or equal).

Division 8 (Doors and Windows)

08110 Steel Doors

- Exterior utility room doors to be insulated metal or aluminum.
- Door size to be a minimum of 3'-0" wide x 7'0" tall and 1 ¾" thick.
- Exterior hollow metal door frames are to be grouted solid.

08210 Wood Doors

- Interior classroom, conference, office, and restroom doors to be solid wood with a Red Oak veneer.
- Door size to be a minimum of 3'-0" wide x 7'0" tall and 1 ¾" thick.

- All office and classroom doors to have a vision kit. Sidelights can be used in classroom locations and some office setting with Facilities Management approval.

08400 Entrances and Storefronts

- Main entry doors to be an aluminum storefront entry systems.

Colors for entry door frames and storefront system frames are encouraged to be either white or natural aluminum (silver) color. If other color is proposed, it must be approved 08520 Aluminum Windows

- Non-operable aluminum windows are the preferred type. Specify with double-paned glazing, low-e thermal coating, as well as a thermal break.
- Operable windows are permitted when its justified as being necessary for the building's mechanical design. Operable windows should be linked to the building automation system when possible.

08550 Wood Windows

Wood windows are not allowed on any CMC buildings.

08600 Skylights

Skylights are not allowed on any CMC buildings.

08710 Door Hardware

Colorado Mountain College has standardized door hardware, locksets, keys and cores. No substitutes to hardware or hardware operation is permitted. These standards are to be followed for operational efficiency and security.

1. Best 9K locksets with office or storeroom locking function or privacy lockset function.
2. Colorado Mountain College will provide all keys and cores for new construction and at completion of construction. Please eliminate this from contractors work scope.
3. Office doors are 9K Best lockset with office function locking.
4. Classroom doors 9K Best locksets with office function or if card reader is specified the store room locking function to be provided.
5. Restroom doors are privacy locking function or occupied indication locksets.
6. Single exit doors are Von Duprin 33 or 98 series rim exit devices with CD dogging outside trim is lever Von Duprin 996L-NL night latch with rim cylinder that accepts 7 pin Best Peak Core.
7. Hinges are 4.5 inches 4 or 5 knuckle ball bearing hinges on interior wood doors. On exterior metal doors 4.5 five knuckle security hinges and on aluminum store front doors surface mounted continuous hinges only. Pivot hinges are prohibited.
8. Door closures are LCN 4040 with parallel arm mount. Store front door closures require a mount plate and parallel arm mount.
9. ADA door closures are to be electric. No pneumatic closures are allowed.
10. Vertical rods or concealed vertical rods are prohibited.

08711 Double Door Hardware

Colorado Mountain College has standardized their hardware and door set-ups for double doors. These standards were created for operational service and security considerations. Please follow in design and application for all college facilities.

1. Double metal or aluminum store front doors will lock to a steel or aluminum set screw removable mullion.
2. All exterior double entry doors will have two surface mounted electrified strikes on the mullion to control access. Hess 9600 series. This is required because of the ADA Operator. On double-door sets that do not require an ADA operator, only one surface mounted electric strike is required.
3. As viewed from the exterior, the door on the left is inactive. **Access is given only by using the ADA operator, and the card reader will activate with the ADA operator. Inactive door only has rim exit hardware. If ADA operator is specified, the electric strike needed. If no ADA operator is required, door locks are to have a rim exit strike.**
4. The door on your right is the active door. It has exterior trim with a rim cylinder, surface mounted electric strike, rim exit device and a mechanical closure parallel arm mount.
5. Vestibule doors will follow the same layout and hardware package as described above.
6. Single entry doors will require electric strike, card reader, rim exit device. Exterior trim with lever and rim cylinder to accept 7 pin PEAK Best core. Door closure with parallel arm mount.

08712 Electrified Hardware and Card Access

Colorado Mountain College has a standardized card access system that is provided and supported by Stanley Convergent Security Solutions. This electrified system needs to follow the provided standards. Electrified hardware such as power transfer hinges, electrified hinges, panic rim exit devices. Exterior trims and locksets are prohibited to control locking functions.

1. Electrified hardware such as power transfer hinges, electrified hinges, panic rim exit devices. Exterior trims and locksets are prohibited to control locking functions.
2. All Locking or access control is done through recessed or surface mounted electrified strikes. Examples are Hes 5000 series [recessed model] or Hes 9600-630 series [Surface mounted model].
3. All ADA operators are Electric only. Electrical contractor to provide power.
4. All Doors that require a card reader are to provide electrical boxes hard piped ¾" MC pipe by electrical contractor

Division 9 (Finishes)

09250 Gypsum Board

- 5/8" thick drywall to be used through-out all facilities.
- Moisture resistant gypsum to be used in all wet areas (certain sections of wet labs, prep rooms, restrooms, janitor closets, mechanical rooms)
- Cementitious backer-board to be used at all wall tile locations.
- Drywall finishes in classrooms to be level 4-5

- Drywall finishes in office and public space can be with a light orange peel, hand or knockdown texture.
- At drywall installation, stagger all panels in a horizontal direction.

