



**UAF FACILITIES SERVICES
DESIGN STANDARDS**

MAY 2026

**UNIVERSITY OF ALASKA FAIRBANKS
FACILITIES SERVICES DESIGN STANDARDS**

UAF/FS Division of Design and Construction
May 2026

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I INTRODUCTION

A. OBJECTIVE

The University of Alaska Fairbanks (UAF) Facilities Services is responsible for being good stewards of public funds and ensuring they are invested efficiently in support of the university's mission. Construction projects should deliver facilities that fully support the university's academic, research, and community service missions, in a timely manner, with a long-term focus on high quality, maintainability, low operating costs, and sustainability. It is essential that all construction projects adhere to the three key principles: on time, on budget, and aligned with these well-established design standards.

The purpose of the UAF Facilities Services Design Standards is to specify those requirements, features, and functions that are unique or especially important to UAF. They aim to communicate these priorities to the design teams preparing documents and specifications for new or modernized UAF facilities. These standards do not reiterate building codes or industry standards that govern the general aspects of design and construction. Instead, they encourage the design team to apply best industry practices and creativity to deliver a facility that meets the university's needs while optimizing for lifecycle costs. The standards are designed to allow flexibility in different conditions and to foster creativity among designers in fulfilling the intent of the standards.

B. ORGANIZATION AND CONTENT

The Design Standards are organized by construction disciplines, according to the industry-standard CSI (Construction Specifications Institute) Master Format Divisions 2 through 33.

DIVISION 2	EXISTING CONDITIONS
DIVISION 3	CONCRETE
DIVISION 4	MASONRY
DIVISION 5	METALS
DIVISION 6	WOOD, PLASTICS AND COMPOSITES
DIVISION 7	THERMAL AND MOISTURE PROTECTION
DIVISION 8	OPENINGS
DIVISION 9	FINISHES
DIVISION 10	SPECIALTIES
DIVISION 11	EQUIPMENT
DIVISION 12	FURNISHINGS
DIVISION 13	SPECIAL CONSTRUCTION
DIVISION 14	CONVEYING EQUIPMENT
DIVISION 21	FIRE SUPPRESSION
DIVISION 22	PLUMBING
DIVISION 23	HEATING, VENTILATION, AND AIR-CONDITIONING (HVAC)

DIVISION 25	INTEGRATED AUTOMATION
DIVISION 26	ELECTRICAL
DIVISION 27	COMMUNICATIONS
DIVISION 28	ELECTRONIC SAFETY AND SECURITY
DIVISION 31	EARTH WORK
DIVISION 32	EXTERIOR IMPROVEMENTS
DIVISION 33	UTILITIES

OTHER DESIGN STANDARDS AND GUIDELINES

This chapter includes other guidelines and standards that define planning issues, and or specific technical issues requiring more detailed specification or illustration.

APPENDIX A	Classroom Design Elements
APPENDIX B	Utility Cost
APPENDIX C	(not used)
APPENDIX D	Division 1
APPENDIX E	Approved “Brand Name Only” List

C. USE OF THIS MANUAL

This document is intended to provide general direction and guidance and is not intended to replace architectural and engineering expertise or knowledge; and is not intended to replace fully developed specifications to be prepared by UAF design consultants. Use of these Design Standards does not absolve the design consultants from any professional responsibility.

The Design Standards use concise declarative statements, inferring that all items are mandatory unless prohibited by project-specific constraints. Exceptions must be discussed and approved by the UAF FS/DDC Project Manager. At the same time, UAF encourages the design team to constantly challenge standards and requirements in the spirit of continuing value engineering and improved methods. For such changes and exceptions, follow the change proposal and approval procedures.

Where a standard requires the consultant to gain approval from “UAF Facilities Services” for alternate methods or products, a written approval must come from the UAF FS/DDC Project Manager. It is the project manager’s responsibility to collaborate internally with other Facilities Services divisions and personnel and forward the approval or disapproval back to the consultant.

Many of UAF’s standards follow local agency and code requirements. The term “AHJ” refers to the “authority having jurisdiction” and is used throughout these standards.

D. UPDATES

UAF will periodically review this manual and issue appropriate revisions. The Table of Contents lists standards sections, tables, references, and related publications. The online Table of Contents

will always indicate the revision status and date for all sections. The revision number and the date of revision are included on each page or sheet for control. Readers of these standards are invited to recommend modifications and enhancements to UAF Facilities Services to the appropriate staff. A form may be provided for proposing improvements and corrections.

II.1 CODES AND STANDARDS

GOAL: It is the goal of this design standard to set forth the criteria for codes, regulations, and standards to be used in all projects.

Deferral for Full Code Enforcement: The University of Alaska Fairbanks has obtained deferral for full building code enforcement from the State of Alaska and is its own Building Official and Authority having Jurisdiction (AHJ). The deferral only applies to the building codes, specifically the current adopted International Building Code and Fire Code, and only to the following campus sites: Troth Yeddha', Koyukuk, Bristol Bay, Northwest, Kuskokwim, and Chukchi. The State of Alaska maintains the AHJ for plumbing and electrical installations.

CODES: The latest edition of the following codes and standards as adopted and modified by the Alaska Administrative Code or by Alaska State Statute, shall be adhered to as a minimum. Where applicable, more stringent requirements are stated in the Specification Standards.

- All applicable Federal, State, and Local Codes
- ICC International Building Code
- ICC Existing Buildings Code
- ICC International Fire Code
- National Electric Code, NFPA 70
- Uniform Plumbing Code
- International Mechanical Code
- NFPA 13 for Installation of Fire Sprinklers
- NFPA 72 for National Fire Alarm Code
- OSHA Regulations, Specifically OSHA 29 CFR 1910

STANDARDS: Publications from the following industries, institutes, and associations shall be used as minimum standards where applicable:

- American Assoc. of State Highway and Transportation Officials (AASHTO)
- American Concrete Institute (ACI)
- American Iron and Steel Institute
- American Institute for Steel Construction (AISC)
- American National Standards Institute (ANSI)
- American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE)
- American Society for Testing and Materials (ASTM)
- American Society of Mechanical Engineers (ASME)

American Welding Society (AWS)
American Water Works Association (AWWA)
APA- The Engineered Wood Association
Factory Mutual (FM)
FM Global (FMG) Loss Prevention Data Sheets
National Fire Protection Association (NFPA)
National Institute of Standards and Technology (NIST)
National Institute of Health (NIH)
International Electric Testing Association (IETA)
Occupational Safety and Health Administration (OSHA)
Portland Cement Association
National Board of Fire Underwriters
National Electric Manufacturers Association (NEMA)
NSF International
Underwriters Laboratory Standards for Safety (UL)
Western Wood Products Association (WWPA)
National Electrical Installation Standards (NEIS)
Air Moving and Conditioning Association (AMCA)
Foundation for Cross Connection Control and Hydraulic Research
(FCCCHR)
American Conference of Governmental Industrial Hygienist
(ACGIH)
National Institutes of Health Design Guidelines (NIH)
ICC/ANSI 117.1 Accessible and Usable Buildings and Facilities

II.2 ENERGY CONSERVATION

Where practical, all new facilities are to be designed to meet or exceed the basic requirements of the International Energy Conservation Code for residential buildings and ANSI/ASHRAE Standard 90.1. For each project, consider sustainable design and materials for the expected life of the building.

Sustainable design shall address issues in all areas of the facility, but particularly site, water, energy, interior environment, waste, and construction materials. As a minimum, the Consultant shall evaluate the following elements of the project.

1. Site coordination, orientation, and positioning.
2. Quantity and type of exterior fenestration and glazing, including view sheds, percent of glazing, and glazing thermal and solar performance.
3. Optimization of the thermal characteristics of the building, including a high level of detail on vapor barriers, and insulation types and thicknesses.
4. Occupancy and HVAC operating conditions.
5. Illumination levels and controls; type of lighting, and daylight harvesting.
6. Energy-consuming equipment, including those with process cooling and heating loads.
7. Electrical equipment systems.
8. Direct Digitally Controlled HVAC systems.
9. Sustainable materials or materials with low environmental impact.
10. Potable and Non-Potable water usage, waste treatment, and stormwater.
11. Metering and sub-metering of power, water, and heat.
12. Availability of local or recycled content materials and durable materials

At the beginning of a new building construction project, or major renovation of an existing building, FS/DDC and the consultant shall establish an energy budget that shall act as the guiding principle behind the sustainable design and selection of means, methods, and materials. The energy budget shall be set and agreed upon with the project's User Committee, FS Utilities, and the University Administration before proceeding beyond the schematic design stage of the project. On the Troth Yeddha' Campus in Fairbanks, the cost of thermal energy is relatively low, and the cost of electrical power is high. At Community Campus locations, the cost of all energy is very high. This will be considered when setting budgets for heat and power usage.

The Consultant is advised that UAF operates its own cogeneration facility, and the actual cost of utilities (steam, electricity, water, and sewer) shall be utilized in life cycle analyses. Current utility costs are set by Facilities Services, and may be obtained from the FS/DDC project manager during design.

In general, all new or majorly renovated commercial construction on the Fairbanks campus shall best ANSI/ASHRAE 90.1 energy targets by at least the following amounts:

Table 1.1

Example Building/Occupancy Type	Exceed ASHRAE 90.1 by
BSL-3 Lab, Animal Care Facility	5%
General Academic Labs and Research Labs up to BSL-2, Museum, Arenas	15%
General Academic Space, Fire Stations, Student Unions, Dining, Residential Dormitories	20%*
General Administrative Buildings	30%*
Non-dormitory style residential	Governed by the International Energy Conservation Code or the Advanced Energy Design Guide for Highway Lodging.
Rural Facilities	30% minimum*

(*UAF will allow the use of the Small Building Guides by ASHRAE for some facilities, see below.)

Using the established energy codes/standards, the consultant will provide life-cycle analysis and an energy model for the facility multiple times between concept design and final construction documents. The model and analysis shall be used as a tool for the University to make best value determinations on all types of systems in the building such as the exterior envelope, heating systems, lighting, and other elements noted above. It is imperative the model be updated on a regular basis and clearly show the cause and effect of each decision related to sustainable and energy-conscious design. In general, the University wants the shortest payback time that can be achieved within budget and without affecting other programmatic needs of the project. In general, the payback time should be shorter than 10 years.

For small facilities under 10,000 gross square feet and for most remote campus facilities, a full energy model is not required as long as the design incorporates the Advanced Energy Design Guide for Small Office Buildings developed by ASHRAE. The guide provides prescriptive energy design that is generally accepted as 30% better than ASHRAE 90.1. If a remote campus facility will exceed 10,000 square feet or does not fit into the intent of the design guide, an energy model may be required in accordance with the values listed in Table 1.1.

Most campuses of the University of Alaska Fairbanks have electrical outlets in parking lots for head bolt heaters (HBO's) and extensive exterior lighting for roads, sidewalks, building entrances, and parking lots. All designs for outlets and exterior lighting must account for extended operating parameters during the winter months (Reference Design Standard Division 26). A baseline budget of 2.5 watts per square foot should be established for all HBO's in parking lots. For exterior illumination in parking lots and pedestrian walkways, the baseline energy budget is .05 watts per square foot and may be adjusted up to provide adequate levels of safe lighting. Roadway illumination shall be of the minimum levels that meet current state

and federal safety and design regulations.

In addition to the modeling, the University may request the consultant to prepare a report outlining the steps being taken to adhere to sustainable building practices such as the Energy Star Program, the US Green Building Council LEED's point system, or Laboratories for 21st Century (Labs21) Guidelines. Each project shall strive to not only conserve energy and reduce heating and cooling cost but also must utilize means, methods, and materials that address the sustainability initiatives of the University. At a minimum, the project shall address in a report the following items:

1. Community Connectivity
2. Alternative Transportation and Access
3. Stormwater Design
4. Water Efficiency Measures
5. Optimal Energy Performance
6. Commissioning
7. Material Resources, Building Reuse, Recycling of Demolition and Construction Debris
8. Indoor Air Quality
9. Daylighting and Views
10. Acoustical Performance
11. Prevention of long term health effects such as allergens, mold, etc.

II.3 Site Assessment and Planning

Site Planning

At the beginning of a new building construction project, or major renovation of an existing building, FS/DDC and the Consultant shall establish parameters and a data set of information related to the site or building planned for construction. Beyond a review of archived records, testing and analysis in the areas below should be completed and placed into the initial concept or schematic design narrative.

- A. Site Survey establishing horizontal and vertical control, property boundaries, and general site features. The site survey may require a title search; UA Land Management will assist.
- B. Land Use: Determine if the land use is consistent and permitted for the proposed improvements. Review the campus master plans for concurrence with land use. If not on the Troth Yeddha' campus, discuss land use parameters with UA Lands and local government agencies in charge of land use approval.
- C. Geotechnical Report: Baseline soil borings, samples, review of historical data sufficient to provide a geotechnical report and recommendation for foundations.
- D. Parking, Traffic, and Circulation: Review access into and out of the site, pedestrian movements, deliveries, and determine parking availability.
- E. Phase 1 Environmental Assessment (see below)
- F. Historical and Cultural Resources: Determine if the site is significant to the history and cultural use of the area, registered as a historical landmark/building, and if the project will need to prepare an archeological survey of the site.
- G. Demolition and Relocation Plan
- H. Utility types, locations, sizes, and capacity near the building should be mapped and an initial concept to provide utility to the building. Within the main core of the Troth Yeddha' Campus, discuss with FS Utilities and FS Maintenance. Outside this area, FS DDC will connect with the local utility for these discussions.

Environmental Assessment

Considering funding, project type, location, and proposed use, the Consultant may be required to prepare an Environmental Site Assessment (ESA). The ASTM E1527 standard is suggested as the framework for the All Appropriate Inquiry, aligning well with the potential submission of the ESA with a future NEPA process.

UAF has many unique challenges and situations regarding land use and building renovations. As such, a collection of reasonably ascertainable information exists within the FS DDC archive. The list below is meant as a starting point for the inquiry portion of the ESA and UAF will endeavor to have this information readily available ahead of the Consultant engagement.

- A review of our archives and records pertaining to possible hazardous materials and

contamination. UAF has an extensive record of asbestos, oil spills, and other hazardous material issues across the campuses. UAF also have access to public records related to environmental conditions, such as SuperFund sites/RCRA, sites with known environmental disasters, and the Alaska DEC catalog of contaminated sites.

- A review, with specific users, of any environmental conditions. This can include staff from EHSRM, Land Management, Utilities, and the research units.
- A review of historical drawings, users, space assignments, road construction using our archive of maps, building projects, and GIS information.
- A review of wetlands, sensitive environmental sites, endangered species, and sites with historical significance.
- A review of the project and the environmental risk (business risk) and risk to users
- A site visit to determine if there are visible signs of environmental concerns based on past utilization. This includes interior and exterior areas.

After reviewing the available information, the Consultant shall advise on additional testing, such as soil borings. Every effort will be made to consolidate testing, such as soil borings, to multiple purposes and benefits.

Building Number and Address

If it is well established that a new building will be built within two years of the initial site planning, apply for and obtain a Facility Inventory Building Number and a street address. The building number is obtained by the FS CADD Department through a form on the UA Strategy, Planning, and Budget Office website. The street address is obtained from the Fairbanks North Star Borough.

II.4 UAF Design Intent

General guidelines for new construction, additions, and major renovations. The guidance can be applied to any project, however.

Work in progress.

Civil

1. Site Layout
2. Site Considerations

Architectural:

1. Building Layout
2. Exterior envelope
3. Program of Spaces and Allocations

Structural

1. Frame type
2. Gridline layout considerations

Plumbing

1. Sustainable and Maintenance-friendly design
2. General layout of systems

Heating and Ventilation

1. Heating system typology
2. Program-driven ventilation typology

Life Safety

1. System considerations based on geographic location, utility, and program

Power and Lighting

1. Balanced approach to power distribution, considering program needs and potential future changes.
2. Lighting that aligns with use and utilization

Communications/Data

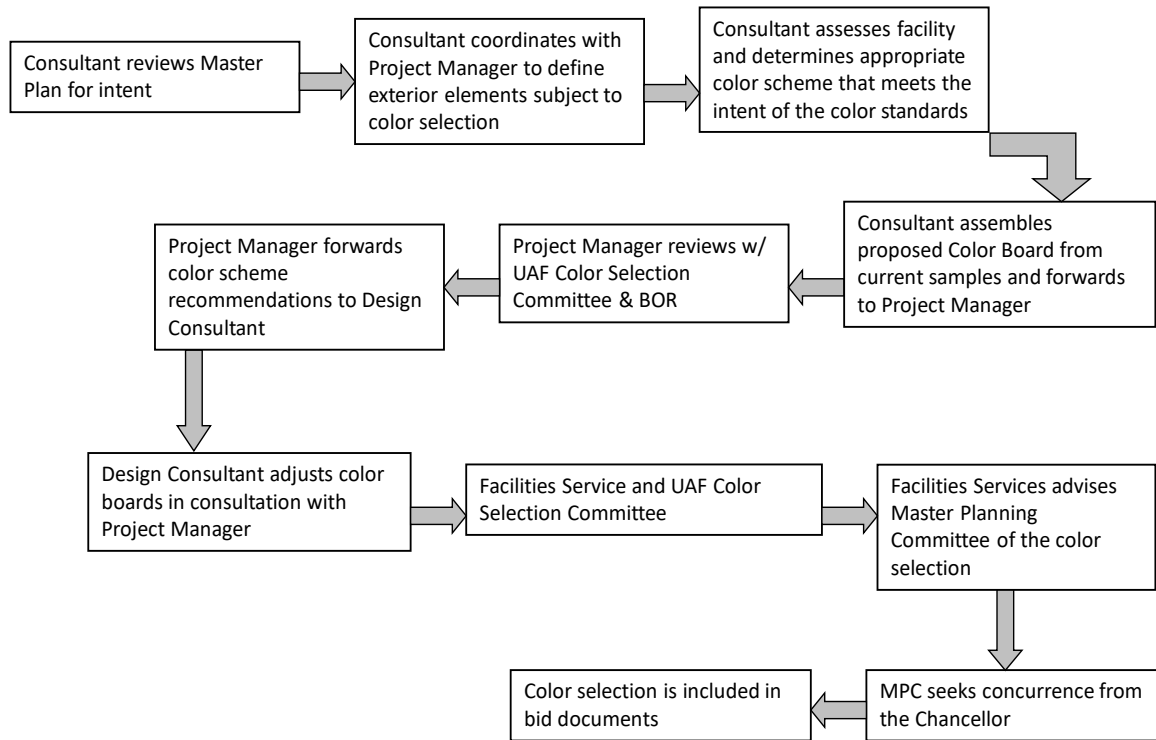
1. Forward-looking tech infrastructure

Utility Systems

II.5 COLOR SELECTION PROCESS – EXTERIOR

1. Before Schematic Design, Consultant reviews UAF Master Plan Design Guidelines and UAF Color Standards for intent.
2. Consultant coordinates with FS/DDC Project Manager to define exterior elements subject to color selection.
3. Consultant assesses facility and its surroundings and determines appropriate color scheme, material, and textures that meet the intent of the color standards and UAF Master Plan. Uniformity and concurrence within the local area while maintaining some distinctive qualities is encouraged.
4. Consultant assimilates this information for review and approval by the Associate Vice Chancellor for Facilities Services and the FS/DDC Project Manager. FS/DDC Project Manager obtains all necessary samples from the Consultant in sufficient size and quantity for use by UAF Color Selection Committee. All samples to be current, available within the project schedule and within budget constraints. Design Consultant is expected to verify the same prior to submitting samples to UAF.
5. FS/DDC Project Manager forms and chairs UAF Color Selection Committee, including the Consultant, a representative(s) from facility User group (Dean or Director, or designee), a student representative, the UAF Architect, and a representative of the Master Planning Committee (chair)
6. Color selection committee finalizes recommendations on color scheme.
7. FS/DDC Project Manager forwards color scheme to Design Consultant.
8. Design Consultant prepares color board(s), based on the color scheme, in consultation with FS/DDC Director and Project Manager. For new facilities and major exterior renewal, exterior colors will be reviewed with the Board of Regents Facilities and Land Management Committee prior to finalizing.
9. Facilities Services and the color selection committee approve the color board.
10. AVCFS advises the Master Planning Committee of the color selection, as appropriate.
11. The Master Planning Committee seeks concurrence of Chancellor.
12. Color selection is made public.

II.5a Exterior Color Selection Process



II.5b EXTERIOR BUILDING COLORS

Note: All colors from “Pittsburgh Paints” current color selections unless noted. Where color is not available in current PP selections, an approved substitute has been listed from the PP selections available or if the color is for an exterior finish material with integral color or finish applied, such as EIFS, concrete panels, insulated metal panel, or metal fascias, the color indicated is to be matched as closely as possible using computer color matching techniques with appropriate documentation.