09300 Tile

- All wall tile locations to have grouted joints (no dry stack look).
- All tile to have a minimum thickness of ¼”.
- All perimeter restroom/bathroom walls to have a wainscot level tile finish.

09510 Acoustical Ceilings

- Preferred ceiling tile sizes are to be 24”x24” squares. 48”x 24” with a score line are permitted with Facilities Management approval.
- Suspended acoustic ceilings are not permitted for use in restrooms/bathrooms, janitor closets, mechanical spaces and entry vestibules.

09600 Flooring

- Recommended flooring types per programmed spaces: 2’x2’ glue down carpet tile at high traffic use areas and offices.
- Glue down carpet at general classroom spaces.
- Ceramic tile at restrooms/bathrooms and kitchens.
- Vinyl flooring at high traffic areas such as cafeteria spaces.
- Polished concrete at high traffic corridor/circulation spaces.
- Sealed concrete at storage, mechanical and garage spaces.
- Walk-off carpet is allowed at building entries with Facilities Management approval.
- Carpeting is not allowed on stair treads.
- Carpet pad is not allowed.

09653 Resilient Base and Accessories

Use vinyl wall base with UV protection.

09910 Paint

There is a maximum allowable use of three paint colors (for interior walls) in any building. All colors choices to be picked from an earth tone color pallet. Colors for trim work, such as hollow metal door frames, can be chosen in addition to the allowable three colors.

Additional accent colors may be allowed for specialty spaces. Please provide options to Facilities Management for approval.

Low VOC paints only.

Paint finish types (in order of preference)

- Semi-gloss
- Satin
- Egg Shell

Paint schedule:

- Drywall applications
 1. Finish tape and mud
 2. 2 finish coats of paint
- Metal applications
 1. DTM finish primer
 2. DTM finish paint
- Wood applications
 1. Sand lightly
 2. Sand sealer 1st coat
 3. Sand lightly
 4. Finish product (varnish, urethane...)
- Raw wood applications
 1. A100 Exterior primer
 2. A100 Exterior satin finish paint
- Masonry applications
 1. Block filler primer
 2. Finish paint

Division 10 (Specialties)

10155 Toilet Compartments

Solid phenolic, ceiling braced toilet partitions to be used through-out. All urinal privacy partitions to also be solid phenolic and ceiling braced.

10262 Wall Guards

Wall guards/chair rails to be installed around the perimeter of general instruction classrooms at a height of 30" above finished floor (30" to center of guard/rail). Guard/rail vertical height to be a minimum of 4".

10263 Corner Guards

48" tall with 2" exposed corners are to be used at all outside corners to high traffic areas such as corridors/hallways. Stainless steel is preferred unless it's a back of house setting, then plastic is acceptable.

10307 Gas Fire Places

CMC to evaluate the use of gas fireplaces on a case-by-case basis.

10350 Flagpoles

Two flag poles are to be included in the design of all new facilities. Flagpole #1 (taller of the two) is to be used for the United States of America flag, flagpole #2 (shorter of the two) is to be used for the State of Colorado. If flagpoles already exist on the campus, additional flagpoles are not necessary.

10430 Exterior Signage

The design team is to coordinate all signage with the CMC Marketing staff.

10440 Interior Signage

The design team is to coordinate all signage with the CMC Marketing staff.

Evacuation maps shall be placed through-out all buildings. Maps are to be self-illuminating in the event of a power outage (glow in the dark is acceptable).

10650 Operable Partitions

All partitions to have a minimum STC rating of 45.

Specify both sides of the wall to have a marker board surface with eraser pockets if used in a classroom setting. Wall panels should be able to be maneuvered into open or closed position by only one individual. Partition should have a closed seal to the floor.

10520 Fire Protection Specialties

All fire extinguisher cabinets to be either fully recessed or semi recessed and be mounted at heights that comply with ADA standards.

10800 Toilet, Bath and Laundry Accessories

Acceptable manufacturers:

1. Bobrick
2. Bradley
3. A&J Washroom Accessories

Division 11 (Equipment)

11130 Audio Visual Equipment see CMC IT Standards

Division 12 (Furnishings)

12490 Window Treatments

Architect to specify window treatment only at spaces where smart technology is used (areas that require natural light to be blocked out in order to view video presentations). Electronic controls preferred in classroom and conference settings.

12600 Multiple Seating

All fixed seating at auditorium/theater spaces to be of the same size – no size variations allowed in fixed seating.