Principal Color: Neutral beige, whites, grays, and tans. Metallic finishes are allowed.

Common EIFS Color on campus is “Buckskin”

Trim Colors: “Ancient Copper”, “Crater Lake”, “Eiffel Tower”, “Sharkskin”, “Rise-N-Shine”, “Candy Corn”, “Bedford Blue”

Roof Fascia: “Coffee Kiss”, “Sharkskin”, “Phoenix Fossil”

II.6 COLOR SELECTION PROCESS – INTERIOR

1. During the Design Development phase and before the Construction Documents phase, the FS/DDC Project Manager collaborates with the Design Consultant to define interior elements of the project, subject to color selection. The FS/DDC Project Manager provides the Design Consultant with the Color Selection Checklist document for completion and return. Coordinate color selections with the requirements outlined in the UAF Design Standard Division 9 Finishes. UAF branding guidelines, available on the UAF website, and Facilities Services color guidelines serve as resources for color selection. The use of colors outside the current approved range is not permitted unless otherwise noted and approved by the Associate Vice Chancellor for Facilities Services or required by the regulatory agency.
2. Consultant reviews the Color Selection Checklist document completed by the Design Consultant. FS/DDC Project Manager contacts the Design Consultant and requests color samples of all items on the Consultant Completed Color Selection Checklist. **Note: All items verified by Consultant to be actual products available per project requirements, budget, and schedule.**
3. FS/DDC Project Manager forms and chairs UAF Color Selection Committee, including the FS/DDC Project Manager, the UAF Architect or Interior Designer, and two representatives from the facility User group (Dean or Director, or designee). The committee's charge during early color selection is to provide guidance on how colors should be consistent and complementary to the program and to UAF goals, vision, and branding, and ensure they are creating vibrant and modern spaces.
4. Consultant assimilates the information for review with the UAF Color Selection Committee. The FS/DDC Project Manager obtains all necessary samples from the Design Consultant in sufficient size and quantity for use by UAF Color Selection Committee—all samples to be current, available within the project schedule, and within budget constraints. Design Consultant is expected to verify the same prior to submitting samples to UAF.
5. Color Selection Committee finalizes recommendations on color scheme and submits to the Associate Vice Chancellor for Facilities Services (AVCFS) and FS/DDC Director for approval. FS/DDC Project Manager records decisions made during the meeting of the UAF Color Selection Committee.
6. FS/DDC Project Manager conveys written information on color scheme to Design Consultant for inclusion in the contract documents.
7. The Contractor submits all color samples for all required finishes at one time for color board preparation.

8. Facilities Services (Associate Vice Chancellor for Facilities Services (AVCFS) and FS/DDC Director) and the UAF Color Selection Committee approve the submitted color samples.
9. If required due to its complexity, the contractor may be required to submit large-scale mock-up samples for final approval.
10. Design Consultant updates the room finish schedule and prepares the interior color board, based on the color scheme, including exterior colors, in consultation with FS/DDC Project Manager. The color board is digitized into a PDF-compatible document for distribution to UAF and the Construction Contractor.
11. The color board is sent to the construction contractor via DCVR/RFI

Color Selection Checklist

Project Name: _____

Project No.: _____

Prepared By: _____

Date: _____

1. Pre-Selection Requirements

Before initiating color selection, ensure the following are provided to the Color Selection Committee:

1.1 Submittal Materials

- Digital folder for color selection packages.
- Pre-organized index tabs or digital sections aligned to CSI divisions.
- Two samples of each item requiring color selection (1"–2" size acceptable except larger format for exterior wall panels and interior carpet).
- All samples verified as current, accurate, and representative of the specified products.
- Clearly labeled "Brand Name Only" items with limited or no color options. The preference is not to specify a Brand Name Only material.

1.2 Coordination Information

- Complete list of all items requiring color selection, referenced to CSI divisions.
 - Identification of long-lead or schedule-critical materials.
 - Supplier and manufacturer contacts for each product (name, phone/email).
 - Confirmation of material availability within project schedule.
-

2. CSI Division Color Selection Scope

Check all divisions and sections that apply to this project. Attach supporting samples within the matching tab/section.

Division 02 – Existing Conditions / Sitework

- Paving & Surfacing
- Water/Drainage Infrastructure
- Site Improvements
- Landscaping
- Other: _____

Division 03 – Concrete

- Cast-in-Place / Precast
- Concrete Finishes / Sealers
- Accessories
- Other: _____

Division 04 – Masonry

- Unit Masonry
- Stone
- Restoration
- Other: _____

Division 05 – Metals

- Structural/Architectural Metals
- Metal Panels / Railings
- Sheet Metal
- Other: _____

Division 06 – Wood, Plastics, Composites

- Architectural Woodwork
- Finish Carpentry
- Plastic or Composite Components
- Other: _____

Division 07 – Thermal & Moisture Protection

- Roofing Systems
- Exterior Cladding
- Insulation / EIFS
- Joint Sealants
- Other: _____

Division 08 – Openings

- Metal/Wood Doors
- Hardware
- Windows / Storefront / Curtainwall
- Glazing
- Other: _____

Division 09 – Finishes

- Gypsum Board
- Acoustical Ceilings
- Flooring (Carpet, Tile, Resilient, Wood)
- Paint & Coatings
- Wall Coverings
- Other: _____

Division 10 – Specialties

- Toilet Accessories
- Lockers
- Signage
- Wall/Corners Guards
- Other: _____

Division 11 – Equipment

- AV Equipment
- Food Service
- Lab Equipment
- Security Equipment
- Other: _____

Division 12 – Furnishings

- Window Treatments
- Furniture
- Rugs/Mats
- Casework
- Other: _____

Division 13–16 (Special Construction, Conveyance, Mechanical, Electrical)

Check only if color selection applies:

- Specialized Construction Materials
- Elevator Finishes
- Mechanical Equipment Finishes
- Electrical Device Finishes
- Other: _____

3. Final Review

- All required color selections completed
- All selections documented in binder/digital package
- All long-lead or unavailable items evaluated and resolved
- Package submitted to UAF Project Manager

Reviewed By: _____ **Date:** _____

III. GENERAL GUIDELINES FOR WRITING AND EDITING SPECIFICATIONS (CSI)

FORMAT REQUIREMENTS

Prepare Specifications as recommended by the Construction Specification Institute's (CSI) Manual of Practice Master Format, including spacing, indentation, headings, and general arrangement. Provide a complete Technical Specification Index.

Specification Page Format:

1. Page Size: 8-1/2 inch x 11 inch
2. Print (Font) Style and Size: **Calibri**, Size 12 (text).
3. Margins: 1 inch left and 3/4 inch right, mirrored on the even pages if using double-sided reproduction and binding
4. Single-sided pages are required (for reproduction to two-sided pages in the bid document).
5. Each Specification Section is to start with page one on the right-hand side.
6. Footer: Division and Section numbering and paragraph numbering shall be consistent with the CSI format. The section number and page number are to be numbered at the bottom. The words "End of Section" are to appear immediately below the end of text on the last page of each section. The consultant may place only the full consultant company name in the footer, on the far-left side.
7. Header: Each specification page is to be identified by "University of Alaska Fairbanks", project title, and project number (project name and number to be furnished by UAF Facilities Services) in the upper left-hand corner. Each specification page is to be identified by Section Number and Section Title in the upper right-hand corner.
8. Tabs: Indents, bullet formatting, and tabs shall be in .5 inch increments starting on the left-hand margin.

Completed Specifications are to be provided in the form of a printed master copy (collated for two-sided reproduction) suitable for direct use by photocopy reproduction, and in electronic format compatible with Microsoft Word.

In addition to the format recommended by the CSI, the following items are set forth for emphasis:

1. Do not repeat requirements covered in the Instructions to Bidders, General Conditions, or Special Conditions in the specifications. This is to avoid conflict.
2. Avoid duplication and conflict between the various drawings and specifications sections.
3. Specify items only once, and where needed, reference to a specification rather than duplicating the same specification.
4. Unless approving an alternate brand, specifications cannot require pre-bid or bid day certifications other than those required on the bid form.

DIVISION 00 and 01

All Division 00 General Conditions are furnished by the University and cannot be altered by the Consultant. Certain Division 01 Sections are furnished by UAF Facilities Services. UAF Facilities Services is responsible for the final edit of these sections, and the Consultant is responsible to ensure that the Technical Specifications conform with, and do not conflict with, these sections. Draft Division 01 Sections, to be finalized by the FS/DDC Project Manager during the development of bid documents, shall be provided to the consultant prior to any specification development. These are furnished to the Consultant for their use in ensuring conformance within the bid documents. Other required Division 1 Sections are to be prepared by the Consultant, in consultation with the FS/DDC Project Manager.

SPECIAL INSPECTIONS

The consultant shall coordinate requirements for special inspections with the UAF FS/DDC Project Manager. Some inspection services are provided by Facilities Services, and others shall be provided by the consultant or a separate contract.

STYLES

Command Sentences

The CSI specifications use command-type sentences extensively. All directives are assumed to be addressed to the Contractor (or in the case of design guidelines, any member of the design team). In a few instances, it may be necessary to address other members of the construction team, but these are exceptions. Note that no sentence begins with the tedious "The Contractor shall..." or " Except as otherwise directed..." or "the designer shall specify that the contractor shall..."

Verbs

The key to this style of writing is to make most sentences begin with a verb. Verbs are the action words of the English language and, when used, automatically require use of the active voice rather than the passive voice. These kinds of sentences tend to be shorter, clearer and more direct.

It would be difficult indeed to misunderstand a sentence such as, "Stake and flag locations of known utilities."

Better yet, avoid complete sentence structure by using an item description followed by a colon, followed by the requirement. E.g. "Data outlets: 6 per room."

Useful Phrases

The CSI format and style lends itself well to brevity. Many of the sections consist of only phrases. Meaning can be conveyed without the need to write complete sentences. Again, this is the result of understanding that all sections are meant to be directives to the contractor, eliminating the need to repeatedly refer to him or her.

Other ways the CSI style helps is by defining several repetitious phrases up front. Examples include:

"as shown" which always means as shown on the plans, drawings, shop drawings or other graphical elements of the contract documents.

"as directed" always means as directed or ordered by the Owner, Architect or Engineer.

"as required" always means as required by some other part of the contract documents which may include reference specifications or manufacturer's recommended practice.

Where a specification requires the Contractor to coordinate, verify, receive specific direction, etc, it is not uncommon to see the phrase "...with the Engineer" or "...with the Contracting Officer." These phrases shall be replaced in specifications with the phrase "...with the Owner."

Confusing and Unnecessary Phrases

Specifications all too often contain confusing phrases easily misunderstood or simply wasteful of everyone's time. An example might be the phrase, "unless otherwise shown or directed".

After reading this phrase, the typical bidder will immediately ask him or herself what it means. Does it mean there is some detail of the plans which is different than all the other similar details? Does it mean that the architect may arbitrarily require some construction different from that shown or specified? Does the bidder have to hunt through all the documents looking for such exceptions to the general rules? If the bidder doesn't find the exception because there are no such exceptions, everyone's time is wasted with unnecessary questions.

Phrases which create doubt in the mind of the bidder/contractor can cause confusion and usually lead to higher costs or requests for change orders later. In extreme cases they can lead to lawsuits.

Prescriptive vs. Objective vs Performance

All three kinds of specifications may be used on any particular project, although objective specifications should be favored.

Prescriptive

Specifications that require not only that some work be done, but which also detail the means for accomplishing that work, are prescriptive. Such specifications are appropriate in some cases, however. For example, the specifications for pressure testing a water main are usually written this way. The water supplier, in order to be consistent on all projects, will usually provide this test procedure. The procedure will ordinarily have been developed over many years and be pretty close to a standard.

Remember, however, that even when a prescriptive specification is used, it is a good idea to avoid lengthy explanations and background information that is of no use to the contractor. You want to tell the Construction Contractor what he is to do, not why he is to do it. The latter tends to add "word weight" to the specifications without adding clarity.

Objective

Generally, it is a good idea to give the contractor as much freedom as possible in performing the work. Doing so will almost always result in lower costs, and good contractors can be very innovative in devising means and methods to get the work done. For this reason, it is a good idea to specify the results desired without dictating procedures. Most specification sections should be written this way.

Performance

Specifications that expressly assign to the construction contractor responsibility for the final design and installation of a specific element of the project may provide the construction Contractor some latitude in how a proprietary element or specialized system is built. Performance-based specifications with an element of delegated design should be limited to these specialized fields, and the FS DDC Project Manager should be consulted regarding performance-based specifications outside normal industry practices. Specifically allowed systems will include: Seismic bracing for non-structural elements, curtainwall wind, lateral, and gravity load carrying supports, certain large heating and cooling equipment, Fire Alarm, Fire Suppression, Elevators, and other vertical lift systems.

PRODUCTS

The use of unusual materials or those not readily available on the local market shall be avoided without the written approval of UAF Facilities Services. Where materials may not be well known, the name and address of either the manufacturer or local supplier(s) should be included in the Specifications. **The Consultant is to verify that all products specified are of current manufacture.** Consultants' record of time and date, and written documentation as to the availability of the product or materials specified in conformance with the project schedule may be requested by the FS/DDC Project Manager or Facilities Engineer.

Alaska Products

Where practical or required by law, Alaska Products are to be specified pursuant to Alaska Product Preference requirements in AS 36.30 and AS 36.15.

Alternate Brands / Substitutions

As stated in the standard "Notice Of Invitation For Bids", the **"University of Alaska has a procedure for accepting alternate products or systems prior to bid opening. Substitutions after award are limited."** The intent is to establish the minimum quality of materials, and to effectively control the materials used in the actual construction, so that the University's needs are met and that the materials of construction presented by the Consultant during the design process, and reviewed by UAF Facilities Services, are placed in the work. The contractual procedures for the implementation process are given in the Instructions to Bidders and General Conditions.

The term "or Equal" in the bid document specifications shall not be used. The Consultant is required (notwithstanding the requirement for specifying Alaska Products) to specify at least two (2) and preferably three (3) brand names as a standard for all materials and products specified, (exception - Case 5, Brand Name Only, see below). Products specified by reference standards, technical specifications, or by description will only be considered for special purposes and approval must be given as an exception to the Specification Standards.

CASE 1: ***Alternate Brand Request or Substitution Request not required:*** For commodities and materials, more typically of standard architectural materials, that are common and generic, and UAF Facilities Services has not developed a preference of manufacturers, then Part II of the technical specification shall state:

Acceptable Manufacturers include, but are not limited to, the following:

- A. *First Mfg identified by Consultant.*
- B. *Second...*
- C. *Third...*

- D. *Any other manufacturer meeting the requirements of the contract documents. Alternate Brand Request or Substitution Request not required."*

CASE 2: **Alternate Brand Request or Substitution Request required:** For materials, more typically of mechanical and electrical components, for UAF Facilities Services has not developed a preference of manufacturers, then the Consultant shall list at least three acceptable manufacturers in Part II of the technical specifications and shall state:

Acceptable Manufacturers are limited to the following:

- A. *First Mfg identified by Consultant.*
- B. *Second ...*
- C. *Third*
- D. *Alternate Brand Request or Substitution Request required.*

CASE 3: **No substitutions:** When preferred manufacturers are listed in the Design Standards, it is UAF Facilities Services' intent not to entertain substitutions. Therefore, the following statement should be utilized in Part II of the Specification Section:

Acceptable Manufacturers are limited to the following:

- A. *First Mfg listed in Design Standards*
- B. *Second ...*
- C. *Third*
- D. *No substitutions.*

CASE 4: **No substitutions: When one or two manufacturer(s) are listed in the Design Standards followed by the words "or equal", the Consultant is required to list one (1) and preferably two (2) additional brand names of equal products in the specification.** The manufacturer(s) listed in the Specification Standards are preferred by UAF Facilities Services, but it is not approved as Brand Name Only (see Appendix for approved list). The specification shall then state:

Acceptable Manufacturers are limited to the following:

- A. *Mfg from Design Standards*
- B. *Mfg identified by Consultant*
- C. *Mfg identified by Consultant*
- D. *No substitutions*

The use of the term "or equal" in the bid documents shall not be used for this situation.

CASE 5: ***No Alternate Brands; No Substitutions (Brand Name Only)***: The University has the authority to limit certain products to one or two brand names, without allowing Alternate Brands ("or Equal") or Substitutions. All of the approved Brand Name Only products are listed in an Appendix. When specifying these products the Consultant is to state in the Specification Section, Part II:

Acceptable Manufacturers are limited to the following:

- A. *Brand Name from Design Standards*
- B. *No Alternate Brands; No Substitutions.*

The use of the term "or equal" in the bid documents shall not be used for this situation.

END OF SECTION

IV. GENERAL GUIDELINES FOR DRAWINGS

ALL DRAWINGS

1. Comply with the most current UAF CADD Standards for all drawings.
2. Borders for all sheets shall be consistent with the Title Sheet.
3. All sheets shall be stamped, signed, and dated by the responsible professional land surveyor, engineer, or architect.
4. All Drawings shall be indexed by the following list:
 - a. Title Sheet
 - b. General Information
 - c. Civil
 - d. Landscape
 - e. Demolition/Abatement
 - f. Architectural
 - g. Lab Casework/Specialty Drawings
 - h. Structural
 - i. Mechanical, including Fire Protection
 - j. Electrical, including Fire Protection, Signal, and Security/Access
5. All sheets shall be numbered in accordance with the National CADD Standards Identification protocols to promote information location consistency. All Sheets shall be named with a short descriptive title, such as: "Exterior Wall Sections", "Mechanical Room Piping Layout", "Electrical Power Riser".
6. Within the General Drawings, all applicable building code information shall be shown, including but not limited to occupancy classification, construction type, rated walls, occupant loads, control areas, exit pathways and travel distances, shafts, and fire protection information.
7. Within the Architectural Drawing set, the door, glazing, hardware, room finish, signage and other architectural schedules shall be shown. A room finish legend shall also be provided
8. Within the Mechanical Drawing set, the equipment, HVAC, plumbing, air flow, and other mechanical schedules shall be shown.

9. Within the Electrical Drawing set, the equipment, lighting, wiring and other electrical schedules shall be shown.
10. Within the Structural Drawing set, the structural building code and structural design information for design shall be shown on the first sheet of the set.
11. Within the Civil or Survey Drawing set, the survey information and coordinate for known and planned points shall be shown on their respective sheets.
12. Sheet notes shall be shown on their respective drawing or on the next drawing sheet. Sheet notes may not be duplicated in the specifications.
13. Legends shall be provided for all disciplines describing the drawn elements and symbols.
14. Room numbers and door numbers shall be reviewed and approved by UAF/FS/DDC (Project Manager and Drafter) prior to proceeding past Schematic Design.

TITLE SHEETS

All Project title sheets should have the following:

1. **Title of Project:** University of Alaska Fairbanks
Building Name and Number (i.e. Murie FS982)
Name of Project
Project Number; Project Acronym
UAF Approved Logo (optional)
2. **Administered By UAF/FS Division of Design and Construction**
3. **UAF Project Manager , Name, Title, email, address, and phone of legible size**
4. **Consultant's Name, Name, Title, email, address, and phone of legible size.**
5. **List of All Consultants on Project (sub-consultants ie. Architects, Engineers, etc.)**
6. **Seals of various Consultants and Sub-Consultants**
7. **Vicinity Map with leader and arrow to project location.**
8. **Number: T1, with date (day/month/year), and revision number. There may be more than 1 page.**

9. **Abbreviated List of Alternates (if applicable)**
10. **List and Designation for Addenda Items (if applicable)**
11. **Key Plan of Building reduced in scale for code analysis**
12. **Code Analysis – Follow the guidelines established in the National CAD Standard (if to large** for the title sheet, provide information on the General Information sheets)
 - List year and code – IBC (organize the following by IBC Chapter Number)
 - Building Occupancy: (actual) (code category) (division)
 - Types of Construction: (code) (actual) (description)
 - Stories: (code) (actual) (description)
 - Allowable Area, including setback factors and allowances, used to determine the allowable area
 - Actual Area
 - Seismic Design Category
 - Fire Protection
 - ADA Compliant
 - Fire Ratings of walls, floors, shafts, stairs
 - Control Areas with Table of Allowable Quantities of Hazardous Materials
 - Travel Distances
 - Project Authority Having Jurisdiction
 - Applicable Laboratory Design Information including information on Fume Hoods
 - Applicable Plumbing Information, including fixture count
 - Applicable Mechanical Information, including a table of code-required ventilation rates
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PART 1 - GENERAL

- 1.01 Consult with UAF DDC and UAF Environmental Health, Safety, and Risk Management (EHSRM) to develop a list of potential hazards and their mitigations for all projects. For large site development projects, follow a standard ASTM 1527 Site Review Questionnaire as a guideline.
- 1.02 Certain known hazardous materials such as those listed below may require UAF EHSRM to dispose of them because UAF is considered the generator of the material. The list includes, but is not limited to:
- A. Aerosol cans
 - B. Lab chemicals, paints, oils, etc.
 - C. Batteries
 - D. Self-illuminating exit signs containing radioactive isotopes
 - E. Certain smoke detectors containing radioactive isotopes
 - F. Fluorescent light bulbs
 - G. Contaminated soils
 - H. Incinerators and their associated exhaust stacks
 - I. Fuel tanks and supply lines.