For fixed seating at auditoriums/theaters, between 20% and 50% of these seats to have a flip-up tablet arm.

All fixed seating (tablet and non-tablet) to be sized for adult occupancy and follow ADA protocol.

Division 13 (Special Construction)

13600 Solar and Wind Energy Equipment

All systems/equipment to be compatible with BACnet.

13700 Security Access and Surveillance

All security and surveillance systems to be compatible with existing CMC software.

SEE SECURITY DESIGN CODE IN THE DOOR HARDWARE

CMC Access Card readers are supplied by Stanley and are connected through Lenel's OnGuard system.

The Alertus system has been installed throughout all CMC Facilities for reverse 911 and emergency preparedness notification. Alertus specifications for new facilities should be reviewed with CMC's Director of Risk Management.

13851 Fire Alarm Systems

Fire alarm systems to be addressable

Alarm systems to be consistent/compatible with existing systems on campus for which the facility is being designed to ensure uniformity with testing and service. Monitoring methods may vary depending upon technology available to the campus. Options should be discussed with Facilities Management. These include hardwire, cellular, radio, and VOIP.

Division 14 (Conveying Systems)

No lifts are allowed, only elevators to be used.

Shafts for elevator systems should be built with CMU or cast in place. Drywall shaft is accepted if real cost savings can be illustrated.

2.01 Elevator Manufacturers

Basis-of-Design Product: Subject to compliance with requirements, provide Schindler Elevator Corp.; 3100 MRL Low-Rise Traction Elevator, or comparable product by one of the following:

1. KONE Inc.
2. Otis Elevator Co.
3. Schindler Elevator Corp.
4. ThyssenKrupp Elevator.

B. Hoistway: The elevator hoistway dimensions are sized to accommodate the largest hoistway requirement from the manufacturers listed above. The successful elevator manufacturer shall provide clip extensions at rails, larger thresholds, and/or other items required to permit installation of elevator into a hoistway which may be larger than their standard dimensions.

C. Electrical and Mechanical Systems: The electrical and mechanical systems have been designed to accommodate the basis-of-design elevator listed above. Revisions to the electrical and mechanical systems required to accommodate the successful elevator manufacturer shall be provided at no cost to the Owner.

D. Source Limitations: Obtain elevators, including freight and hydraulic elevators specified in other Sections, from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.02 Performance Requirements

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.03 Elevator indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

A. Elevator Description:

1. Machine Type: Gearless traction.
2. Rated Load: 3000 lb.
3. Freight Loading Class for Service Elevator(s): Class A.
4. Rated Speed: 100 fpm.
5. Operation System: Selective-collective automatic operation.
6. Auxiliary Operations:
 - a. Nuisance-call cancel.
 - b. Loaded-car bypass.
7. Security Features: Keyswitch operation.
8. Car Enclosures:
 - a. Inside Width: 6'-9 5/16" from side wall to side wall.
 - b. Inside Depth: 4'-10 7/8" from back wall to front wall (return panels).
 - c. Inside Height: Not less than 7'-9" to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
 - e. Car Fixtures: Satin stainless steel, No. 4 finish.
 - f. Side and Rear Wall Panels: Enameled or powder-coated steel with plastic-laminate wall panels.
 - 1) Enclosure: Color to match HM door frames.
 - 2) Plastic-laminate wall panels: Pittsburgh Steel.
 - g. Door Faces (Interior): Enameled or powder-coated steel.
 - 1) Color to match HM door frames.
 - h. Door Sills: Aluminum.
 - i. Ceiling: Satin stainless steel, No. 4 finish with CFL.
 - j. Floor prepared to receive resilient flooring (specified in Section 09 65 16 "Resilient Sheet Flooring").
9. Hoistway Entrances:
 - a. Width: 3'-6".
 - b. Height: 7'-0".
 - c. Type: Single-speed side sliding.
 - d. Frames : Enameled or powder-coated steel.
 - 1) Color to match HM door frames.
 - e. Doors : Enameled or powder-coated steel.
 - 1) Color to match HM door frames.
 - f. Sills : Aluminum.
10. Hall Fixtures : Satin stainless steel, No. 4 finish.
11. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.

2.04 Traction Systems

- A. Elevator Machines: Variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.
- B. Fluid for Hydraulic Buffers: Fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 05 50 00 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.05 Operation Systems

General: Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Auxiliary Operations:

1. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
2. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car responds only to car calls, not to hall calls.
3. Independent Service: Keyswitch in car-control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from keyswitch when car is in independent service. When in independent service, doors close only in response to door close button.

C. Security features shall not affect emergency firefighters' service.

1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations and hall push-button stations. Key is removable in either position.

2.06 Door Reopening Devices

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

Door Reopening Devices

2.07 Car Enclosures

A. General: Provide enameled or powder-coated steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Floor Finish: Resilient tile, specified in Section 09 65 19 "Resilient Tile Flooring."

2. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to manufacturer's standard panels with manufacturer's standard protective edge trim. Panels shall have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect from elevator manufacturer's full range.

3. Fabricate car with recesses and cutouts for signal equipment.

4. Fabricate car door frame integrally with front wall of car.

5. Primed or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet, minimum 18 gauge, with factory-applied, rust-resistant primer or powder-coating for field painting.

6. Sight Guards: Provide sight guards on car doors, minimum 16 gauge.

7. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

8. Metal Ceiling: Flush panels, with CFL.

2.08 Hoistway Entrances

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.

1. Fire-Protection Rating: 1 hour.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Stainless-Steel Frames: Formed from stainless-steel sheet, minimum 14 gauge.

2. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both jambs of hoistway door frames.

3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated.

4. Sight Guards: Provide sight guards on doors matching door edges.

5. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

6. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.09 Signal Equipment

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled signal equipment designed for destination-based system. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.

2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in

D. Car Position Indicator: Provide digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

E. Hall Push-Button Stations: Provide one hall push-button station at each landing for each single elevator or group of elevators, but not less than one station for each four elevators in a group.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
3. Provide telephone jack in each unit for firefighters' two-way telephone communication service specified in Section 28 46 21.11 "Addressable Fire-Alarm Systems."

F. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

H. Hall Position Indicators: Provide digital-display-type position indicators, located above each hoistway entrance at ground floor. Provide units with flat faceplate and with body of unit recessed in wall.

I. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 Finish Materials

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

D. Stainless-Steel Bars: ASTM A 276, Type 304.

E. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

F. Aluminum Extrusions: ASTM B 221, Alloy 6063.

G. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications.

Division 15 (Mechanical)

General Mechanical Guidelines

- Factory start-up, by the manufacturer's representative, is required on all pieces of HVAC equipment. A CMC representative as well as the general contractor is to be present at start-up.
- Balancing of mechanical equipment is the contractor's responsibility. New air filters are required before the test and balance. All strainers shall be removed, cleaned and replaced.
- Acceptable Building Automation Systems manufacturers are ALC and Alerton.
- The supply and return shall be protected with temporary seal-offs at all inlets and outlets required by SMACA level 3 and shall remain in place until the system is ready for start-up.
- Motorized fire and smoke dampers are required to have end switches.
- In the rooftop mechanical room doghouse, a beam (for an owner supplied hoist) is to be located directly above the roof hatch opening.
- All main pieces of equipment are to be labeled to what area it serves.
- All equipment will be labeled per mechanical drawings description.
- For all chillers, add a tee for possible addition of a future dry cooler.
- Gas and water meters will be capable of being attached to the BAS.

New Mechanical Units

- Condensing boilers with air cooled chiller and an ERV for minimum outside air and economizer.
- System will be designed to use the lower boiler temperature available in condensing boilers.
- The design team is to include in their specifications that a factory authorized service representative is to train CMC maintenance personnel.

Temporary Heat

- The use of the building permanent heating system will not be allowed for temporary heat without approval by owner and the engineer.

- If the use of the permanent system is allowed (for temporary heat) the building must be enclosed with final materials or barriers acceptable to owner and the engineer. System must be under control and in a safe condition. Mechanical contractor is responsible for the safe operation of system. Before the permanent units are put into final operation all ducts and fans have to be cleaned to owner's satisfaction.
- If permanent heat is used as temporary heating during construction, any warranties on the units that began at startup will have to be extended at General Contractor's expense so that the owner has a full warranty period when he accepts the building.

Server Rooms

All server rooms to be cooled on dedicated stand-alone systems (do not use the building's main cooling system to condition this space).

15060 Hangers and Supports

Acceptable roof top pipe support systems:

1. CX-VALUE - Base Only
2. CXM-MINI-PORT - Base Only
3. C-SERIES - Base with 14ga Galvanized Channel
4. C6-SERIES - Base with 14ga Galvanized Channel
5. CE-EXTENSION - CXP Rubber Base with 2 Threaded Rod Risers
6. CES-SUPPORT - Medium Load
7. CESH-SERIES - Heavy Load
8. CB-BRIDGE - Two Bases Bridged with Galvanized Channel
9. CS-VARI-ANGLE - Bases with Galvanized Channel and Adapter Leg
10. DSA-DUCT - Duct Support Series
11. AIR-PORT - Utility Pads
12. CR-ROLLER - Series for Support of Gas or Refrigeration Piping
13. CP-PLATFORM - Series "Mr. Slim"
14. CZ-SEISMIC - Series for Support of Gas or Refrigeration Piping

15110 Valves

Acceptable valve manufacturers (substitutions are allowed with CMC's approval)

1. Siemens
2. Belimo

15130 Pumps

Acceptable pump manufacturers (substitutions are allowed with CMC's approval)

1. B&G
2. Taco

15410 Plumbing Fixtures

Acceptable faucet and shower manufacturers (substitutions are allowed with CMC's approval)

1. Delta
2. Moen
3. Price Pfister
4. Newport Brass

5. Kohler

Acceptable toilet manufacturers (substitutions are allowed with CMC's approval)

1. Briggs
2. Sterling
3. American Standard
4. Gerber
5. Kohler

Acceptable flush valves manufacturers (substitutions are allowed with CMC's approval)

1. Zurn
2. Sloan
3. Kohler

Acceptable sink manufacturers (substitutions are allowed with CMC's approval):

1. Briggs
2. Sterling
3. American Standard
4. Gerber
5. Kohler

Acceptable 1/8th flush urinal manufacturers not allowed

1. Kohler
2. Sloan

15500 Heat Generating Equipment

Cabinet heaters shall have zone control capability through the BAS system.

15510 Heating Boilers and Accessories

Acceptable boiler manufacturers (substitutions are allowed with CMC's approval):

1. Lochinvar
2. Paterson Kelly
3. Bosh Budarus
4. Weil McClain

15720 Air Handling Units

Acceptable HVAC manufacturers (substitutions are allowed with CMC's approval):

1. Aeon
2. Carrier
3. Trane
4. Engineered Air
5. Daikin
6. Reznor (make-up air)
7. Sterling (make-up air)
8. Innovent (ERV)
9. Annexair (ERV)

15830 Fans

Acceptable manufacturers (substitutions are allowed with CMC's approval):

1. Cook

15855 Diffusers, Registers and Grills

Acceptable manufacturers:

1. Kruger PLQ's or comparable

15900 HVAC instrumentation and Controls

General Requirements

Statement of Intentions: It is the intention of Colorado Mountain College to create a DDC system that is reliable, easy to navigate and maintain, and is cost effective in order to best support the mission of the college as a whole. The learning that occurs at this institution deserves a system that takes full advantage of the technology available to create a safe and operational environment for each member and Student of Colorado Mountain College

This document is intended to cover standards and instructions for design and installation on all construction projects and installations of BAS controls at Colorado Mountain College. This includes both in house installations and contracted installations.

These standards that are laid heretofore are intended to create the Building Automation System of Colorado Mountain College to maintain the best environment for all groups and users of the system and its information. The Facilities Department is the creator and maintainer of this standard. Deviations from this standard must be approved in writing by the Facilities Department All installation under this standard and application of this standard shall be subject to all applicable local, state, and federal codes and requirements.

Acceptable Vendors

Currently, Colorado Mountain College utilizes two separate vendors for Building Automation Systems. They are Alerton controls supplied by Rocky Mountain ATS and Automated Logic Controls supplied through Elogic. Any one of these acceptable vendors must comply with all standards that are applicable here in. Some of these standards are specifically laid out on a per vendor basis in order to maintain a consistent product for all Building Automation Systems at the college.

Critical Expectations

Alarm delivery is one of the most critical functions of the BAS system at Colorado Mountain College. Alarm installations shall be in such a manner to avoid all possible lost alarms. System architecture in hardware and software must be designed in such a way to make alarms a priority.

All new installations shall be de-scoped and pre- approved by the Facilities Department. The impact on the system must be evaluated by the Facilities Department before any new equipment is merged with the existing system. All controllers and hardware shall be a part of the larger college's Building Automation System and shall be able to be accessed from anywhere on the internet.

Protecting the stability and integrity of the college's Building Automation System is critical and a primary function of the Facilities Department Therefore, all demolition of existing controllers shall be overseen by the Facilities group.