Hazardous materials brought onto site used in the course of the demolition by the contractor, such as aerosol spray paint cans and batteries, belongs to the contractor and is not owned by UAF. The contractor should count those wastes towards their hazardous waste generator status.

- 1.03 The Contractor shall provide all necessary drums, labels and packaging materials for containment of the hazardous material. EHSRM can provide guidance to the contractor regarding the proper type of container. The contractor shall deliver the waste to the 90-day hazardous waste storage facility after coordinating with EHSRM for delivery. EHSRM will properly dispose of the materials.
- 1.04 For certain renovations such as laboratories, animal care facilities, etc., EHSRM should be consulted to test and clear/clean the labs and their associated systems of any chemical, biological, radioactive, or other potentially harmful hazards prior to construction. An example would be cleaning lab counters of ethidium-bromide or sterilization of duct work

in a public health laboratory.

- 1.05 UAF DDC retains previous soils studies from across the main and remote/rural campuses. Consult with the Project Manager for any existing soils studies.
- 1.06 Certain areas of main and remote/rural campuses have known or suspected contaminated soils. Prior to excavation, contact EHSRM for information regarding the area of soil removal. If contaminated soils are found during excavation immediately stop excavation and notify the project manager and EHSRM. EHSRM will make any and all required notification to the Alaska Department of Environmental Conservation (ADEC) and work with the project manager and contractor to develop a plan for removal and remediation.
- 1.07 Consult with UAF DDC to determine if the project will affect registered historical facilities or districts and conform with current policies and procedures of the state historic preservation office.
- 1.08 Certain fixed equipment scheduled for demolition may retain value for re-use or should be returned to the UAF Property Office in lieu of being placed with demolition debris and trash. Consult with UAF FS on items to be salvaged or sent to surplus.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- 3.01 As needed, EHSRM will provide containers to the project contractor to place hazardous materials and EHSRM will properly dispose of the materials.

END OF SECTION

PART 1 - GENERAL

- 1.01 Existing facilities built before 1990: Perform a full asbestos survey of the building or work area and include the results in the construction documents.
- 1.02 Existing facilities built after 1990 may need a survey for asbestos containing material in the gypsum wallboard.
- 1.03 Air clearance: In buildings to be occupied by the public at the completion of the abatement activities, clearance testing shall be performed according to current regulations.
- 1.04 Contractor is required to legally dispose of any hazardous material and/or hazardous waste generated by the Contractor's activities. It is the Contractor's responsibility to procure in advance the appropriate EPA ID number, if required. The Contractor will be the "generator" on all disposal activities and forms submitted. UAF will not be the generator and UAF's EPA ID number will not be used for any disposal of Contractor generated material. The following language shall be included in any project performing abatement activities.

Notification:

Contractor shall notify the AKDOL and the EPA, as required, at least ten (10) days before work begins in accordance with applicable regulation.

- a. *The Contractor shall be the generator on all forms submitted and shall procure in advance the EPA ID number as required.*
- b. *The Contractor shall mail the notification to the EPA via certified mail.*
- c. *Contractor shall provide the Owner with a copy of the EPA Notification **and** a copy of the return receipt indicating EPA's receipt of the notification.*

- 1.05 Contractor is required to provide copy of all EPA documents to the FS/DDC Project and all of the documents will be transmitted to the UAF Environmental Health, Safety, and Risk Management (EHSRM) Department. At a minimum the following items must be submitted:

Copy of Insurance.

Copies of Daily Job Logs.

Copies of Safety Meeting Logs.

Copies of Sign-In/Out Logs.

Copies of Manometer Recording Tapes.

Copies of Manometer daily readings. Identify each day of data.

Copies of Bulk Samples.

Copies of Waste Manifest

1.06 FS/DDC Project Manager will be responsible for transmitting all documents to EHSRM.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Decontamination Area: Contractor to provide for separate fire exiting per code.

3.02 At the end of a project, Contractor to provide certification that all asbestos required to be removed in the contract documents has been removed AND that no products containing asbestos were installed in the renovation work.

END OF SECTION

PART 1 - GENERAL

- 1.01 If Consultant is required to survey lead, include results in Technical Specifications.
- 1.02 The Contractor must legally dispose of any hazardous material and/or hazardous waste generated by the Contractor's activities. It is the Contractor's responsibility to procure in advance the appropriate EPA ID number, if required. The Contractor will be the "generator" of all disposal activities and forms submitted. UAF will not be the generator, and UAF's EPA ID number will not be used for any disposal of Contractor-generated material.
- 1.03 Provide a copy of all EPA documents to FS/DDC Project Manager.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- 3.01 At the end of a project, Contractor to provide certification that all lead required to be removed in the contract documents has been removed AND that no products containing lead over limits established by regulation were installed in the renovation or new work.

END OF SECTION

PART 1 - GENERAL

- 1.01 Include adequate expansion joints for anticipated temperature extremes to protect concrete from cracking and without exceeding the expansion joint spread capability.
- 1.02 FS/DDC Project Manager to determine if material testing is to be performed by the construction contractor or contracted directly by UAF. In any instance, the Consultant is to specify the minimum number of tests required and intervals between tests.
- 1.03 Reference relevant and current ACI and ASTM standards in all concrete specifications including guidelines on placement of concrete in cold weather, testing frequency/type, and placement of reinforcing steel.
- 1.04 Interior Stairs: Poured pan stair treads are preferred at UAF. Pre-cast treads may be accepted upon approval by FS/DDC with consideration to future replacement and attachment details. Utilize cast-in-place, durable, abrasive nosing installed integral with the stairs unless otherwise noted. Alternate finishes will be applied under Division 09.
- 1.05 Require inspection of reinforcing by FS/DDC before placement of concrete. These inspections are concurrent with special inspections required by the building code.
- 1.06 Require samples of special finishes for FS/DDC approval.
- 1.07 Refer to Division 32 for additional exterior concrete requirements.
- 1.08 Design all concrete with proper expansion, contraction, and construction joints. Concrete overlays on existing concrete must have a concrete bonding agent or other alternative product applied to existing concrete.
- 1.09 Install dowels at all locations where new concrete connects to existing concrete when required by ACI. Dowels placed into existing concrete will be epoxied. Drilled holes will be cleaned and dust-free.
- 1.10 Interior slabs must be designed to accommodate uniform and concentrated loads as prescribed in the building code. Some floor loading criteria may need to be specified above and beyond the code requirements (such as laboratories at 150 psf minimum loading); consult with the FS/DDC Project Manager for final floor loading criteria.
- 1.11 Form-facing materials in contact with concrete must be of wood or metal, or plastic-lined wood or metal. Design formwork, shores, re-shores, and backshores to support loads transmitted to them and to comply with applicable building code requirements. Design formwork joints to inhibit leakage of mortar.

1.12 Specify a clean-out/wash-down location in the construction documents.

PART 2 - PRODUCTS

2.01 All concrete to have a minimum compressive strength of 3,500 psi with the exception 2.02 below.

2.02 Concrete exposed to freezing temperatures and/or subject to equipment loading (i.e. snow removal) to have a minimum compressive strength of 4,000 psi and air entrainment of 4-7%. Refer to Division 32 for further requirements.

2.03 Design capacities of drilled-in anchors per ICBO reports.

PART 3 - EXECUTION

3.01 Placing concrete:

- A. Only approved additives, and water up to that specified in the design mix, may be added on-site prior to placement.
- B. Obtain approval from the engineer of record of FS/DDC before placing concrete in cold weather. Provide for protection and warming blankets as required in ACI 306.1.
- C. Use suitable means to control concrete temperatures during hydration and prevent rapid curing of newly placed concrete, in accordance with ACI 305.1
- D. Before placement, require the contractor to obtain approval from the FS/DDC Project Manager and, if required, the Special Inspector.

3.02 Finishing slabs: No water or cement added to the surface to finish the surface. Provide for a water cure after the slab is finished. A curing compound may be used only upon approval by FS/DDC. Provide hardeners and sealer as needed and appropriate for use.

- A. Interior locations: A troweled level finish is the basis for all slabs receiving finishes. Hard trowel with hardeners or sealers is required where concrete will be left exposed. Refer to Division 32 for exterior finish.
- B. Coordinate polished concrete finishing with the manufacturer of the slab sealant.
- C. Specify the contractor is responsible for providing adequate environmental conditions for curing all slabs.
- D. Specify the contractor is to protect finished concrete from damage by construction

operations.

3.02 Repairs to concrete: Acceptable means included with project specifications.

3.03 Minimum tolerances:

- A. Horizontal work - Install surface within 1/8 inch of the required elevation at any point. Uniform surface; maximum variation 1/8 inch from the bottom of a 10 foot straight edge.
- B. Vertical work – For work in finished spaces: Install structure within 1/8 inch of the specified horizontal location. Maximum thickness variation within 1/8 inch from specified thickness. Maximum variation of 1/8 inch of true plumb for any 10 foot vertical section. Uniform vertical surfaces with maximum variation within 1/8 inch from a 10 foot straight edge. For work in unfinished spaces, the tolerance can be increased to 1/4 inch.
- C. Uniform stair riser height within current building code requirements.
- D. Mechanical rooms and rooms with concrete floors and floor drains: Slope uniformly from walls to drain at a slope between 1/8 inch per foot and 1/4 inch per foot or at a grade that accommodates floor finish and equipment being installed.
- E. Slope concrete around floor drains in a 2-foot radius when drain is placed on a flat floor.

END OF SECTION

PART 1 - GENERAL .

1.01 General:

- A. Special unit masonry shapes: Pre-approval by Facilities Service required. Provide realistic manufacturer's cost and delivery estimates with design proposal.
- B. Expansion/control joints: Accommodate temperature extremes.
- C. Weeps, flashing and waterproofing: Design appropriate details and materials for project conditions to eliminate water-intrusion.
- D. Unreinforced masonry is not allowed for building construction.

PART 2 - PRODUCTS

2.01 Materials:

- A. Avoid residential grade.
- B. Source local materials when available

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 No exposed steel framing for general laboratories, shops, or other spaces that produce large amounts of dust unless approved by FS/DDC.
- 1.02 Finish exposed steel in mechanical spaces, garages, loading docks, etc., under Division 9.
- 1.03 Consider provision for additional vibration control and future loading.
- 1.04 Post the following information on main structural beams and columns: UAF Project Number, General Contractor, Grid or Column Line, and Month and Year installed.
- 1.05 Do not apply primer on structural steel where fire-proofing is to be applied.
- 1.06 Consultant to coordinate Special Inspections with FS/DDC Project Manager. In general, the Contractor will provide for special inspection work within the construction contract with oversight by the engineer-of-record.

PART 2 - PRODUCTS

- 2.01 Utilize steel shapes specified in the latest edition of the AISC Steel Construction Manual and generally available in the continental US. Utilization of special steel shapes will require the approval of the FS/DDC Project Manager.

PART 3 - EXECUTION

- 3.01 Perform required metal finishes touch-up before covering during construction. Coordinate with other work to ensure that all metal surfaces have required protective coatings.

END OF SECTION

PART 1 - GENERAL

- 1.01 Refer to Division 9 Gypsum Sheathing Systems for lightweight metal framing
- 1.02 Deflection criteria for Cold Metal Framed ceilings and walls
 - A. Receiving finishes, such as tile or bathroom accessories, will be L/360 minimum.
 - B. All other interior framed walls will be L/240.
 - C. Regardless of deflection, the minimum stud capacity will be a 33-mil, 33ksi, or 33EQS
- 1.03 Provide stud-to-stud bracing with cold-formed metal runners or fire-retardant-treated wood.
- 1.04 Follow current standards set by ICBO/ICC and the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

- 2.01 Minimum 20-gauge (0.033-inch minimum), 33-ksi minimum yield strength, 1-5/8 inch flange width metal studs for exterior non-bearing walls
- 2.02 Minimum 18-gauge (0.043-inch minimum) 33-ksi minimum yield strength, metal framing for load-bearing walls
- 2.03 Minimum 16-gauge (0.054-inch minimum) 33-ksi minimum yield strength, metal framing for floor and ceiling joists
- 2.04 Galvanized finish on cold-rolled studs.
- 2.05 Design capacities of fasteners per ICBO reports.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 For exterior stairs, UAF prefers open-tread galvanized steel with wood or steel stringers where drainage at the bottom of the stair can be achieved without creating an ice hazard. Concrete treads and risers are also allowed, especially when a canopy is also provided. The design of concrete stairs requires precise placement of nosing reinforcement. Metal tread nosings are not allowed on exterior stairs.
- 1.02 For exterior, UAF prefers steel handrails and guardrails, either stainless or galvanized but may accept heavy gauge welded aluminum in locations close to the building or not subject to damage from snow removal equipment. No painted steel handrails or guardrails for exterior applications.
- 1.02 For interior metal stairs, UAF prefers a steel stair assembly with concrete-filled pan treads and metal risers. Treads may be covered with an approved material under Division 9. Perforated risers may be allowed upon approval by the UAF FS/DDC Project Manager. Open-tread galvanized steel is acceptable for stairs in non-public areas such as utility spaces. Prime and finish all exposed metal parts with approved coating unless stainless or galvanized steel is provided. UAF prefers stainless or aluminum handrails and guardrails but may accept painted steel components in areas not subject to high traffic. Structural glass guardrails are acceptable when paired with stainless or aluminum handrails. Metal treads/nosings are allowed on interior stairs for retrofit situations. Other finishes specified in Division 09 Finishes.
- 1.03 For stairs used to access mechanical spaces or roofs, provide painted steel ladder rails and rungs for interior applications and galvanized steel for exterior applications. Designs should avoid use of ships ladders, alternating tread stairs, and ladders that require cages due to their height.
- 1.04 No spiral staircases allowed.
- 1.05 For remote sites/rural campus, consider fiberglass treads, in the same design as the metal treads, for ease of shipping.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Utilize fire-treated wood inside walls for backing cabinets, shelving, toilet accessories, and the like.

PART 2 - PRODUCTS

- 2.01 Fire-retardant treated materials:

- A. Maximum 25 % resultant wood equilibrium moisture content at 95% relative humidity and 80 degrees F.
- B. Non-bleed-through finished surfaces.
- C. Field made end cuts and drilled holes; treatment is required.
- D. Treating chemicals: Free of halogens, sulfates, ammonium sulphate, and formaldehyde.

- 2.02 Shop treatment of wood materials:

- A. Pressure treatment to UL FRS rating.
- B. Require UL-approved identification for fire-resistant treated materials and required color coding to easily identify the wood as treated.
- C. Re-dry lumber after pressure treatment to a maximum 19% moisture content.

- 2.03 Use fasteners compatible with fire-retardant material.

PART 3 - EXECUTION

- 3.01 Field cuts: End cuts for size permitted. Do not rip or plane the surfaces of fire-retardant-treated wood. Treat all exposed cut pieces with the same fire-retardant treatment material.

END OF SECTION

PART 1 - GENERAL

- 1.01 Hollow wall anchors prohibited in new construction.
- 1.02 Metal or fire treated wood required for wall blocking behind specialties for any item surface mounted on wall. Plywood behind large markerboard, TV screens, etc.
- 1.03 Require identification of lumber and plywood by official grade mark.

PART 2 - PRODUCTS

- 2.01 Softwoods: Kiln dried less than 15% moisture content.
- 2.02 Hardwoods: Kiln dried less than 7% moisture content.
- 2.03 Use preservative treatment for wood above metal roof deck and at top of roof parapets, sill plates, toe plates, and wood in contact with concrete or masonry.
- 2.04 Use only galvanized steel, ceramic coated steel, stainless steel, or aluminum hardware and fasteners approved for exterior use on any exterior wood

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 For all cabinetry and wood wall paneling, do not allow exposed particle board and cardboard cores. UAF Basis of Design is hardwood plywood (such as apple-ply) or industrial grade particle board.
- 1.02 Include fire-retardant-treatment certification data by treatment plant for treated material.
- 1.03 Review materials for wainscot, wall protection, and architectural finishes on wall to ensure compatibility with the climate at the site, space utilization, cleanability, fire rating, durability, and sustainability. Materials may include laminated plywood/particleboard, stained plywood, stone, metal, modern plastics and resin panels (phenolic, Trespa, Parklex).
- 1.04 Reference Division 12 for countertops.

PART 2 - PRODUCTS

- 2.01 In public exposed areas and all areas subject to water or high humidity, use stainless steel fastening hardware when exposed, french-cleat hardware when not exposed.
- 2.02 M3 Grade Industrial Particleboard Core Plywood is acceptable for door and drawer fronts where plywood doors may warp.
- 2.03 Cabinet boxes shall be plywood or M3 Industrial Grade particle board. Cabinet liners to be HPDL. Drawer slides and backs shall be of solid hardwood, drawer bottoms of hardwood plywood. M3 Grade Industrial Particleboard Core Plywood is acceptable for door and drawer fronts where laminated plywood doors may warp. Drawer construction shall be glued dovetails.
- 2.04 Solid hardwood or thickened PVC edge banding, at least 3mm thick, is preferred on all exposed edges and drawer and door fronts.
- 2.05 Solid wood furniture is discouraged due to the low humidity inside University facilities. Choose materials that are stable for the conditions of the facility such as apple-plywood or species such as Birch or Maple that have been conditioned inside the facility for at least one winter season.
- 2.06 Provide adjustable (European Style) self-closing hinges. and commercial grade heavy-duty full extension ball bearing type self-closing drawer slides. Drawer and door pulls to be easily cleanable and stainless steel. Review style of pull with FS/DDC Project Manager.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Summary: Surface preparation, furnishing and installation of insulation and accessories for sitework and building insulation including:
- A. Foundation wall insulation (supporting backfill).
 - B. Safing insulation.
 - C. Concealed building insulation in board form.
 - D. Building insulation in batt form.
 - E. Loose-fill building insulation.
 - F. Foamed-in-place insulation. Isolate from interior space per code requirements.
 - G. Other insulation per project requirements.
- 1.02 EIFS: Where EIFS is utilized as an exterior covering, provide protection (concrete skirting, mow strips, bollards, impact-resistant assemblies) where it may be impacted by snow removal, high pedestrian traffic, bicycles, etc.
- 1.03 The use of foam plastics requires coordination with the AHJ, local codes, and the University's insurance carrier. Where applicable, listings from acceptable agencies may be required.
- 1.04 Coordinate firestopping and fire safing with other requirements of these design standards.

PART 2 - PRODUCTS

- 2.01 Insulating materials for buried utilities, exterior below-grade walls, foundations, or subgrade insulation:
- A. Extruded polystyrene board insulation: Rigid, cellular polystyrene foam thermal insulation with closed-cells and integral high-density skin, rated for direct burial, minimum 15 psi rating.
 - B. Urethane foam: Rigid, closed cell, two-component urethane foam with a spray-on waterproofing membrane.
 - C. Expanded Polystyrene Board, 40 psi rating

- D. Polyisocyanurate Board rated for direct burial
- E. Select density and strength based on application: above specifications are minimums. Consider damp or waterproofing compatibility.

2.02 Insulating materials for interior partition walls

- A. Mineral fiber type: formaldehyde free
- B. Combustion and surface burning characteristics: Code compliant.
- C. Blanket/Batt insulation including sound batts: Unfaced fiber batts designed for installation between framing; friction held. Completely fill stud cavity.

2.03 Safing insulation and accessories:

- A. Semi-refractory fiber board safing insulation: Semi-rigid boards designed for use as a firestop in locations per code.
- B. Use caulking compound per safing insulation material manufacturer recommendation in locations required by code
- C. Use manufacturer-approved galvanized steel safing clips.
- D. System must be UL Listed when used in a rated structure.

2.04 Insulating materials for exterior above-grade walls:

- A. Extruded polystyrene board insulation: Rigid, cellular polystyrene foam thermal insulation with closed cells and integral high-density skin
- B. Urethane foam: Rigid closed-cell, two-component urethane foam
- C. Expanded Polystyrene Board
- D. Polyisocyanurate Board
- E. Mineral Fiber/Fiberglass Batts or Blankets: Glass, formaldehyde-free
- F. Bio-based (Soy) Insulation only with UAF FS/DDC pre-approval based on

application.

- G. Spray-applied foams may require a flame retardant.
- H. Rigid or semi-rigid, high-density, non-combustible rock (stone) wool insulation board, specifically in curtain wall and parapet applications.