General Installation Requirements

Building Automation System Installation

1. Electrical and Gas meters pulse output must be monitored by the building automation system.
2. All communication, sensor wiring, and low voltage wires going for room level control shall be in conduit or cable tray until it at least penetrates the room that the terminal equipment controller and sensors are in. Wiring within the room shall be installed in such a manner as to minimize the risk of damage to the wire by keeping it well supported per code and out of the way with termination leads being kept as short as possible.
3. All communication, sensor wiring, and low voltage wires going for room level control shall be in conduit or cable tray until it at least penetrates the room that the terminal equipment controller and sensors are in. Wiring within the room shall be installed in such a manner as to minimize the risk of damage to the wire by keeping it well supported per code and out of the way with termination leads being kept as short as possible.
4. All higher level control (Building Level Controllers) should have communication lines in conduit for their entirety. Wire within the rooms run within acceptable applications not to be run in conduit shall be plenum rated. All raceways and ring runs shall be dedicated to both low voltage applications and BAS applications only and shall be labeled at all terminations and junctions and every 10 feet.
5. All conduit associated with the BAS must be a light blue color along with all of the junction box covers for the system. All low power (<50vac) must be separated from all higher voltages hazard.
6. All 120V AC power sources for controller panels shall be installed in a lower junction box to create a separation from the lower voltage controls section. All controllers requiring 120V must have the power guarded and protected in order to minimize the risk of arc flash. This portion will be NFPA arc flash hazard level 1 and shall be appropriately labeled with arc flash labeling.
7. All electrical circuits used for controllers must be dedicated to the building automation system.
8. Controllers and equipment power sources should be carefully coordinated to avoid field tracing difficulties. Labeling should include power and network/communication sources and destinations on all controllers for the best field tracing in the future.
9. BAS power panel when available. New building construction should include BAS dedicated power panels.
10. All power and communication/control wiring shall be run in separate raceway/conduit.
11. All control wiring shall be home runs to the main controller and shall contain no splices.
12. All wires are to be labeled clearly with wrap around tags on both terminations of the wire. All junction box covers shall be painted medium blue. Both box covers and termination

- cabinets are to be clearly labeled. Wires, both power and communication shall be labeled on both sides of visual obstructions.
13. All power wiring that is of an auxiliary nature, meaning that power is fed from a secondary source, must be run in yellow wire. This will indicate that there is a need to disconnect a secondary “power source” in order to safely secure the equipment that is being fed by yellow wire.
 14. All abandoned control wiring, pneumatic tubing, control enclosures, conduit, sensing devices, abandoned controllers, and raceway shall be removed to its source when involved in a project.
 15. All safety circuit devices such as low temperature detectors, high pressure cut outs, and fire safety devices shall be physically wired in series with the variable frequency drive safety circuit or motor starter in such a way that the equipment will shut down without intervention from the BAS. BAS is to monitor all of these points for purpose of alarming. Multiple safety devices of the same type must also be wired in series when applied within the same system.
 16. All heating pumps, lighting, and critical exhaust fans, as deemed so by the College Facilities or Energy Operations Group shall be wired to fail in a system and environmentally safe position in case of loss of BAS signal. For example, exhaust fans may fail on due to a critical environment that they are serving.
 17. The freeze protection circuit must shut the fan down, must shut the outside air dampers and exhaust air dampers fully and open the return air dampers fully, and must control the air temperature inside the air handler to 90 degrees Fahrenheit with the heating valve. All safety operations, except modulation of the heating valve, must be done through the hardwired circuitry and not done through the BAS software. Software safety shutdowns are only allowed as a secondary safety. If there is no heating coil, the return air fans shall also turn on.
 18. All safeties must operate whether in manual or automatic position, except preheating valves, which upon loss of power or controller signal will fail full open.
 19. All smoke fire systems controlled by the BAS shall have notification to the central fire panel when called for by the Authority Having Jurisdiction (AHJ).
 20. All electrical installation is to adhere to the latest version of the National Electrical Code that has been adopted by New York State. All installations shall comply with all local and state codes.
 21. All Automation Level Network (ALN)/ Building Level Network (BLN) controllers shall use an IP/Ethernet connection to the college Network for communication. The Floor Level Network (FLN), Infinet, Arcnet, room level controllers, single use, or specific use equipment controllers contained in the “sub architecture” are not required to be IP based, but may be IP based at any level.
 22. Power supplies for controllers and end devices (such as valves, transducers, and actuators) shall be separate transformers
 23. All controller layouts shall be physically wired such that all critical inputs and outputs shall be wired to the same controller on the network. Points for PID type control loops shall not be passed from controller to controller across the network. All control loops in a controller shall act in a standalone manner, if the network communication to that controller were lost.
 24. Each major piece of equipment that is called to be shut down by the fire system shall include an additional “Form C” (Normally Closed) relay to alert the building automation system when it is shut down. This will in turn initiate an appropriate fire alarm shutdown sequence which may be necessary for associated fans and equipment in the building automation system.

Accessibility

1. All electrical cabinets containing controllers must be lockable and must use the LL802 key to open the lock, except terminal unit boxes (such as those for VAV's). Power enclosures located below the main controllers shall be lockable with LL802 key when they are not located within a secured mechanical space.
2. All major controller cabinet locations should be placed in easily accessible places in secured mechanical spaces. Room level controllers need not be placed in secured mechanical rooms, but still should be accessible for replacement and maintenance as needed.
3. Also all actuators and valves must be placed in spaces that are accessible for full testing without removal. Actuators and valves should be easily remove-able and should have hand valves in place in order to easily change out actuators and control valves without shutting a section of the larger system down than is already affected by the actuator and valve itself.
4. Ladders should not be required to reach controllers, except in the case of room level controllers above ceilings. Also, all devices, valves, and actuators shall not require a ladder to access them, except in cases where it is required to be above ceiling for room level control.
5. All room level controllers shall have adequate access to remove covers, replace and service components. This includes valves, dampers, filters, etc.
6. Access panels for controllers, actuators, sensors, etc. above ceilings shall be a minimum of 24" x24".
7. All devices that are capable of physical reset (such as a low temp detector or high pressure cutout) shall be in an easily accessible place that can be reset. This must be able to be reset without the use of a ladder, in all cases that are reasonable.

Spare Capacity

1. All installations controllers should leave at least 10 percent spare point capacity of a distributed variety (BI, BO, AI, and AO), specifically for each type of point provided on the controller. These point types are defined below:
2. Binary Input (BI): An on/off indication that has a maximum cycle rate of 1 Hz. This is typically sensing a contact closure.
3. Binary Output (BO): A contact closure on the controller that will cause an action in the system.
4. Analog Input (AI): A continuously varying voltage or amperage signal that is varied by a sensor in relation to a sensed variable. This signal is processed in the controller after an analog-to-digital converter on the controller that converts the analog signal to a digital value.
5. Analog Output (AO): A continuously varying voltage or amperage signal that is generated from the controller after digital-to-analog conversion. The voltage or amperage signal will be used, for instance, to drive a modulating actuator or reset a hardwired set point on a packaged device.
6. All controller cabinets or enclosures installed are required to be large enough to house spare expansion modules in anticipation of future growth.

Required Naming and Labeling

1. All installations shall include the updated graphics which should be referred to through the vendor specific graphic standard. This should include tables of contents, floor plans which include locations of important sensors, good labeling and notes, equipment specific graphics and all standard links as laid out in detail in the graphics standards section 10.
2. All building automation AI, BO, AO, BI, BV and AV points need a proper description and not left with no description.
3. All installations shall provide all labor, materials, equipment, and services necessary to be compatible with the existing college system.
4. All of the devices will be labeled on the system graphics for their normal failsafe position.

Documentation required for projects

1. All bids given to the College for any project, shall contain specified controllers to be used for each application.
2. All point names and controller name lists will be editable.
3. Each controls installation shall include a set of as built documents that are sent electronically to facilities. As-builts are to be surrendered to facilities group at the time of turnover, including digital media copies, one for each group. These documents must contain all applicable schematics, system architecture, valve schedules, product specification sheets, and sequences for how the controls are operating when the project has reached completion.
4. As built documentation must be updated within the one year warranty period with any changes that were made to the project as completed at the time of turnover. A new electronic copy of this documentation is to be sent to facilities electronically in order to include them in the project documentation.
5. As built documentation submitted to the facilities shall be of a PDF form that will be tabbed and/or bookmarked and labeled in a manner which allows ease of documentation navigation.
6. All IP addresses used in projects should be from the college's private network provided by facilities.
7. A copy of all as built documentation shall be left in all main panel controller locations in a plastic sleeve located on the inside of the door.
8. All specific documentation that shall be required for any structured pricing process, as applicable.
9. Provide riser diagrams for all controller and BAS major equipment designating locations on a set of as built plans.
10. All building automations system submittals and as built documentation should include a quality sequence of operations section for each piece of equipment to be controlled.
11. All graphics associated type files used to create graphics or floor plans on the BAS graphics package shall be surrendered in electronic format to facilities in order to update graphics in the future.
12. All submittals and as built packages shall include full riser diagrams for power and communication with locations labeled for all controllers, transformers, and other relevant control components on a as built set of plans.
13. The total volume of the liquid in the hot water heating system and chilled water system and the amount of glycol that was added to each system will be documented on the as-built drawing set.

14. The Hot water heating system total system volume amount and the amount of glycol that was added to the system during startup will be documented (metal plate) at the heating system pump station.
15. Chilled water total system volume amount and the amount of glycol added to the system during startup will be documented (metal plate) at the chilled water pump station.

Required Trending

1. All projects must contain trended points that include but are not limited to the following:
2. All associated temperatures and their set point
3. All associated valve and damper positions/signals
4. All CFM and flow values and set points
5. All digital proofs for pumps and fans
6. All vfd signals
7. All pressurization values and set points