PART 3 - EXECUTION

- 3.01 At the end of a project, Contractor to provide certification that all products installed are asbestos-free.
- 3.02 When exterior foundations require damp or waterproofing, incorporate insulation material listed in Part 2 as a minimal cover (protection) board.

END OF SECTION

PART 1 - GENERAL

- 1.01 Consultant shall consult with UAF FS to determine the best wall section and vapor retarder design for the building and/or application during concept design level. Vapor retarder must be planned to protect the insulation from moisture and provide an air-tight assembly. Placement of the retarder within the wall section shall be reviewed with UAF FS. Wall systems that place the vapor retarder outboard of the interior walls that are filled with electrical and mechanical outlets and piping is preferred. When interior spaces are humidified, the space shall be isolated from non-humidified spaces with a vapor retarder. Double vapor retarders are not allowed.
- 1.02 Provide readily constructible, complete, and **continuous** design and installation of a vapor retarder system that shall also act as an air barrier to prevent leakage of water vapor and heated interior air to the exterior. Provide vapor retarder system design and details on the Architectural sheets for each area:
- A. Doors and windows.
 - B. Outlets, switches, and other electrical penetrations.
 - C. Seismic and expansion joints.
 - D. Interface with interior partitions.
 - E. Roof penetrations.
 - F. Floor/wall interface.
 - G. Roof/wall interface.
 - H. Structural elements.
 - I. Floor slabs.
 - J. Mechanical, electrical and miscellaneous pipe or conduit penetrations.
 - K. Louvers and Ducts
 - L. Exterior Expansion Joints
 - M. Construction joints connecting to existing construction

1.03 Quality Control:

- A. Require 100 percent visual inspection by FS/DDC and possibly blower door test of complete vapor barrier system before system is concealed by interior construction, finishes.

PART 2 – PRODUCTS

2.01 Sheet materials:

- A. Polyethylene Sheeting: Minimum of clear 10 mils (minimum perm of .05) polyethylene sheeting.
- B. Self-Adhering sheet goods: Minimum perm rating of .05 such as Grace Ice and Water Shield or Henry Blueskin
- C. Sheet metal backpan: Minimum 22 gauge galvanized sheet metal backpan in curtain wall systems.
- D. All Sheet goods shall meet code for flame and smoke ratings as required for the facility.

2.02 Use pressure sensitive polyethylene tape with a perm rating equal to or better than the vapor retarder and with good adhesion rates such as DOW SARAN or 3M 8087 Construction Seaming Tape.

2.03 Use acoustical sealant that remains pliable as recommended by manufacturer: Tremco, Alternate Brand Request or Substitution request required.

2.04 Use adhesives recommended by manufacturer of the vapor retarder and compatible with substrate surfaces encountered.

PART 3 - EXECUTION

3.01 General installation, polyethylene sheeting: Per manufacturer's recommendations and:

- A. Overlap and seal wall vapor retarder minimum 2 feet or 2 studs/joists at all intersections using sealant and tape to seal the lap.
- B. Intersections-interior partitions: Extend vapor retarder continuously behind, at intersections with exterior walls and ceilings.
- C. Apply continuous bead of acoustical sealant to perimeter of substrate before applying vapor retarder.

- D. Interior slab on grade: Typically not required in soils that are dry but may be needed for soils with higher moisture content: consult with UAF FS/DDC
- E. Ensure the vapor retarder is continuous from the exterior wall onto the roof before installing the roofing.
- F. Install vapor barrier in such a way to allow for expansion and contraction and movement of the exterior wall framing.

3.02 Attachment as recommended by the manufacturer.

- A. Fasten sheeting at the top and bottom of the wall. Minimize fastening within the field of the wall. Battens may be needed to support plastic sheet goods every 8 feet.
- B. Allow for adequate expansion and contraction of the wall system.

3.03 Avoid penetrations through adequate design coordination.

- A. Utilize two layers of tape to seal nails, staples, punctures, or holes up to ½ inch in diameter.
- B. For large holes, utilize a seal-adhered membrane.
- C. In wall sections requiring structural elements to pass through the vapor retarder, apply a self-adhered membrane between the vapor retarder and the element to ensure adequate seal.

3.04 Sealing:

- A. Exterior and penetrations: Seal joints to other surfaces; use adhesive. Run sealing tape and acoustical sealant continuously along lapped materials
- B. Stud wall partitions abutting exterior wall or roof construction: Wrap vapor retarder around edges, lapping over adjacent vapor retarder minimum 2 feet each side. Provide continuous vapor retarder between interior framing and exterior walls, floor, and roof.
- C. Nails, staples, tears, and punctures: Refer to 3.03 above.
- D. Design facility to prevent electrical boxes, plumbing, etc. in the exterior walls to the greatest extent possible. In laboratory facilities, the design requires construction of a false wall inboard of the vapor retarder to route piping and

electrical.

- E. Electrical boxes, knock-outs in electrical boxes, and light fixtures: Create vapor tight condition when sealing. Careful inspection required prior to covering, repair where necessary, and re-inspect. Utilize electrical boxes that are Air-Vapor Barrier rated.
- F. For louver penetrations and other similar penetrations, utilize a sheet metal back-pan design or similar material to bridge between the vapor retarder and louver/duct, sealing and taping the vapor retarder to the metal back-pan.
- G. Completed vapor retarder envelope to be absolutely vapor and air-tight.
- H. Provide pest intrusion barriers at all exterior wall and roof vents.
- I. Repair all damage to retarder prior to inspection by Owner.

END OF SECTION

PART 1 - GENERAL

- 1.01 Summary: Manufactured roofing and siding systems inclusive of pre-formed metal roof and wall panels, soffits, miscellaneous fasteners, concealed and non-concealed, and flashing and trim for weather-tight system as appropriate.
- 1.02 Avoid snow and ice slide hazards. Metal roofs to have manufacturer approved devices to prevent snow and ice cascades from roof where injury to pedestrians or damage to property may occur.
- 1.03 Place stacks as close to ridge line as practical. Stack to extend above ridge or in accordance with requirements of the IMC (review with FS/DDC).
- 1.04 Specify high level of detail for shop drawings and require stamped engineering calculations specific to the panel and job load conditions
- 1.05 Discuss and confirm use of metal wall siding panels with FS/DDC Project Manager. Preference is to use an insulated metal panel product on main campus but other systems may be utilized based on the building's energy model. A metal wall siding panel may be used as the exterior cladding when the exterior wall is well insulated and provides for thermal breaks such as a remote wall system.
- 1.05 Warranty:
- A. Manufacturer's standard twenty-five (25) year or greater warranty that paint finish will not peel, crack, check or chip.

PART 2 - PRODUCTS

- 2.01 Materials:
- A. Exterior finish: 0.8 millimeter premium fluoropolymer resin based finish coat (PVDF) applied over a 0.2 millimeter zinc and aluminum alloy base primer to a total film thickness of 1.0 millimeter. Interior finish: 0.35 off-white top coat over a 0.15 primer.
- B. 22-24 gauge minimum on face. Insulated Metal Panels shall have minimum 24-gauge back panel. Thickness must be a minimum to prevent oil-canning and dimpling.
- C. Trim shapes, soffit/wall panels, and roofing and wall cap flashing formed from same materials with the same finish as soffit/wall panels. Parapet caps to slope in to roof area. All exposed areas finished with PVDF.

2.02 Fasteners:

- A. Concealed: Recommended by the panel system manufacturer.
- B. Exposed: With neoprene washers. Color to match flashing and soffit/wall panels.

2.03 Perforated metal vents:

- A. 24-gauge minimum
- B. Provide screens sufficient to prevent bugs and embers from entering

PART 3 - EXECUTION

- 3.01 Protection: Treat any contacting surfaces of dissimilar materials to prevent electrolytic corrosion.
- 3.02 Install a solid substrate and self-adhering membrane under all metal roof panels
- 3.03 Install wall siding panels with a thermal break between the exterior panel and the interior studs/wall finish.
- 3.04 Provide snow guards where required by local code and at minimum on any roof that may shed snow onto an entrance, walkway, or parking area.
- 3.05 Provide metal gutter system for all pitched roofs. Collect water and route to an approved storm water system. In no case shall a gutter discharge directly onto a driving surface, sidewalk, stair, or other pedestrian walkway. Provide heat trace in downspouts as directed by FS/DDC per Division 23 or 26.

END OF SECTION

PART 1 - GENERAL

- 1.01 Membrane manufacturer: minimum 20-year total system warranty, longer if offered. Coordinate warranty during design to ensure manufacturers listed provide the specified warranty, especially the wind warranty.
- 1.02 New roofs - structural deck: positive slope of $\frac{1}{4}$ inch per foot minimum, directed toward interior drainage. It is preferred that the slope be in the structural roof system where possible and should be reviewed with FS/DDC during early design. It is recognized some buildings and projects may require a flat roof support system in which case the slope will be achieved through tapered insulation.
- 1.03 Existing roofs - finished roof surface: maintain a positive slope of $\frac{1}{4}$ inch per foot, directed toward interior drainage.
- 1.04 Design will coordinate the need for fall protection with FS. In most circumstances, a new roof should provide fall-safety height-compliant parapets. For replacement or major modification of existing roof systems targeted systems such as ballasted rail, fall anchors, or other solutions can be considered based on the anticipated roof traffic and areas being accessed/serviced.
- 1.05 Provide handrails on existing low-slope roofs not meeting the 42-inch parapet rule.
- 1.06 Roofs not having serviceable equipment mounted on them need not comply with 1.04 or 1.05 (i.e. penthouse roof with no mounted equipment). An engineered fall protection system shall be provided for roofs not meeting 1.04 or 1.05, compliant with OSHA Fall Protection regulations.
- 1.07 Position roof-mounted equipment in a manner to allow for roof maintenance. Provide permanent access to the roof-mounted equipment. Mount equipment on pipe stanchions, with a vertical clearance per the current NRCA manual requirements. Mount horizontal piping a nominal 18 inches above the roof surface.
- 1.08 Provide walking mats or a surface around, to, and from access to equipment requiring maintenance when the membrane is exposed. Walkpad paths to be required in shop drawings. This is critical on EPDM and other single-ply roofs.
- 1.09 Coordinate and provide for additional future roof-mounted equipment, penetrations, and pedestals.
- 1.10 Use the current edition of the NRCA Roofing and Waterproofing Manual as a basis of design.
- 1.11 In addition to standard product data submittals, require submittal of detailed shop

drawings and warranty information certifying the materials and system adhere to the Contract documents and the current building code.

- 1.12 The preferred roofing system for new low-sloped roofs shall be a 5-ply built-up roof system. At a minimum, the basis of design shall consist of (from roof deck upward):
- A. Thermal barrier (glass-mat gypsum board, Dens-Deck or similar product selected by the consultant)
 - B. Vapor Retarder/barrier (hot mopped 2-ply asphalt sheets, bituminous membrane, or self-adhered membrane) fully adhered to wall vapor retarder.
 - C. Rigid insulation board: Follow ASHRAE 90.1 standards and building energy model for recommended insulation thickness. In new construction, insulation shall be not less than R-40 at the rain bowl, not less than R-60 average. For renovation work, provide life-cycle cost analysis for selection of roof insulation thickness considering the existing parapet height, roof drains, structure, and adjacent walls.
 - D. Cover/securement board
 - E. Roofing membrane: Basesheet, 3-ply SBS asphalt sheets, capped with a mineral cap. Exception being walking decks or plazas which are capped with a flood coat of asphalt, spread rate per manufacturer, and lined with a slip-sheet and ballasted with a pedestal and paver system.
- 1.13 If EPDM rubber is utilized in lieu of the 5-ply built-up roof membrane in renovations and special circumstances, and only upon approval of UAF FS. If EPDM is used, all seams are to be stripped-in, per the manufacturer's recommendations. At a minimum, the basis of design shall consist of (from roof deck upward):
- A. Thermal barrier: Glass-mat gypsum board, DensDeck, or similar product selected by the consultant to provide fire resistance and dimensional stability over combustible decks. Where existing substrate meets fire classification, verify compatibility with the vapor retarder manufacturer's substrate requirements.
 - B. Vapor Retarder/barrier: manufacturer-approved self-adhering rubberized asphalt membrane, which is compatible with a fully adhered roofing system.
 - C. Rigid insulation board: Follow ASHRAE 90.1 standards and building energy model for recommended insulation thickness. In new construction, insulation shall be not less than **R-40 at the drain bowl, not less than R-60 average**. For renovation work, provide a life-cycle cost analysis for the selection of roof insulation thickness considering the existing parapet height, roof drains, structure, and

adjacent walls.

- D. Cover/securement board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, thickness per membrane manufacturer.
- E. Roofing membrane: Fully adhered, minimum 60 mil, reinforced EPDM single-ply membrane. Where access to rooftop equipment is required, provide walking mats compatible with the membrane product. Where dining kitchen exhaust vents are used, provide additional protection (via a second layer of membrane or grease guard) that meets or exceeds, manufacturer's requirements for warranty.

1.14 The roof assembly must be FM Approved or similar unless otherwise approved.

PART 2 - PRODUCTS

- 2.01 Utilize "No-Smell" low-odor roofing asphalt and require an odor-free kettle.
- 2.02 Specify systems that have design, installation, and warranty service representatives in the State of Alaska.

PART 3 - EXECUTION

- 3.01 Penetrations: minimum outside-to-outside clearance of 24 inches from other penetrations, parapets, or other structures. For large curbed units, specify 48 inch minimum clearance between the exterior of a unit and the perimeters of walls, etc.
- 3.02 Ensure compatibility of all roofing products in the roof assembly.
- 3.03 Connection of vapor retarder to rain leaders, VTR's and other roof penetrations must be continuous between the two and flexible to allow for movement of the roof.
- 3.04 Require the contractor to place the asphalt kettle in a location that will limit the entrainment of the roofing odors into the occupied facilities. Require that all asphalt kettles used on the UAF campus be configured with an afterburner (i.e, a closed-manufactured fume control system).

END OF SECTION

PART 1 - GENERAL

- 1.01 Roof Access: Designs should provide roof access via in swinging doors where possible. Roof Hatches should be avoided. Confirm roof access device with the AHJ. Provide fixed roof access ladders to facilitate access to roofs without their own hatch or door.
- 1.02 Roof hatches:
- A. Insulated, corrosion-resistant finish, leak proof, and capable of supporting snow load per code.
 - B. Design covers, especially smoke hatches, to minimize snow buildup.
- 1.03 Direct overflow scupper discharge away from entryways or walkways.

PART 2 - PRODUCTS

- 2.01 Roof hatches:
- A. Provide corrosion-resistant hardware, including a hasp for locking.
 - B. Provide positive hold open device.
 - C. All roof hatches must be counter-balanced or spring-loaded.
 - D. Provide lockable "ladderup" device with all roof hatches.
 - E. Confirm requirements for security alarm with FS/DDC.
- 2.02 Rain gutters: seamless construction.
- 2.03 Snow guards are required on metal roofs.
- 2.04 Lightning Rods per Division 26
- 2.05 Discharge Scuppers: Per Division 22, Bronze finish
- 2.06 Heat Trace: Per Division 23 or 26
- 2.07 Drain Bowls: Per Division 22
- 2.08 Roof Mounted Cameras: UAF PD & OIT should be consulted whenever building or replacing a roof.

PART 3 - EXECUTION

- 3.01 Mount roof accessories on curbs high enough from the roof surface to allow maintenance and avoid flooding. Typical heights for roof curbs are 18 inches to 24 inches above roof finish.
- 3.02 Items to be coordinated amongst multiple trades: Roof drain discharge scuppers, bowls, and leaders:
- A. Heat-tracing: Do not provide heat trace on roof drain bowls inside warm ceilings unless directed by FS/DDC. Heat trace the discharge outlet of any scuppers to a point inside the interior of the building from where it is controlled. Place control of heat trace on the DDC system such that the heat trace is only on when the outside air temp is between 10 and 35 degrees Fahrenheit above zero. Provide current monitoring as a form of operational proof. Refer to Division 25, 26, and 33 for additional requirements.
 - B. Insulation: Refer to Section 22 07 00
 - C. Install scuppers at ground level, discharging away from pedestrian walkways.
 - D. Refer to Division 22 for the installation of drain bowls. Place drain bowls so as to allow heat from the building to keep them frost-free.
 - E. Provide debris guard on all roof drain bowls.

END OF SECTION

PART 1 - GENERAL

1.01 Only listed and rated firestopping systems for joints and penetration systems in fire and smoke-rated assemblies shall be specified. The consultant will ensure all systems specified are currently listed for the required assembly. The consultant will work with FS/DDC for non-typical applications in review with a rating agency, manufacturer, and AHJ.

1.02 RELATED SECTIONS *(Based on Project Work)*

- A. Section 07 00 00 Thermal and Moisture Protection
- B. Section 09 00 00 Finishes
- C. Section 14 00 00 Conveying Equipment
- D. Section 21 00 00 Fire Suppression
- E. Section 22 00 00 Plumbing
- F. Section 23 00 00 HVAC
- G. Section 26 00 00 Electrical
- H. Section 27 00 00 Communications

1.03 SUMMARY

- A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity the fire-resistance-rated construction by maintaining an effective barrier against the spread of flame, smoke, and/or hot gases through penetrations, blank openings, construction joints, or at the gap that is created at the building perimeter of the horizontal fire-resistance rated assembly and non-fire-resistance rated exterior wall and in or adjacent to either fire-resistance or non-fire-resistance rated barriers in accordance with the requirements of the building code for the project.
- B. Provide a summary of applicable codes and standards for tests, installations, and inspections.
- C. Schedule and Summary of firestopping types for the project to include at minimum, information required to select a basis of design for the listed reference system(s) such as:

1. Assembly Type, Construction, and Ratings (F, T, S, etc.)
 2. Assumed Penetrant material and size if known
 3. Firestop materials such as:
 - a. Intumescent, Endothermic, Elastomeric, and Silicone Sealants
 - b. Intumescent collars
 - c. Mineral Wool
 - d. Rated Cable Pathways
 - e. Putty Pads, Pillows, and Blocks
 - f. Mortar
 - g. Composite Sheets
 4. Special considerations such as insulation, dampers, supports, retaining angles, wrap strips, plugs, gaskets, and bands, if known.
- D. If contract documents do not clearly identify project conditions as required to select a firestopping system, a Basis of Design should be provided for each type of through penetration and/or joint assembly, compatible with the construction and ratings of the penetrated assemblies.
- a. Where multiple acceptable Manufacturers are listed, clarify that materials shall be per the alternate Manufacturers *referenced listing*, and may not be substituted with products from any other brand.

1.04 PERFORMANCE REQUIREMENTS

- A. Firestopping requirements for through penetrations and joint penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated floor, wall, and joint assemblies.
- B. Only listed and rated firestopping systems for joints and penetration systems in fire and smoke rated assemblies shall be specified. The consultant will ensure all systems specified are currently listed for the required assemblies. The consultant will work with FS/DDC for non-typical applications in review with a rating agency, manufacturer, and AHJ.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Each Installer shall be certified by the manufacturer and maintain certification for the duration of the project.
- B. Special Inspections (If special inspections are required, UAF will have someone perform inspections per ASTM 2174, and/or ASTM 2393, Non-Destructive testing methods.)
 - 1. Include requirements for Special inspections as governed by the currently adopted building code, including the standard practices for on-site inspections. Only provide standards that correspond to the types of firestop systems being used.
 - 2. Require 100 percent visual inspection by FS/DDC before covering.
- C. Mock-ups: Identify requirements for demonstrating typical installation if the project scale warrants.

1.06 SUBMITTALS

- A. Installer Qualifications: For each Installer.
- B. Product Data: for each type of firestopping product indicated.
- C. System Drawings: listed systems from a qualified third-party testing agency that apply to each firestopping system configuration for construction, opening size, and penetrating item(s).
- D. Manufacturers' Installation Instructions: for each material used.
- E. Placard and stenciling format and materials

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to the Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture, lot number, shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instructions for multi-component materials.
- B. Store and handle materials for firestopping products to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.08 PROJECT CONDITIONS

- A. Do not install firestopping products when ambient or substrate conditions are outside the limitations recommended by the manufacturer.

PART 2 – PRODUCTS

2.01 FIRESTOP SYSTEMS

- A. Provide firestop systems listed by approved testing agencies that conform to the rated construction, penetration or joint, gap, or opening size and type, in each specific condition. Systems shall be compatible with adjacent firestopping assemblies, with the substrates forming the openings, and with all penetrating items under conditions of application and service. Where dissimilar materials converge at transitions, verify compatibility with the firestopping manufacturer, third-party tested reference listing, or AHJ.
- B. Single Source: Obtain Firestop systems for each type of penetration and construction condition indicated, only from a single manufacturer.