Documentation required for projects

1. All bids given to the college for any projects shall contain specified controllers to be used for each application.
2. All point names and controller name lists will be provided in a CSV type file that can be edited by EOG. They must be sent to EOG as early as possible. This process should take place after a vendor has been chosen to do the job and the job has been designed to the point that the database can be built. All names must be approved by EOG through email before they can be implemented.
3. Each controls installation shall include a set of as built documents that are sent electronically to EOG. As-builts are to be surrendered to the EOG group and the appropriate Facilities group at the time of turnover, including digital media copies, one for each group. These documents must contain all applicable schematics, system architecture, valve schedules, product specification sheets, and sequences for how the controls are operating when the project has reached completion. The documents will be linked by EOG via a College shared drive for all College system users to utilize on a link in the graphics for the project. All appropriate graphics shall contain inactive specialty links created by the vendor before turnover for the previously explained purpose. The specialty links shall be included on the lowest graphics table of contents page that is applicable to the entire document to be linked.
4. As-built documentation must be updated within the one year warranty period with any changes that were made to the project as completed at the time of turnover. A new electronic copy of this documentation is to be sent to the project manager, the architect of record, and the Energy Operations Group electronically in order to include them in the project documentation and link them up to the appropriate graphics.
5. As-built documentation submitted to the Energy Operations Group shall be of a PDF form that will be tabbed and/or bookmarked and labeled in a manner which allows ease of documentation navigation. .
6. All IP addresses used in projects should be from the UF&S private network and should be submitted to EOG via email during the project.

7. A copy of all as built documentation shall be left in all main panel controller locations in a plastic sleeve located on the inside of the door.
8. All specific documentation that shall be required for any structured pricing process, as applicable.
9. Provide riser diagrams for all controller and BAS major equipment designating locations on a set of as built plans
10. All building automations system submittals and as built documentation should include a quality sequence of operations section for each piece of equipment to be controlled.
11. All graphics associated AutoCad type files used to create graphics or floor plans on the BAS graphics package shall be surrendered in electronic format to the Energy Operations Group in order to update graphics in the future.
12. All submittals and as built packages shall include full riser diagrams for power and communication with locations labeled for all controllers, transformers, and other relevant control components on a as built set of plans

Division 16 (Electrical)

General Electrical Guidelines:

1. Always exceed the code minimum required wall outlets (power).
2. Offices to have power and data outlets located on each wall system.
3. Classrooms to have 50% more power outlets than what is required by code.
4. Classrooms to have data outlets located on each wall system.
5. Located at the front of each classroom (under the smart board) are to be a 4 gang boxes and a data outlet.
6. LED lighting systems are required with dimmable controls and connected to a lighting control system.
7. At the beam located in the mechanical doghouse directly above the roof hatch, provide power for a future owner provided hoist.
8. Electric meters will be capable of being attached to the BAS.
9. Interior and exterior lighting, as well as occupancy sensors to be tied into the BAS system.

Provide color coding for all boxes and identification on the cover.

1. 120 volts – white
2. 277 volts – orange
3. 480 volts – yellow
4. Fire – red
5. Control wiring – fluorescent green

Identification on cover plate of boxes:

1. Voltage, panel number and breaker number

16071 Rooftop Conduit Supports

Refer to section 15060 for acceptable conduit supports.

16140 Data Wiring.....**SEE IT STANDARDS**

1. Offices: Allow for two data ports on at least three walls.
2. Classrooms: Allow for one data port, mounted at 45" AFF, at entry door for phone system.
3. Smart Classrooms: Allow for data ports at the front of the room for the smart cart as well as two additional data ports for additional equipment.
4. Cable that is used for fax machines, analog phones... is to be white cat 5e plenum rated with white jacks. All other cabling to be blue cat 6 plenum rated with blue jacks.

16225 Motors and Variable Speed Drives

1. In general, all motors greater than $\frac{3}{4}$ horsepower and larger shall be 3-phase. Get Owner's approval if otherwise.
2. In general, all motors less than $\frac{3}{4}$ horsepower shall be ECM.
3. Fractional motors used for walk in coolers, unit heaters, fan coil units, etc. shall be high efficiency DC types or ECM, provided by the fan or cooler coil manufacturer.
4. The VFDs shall have the necessary communication module to directly communicate with the building DDC system without any additional integration device via BACnet MSTP.
5. All drives shall automatically restart once the fault condition has been corrected. All safety features (fire alarm integration, over pressurization, low or high temp, etc.) shall work in either hand or auto position.
6. Motor(s) on a variable speed drive will not be allowed to exceed 60 hertz.
7. All motors for frequency drive applications shall be inverter duty rated and the motors will have a rotor grounding system (without mercury) and meet the IEEE 841 and be rated for frequency drive use

16500 Lighting

See design standards

1. Do not over illuminate spaces.
2. Provide either dimmers or banking of the lighting systems at all classroom and office spaces.
3. Occupancy sensors to be installed at all classrooms, offices, restrooms.
4. Occupancy sensors at restrooms to be extended time sensors.
5. The classrooms occupancy sensor will be wired to the building automation system and the building automation system will control the lights based on direct digital control.
6. The preferred method of controlling the building interior and exterior lights are controlled by the building automation system and the building automation system devices. Lighting controllers are not preferred unless approved by CMC. Lighting controllers must have BACnet protocol and integrated with the building automation system.
7. Mechanical time clocks are not allowed.