2.02 Finishes

- A. Selected firestopping systems should be compatible with finishes chosen. Where applied to a painted surface, the preference is to have paintable firestopping systems unless otherwise concealed.
- B. *Specific/Optional requirements by division to establish the Basis of Design, to be separated by trade, and correlate with the respective division and this standard.*

2.03 Conveying Equipment

- A. *Specific/Optional requirements by division to establish the Basis of Design, to be separated by trade, and correlate with the respective division and this standard.*

2.04 FIRE SUPPRESSION

- B. *Specific/Optional requirements by division to establish the Basis of Design, to be separated by trade, and correlate with the respective division and this standard.*

2.05 PLUMBING

- A. *Specific/Optional requirements by division to establish the Basis of Design, to be separated by trade, and correlate with the respective division and this standard.*

2.06 HVAC

- A. In some instances, a UL-listed ductwork and firestopping system may be substituted for a fire damper. Obtain review and acceptance of this method from the DDC Project Manager prior to inclusion in the documents. Ensure UL listing is provided in the Contract Documents.
- B. *Specific/Optional requirements by division to establish the Basis of Design, to be separated by trade, and correlate with the respective division and this standard.*

2.07 ELECTRICAL

- A. For wiring allowed outside conduits, such as in cable tray, provide fire-rated pathways that allow for future changes, and are capable of retrofits around existing conditions, and/ or listings with fill ratings encompassing 0-100%.
- B. *Specific/Optional requirements by division to establish the Basis of Design, to be separated by trade, and correlate with the respective division and this standard.*

2.08 COMMUNICATIONS

- A. Fire-rated pathways that allow for future changes, and are capable of retrofits around existing conditions, and/ or listings with fill ratings encompassing 0-100%.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Remove equipment, materials, and debris prior to installation.
- B. General installation shall comply with each specific listed reference system and manufacturers' instructions.
- C. Immediately notify Owner if actual project conditions vary from Contract Documents. Do not proceed with installation if existing conditions do not match those described in the listed system.
- D. Do not use any materials, accessories, fillers, or components that are not specifically included in, or allowed by, the tested and listed firestop system. Field-applied materials such as insulation, backer rod, sealants, and wrap, not listed as part of the system, are prohibited unless the testing agency's documentation explicitly permits their use within the specified system. Materials and installation methods not specified in the referenced listed system are only allowed with approval from the AHJ.

- E. Coordinate so that the Owner may be present during system installations.
- F. Schedule work such that final inspections are performed before other construction activities conceal the penetration or joint.

3.02 IDENTIFICATION

- A. Firestopping and fire-resistant rated assemblies will be marked/identified following the current adopted IBC and NFPA requirements for placards and stenciling.
 - 1. In public areas with exposed ceilings, an approved placard or other indelible marking may be installed in lieu of stenciling.

END OF SECTION

PART 1 - GENERAL

- 1.01 Exterior and interior standard steel doors and frames including exterior insulated rolled steel doors and thermal break frames:
- A. Thermal breaks at all exterior frames and door glazing channels.
 - B. Minimum double pane ($U=.25\text{BTU/hr-ft}^2\text{-F}$ center of glass maximum) safety glass for exterior door glazing.
- 1.02 Fully welded frames at all conditions except where unavoidable at remodeled jambs. When using knock-down jambs, use minimum 14-gauge frame. If knock-down frames are installed provide details demonstrating solid framing for the opening.
- 1.03 Utilidor connections, mechanical rooms, and other utility rooms will use metal doors only.
- 1.04 Coordinate hardware with Division 8 and 28. Provide door operators and security as requested by FS/DDC.
- A. For new construction, all exterior door entrances to be controlled via the Division 28 Security System. Also, allow for a door operator on each door that is deemed accessible for ADA.
 - a. Supply raceways inside the frame or door for wiring.
 - B. For renovations, consult with FS/DDC on operators and security.
 - C. In general, the outside door remains unlocked and the inside door is locked in a vestibule arrangement.
- 1.05 Provide kick/armor plates on doors into labs, bathrooms, and other high traffic areas. Size to use of space being accessed. For example, labs where lots of carts are being pushed through should receive an armor plate to the height of a typical cart.
- 1.06 Obtain door numbers from the FS/DDC CAD Group
- 1.07 Coordinate with FS/DDC for door relite requirements. In general, offices and similar spaces, and classrooms will receive a narrow lite in the door and possibly a side lite or transom lite. Breakrooms, labs, and similar spaces should receive a half-lite.

PART 2 - PRODUCTS

- 2.01 Door bumpers required. Forged style wall bumpers. Provide solid backing in the walls. Floor stops should be avoided.

- 2.02 All residential entry doors require security view ports.
- 2.03 Overhead doors: Use electrically operated overhead doors with bumper sensing door bottom. Fully insulated and sealed.
- 2.04 Exterior doors: 16 gauge faces, with polystyrene core, minimum R value of 14
- 2.05 Exterior frames: 14 gauge thick material, with integral thermal break
- 2.06 Interior doors: 16 gauge cold-rolled sheet steel faces
- 2.07 Interior frames: 14 gauge thick material, one piece, welded. Knock down only where necessary at remodel condition and only after approval from FS.
- 2.08 Provisions for hardware: Mortise, reinforce, and tap doors and frames at factory for hardware. Drill for door silencers as required. Provide plaster guards at strike pockets and door silencer locations. Reinforce for magnetic door holders and door closers whether or not closers are listed in the hardware schedule.
- 2.09 Finish:
 - A. Exterior units: hot dipped galvanized with factory applied oil based primer and finish coat in the field to provide a 20-year finish.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Interior solid core flush wood or plywood-backed veneer doors and accessories. Masonite-backed veneer doors are acceptable, but not preferred.
- A. Interior use only. No exterior wood doors allowed.
 - B. No wood doors allowed on fire doors rated more than 45 minutes.
- 1.02 Coordinate hardware with Divisions 8 and 28. Provide door operators and security as requested by FS/DDC. For wood doors receiving Division 28 Security Access controls, prepare door at factory to utilize a power transfer device or electronic power transfer provided under 08 70 00.
- 1.03 Provide kick/armor plates on doors into labs, bathrooms, and other high traffic areas. Size to use of space being accessed. For example, labs where lots of carts are being pushed through should receive an armor plate to the height of a typical cart.
- 1.04 Obtain door numbers from the FS/DDC CAD Group
- 1.05. Coordinate with FS/DDC for door relite requirements. In general, offices and similar spaces, and classrooms will receive a narrow lite in the door and possibly a side lite or transom lite. Breakrooms, labs, and similar spaces should receive a half-lite.

PART 2 - PRODUCTS

- 2.01 Door bumpers required. Forged style wall bumpers preferred. Provide solid backing in the wall behind the bump. Floor stops are to be avoided.
- 2.02 Require security view ports for all residential entry doors.
- 2.03 Provide wood frames or painted metal frames on glazed door lights. For retrofits, match adjacent doors to the extent possible.
- 2.04 Require solid wood blocking on all stiles and rails and any location where hardware will be attached, for non-rated doors. Require composite blocking with improved screw-holding capability for fire rated doors. Minimum dimensions noted below.
- A. 5 inch bottom rail
 - B. 5 inch top rail
 - C. 1.75 inch side rails (or hinge blocks)
 - D. 5 inch x 10 inch lock blocks

- E. 5 inch mid-block (for doors with exit hardware)
- 2.05 Lever locksets and combination locksets: 2 ¾ inch backset, appropriate latch bolt reinforcing. No mortise locks in wood doors unless solid side rail and mid-block is provided.
- 2.06 Interior flush wood doors:
- A. Transparent finish solid core doors:
 - 1. Birch, oak, or hard maple, plain sliced faces, Semi-gloss Polyurethane finish. Book match to room or corridor.
 - 2. Minimum 5-ply veneer faces.
- 2.07 Provide metal door frames specified under 08 11 00.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 Access doors and accessories for various conditions including:

A. Locations:

1. Wall access doors.
2. Fire-rated access doors.
3. Ceiling access doors.
4. Fire-rated ceiling access doors.
5. Utilidor exterior access door
6. Trap primers, valves, and cleanouts
7. Dry Pendent Fire Sprinklers

B. Door sizes:

1. 2 feet x 2 feet minimum for equipment access in walls or above ceilings where more than a simple valve or mechanical operator access is required.
2. 1 foot x 1 foot minimum clear for isolated valves and mechanical operators located within 12 inches and directly behind access doors.
3. Exterior utilidor access: 3 feet x 3 feet minimum, 4 feet x 4 feet preferred.
4. Interior utilidor or utility access: Full-size door and jamb per Section 08 11 00

C. Utilidor connections: 2-hour fire-rated door and frame assembly as approved by AHJ between the utilidor and building

1.02 Locking Hardware: square key quarter-turn cam lock or slotted screw quarter-turn cams. No keyed locking doors unless requested by FS/DDC. Locking access doors will be listed in the door schedule.

1.03 To the extent possible, indicate access doors on drawings and indicate the minimum acceptable size for each.

1.04 Require doors to be located for the best access to equipment or space above. In walls,

center door on valve is being accessed to the extent possible.

1.05 Swing doors into pressurized shafts.

PART 2 – PRODUCTS

2.01 Hinged: stainless steel or aluminum at wet locations. Plain steel, factory primed and field finished in non-wet locations. Do not paint locking hardware.

2.02 Exterior Utilidor Access Door:

- A. Bilco Hatch access door is the basis of design; however, UAF will accept other brands that have a record of performance and service in Alaska
- B. Heavy load capacity equal to AASHTO H20
- C. Provide a standard slam lock with a security feature on the exterior to prevent general public access
- D. Provide OSHA OSHA-approved ladder from the floor of the utilidor to the access door.

2.03 Access panels for Radiant Floor heating manifolds may be per paragraph 2.01 or can be non-hinged panels that are attached with screws or quarter-turn cam locks.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Entrances and storefront systems, including metal frames, glazing, and accessories.
- A. Aluminum framing with thermal breaks at glazing channels and/or at mid-point between exterior and interior surfaces. Provide insulated frames and doors when entry/vestibule is not heated sufficiently.
 - B. Maximum U value at the center of the glass of 0.25 BTU/hr-ft²-F and whole window of 0.30 BTU/hr-ft²-F.
 - C. Design Compliance for installed systems:
 - 1. Infiltration: maximum 0.05 cfm/foot. (ASTM E283)
 - 2. No condensation on interior windows or frames at the expected interior temperature and humidity and the outside air temperature at -55 degrees F. Minimum CRF of 50. Coordinate with mechanical for ventilation near storefronts.
 - 3. Thermally broken.
 - D. Specify doors with reinforced corners and thickened hinges and lock blocks. Utilize heavy-duty butt hinges and require hinges that are recessed into the frame of the door and the jamb in accordance with manufacturer recommendations.
 - E. Wide-stile is required on all entrance door systems to allow acceptance of the electronic door hardware.
 - F. Specify doors with glass to have two panes separated by a solid rail for installation of the hardware exit device.
- 1.02 Coordinate Hardware with Division 8 and 28. Supply raceways inside the mullions or door for wiring. Provide door operators and security as requested by FS/DDC.
- A. For new construction, all entrance doors are to be controlled via the Division 28 Security System. When two or more entrance doors are present in a single entrance, one door (leaf) shall be controlled via a card key swipe (or proximity reader) and the other doors (leaves) shall simply be locked and unlocked by the system. Also, allow for a door operator for each entrance that is deemed accessible for ADA.
 - B. For renovations, consult with FS/DDC on operators and security.

- C. In general, on the Troth Yeddha' Campus, the outside door remains unlocked and the inside door is locked in a vestibule arrangement.
 - D. Ensure door is prepared for the electronic-power-transfer device: no electronic hinges allowed on storefront doors.
 - E. Ensure door is prepared for ADA operators.
- 1.03 Warranty: Manufacturer's standard (2) year warranty against overall material defects.
- A. Limited lifetime warranty on door corners
 - B. Extended warranty on finishes
 - C. When specifying products other than the basis of design, require an extended general warranty and confirm the manufacturer has a local warranty/service contractor.

PART 2 - PRODUCTS

2.01 Aluminum Storefronts

- A. Basis of Design: Kawneer 500 Heavy Wall (formerly Tuffline) Series or 560 Insulclad Series Door
 - 1. The Heavy Wall (formerly Tuffline) Series is preferred where the entryway will be sufficiently heated to prevent frost on the doors. The Insulclad Series is preferred where the entryway may not have sufficient heat or is not in a warm vestibule.
 - B. EFCO, equivalent to the Kawneer 500 Tuffline or 560 Insulclad Series Door
 - C. Old Castle, equivalent to the Kawneer 500 Tuffline or 560 Insulclad Series Door
 - D. No Substitutions
- 2.02 Finish Color: Clear anodized aluminum is the preferred common color for storefronts. Medium to dark anodized bronze is used on the east side of campus, around the Fine Arts to Signers' Hall area. Alternate colors that complement the building finish or existing doors may be allowed. Coordinate with the FS/DDC Project Manager.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Manufactured aluminum window systems (including curtain walls), inclusive of pre-fabricated anodized aluminum windows and frames, closure members, reinforcement, shims, accessories, anchorage devices, and miscellaneous fasteners, concealed and non-concealed, and flashing and trim for a weather-tight system.
- A. Aluminum windows: Heavy-duty standard units with PVDF finish. Glazing per 08 80 00.
 - B. Operable heavy-duty latch. Screens.
 - C. Stationary: One color throughout the building.
 - D. Fully thermally broken systems are required.
 - E. Design compliance:
 - 1. No condensation on the interior windows or frames at the expected interior temperature and humidity, and the outside air temperature at -55 degrees F. This may require coordination with mechanical ventilation or heating based on the selected window.
- 1.02 Quality Assurance:
- A. Manufacturer's qualifications: Minimum 5 years of manufacturing aluminum windows and frames
 - 1. Test criteria: Qualified independent agency.
 - a. Design wind velocity: Per AHJ as required in the building code or per ASCE 7 "Minimum Design Loads for Buildings and Other Structures."
 - 2. Compliance: Per AAMA reference standards for the type, grade, and performance class of window units required. Tests for:
 - a. Air-infiltration rate, operating units: Maximum 0.37 cfm/ft² (2.06 cu. m/h per m) of operable sash joint for inward test pressure of 6.24 lbf/square foot (299 Pa).
 - b. Air-infiltration rate, non-operating units: Maximum 0.025 cfm/ft² (2.74 cu. m/h per m) of area for inward test pressure of 6.24 lbf/square foot (299 Pa).

- c. Water penetration: None at inward test pressure of 20 percent of design pressure.
- d. Structural performance: No failure or permanent deflection in excess of 0.4 percent of any member's span after removing imposed load, for positive (inward) and negative (outward) test pressure of 30 lbf/square Foot (1437 Pa).
- e. Condensation resistance: "Thermally improved" units, tested for a condensation resistance factor (CRF) of 62.
- f. Thermal transmittance: Maximum whole window U-value, 0.20 Btu/hr-ft²-F at 15-mi./h exterior wind velocity per AAMA test.
- g. Forced-entry resistance: Performance level 10 per ASTM.
- h. Engineered calculation allowance for thermal movement from maximum temperature change (range) of 170 deg F, ambient.
- i. If required, certification for minimum 40 rating, Sound transmission class (STC).

1.03 Warranty:

- A. Manufacturer's standard: Ten (10) year warranty against material defects in manufacture including hardware failure of any kind: screws stripping, frames and sashes failing during normal use.
 - 1. Windows: Guaranteed to operate under any normal temperature and humidity condition for Fairbanks, Alaska.
 - 2. Insulated glass units (IGU): Guaranteed against seal failures causing clouding or condensation of any kind between glass for ten (10) years.
- B. Contractor's warranty: Warrant aluminum windows and frames and related flashing, sealants, fasteners, and accessories against defective materials and/or workmanship to remain watertight and weatherproof with normal usage for two (2) years following substantial completion date and to repair or replace without additional cost to the Owner any leaks and resulting damage to other materials and building contents as may occur.

PART 2 - PRODUCTS

- 2.01 Aluminum windows and frames: Heavy-duty anodized or PVDF painted aluminum. Frame and sash members, similar construction, designed for removable triple glazing panel. Turn/tilt (dual action), casement, awning, stationary, or other style per design for project.
- A. Aluminum frame, sash, and sill extrusions: Alloy and temper per manufacturer recommendations for strength, corrosion resistance, and application of anodized finish. Minimum 22,000-psi (150-MPa) ultimate tensile strength and 0.062 inch (1.6 mm) thick at main frame and sash members.
 - B. Removable glazing panel: Minimum triple insulating glass glazing, select quality glass; low-iron glass may be considered on larger projects. Similar construction as frame and sash.
- 2.02 Manufacturers
- A. Overguard
 - B. EFCO
 - C. Kawneer
 - D. No Alternate Brands/No Substitutions

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Manufactured plastic window systems inclusive of pre-formed plastic windows and frames, closure members, reinforcement, shims, accessories, anchorage devices and miscellaneous fasteners, concealed and non-concealed, and flashing and trim for weather-tight system.
- A. Do not use windows with nailing fins.
 - B. Design compliance:
 - 1. Infiltration: Maximum 0.03 cfm/foot.
 - 2. Maximum U value for whole window of .25 BTU/hr-ft²-F
 - 3. No condensation on the interior windows or frames at the expected interior temperature and humidity and the outside air temperature at -55 degrees F. Coordinate with mechanical for heating and ventilation based on window selected.
- 1.02 Quality assurance:
- A. Manufacturer's qualifications: Minimum of 5 years experience in manufacturing plastic windows and frames.
- 1.03 Warranty: Manufacturer's standard ten (10) year warranty against material defects in manufacture including hardware failure of any kind: screws stripping, frames and sashes failing during normal use.
- A. Windows: Guaranteed to operate under any normal temperature and humidity conditions for Fairbanks, Alaska.
 - B. Insulated glass: Guaranteed against seal failures causing clouding or fogging of any kind between glass for ten (10) years.

PART 2 - PRODUCTS

- 2.01 Materials
- A. Plastic windows and frames: Extruded, polyvinyl chloride (PVC). Integral color throughout frame. Frame and sash members, multi-chambered design, minimum 2 air spaces between interior and exterior spaces. Frame and sash walls, minimum 1/8-inch thick. Turn/tilt (dual action), casement, or awning or other style per design for project.
 - 1. Frame: Sash, and mullion extrusions: Minimum 2-3/4-inch inside to outside.
 - 2. Glazing bite: Minimum 7/8-inch deep, periphery of insulated glass, refer to

Section 08 88 00.

3. Pressure equalization capability: Baffled internal weepage system.
 4. Drywall Return/Receiver
- A. Hardware:
1. Sash locks and handles to provide security and permit easy operation of units.
 2. Color: Color as selected from full range of manufacturer's standard colors.
 3. Hardware shall be screw attached with tamper proof screws.
 4. Locks: provide operation sash with spring loaded locking device: provide automatic locking in closed position, cam-locks. Provide locking handle on tilt/turn windows to only allow ventilation option: keyed access for maintenance and cleaning staff only.
 5. Single operating handle options and universal interlocked components with lock spacing adaptable to sash size.
- B. Weatherstripping at operable sash:
1. Neoprene, thermoplastic rubber, or EPDM.
 2. Flexible at minimum design temperature.
- C. Insect Screens: Provide manufacturer standard fiberglass insect screens on operable units.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Manufactured pultruded fiberglass framed window systems, inclusive of factory-formed windows and frames, closure members, reinforcement, shims, accessories, anchorage devices, and miscellaneous fasteners, concealed and non-concealed, and flashing and trim for a weather-tight system.
- A. Do not use windows with nailing fins.
 - B. Design compliance:
 - 1. Infiltration: Maximum 0.03 cfm/foot.
 - 2. Maximum U value of whole window of .20 BTU/hr-ft²-F
 - 3. No condensation on the interior windows or frames at the expected interior temperature and humidity, and the outside air temperature at -55 degrees F. Coordinate with mechanical for additional heating and ventilation based on the window selected.
 - C. Include insect screens
- 1.02 Quality assurance:
- A. Manufacturer's qualifications: Minimum of 5 years experience in manufacturing plastic windows and frames.
- 1.03 Warranty: Manufacturer's standard ten (10) year warranty against material defects in manufacture including hardware failure of any kind: screws stripping, frames and sashes failing during normal use.
- A. Windows: Guaranteed to operate under any normal temperature and humidity conditions for Fairbanks, Alaska.
 - B. Insulated glass: Guaranteed against seal failures causing clouding or fogging of any kind between glass for ten (10) years.

PART 2 - PRODUCTS

- A. Frames shall be a minimum of 2-3/8 inches deep, and in compliance with:
 - 1. AAMA 101/1.S.2, Rating C60
- B. Nominal wall thickness: minimum 0.090 inches
- C. Minimum glass content: 60 percent.

- D. Frame and sash corners chemically bonded or are connected with molded reinforced polymer shear blocks and mechanically secured. Joints are factory sealed and neatly fitted together.
- E. Finish:
 - 1. All exposed surfaces:
 - a. Coating: Durable, Isocyanate-free, 2-part Polymer enamel.
 - b. Thickness: Minimum dry film thickness of 1 mil.
 - c. Gloss: Medium gloss of 25-40.
 - 2. Finish shall not blister, crack, or peel under normal atmospheric conditions.
 - 3. Color: Custom color as selected.
- F. Hardware:
 - 1. Sash locks and handles to provide security and permit easy operation of units.
 - 2. Color: Color as selected from full range of manufacturer's standard colors.
 - 3. Hardware shall be screw attached with tamper proof screws.
 - 4. Locks: provide operation sash with spring loaded locking device: provide automatic locking in closed position, cam-locks. Provide locking handle on tilt/turn windows to only allow ventilation option: keyed access for maintenance and cleaning staff only.
 - 5. Single operating tilt/turn style handle options and universal interlocked components with lock spacing adaptable to sash size.
- G. Weather stripping at operable sash:
 - 1. Neoprene, thermoplastic rubber, or EPDM.
 - 2. Flexible at minimum design temperature.
- H. Insect Screens: Provide manufacturer standard fiberglass insect screens on operable units.

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 General: Provide mechanical and electronic hardware, seals, thresholds, hinges, and other door hardware in accordance with this design standard and current codes, regulations, and best practices. Closely coordinate the requirement for active intruder functionality with the UAF FS/DDC Project Manager. (All normally occupied rooms will be securable from within without requiring special equipment or always locked.)
- 1.02 Quality assurance:
- A. Designer to request keying information from UAF FS prior to Design Development Designer to provide hardware schedule to UAF FS Lock Shop for review prior to 65% design. Designer shall be responsible for careful coordination of Division 8 hardware with Division 28 security. Contractor to provide hardware submittal to UAF FS Lock Shop for final approval.
 - B. Guarantees: Per general conditions except door closers guaranteed for 10 years.
- 1.03 Permanent keying and bitting: conform to the existing UAF campus Best Lock small format interchangeable core (SFIC) grandmaster keying system. Coordinate keying with the door numbering system. Verify required system with the UAF FS prior to initial submittal. Obtain written confirmation prior to completing hardware specifications. Obtain door numbers from UAF FS/DDC.
- A. Verify that locksets and key cylinders installed in renovated areas are compatible with key systems in building. Contact UAF FS Lock Shop to verify keying system.
- 1.04 All cylinders shall be Best 7 pin SFIC and keyed into the existing factory registered Grand Master key system with a restricted keyway.
- 1.05 All new facilities shall be provided with owner provided KNOX brand key box located on the exterior of the facility near the main fire department entrance. Coordinate with the FS/DDC Project Manager and the University Fire Department for specifications and final location. KNOX box shall be Owner Furnished Contractor Installed.
- 1.06 Door Operators: One paddle per door to prevent both doors from opening and cold air infiltrating into the building.
- 1.07 Security Strategies: Follow the guidelines below when developing doors and hardware schedules:
- A. In general, all exterior entrances shall have at least one level of electronic control or monitoring by the Division 28 Security Access Controls.
 - 1. All doors shall be monitored for egress with door position and request to exit (RX).

2. All doors considered as entrances shall have hard-wired security access controls including magnetic or proximity card reader, latch monitoring, request to exit and door position.
 3. Doors requiring an ADA operator (FS/DDC to provide direction) shall have hard-wired security access controls as specified above and include an ADA operator, push buttons, and integrated controls with the security access controls system.
 4. In general, on the Troth Yeddha' Campus, entrances to buildings under new construction and major renovations will be designed as a warm vestibule arctic entry, with the outer door always unlocked and the inner door under electronic control.
- B. Interior door security shall vary by location and type of space as shown below.
1. Classrooms, laboratories, and suite entrances shall have security access controls by means of a magnetic or proximity card and a wireless lockset. Hardwired locksets on interior doors may be provided as directed by UAF, e.g. double doors without mullions
 2. Specialty spaces requiring high levels of security or monitoring such as imaging suites, communications (MDF/IDF) rooms, BSL-2 and higher, or animal care, shall have security access controls by means of a magnetic or proximity card and a wireless lockset. Hardwired locksets on interior doors may be required as directed by UAF, for spaces such as Magnetic Resonance Imaging (MRI) suites where wireless locksets may not function or where high levels of reliable reporting and lockdown are required by regulatory agencies or risk management, such as a daycare center.
 3. Offices shall have security provided by means of a keyed lever lockset. Select locksets with the Entrance(ANSI NO. F109) Function (Push and Turn button) and include means to lock the lockset from the interior of the office. Keyed intruder function is not allowed.
 4. Single-use restrooms, showers, and lactation rooms shall have an occupancy indication built into the mechanical or electronic lockset.
 5. Utilidors shall have security provided by a keyed/combination lever lockset.
 6. Mechanical, Janitor, and Utility rooms shall have security provided by means of a keyed lever lockset. In general, select locksets with the Storeroom Function (ANSI NO. F86).
 7. Rooms requiring exit hardware in lieu of a lever trim will follow the requirements above for wireless, wired, or manual lockset security. In

general, most exit hardware will function with the wireless locksets specified in Part 2.

8. Review additional requirements for residential with UAF/FS DDC and Residence Life. Additional requirements may include items such as security chain/hotel latch and peepholes.
9. Review with FS/Maintenance and FS/DDC Project Manager for specific applications.

- C. If the building does not have an existing security access controls system or if UAF defers the installation of the system, at a minimum, prepare door and hardware for future security access controls as listed above.
- D. Provide a door security matrix listing door number and security access to the owner before or during the Design Development Phase.

1.08 Fully coordinate hardware with other divisions including aluminum storefronts. Clearly delineate the division of work between Division 8 and Division 28 in the contract documents.

1.09 Warranty: Specify extended warranties for door closers, operators, exit devices, and electronic locksets.

1.10 Spare Parts: Specify one (1) each of each hardware component except two (2) each of each mechanical locksets, wireless locksets, door closers, and exit devices. Additional quantities may be requested by FS Maintenance for new buildings.

PART 2 - PRODUCTS

2.01 Keying: All keys and lock cores are Best SFIC for Troth Yeddha' Campus. (All on-campus keying on factory registered patented system)

2.02 Mechanical Locksets: All locksets, except for combination locksets, within a given building by the same manufacturer. Locksets either Schlage or Best Lock, Brand Name Only. Cylindrical Lever locksets with backset of 2 ¾ inch. Coordinate with FS Maintenance and select appropriate locksets for the particular building.

- A. Provide mechanical push button combination lock similar to a Kaba Simplex for all utilidor access doors.
- B. Provide mortise locksets with integral color coded vacant/occupied operated by a thumb turn for rooms such as single-use restrooms and lactation rooms.

2.03 Butt hinges: McKinney, Stanley, Ives

- 2.04 Door closers: LCN (Basis of Design) or Stanley; No alternate brand; No substitutions. Specify spring cushion arm where applicable (e.g. door swinging into a wall)
- 2.05 Exit devices:
- A. Rim exit device: Von Duprin 98 Series (Basis of Design) or an equivalent product from Precision
 - B. Mortise exit device: Von Duprin (Basis of Design) or Precision (require Fail Secure on Exterior Doors)
 - C. Surface vertical rod exit device: Von Duprin (Basis of Design) or Precision, specify less bottom rod
 - D. Vertical concealed rod exit device: Von Duprin (Basis of Design) or Precision
 - E. Push/pulls: Trimco, Ives, or Von Duprin
 - F. Specify filler strip between exit device and glass to prevent chaining the doors from inside
- 2.06 Flush bolts: Trimco, Ives, Architectural Builders Hardware (ABH)
- 2.07 Automatic flush bolts: Trimco, Ives, Architectural Builders Hardware (ABH)
- 2.08 Removable mullion: Von Duprin (basis of design), Stanley. Finish to match storefront color. Provide Best SFIC-compatible cylinders.
- 2.09 Door stops, Overhead Door Stops, and Holders: Glynn-Johnson, Rixson, Architectural Builders Hardware (ABH)
- 2.10 Smoke gaskets and weather-stripping: Pemko; Sealeze; National Guard.
- 2.11 Magnetic door hold opens: LCN; Rixson; Architectural Builders Hardware.
- 2.12 Magnetic door locks: Von Duprin; Or Alternate Brand or Substitution Request required
- 2.13 Door operators, included ADA Doors: LCN: No Alternate Brand or Substitution Request allowed. Provide concealed switches for power and control. (UAF will only accept an alternate brand such as Dormakaba ED100 if there is a locally trained service center or the alternate manufacturer is willing to train UAF FS Lock Shop Personnel at no cost to the University and have a readily stock of spare parts available)

- 2.14 Electronic locksets:
- A. Cylindrical Wired: Best 9KW or Schlage AD-300
 - B. Mortised Wired: Best 45HW or Schlage AD-300
 - C. Cylindrical or Mortise Wireless: Schlage AD-400, Brand Name Only.
 - D. Exit Hardware: Interior doors for the locking door to be electronic trim for locking and similar to Von Duprin QEL functionality for ADA operated doors Exterior doors or the non-locking door to be QEL functionality with non-electronic trim for ADA operated exterior on warm vestibule with LX function to be controlled by access control system.
 - 1. Provide latch monitoring and request to exit monitoring for all Exterior Doors exit hardware.
 - 2. Ensure locking trim is matched up with the door stile width and set up for locking/unlocking. Avoid latch retraction as a means of keeping doors unlocked.
 - E. Require Fail Secure unless otherwise directed.
 - F. Confirm with UAF FS for current electronic lockset requirements as the University has moved towards wireless locksets on all interior doors and wired only on exterior doors and some double interior doors, and where wireless coverage is not feasible.
- 2.15 Power Transfer Devices or Electronic Power Transfer Devices: Von Duprin EPT, Securitron CEPT, Security Door Controls PTM.
- 2.16 Weather-stripping. Provide compression weather-stripping at stops at aluminum doors. At other locations: sliding weather-stripping retained in adjustable strip mortised into door edge. Self-adhesive rubber/vinyl compression type.
- 2.17 Coordinators: Ives, Door Controls, Rockwood
- 2.18 Power Supplies: Von Duprin, sized sufficient to operate the specified door hardware including inrush current. Must include multiple input/output control board. All security related enclosures shall be furnished with a manufactured supplied lock with key.
- 2.19 Finish: In general on the Troth Yeddha' Campus, all hardware to be finished to the 626 Satin Chrome. Review finish with FS/DDC Project Manager and UAF/FS Lockshop.

PART 3 – EXECUTION

- 3.01 Specify that installer shall not use a drill motor to install screws in door hardware.
- 3.02 Specify thermal breaks in all systems including areas where exterior finishes may carry cold into the building such as sidewalks. Thermally broken thresholds are a required element.

UAF TYPICAL ITEMS FOR HARDWARE SCHEDULE FOR EXTERIOR ENTRIES

KEYED REMOVABLE MULLION REQUIRED ON DOUBLE DOOR ENTRIES UNLESS EACH DOOR HAS ITS OWN FRAME (SIMILAR TO THE ENGINEERING CORNERSTONE PLAZA ENTRY)

ADA NON-LOCKING

EXIT DEVICE	LX-QEL-98L-LD 996L-BE	VON DUPRIN
DOOR OPERATOR	4642	LCN
POWER TRANSFER	EPT-10	VON DUPRIN

NON-ADA NON-LOCKING

EXIT DEVICE	98L-LD 996L-BE	VON DUPRIN
CLOSER*	4040XP SCUSH	LNC
POWER TRANSFER	EPT-10	VON DUPRIN

ADA LOCKING

EXIT DEVICE	LX-RX-QEL-98L-LD E996L	VON DUPRIN
DOOR OPERATOR	4642	LCN
POWER TRANSFER	EPT-10	VON DUPRIN

NON-ADA LOCKING

EXIT DEVICE	LX-RX-98L-LD E996L	VON DUPRIN
CLOSER*	4040XP SCUSH	LCN
POWER TRANSFER	EPT-10	VON DUPRIN

*coordinate closer part number with the degree of opening of the door.

END OF SECTION

PART 1 - GENERAL

- 1.01 Summary: Manufactured glass and glazing systems for project window and door requirements, including vision lights and interior windows, sealants, glazing tape, gaskets, setting blocks, edge blocks, shims, glazing accessories, anchorage devices and miscellaneous items, concealed and non-concealed, for weather-tight systems, per energy code and in compliance with UAF's Design Standards for Energy Conservation. Refer to other Division 8 Design Standards for glazing requirements for insulated plastic and fiberglass window units.
- 1.02 Manufacturer's standard warranty against material defects in manufacture of glass or deterioration due to normal conditions of use under any normal temperature and humidity condition for Fairbanks, Alaska, and not to handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.
- A. Coated glass products: Five (5) years.
 - B. Laminated glass products: Guaranteed against cohesive failure of the interlayer and/or the connectivity between the panes and the interlayer for Five (5) years.
 - C. Insulated glass products: Guaranteed against seal failures causing clouding or fogging of any kind between glass for ten (10) years.
 - D. Non-domestic fully tempered glass shall be 100% heat soak tested for nickel sulfide inclusions at the manufacturer's facility prior to shipment. These records shall be provided to the owner.

PART 2 - PRODUCTS

- 2.01 Insulated glass units (IGU): Minimum: Heat-treated, heat-strengthened, glass, fully tempered where safety glass is required. No tinting unless approved by the UAF FS/DDC Project Manager. Preassembled, organically sealed lites of glass separated by dehydrated air space. Consider low-iron glass in large projects for additional clarity.
- A. Minimum Thickness, each pane: 1/8 inch glazing, 1/2 inch to 3/4 inch air space, 1/8 inch glazing. For new construction, 1/4 inch glazing, 1/2 inch to 3/4 inch air space, 1/4 inch glazing, 1/2 inch to 3/4 inch air space, 1/4 inch glazing.
 - B. Sun/UV Control Low-E coating on 2nd and 5th surface for triple-pane unit and on 2nd surface for double pane unit. Require sample of glazing to ensure Low-E coating is not causing unwanted color or tinting of insulated glass unit.
 - C. Sealing system: Manufacturer's thermal break system.
 - D. Air space filling: Argon.

- E. U-value: Not more than 0.20 BTU/hr-ft²-F. Review current available materials for better than this standard's thermal performance.
 - F. Shading coefficient (SC): 0.32 or better, for new construction 0.28 or better.
 - G. Solar Heat Gain Coefficient (SHGC): 0.28 or better, for new construction .025 or better.
- 2.02 Non-insulated glass units: Colored interior glass is only allowed upon approval of the FS/DDC Project Manager. Select fire rated glazing that is clear.
- 2.03 High Performance Sealed insulating glass units: Select a high performance insulating glass unit such as Solera or Kal-Wall when a high percentage of transparency is not a driving factor and U-value, SC, and SHGC are better than a sealed insulating glass unit.

PART 3 – EXECUTION

- 3.01 Ensure contractor leaves all required fire listing labels/etchings remain intact post construction.

END OF SECTION

PART 1 - GENERAL

- 1.01 Summary: Exterior and interior gypsum board assemblies, including:
- A. Gypsum wall board (GWB)
 - B. Patching of interior gypsum board
 - C. Metal framing suspended ceiling system
 - D. Light gauge metal framing
 - E. Ensure gypsum wall assemblies are constructed to proper STC ratings for the given application. In general, UAF requires all gypsum wall assemblies to extend to the bottom of the structural deck unless otherwise directed.
 - F. Require certification that all gypsum products do not contain asbestos.
- 1.02 See Division 07 84 00 for firestopping requirements in rated walls and floors.

PART 2 - PRODUCTS

- 2.01 Exterior sheathing-behind exterior panels: Inorganic glass mat facing sheathing, ½ inch silicone-treated core where protected by specialty exterior surfacing.
- 2.02 Interior Sheathing: Minimum 5/8 inch paper faced gypsum board. Provide mold and moisture resistant in wet areas.
- 2.03 Light gauge metal framing- general:
- A. Metal studs and runners: Manufacturer's recommended for intended use and meeting ICC requirements for the intended application. The metal stud basis of design should have 90-degree flange edges bent and doubled over to form a minimum 3/16-inch-wide lip (return). Specify coating as needed.
 - 1. Thickness: Minimum 30-mil, 20 gauge (0.033-inch minimum), 33-ksi, 1-5/8-inch flange width metal studs for interior non-bearing walls.
 - 2. Provide for L/240 deflection criteria for most walls, L/360 for walls receiving tile, epoxy, or other specialized finishes or specialty equipment such as mirrors or television screens.
 - 3. Discuss deflection criteria above industry standards for hard ceilings with UAF FS/DDC.

PART 3 – EXECUTION

- 3.01 At the end of a project, the Contractor to provide certification that all products installed are asbestos-free.

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide ceramic or porcelain tile as required by the project. Porcelain is preferred for high-traffic floor areas.
- 1.02 Provide tile in all restrooms and showers
- A. Preferred floor tile is a 2-inch x 2-inch mosaic.
 - B. Walls will be tiled in restrooms to a minimum of 60 inches above floor finish, all around the room; preferred size is 4-inch x 4-inch up to 4-inch x 12-inch. No large-format tile on walls
 - C. Walls in shower rooms will be tiled from floor to ceiling all around the room; preferred size is 4-inch x 4-inch up to 4-inch x 12-inch. No large-format tile on shower walls unless approved by FS/DDC and FS/Maintenance.
 - D. Large-format tiles may be allowed upon approval by FS/DDC. Large-format floor tile will only be allowed in new construction or renovations that can provide sufficient mortar beds to ensure the floor slopes to the floor drain.
- 1.03 Provide quarry or terrazzo tile in food service areas unless otherwise specified and approved by FS/DDC. The intent is to select a cleanable, durable, and safe floor surface material.
- 1.04 If the tile layout or manufacturer does not allow for edge and corner transition with tile, specify stainless steel or aluminum edges, such as Schluter Systems profiles.

PART 2 - PRODUCTS

- 2.01 Ceramic tile: Provide "Bright and Shiny" type tile in restrooms unless approved by FS/DDC
- 2.02 Manufacturer approved tile backer board: no plain gypsum allowed
- 2.03 Manufacturer approved setting materials for all tile. No mastic application of ceramic floor tile.
- 2.04 Polymer modified or water cleanable grout as required. Grout joints will not exceed ¼ inch.
- 2.05 Provide uncoupling membranes at on-grade areas receiving tile

PART 3 - EXECUTION

- 3.01 UAF to approve substrate prior to tile installation.

- 3.02 Grout or sand bed for quarry tile floors, depending on substrate.
- 3.03 Provide an isolation membrane for tile floors where applicable.
- 3.04 Seal all tile and grout per manufacturer's recommendations.
- 3.05 Caulk inside corners: no grout allowed.

END OF SECTION

PART 1 - GENERAL

- 1.01 Acoustical ceiling systems with acoustical panels and tiles, metal suspension grids, and related accessories.
- A. Lay-in tiles and grid: 2 feet x4 feet unless otherwise approved by UAF FS/DDC.
 - B. Alternative acoustical systems, especially those for rooms needing acoustic treatment, will be reviewed by UAF FS/DDC.
- 1.02 Contractor to submit shop drawings demonstrating that seismic bracing meets the current building code. Inspection of bracing are required and need to be included in the technical specifications.
- 1.03 Design shall coordinate with other divisions of these design standards, specifically for equipment access, light placement, and security. The final construction drawings shall present a well-coordinated reflected ceiling plan.
- 1.04 Acoustical ceilings are not acceptable in restrooms, areas with cooking, animal holding rooms, high-humidity rooms, and other locations where tiles are not compatible with the ambient conditions.

PART 2 – PRODUCTS

- 2.01 Acoustical tile and ceiling units:
- A. No residential grade.
 - B. Armstrong, USG, or other manufacturer meeting the requirements of this design standard and the project requirements with readily available spare material.
 - C. UAF FS Standard tile is Armstrong: 2 feet x 4 feet Cortega in Second Look Tegular or Square Lay-In.
 - 1. Other products shall be reviewed and approved by the FS/DDC Project Manager.
 - 2. New construction is not bound to the standard product listed above. The architect of record shall discuss ceiling options with FS/DDC and FS/Maintenance and provide options that are aesthetically pleasing, readily available, and maintenance-friendly.
 - 3. Cleanable tiles, such as Mylar-faced tiles, shall be used in rooms susceptible to

moisture, vaporized grease, healthcare, laboratory rooms and other locations requiring a cleanable tile.

- D. Adhered ceiling tile: Armstrong 12-inch x 12-inch
- E. Wood and metal acoustical panels are acceptable, provided the panels are easily removed without specialty tools, for above-ceiling access.
- F. Select high recycled content and high NRC sound rating

2.02 Suspension systems: DONN, USG Interiors, DXL.

- A. Standard-width grid sized for seismic requirements.

PART 3 – EXECUTION

- 3.01 Layout grid to ensure no smaller than a 6-inch tile adjacent to walls or other transitions.
- 3.02 If a 2-foot by 2-foot tile is allowed, provide for the grid between two tiles to be easily removed if equipment access is required.
- 3.03 Specify the use of colored dots on the grid just below a piece of equipment or series of valves. For fire suppression access, allow for a hanging metal sign.

END OF SECTION

PART 1 - GENERAL

- 1.01 Use resinous flooring such for all mechanical room floors above grade or where requested.
- 1.02 Use epoxy flooring in wet areas such as greenhouses, animal holding rooms, etc.
- 1.03 Specify substrates that are approved by the specialty flooring manufacturer.
- 1.04 Require moisture content and pH testing before installation.
- 1.05 Review product application and durability if the slab is heated or cooled with in-slab tubing. Some products are not compatible with high radiant slab temperatures.
- 1.06 Review the grip-ability required for the use of the space to ensure the floor surface is safe and slip-resistant. Some applications require a smooth floor for ease of cleaning, but still need to provide slip resistance.

PART 2 - PRODUCTS

- 2.01 Slip-resistant surface with expansion joints when ceramic or quarry tiles are used (interior applications only).
- 2.02 Static dissipative tile for computer access floors.
- 2.03 Epoxy adhesive for rubber tile applications. Avoid rubber flooring in restrooms and other places subjected to corrosive fluids.
- 2.04 Water-based product such as polyurea for resinous flooring unless otherwise requested from Facilities Services.
- 2.05 Methyl-methacrylate urethane for wet labs with heavy washing activities.
- 2.06 Epoxy flooring: General Polymers Ceramic Carpet 400 with flexible matrix resin substrate coating, Dex-O-Tex, Dur-A-Flex with granulated sand or walnut topping.

PART 3 - EXECUTION

- 3.01 Seal and/or paint bare concrete floors in all assignable spaces, mechanical, electrical, and janitor rooms, and other spaces as required by FS unless they are receiving a specialty floor listed in Part 1 or 2.

END OF SECTION

PART 1 - GENERAL

- 1.01 Surface preparation, furnishing, and installation of resilient tile (vinyl composition) or resilient sheet vinyl or linoleum floor covering and accessories on interior floor surfaces.
- 1.02 Laboratory flooring must be reviewed for compatibility with current and projected use. Certain lab equipment will be sensitive to the off-gassing from flooring. Dry labs and low-chemical use labs may utilize sheet-vinyl, sheet-rubber, or polished concrete, terrazzo, or other poured cementitious flooring. Wet labs must use sheet goods similar to dry labs or other specialty flooring specified under specification section 09 62 00. Ceramic or porcelain tiles are not allowed in labs due to the incompatibility of the grout joints.
- In laboratories and similar spaces, sheet goods are to be integrally (flash) coved to the room walls, thus creating the bathtub effect. Plan casework and cabinets to accommodate the cove radius projection from the wall.
- 1.03 Rubber flooring is not preferred in bathrooms and other areas with incompatible chemicals and urine.
- 1.04 Sports and Recreation area flooring will be decided on a project-by-project basis by FS/DDC.

PART 2 - PRODUCTS

- 2.01 Vinyl composition resilient floor tile: Design industry designation per project requirements.
- A. Class: Per project requirements.
 - B. Wearing surface: Smooth.
 - C. Thickness: 1/8 inch.
 - D. Size: 12-inch x 12-inch is preferred, other sizes allowed with approval of FS/DDC Project Manager.
 - E. Pattern: Similar to Armstrong Standard Excelon.
- 2.02 Resilient edge strips: Minimum 1/8-inch-thick and 1-inch wide, homogenous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or from standard colors.
- 2.03 Tactile warning strips as required, minimum ¼ inch nominal with raised profile surface pattern, manufacturer's standard heavy-duty model.
- 2.04 Resilient sheet vinyl: Commercial grade products, minimum 1/8-inch-thick, minimum 12-foot rolls, heat welded seams.

- 2.05 Sheet Linoleum: Commercial grade products, minimum 2.5-millimeter-thick, minimum 20-inch x 20-inch tiles or 2-meter-wide rolls, welded seams.
- 2.06 Rubber Sheet Flooring: Commercial grade products, minimum 3-millimeter-thick vulcanized, welded seams, tiles or rolls. Ensure compatibility with room use prior to specifying. Nora-Rubber Environcare or similar is preferred.
- 2.07 LVT/LVP: Commercial-grade products, minimum 1/8 inch thickness, cut-tight seams. Standard for residential spaces and can be used in low-traffic office and classroom settings. Do not use LVP/LVT in high traffic areas, exterior entries, stairwells, ground level spaces, and spaces subject to damage due to the nature of use of the space.
- 2.08 Specify a minimum wear layer of 20-mil thick.
- 2.09 Rubber wall base: Manufacturer's standard, rubber of size and profile designed per project requirements and manufacturer's standard color selection.
 - A. General use areas 4-inch height.
 - B. At toilets, food service, and wet areas, 6-inch height.
 - C. 1/8-inch gage thickness.
 - D. Standard top-set cove or carpet style.
 - E. Matte finish.
 - F. Field formed base inside and outside corners with long legs.

PART 3 – EXECUTION

- 3.01 Review the need for a rubber transition strip between the flooring material. UAF desires a blended flooring material thickness without the transition strip.
- 3.02 Surface preparation requires moisture and pH testing, and the Contractor must certify the surface is prepared in accordance with the manufacturer's written instructions.
- 3.03 Contractor to provide a green concrete isolation membrane for any installation on new concrete.
- 3.04 Install integral (flash) cove in accordance with the manufacturer's instructions.

END OF SECTION

PART 1 - GENERAL

- 1.01 Surface preparation, furnishing and installation of rubber stair treads, and risers and related accessories on interior wall and floor surfaces.
- 1.02 The use of rubber treads and risers is an economical method for covering stairs in retrofits or stairwells used more for employee access or emergency egress only. In new construction, more durable alternatives should be chosen, such as concrete and porcelain tile. In older buildings with significant tread wear on the structural component, consider metal treads with built-in grip nosings.

PART 2 - PRODUCTS

- 2.01 Rubber stair treads, risers, nosings: Manufacturer's standard, rubber of size and profile designed per Project requirements and manufacturer's standard color selection.
- A. Stair tread size: Single-piece units for width of stair treads, or equal-length units if tread width exceeds available manufactured lengths.
 - B. Stair tread type: Raised profile surface pattern, sanded backs, type and style per project requirements.
 - C. Stair tread thickness: Minimum 1/4-inch nominal.
 - D. Stair tread nose design: Square or per project requirements, integral with the tread.
 - E. Stair riser size: Single-piece units for height and width of stair risers, or equal-sized units if riser width exceeds available manufactured lengths.
 - F. Stair riser height and thickness: 7-inch cove base, 1/8-inch gage.
 - G. Stair stringer skirt: Cut to match riser and tread, meet wall base height, same material and color as base.
- 2.02 Edge strips: Min. 1/8-inch and 1-inch wide, rubber composition, tapered or bullnose edge, color to match flooring unless required to contrast by code.

PART 3 - EXECUTION (*NOT USED*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Carpet criteria (listed in order of precedence):
- A. Durability
 - B. Ease of maintenance
 - C. Cost
 - D. Warranty
 - E. Ease of repair/replacement
- 1.02 Use the location, anticipated traffic/usage, and budget to determine the quality and type of carpet to be specified. Facilities Services allows the use of modular tiles and broadloom goods in all areas.
- A. Modular tiles are preferred in rural sites for ease of shipping. Review the approved manufacturer adhesive type to ensure it can be transported to rural sites.
 - B. Use of carpets in high-traffic corridors is discouraged due to high wear, staining from exterior ice melt use, and the cost of daily maintenance.
- 1.03 Match carpet color and pattern of multiple dye lots, or different looms or manufacturing plants to the satisfaction of Facilities Services prior to shipping. Provide two (2) 12 inchx12 inch samples from each run for review.
- 1.04 Avoid using carpet on stairs and landings in non-residential applications. Carpet may be considered for interior stairways of apartments on campus.
- 1.05 Specify walk-off carpet in all entries for function of removing rocks, snow, and other materials from shoes but also for ease of cleaning. If possible, provide a walk-off carpet 25 to 30 feet into a building.

PART 2 - PRODUCTS

- 2.01 General:
- A. All fiber to be branded Nylon Fiber with soil and stain protection.
 - B. Static ratings below human sensitivity: 3.5kv at 20-percent humidity
 - C. Impervious to liquids.

- D. Post-consumer and post-industrial content preferred.

2.02 Broadloom (rolled) goods:

- A. Carpet construction: tufted loops, multi-level pattern loop, cut and loop, level loop, multi-level cut and loop
- B. Gauge: 1/8 inch minimum.
- C. Width: 6-foot (preferred) or 12-feet.
- D. Face weight: 20 oz. minimum; select based on TARR rating for severe and high traffic.
- E. Stitches per inch: 9.5 minimum
- F. Density: High-density crush-proof for severe traffic rating. Review density with FS/DDC Project Manager based on project needs and product suitability.
- G. Fiber: 100% solution dyed type 6 or type 6,6 Nylon, with soil and stain protection.
- H. Backing: Select a high-performance commercial backing designed for dimensional stability and that prevents edge ravel, zippering, and delamination.
- I. Warranty: Lifetime commercial limited warranty for edge ravel, delamination, and zippering.
- J. Installation: per manufacturer recommendations to match warranty.
- K. Pattern: multi-colored random patterns are preferred for the field carpet.

2.03 Modular carpet tile:

- A. Products: Any major manufacturer meeting these design standards.
- B. Fiber: 100% solution dyed type 6 or type 6,6 Nylon, with soil and stain protection
- C. Face construction: tufted loop pile, tip-sheared loop
- D. Thickness: Minimum .10 inch, maximum .5 inch. Review with FS/DDC Project Manager based on project needs and product suitability.
- E. Surface pile weight: 17 oz. minimum; select based on TARR rating for severe and high traffic.

- F. Density: High density crush proof for severe traffic TARR rating. Review density with FS/DDC Project Manager based on project needs and product suitability.
- G. Primary backing: High-performance commercial synthetic primary backing intended to provide dimensional stability and prevent edge ravel, zippering, and delamination.
- H. Secondary backing: Fiberglass reinforced with cushion or hard back compound.
- I. Releasable adhesive: Water resistant low VOC, non-staining and per carpet manufacturer recommendation.

2.04 Walk-off modular carpet tile:

- A. High-performance transition carpet tiles with a high-denier textured scraper nylon fiber. Similar to Shaw Contract's "All Access" or "Steppin' Out" Collections, Mohawk Group Tough Stuff Collection
- B. Backing to be similar to modular tile carpet, resilient to moisture, salts, and sand often found in UAF entryways.

PART 3 – EXECUTION

- 3.01 Ensure substrate has been properly prepared and inspected by the University before carpet placement.
- 3.02 Review adhesives with substrate where radiant floor heating is being utilized.

END OF SECTION

PART 1 - GENERAL

- 1.01 Surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.
- A. Semi-gloss enamel for high-traffic areas, kitchens, restrooms, childcare facilities, and other locations requiring a higher level of cleaning, eggshell elsewhere.
 - B. Use latex enamel where possible.
 - C. Do not paint galvanized finishes.
 - D. Epoxy painting for spaces needing a higher level of cleaning, such as vivarium or autoclave rooms.
 - E. Use high-performance coatings on areas subject to heavy traffic, such as stair risers, exterior structural steel, etc.
- 1.02 Supplied products must comply with local regulations controlling the use of volatile organic compounds (VOCs). UAF prefers low to no-VOC paint.
- 1.03 Select colors from a palette with colors approved by FS/DDC. In a typical room that is assignable (occupied), limit accent colors to one wall with an FS-approved base color for the other walls. In other locations, review accent colors with FS/DDC and the user group to discuss branding, UAF color use, lighting, pedestrian traffic, etc.
- 1.04 Specify the level of finish by room or area. All projects shall have a room finish schedule.

PART 2 – PRODUCTS

- 2.01 Pittsburgh Paints is the basis for design and color selection charts. Several other manufacturers are acceptable.
- 2.02 High-performance coating similar to Tnemec Protective Coatings, Sherwin-Williams Tile-Clad Epoxy system, or Sherwin-Williams Pro Industrial DTM High Performance Acrylic. Select higher-end products based on location, traffic, damage potential, and cleanability.

PART 3 - EXECUTION

- 3.01 Field quality control: Specify and note on drawings UAF's right to invoke test procedures at any time and as often as deemed necessary during painting work, including services of an independent testing agency.

END OF SECTION

PART 1 - GENERAL

- 1.01 Utilize erasable marker boards as specified by the FS/DDC. Chalkboards are not allowable.
- 1.02 Provide marker tray for all marker boards. At UAF option, provide tack strip at top of marker board.
- 1.03 No painted walls for writing surfaces.
- 1.04 Provide marker boards at the front of all classrooms and on the sides of the classrooms as needed. Other locations to consider for marker boards include the following.
 - A. Offices
 - B. Laboratories
 - C. Corridors in locations that are code compliant (e.g. not in the exit)
 - D. Student study areas
 - E. Outside of classrooms, with the intent of providing space for announcements to be posted.

PART 2 - PRODUCTS

- 2.01 White porcelain on steel similar to Greensteel, Inc.
- 2.02 Laminated safety glass with white background such as from Bendhiem or Clarus.
 - A. Provide ferrous backing where needed for use with magnets.
 - B. Provide a minimum of five markers recommended by the glass board manufacturer with each markerboard.
 - C. Alternate colors may be proposed for non-classroom markerboards.

PART 3 - EXECUTION

- 3.01 Use manufacturer approved adhesive and mount no more than 36 inches above floor finish. The preferred method of installation is full adhesion on a plywood substrate for classrooms and areas where the board will be highly utilized. Installation with cleats should be limited to smaller boards, boards not in classrooms, and boards in offices.
- 3.02 Closely coordinate marker board installation with other trades and classroom AV technology to avoid interference/conflicts.

END OF SECTION

PART 1 - GENERAL

- 1.01 All display cases and bulletin boards located in exit pathways must be enclosed with an approved non-combustible material unless otherwise approved by the UAF AHJ.
- 1.02 For new construction, recessed or semi-recessed cabinets are required. For renovation construction, semi-recessed or surface-mounted fixtures are necessary.
- 1.03 Surface-mounted cabinets must meet ADA requirements, specifically for mounting height and depth.
- 1.04 Verify size of display with consideration for posters, art, student projects, artifacts, etc. Lighting and power should also be considered during design.

PART 2 - PRODUCTS

- 2.01 Aluminum frame, glass front enclosed cabinets with cork or fabric-covered tackable surface.
- 2.02 Claridge Products Imperial Series, Overguard, Allen Display, Mooreco Inc., Blumcraft.
- 2.03 Cork tackable surface similar to that from Forbo.

PART - 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 Toilet and Urinal compartments

- A. Toilet Compartments: Floor-anchored and overhead-braced. Ceiling hung are strictly prohibited due to a lack of durability.
- B. Urinal and other screens: Wall-Hung with full-length bracket at each urinal. Screen height to be coordinated with urinal height; no need for screens to extend to the floor.
- C. During design, ensure the compartment width is coordinated with the toilet accessories. UAF utilizes a larger-than-normal toilet paper dispenser, which requires a wider compartment.

1.02 Shower compartments:

- A. Shower stall walls in public locker rooms shall extend to within 4 inches of the floor and extend to within 18 inches of the ceiling unless otherwise directed.
 - 1. In residential settings, review the shower stall height with project goals for privacy, potentially placing the top of the stall door only 1 inch from the ceiling.
- B. Shower bases shall be tile per Division 9 or terrazzo per Division 22. Solid surface fiberglass reinforced acrylic polymer may be allowed in apartment-style residential units. Coordinate specification of the bases with Division 22 Plumbing.

1.03 In general, compartments are to be provided with privacy features such as zero-sightlines, astragals on the latch side, rabbited sections on the hinge side, and other features to increase privacy. Additionally, design compartments to eliminate sight lines from mirrors and doors.

PART 2 - PRODUCTS

2.01 Materials - General: HDPE solid polymer partitions for all locations except at isolated small restrooms, where stainless steel may be acceptable. No plastic laminate or solid phenolic.

- A. Partitions: HDPE solid polymer floor mounted with overhead brace. No ceiling-hung partitions.
- B. Hardware: Continuous double-ear stainless steel brackets at all locations. Provide locks and latches with occupancy indicators.

- C. Anchorage and fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass, finished to match hardware, theft-resistant-type heads and nuts. Concealed anchors: hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.
- D. Shower base: Tile, Solid terrazzo (preferred) or 1-piece fiberglass-reinforced acrylic polymer such as Swanstone(residential only). Provide a full grout bed for base.
- E. Shower walls: High impact public areas: Ceramic Tile on a grout bed with cement backer board (preferred), or solid surface style wall panel such as quartz or man-made stone. Reinforce walls to accept accessories.
- F. Shower wall: Low impact or apartment style residential areas: Solid surface style wall panel such as Swanstone Panel System or Corian. In no case shall fiberglass surrounds be specified unless specially approved by UAF/FS Maintenance Director. Provide manufacturer's recommended moisture-resistant sheetrock (Dens Shield Gold) behind panel system.
- G. Shower accessories: Stainless steel curtain rod, chromium-plated brass brackets, PVC curtain. Provide one stainless steel hook in the stall for towels. In general, soap dishes are not required unless requested for apartment-style residential units. One wrap-around grab bar and one vertical grab bar, both stainless steel. Folding wheelchair seat of phenolic-resin core and melamine surface, stainless steel tubing, and bolts.
- H. Toilet accessories: Refer to Specification 102813. Provide stainless steel grab bars and rails as required by most current code requirements. Ensure bars are coordinated with toilet accessories, specifically the toilet paper dispenser(TPD).
 - 1. ADA Compliant Stall: The location of the TPD is preferred above the grab bar, but must be carefully laid out to meet the strict requirements of placement and separation from the grab rail.
 - 2. Non-ADA Stall: The location of the TPD should be placed 24 inches from the floor to the bottom of the TPD.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Apply external corner guards in all corridors with gypsum board walls. Review the attachment method during design to ensure corners are coordinated with the type and attachment method.
- 1.02 Wall protection, including chair and table rails, in seating areas of food service locations and classrooms. Coordinate placement with room furniture.
- 1.03 Provide wall protection behind service and janitor sinks.
- 1.04 Provide additional door protection, such as kickplates, per Division 08.

PART 2 - PRODUCTS

- 2.01 Corner Guards: Stainless steel 18 gauge minimum, 60-inches tall in facilities subject to damage from carts, extruded PVC, full height, elsewhere.
- 2.02 Chair and Table rails: Solid plastic such as HDPE or Corian, stainless steel, or solid stained wood rails, minimum 4 inches wide. No painted wood allowed.
- 2.03 Wall Protection: Solid plastic such as high-impact acrylic-modified vinyl, Corian, ceramic tile, stainless steel, or solid stained wood. No painted wood allowed. For wall protection behind service and janitor sinks, provide stainless steel panels.
- 2.04 Low-quality fiberglass reinforced plastic shall be avoided on all projects.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide adequate counter space in all washrooms.
- 1.02 Call out solid backing for all accessories
- 1.03 Design restrooms to have sufficient room for owner-selected accessories.
- 1.04 Consult with FS/DDC Project Manager on requirements above and beyond this section, such as sharps containers.
- 1.05 Designer to consult with FS/DDC Project Manager and UAF FS Custodial Manager to obtain the most current model numbers for all toilet accessories.
- 1.06 Allow for baby changing stations in all public restrooms, regardless of gender specificity. Consider adult changing stations in residential or institutional locations.
- 1.07 Allow for both semi-recessed trash receptacle and a free-standing receptacle when the fixture count exceeds three (3) water closets.
- 1.08 Provide coat hooks inside toilet stalls, shower stalls, and in single-use restrooms.
- 1.09 Provide paper towel dispenser and waste receptacle in lactation rooms.
- 1.10 Hand Dryers are only to be installed upon approval by UAF Facilities Services where there is increased public use of restrooms, like the UA Museum or Davis Concert Hall.

PART 2 - PRODUCTS

- 2.01 Owner supplied, project purchased, contractor installed (FS/DDC may elect to have contractor supply these products also, especially for a larger project):
 - A. Toilet paper dispenser: Double roll, surface-mounted, stainless steel, similar to Bobrick B-2892. No exceptions.
 - B. Sanitary napkin disposals: Surface-mounted, stainless steel, self-closing, similar to Bobrick B-270. Where applicable, a recessed unit similar to Bobrick B-4353 is allowable.
 - C. Surface-mounted soap dispenser: UAF shall furnish a black plastic soap dispenser from the UAF FS Central Stores. No stainless-steel soap dispensers due to incompatibility of soap. No built-in countertop soap dispenser.
 - D. Paper towel dispenser: Jumbo roll feed. Manual surface mount, stainless steel

similar to Bobrick B-2860 or plastic provided through UAF Central Stores, similar to Kimberly-Clark Lev-R-Matic or Georgia-Pacific Push Paddle Model 54338. Hands-free is preferred with 120V power supply when possible, similar to Bobrick B-2974. Select semi-recessed where possible. Coordinate power with Division 26 and FS DDC Electrical Engineer.

- E. Semi-Recessed Waste Receptacle: Specify integral with paper towel dispenser similar to Bobrick B-3974.

Free Standing Waste Receptacle. Consult with FS/DDC as this is usually an Owner furnished item ordered through the UAF/FS Central Stores. Match finishes with toilet accessories.

- F. Laboratory paper towel dispenser: Jumbo roll, surface-mounted, stainless steel preferred, C-fold towel, surface-mounted, stainless steel may be substituted in laboratories and other locations where a jumbo roll will not fit.
- G. Book/purse shelf and coat hook for toilet partitions. Purse Shelf: Fold Down, stainless steel, similar to Bobrick B-287. Provide a shelf above the urinal similar to Bobrick B-296.
- H. Mirror: welded frame mirror sized to the width of the sink, non-tilting. For new construction, frameless mirrors specified under Division 8 Glazing are allowed.

2.02 Manufacturer: Bobrick is the basis of design. UAF may consider alternate brands that are readily available in Fairbanks or Anchorage.

2.03 Hand Dryers: Dyson Air Blade, Toto, or other manufacturer meeting these design standards. Specify low noise units.

2.04 Baby changing station: Koala, Basis of Design. Stainless steel in new construction and a higher level of finish, otherwise utilize the plastic model.

PART 3 - EXECUTION

3.01 Toilet stalls must be built wide enough to accommodate the surface-mounted toilet accessories.

3.02 In ADA-compliant stalls, install the toilet paper dispenser above the grab bar, ensuring required separation between the two. In non-ADA stalls, install the toilet paper dispenser at 24 inches AFF.

3.03 Consult with FS/DDC Project Manager and Facilities Electrical Engineer on the detail for

power to the hand dryer.

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide Fire Extinguishers at locations required by code and the AHJ. For all residential facilities, discuss the need for fire extinguishers with the UAF Fire Marshal. At a minimum, all labs and kitchens shall be provided with at least one 2A-10BC Dry Chemical Extinguisher.
- 1.02 All commercial kitchen range hoods shall be provided with an approved fire extinguishing system, with the minimum being a Type K system. All affixed hood systems shall be tied into the building's fire alarm system.
- 1.03 Fire extinguisher cabinets: Recessed or semi-recessed where required, locking with a breakaway lock. Do not specify break-glass type cabinets.
- 1.04 Discuss alternate fire extinguishing systems for other hoods, particulate walls, filtration systems, computer data server rooms, and other unique project requirements with the AHJ and UAF FS Maintenance to ensure compatibility and sustainability of the extinguishing agent.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 All laboratory casework: steel box with factory finish suitable for laboratory corrosive environments unless other materials are requested by Facilities Services for specific user needs.
- A. Doors and Drawer Fronts may be metal or wood.
 - B. Wood doors and drawer fronts shall be made of M3 high-grade industrial particleboard core plywood to prevent warping and shrinkage. Provide hardwood or approved plastic laminate face and 1/8-inch solid edge banding.
 - C. Wood products not allowed in areas subject to extremely high humidity or wet areas.
 - D. Wood boxes may be allowable based on a high-level specification built for high-end academic lab use.
 - 1. Wood drawer boxes shall be of solid plywood such as Baltic Birch, and be joined with dovetails, dowels, or glue and pinned lock shoulders.
 - E. Metal drawers shall be one-piece construction
- 1.02 All casework, especially storage shelving units, equipped with features such as glass doors or retainage rod to prevent spillage or breakage of laboratory materials during earthquake events.
- 1.03 Request Facilities Services to furnish a list of chemicals to be used in the lab, and furnish MSDS sheets. Consultant is to verify the specific chemical resistance of the countertop surface material. List the chemical resistance characteristics in the technical specification.
- 1.04 Use epoxy resin tops for casework unless other materials are requested by Facilities Services. Epoxy countertops shall not have an integral backsplash. Call out for contractor to seal the joint formed by the top and backsplash with approved material.
- 1.05 Full extension type drawer hardware with roller bearing.
- 1.06 Stainless steel wire drawer and door pulls. Hinges shall be stainless institution grade, adjustable, similar to bullet type barrel
- 1.07 Under-mount epoxy sinks for most labs. Stainless steel sinks may be used in areas subject to heavy use of soiled material, animal surgery, or as required by Facilities Services or applicable codes.
- 1.08 Roll out traps preferred if solid traps are required due to the lab use. Standard design: an 18 inch x12 inch x 12 inch polypropylene or stainless steel tank. Trap with 1.5 inch

overflow and swivel casters 2w/ brakes, on a stainless steel frame. Design: include a floor drain adjacent to the trap. Roll out soil traps can not be used with extra deep sinks.

- 1.09 Design proper wall backing, wood or heavy metal lathe, for adjustable shelving and wall mounted cabinets.
- 1.10 Adjustable shelving may be metal, chemical resistant P-lam wood, or epoxy with a minimum of 100 lb load capacity. Call out proper sized backing on drawings.
- 1.11 Provide a flammable and acid storage cabinet in all labs. Preferably, cabinets will be placed under the fume hood for easy connection to the exhaust system. Cabinets will not be vented unless specifically required by NFPA 30 and the IFC.
- 1.12 Under-counter garbage disposals are by special request by Facilities Services. In general, disposals not allowed due to high maintenance cost.
- 1.13 Provide lab services fittings on countertops and in fume hoods. Color coded 4-blade or single blade valve handles.
 - A. Specify an accessible isolation valve for lab gas by room level, either in a manual valve box located near an exit or an automatic shut off valve with a push button located near an exit. Coordinate with Division 22.
- 1.14 Use ground key cocks on all lab gas valves.
- 1.15 Provide drying racks in wet labs.
- 1.16 Use umbilicals to bring lab services from overhead to island and peninsula case work.
- 1.17 Provide overhead service carriers for a minimum of two shelves, under mount lights and wire mold for electrical and data outlets. Carriers shall be painted or powder coated.
- 1.18 Provide task lighting where needed or requested. If mounted to an adjustable shelf, provide provisions for the fixture to be shorter than the shelf and the electrical has flexible cords.
- 1.19 Make provisions for hand washing in lab layouts to include PTD, Soap, and trash receptacle.
- 1.20 Provide at least one accessible work station and fume hood in every teaching laboratory. In research labs, consult with FS/DDC Project Manager for number of accessible work station in each space.
- 1.21 Consultant shall provide a well-coordinated, highly detailed custom specification for this division to ensure the project receives casework that is maintenance friendly, is long lasting, and sustainable.

- 1.22 Provide floor drains for lab equipment, emergency showers, and as indicated by the user.
- 1.23 To the extent possible, design labs for flexibility, easy conversation, and with robust lab services to allow changing teaching and research processes. Lab services plumbed from ceiling service panels is a good design direction for new lab construction.

PART 2 – PRODUCTS

- 2.01 Acceptable manufacturers of laboratory casework limited to:
- A. Fisher Hamilton Industries.
 - B. Jamestown/ISEC
 - C. Kewaunee Scientific Equipment Corporation
 - D. Mott Manufacturing
 - E. BEDCO
- 2.02 Lab fittings: Water Saver, TS Brass, or Chicago Faucet, No Alternate Brands, No Substitutions.
- 2.03 Specialty Lab Equipment
- A. Specify in section 11 53 50
 - B. Autoclaves: Steam Driven, either from building steam or electric steam generator, Steris or Lynx are the basis of design. If an electric generator is specified, specify water treatment to remove hardness and other undesirable elements upstream of the supply water.
 - C. Vacuum Pump: Specify under Division 22
 - D. Shelving: Stainless steel free-standing wire shelving, such as Metro shelving or purpose-specified shelving meeting the requirements of the lab use.
 - E. Ice Maker: Manitowoc is the basis of design; other manufacturers meeting the specifications will be allowed. Obtain specific ice cube size and shape from user during design. Provide water treatment to remove hardness and other undesirable elements upstream of the supply water.

PART 3 – EXECUTION (NOT USED)

PART 1 - GENERAL

1.01 Work included:

- A. Chemical laboratory fume hood.
- B. Perchloric laboratory fume hood.
- C. Radioisotope laboratory fume hood.
- D. High temperature process hood.
- E. Snorkel and snorkel extractor arm.

1.02 Work not included:

- A. Biological safety cabinets: Provided by user, coordinated within the design.
- B. Industrial-type fume or heat removal equipment (process fume hoods) under Division 23.

1.03 Quality assurance:

- A. Manufacturers: Companies specializing in the manufacture of laboratory fume hoods, with a minimum of five years of experience.
- B. Testing agency- Companies specializing in testing fume hoods to ANSI/ASHRAE 110 and ANSI Z9.5 standards.

1.04 Provide at least one ADA accessible hood in each instructional classroom and in research labs as required by UAF.

1.05 Basis of Design: Variable Volume Fume Hoods

- A. Where appropriate for the intended application, variable volume fume hoods with restricted bypass shall be used. Other types may be approved by UAF FS/DDC
- B. Appropriate VAV exhaust terminal and VAV control system must be applied, see Division 25 51 00.
- C. Specific project input needed from laboratory design to Division 23 and 25.
- D. Provide VAV or simple controls activated damper on snorkel systems with a wall switch for activation.

- 1.06 Energy Savings: Provide fume hoods with occupancy sensor for sash control. Set sensor to close sash after no more than 5 minutes of no activity

PART 2 - PRODUCTS

- 2.01 Acceptable laboratory fume hood manufacturers limited to:

- A. Kewaunee Scientific Equipment Corporation
- B. Labconco
- C. Fisher Hamilton Industries.
- D. Jamestown
- E. Snorkels: Movex, Alsident, or Nederman

- 2.02 General:

- A. Fume hood: Integrate control system specified in Division 25 51 00
- B. Division 25 shall provide controller with an LED display showing the face velocity measured at the sash.
- C. Select sash velocities in accordance with ACGIH and equipment manufacturers' recommendations for the application. Required average face velocity is 100 fpm at all sash opening ranges, with no single reading greater than 120 fpm or less than 80 fpm at full extension. Normal operations: 0 – 18 inches; Full opening up to 28 inches.
- D. Determine the need to operate individual hoods 100% of the time due to the nature of items stored. In most cases, design with reduced flows when the sash is closed or to provide ventilation of the integral storage cabinets.
- E. Design fume hood exhaust system in coordination with Division 23 and Division 25 to ensure compliance with NFPA 45.
- F. Duct hood vertically unless specifically approved by UAF FS. Stainless steel ducting shall be specified at least to the connection with the room's general exhaust.

- 2.03 Fume hoods - chemical resistant:

- A. Construct of appropriate acid-resistant materials.
- B. Provide ventilated acid storage base cabinets as required; ventilate cabinet through hood exhaust.

- C. Provide with acid-resistant waste and vent for cup sinks only as specifically applicable to the lab. Fume hoods without waste and water are preferred to prevent accidental chemical discharge.
- D. The chemical laboratory fume hood is the standard hood for use in laboratories. Use with all standard laboratory chemicals.
- E. Electrical power: Minimum of two 120 V. AC, 20 amp rated GFCI receptacles. Optional 208 V. AC, 30 amp rated receptacle, per Facilities Services request.
- F. Lights: Minimum 80 foot-candles.
- G. Service fixtures and fittings: Electrical power connections, sinks or cup sinks, potable water, R.O. water, vacuum, air, or gas connections will vary. Coordinate these options with the Facilities Services and AHJ. Electrical power connection shall allow outlets, lighting, and sash control to work independently i.e., the lights will continue to work when the GFCI outlet trips.
- H. Service Fixture Handles to meet the specification for Laboratory Equipment.
- I. No fire protection system required as long as the hood is specified with fire-listed materials..

2.04 Fume hoods - perchloric acid (Only allowed with Facilities Services and AHJ approval.):

- A. All components are acid-resistant.
- B. Special considerations necessary for safe and 100% effective removal and drainage of washdown water.
- C. Specific project input needed from a laboratory design professional.
- D. Fume hood for exclusive use with perchloric acid. Face velocity of 125 fpm required. Dedicated exhaust duct system for perchloric fume hoods, provided with a manually-operated wash-down system. Install all fans on the exterior of the building to ensure negative air pressure in the interior exhaust ductwork.

2.05 Fume hoods - explosion proof:

- A. For use with highly flammable chemicals.
- B. Specific project input needed from laboratory design professional.

2.06 Prohibited fume hoods:

- A. Compensating or "add air" type fume hoods not allowed.

2.07 Radioisotope laboratory fume hood:

- A. Radioisotope fume hood. Face velocity of 125 fpm required. Dedicated exhaust duct system for radioisotope fume hoods, provided with filter racks, as room allows, for a 2-stage filter unit (1 pre-filter; 1 HEPA filter; located as close to the fume hood exit as possible). Coordinate with UAF FS for filter selection. The filter rack is for future use only. Install all fans on the exterior of the building to ensure negative air pressure in the interior exhaust ductwork.
- B. Specific project input needed from a laboratory design professional.

2.08 High temperature process hood:

- A. High-temperature hood. Face velocity of 125 fpm. These hoods are required for use with exhaust temperatures in excess of 150°F. Customized design construction.

2.09 Snorkels:

- A. Chemically resistant and designed to collect and exhaust fumes and odors from a localized area near a bench top.
- B. Snorkel shall be provided with an extractor arm for extended use on the benchtop.
- C. Specify a minimum volumetric flow rate that provides for safe removal of fumes and odors at the benchtop.
- D. Provide a clear cone on the end of the arm
- E. Provide all components to exhaust at least 75 degrees Celsius exhaust

PART 3 – EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 General countertops shall be constructed of commercial grade materials. Chemical resistant must be utilized on laboratory countertops unless otherwise approved by FS/DDC.
- 1.02 To the extent possible, provide a one-piece counter and backsplash(post-formed) in wet areas.
- 1.03 Typical composition:
 - A. Residential: Plastic Laminate or solid-surface plastic resin
 - B. Non-residential: Plastic Laminate (limited to dry counters only), solid-surface plastic resin, stone, concrete, or epoxy.
- 1.04 Select material based on use, cleanability, compatibility, moisture exposure, level of finish and with input from the UAF/FS DDC Project Manager.
- 1.05 Coordinate countertop and backsplash height with the balance of the design. Some items to avoid are: backsplash being cut to fit around power outlets, deep sinks in ADA compliant counters where the waste piping cannot be installed, etc
- 1.06 For ADA counters with sinks, UAF prefers a full-depth knee opening with insulated piping to comply with the guidelines. In public spaces where aesthetics are a concern, UAF will accept an easily removed/installed beauty skirt over the piping chase. The skirt shall meet current ADA guidelines, have a simple support system utilizing spring clips or a french cleat, and allow for a single maintenance staff removal and installation. The skirt design must be coordinated with the selected sink.

PART 2 - PRODUCTS

- 2.01 Core Material shall be exterior grade plywood or M3 Grade Industrial Particleboard Core Plywood.
- 2.02 Plastic Laminate: high-grade high-pressure decorative laminate, post-formed integral backsplash and nosing.
- 2.03 Solid-surface sheet: high-grade solid-surface sheet of minimum ½ inch thickness overlaid on approved substrate. During bidding, specify the price grouping in the bid documents to ensure availability of color selection is appropriate to the project.
- 2.04 Concrete: preferred off-site construction utilizing high-strength lightweight epoxy concrete. Locally sourced is the best option as shipping costs may exceed the benefit of using concrete. Provide proper substrate and structure to support the counters.
- 2.05 Epoxy: Specified under Division 11 Lab Equipment

2.06 Stone: Natural or resin composite stone with a minimal thickness of 1.25 inches

2.07 Backsplashes are to be of the same material as the countertop.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.01 Consider the depth of an entrance and lobbies/corridors when selecting flooring materials for entrances. UAF FS Recommends between 25-30 feet of walk-off carpet may be required to sufficiently remove rocks from shoes.
- 1.02 Entry/walk-off carpet is required on the interior of every entrance to every building. It is the intent that the mats remove soil, rock chips, and moisture that will be tracked into the building by pedestrians. Mats cannot require excessive maintenance efforts to remove the rock chips and dirt. If removable, the mats must be able to be lifted by a single custodian. Walk-off carpet is preferred at all entrances.
- 1.03 Floor mats and frames consisting of entry mats or other mats, frames set in floors to receive mats and accessories, including installation items.
- A. Recessed mat frames required at arctic entry areas and other locations per project requirements. Minimum 18 inches wider than the door by the full length of the vestibule, 16 inches where no vestibule is present. Recessed frames are not required if carpet matting is used.
 - B. Matting required at locations of recessed frames.
 - C. Avoid aluminum tie-rod walking grids or coca mats.
 - D. 5-year warranty
 - E. Loose-laid mats are not acceptable.
- 1.04 Closely coordinate final product selection with slab height and door weather stripping to ensure sufficient clearance between the bottom of the door and the flooring.

PART 2 - PRODUCTS

- 2.01 Matting as required for specific project conditions.
- A. Matting: Tufton Coral Duo or Coral Brush w/ waterproof vinyl backing.
 - B. Rubber: R.C. Muson, pyramid top profile and ¼ inch perforations.
 - C. Walk-off carpet: specified under Division 9.
- 2.02 Recessed matt frames: Extruded aluminum, alloy 6063-T5. Zinc chromate paint or manufacturer's standard protective coating. Single lengths or minimum number possible for removal by maintenance staff, hairline joints, spliced by straight connecting pins.

PART 3 – EXECUTION (NOT USED)

PART 1 - GENERAL

- 1.01 When installing auditorium seating, install polished concrete underneath and avoid using carpet. Carpet will only be used in the aisles, at the front of the room, and at the back of the room.
- 1.02 If seating is provided with tablets, provide a sufficient number of left-handed tablets and ADA-compliant tablets.
- 1.03 Allow for ADA Wheelchair seating at the top and bottom of the auditorium.
- 1.04 Review the requirements of lighting for the aisle to determine if the light will be integrated into the seat frame.
- 1.05 In some auditoriums, a handrail will be required in the aisle. The Consultant must review the seat layout and adjust to maintain proper exiting widths.
- 1.06 Ensure seating material is consistent with code requirements for flame and smoke ratings.

PART 2 - PRODUCTS

- 2.01 Rear of seat back and bottom of seat un-upholstered wood back preferred. Plastic (HDPE) back may be preferred in some classroom applications. Review selection with UAF/FS Maintenance and Project Manager.
- 2.02 Replaceable glides for movable classroom seating.
- 2.03 Removable upholstery to allow recovering.
- 2.04 Solid wood, laminated wood, or solid plastic tablets that are fully adjustable.
- 2.05 Upholstery must be easily cleaned, durable, and resistant to damage. Cloth is preferred over other materials.
- 2.06 Provide unique seat/row numbers for each chair and provide white lights built into the chair for illumination.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

1.01 SCOPE

- A. This section specifies performance requirements for the design, furnishing, installation, supervision, and administration for all aspects of thermal expansion and contraction, vibration isolation, and seismic control of non-structural elements of the Project as shown on the drawings and/or specified in this and other Divisions for this non-essential facility. The Consultant shall provide a Specification 134800 for each project that is fully coordinated with all other disciplines.
- B. It is the design intent to anchor, brace, and support the facility's non-structural elements, including pre-engineered equipment, to the building's structure. This includes mechanical and electrical equipment, system piping and conduit, tanks, vessels, equipment racks, and cabinets.
- C. Utilize the most current adopted IBC and ASCE 7 design requirements for all systems and reference the most current FEMA E-74,412,413, and 414 guidelines.

1.02 GENERAL REQUIREMENTS

- A. Require the construction contractor to engage a Seismic Design Firm to provide any specialized designs and product selections. A single firm for any one discipline is required, and it is preferred that a single firm be the seismic designer for all disciplines.
- B. Pre-engineered and certified assemblies or pre-manufactured systems in accordance with the IBC, with written certificates of compliance, are acceptable.
- C. Additional Vibration Control may be needed to isolate building systems from the building structure, such as in specialized laboratories. Additional building structure design may be needed to accommodate highly sensitive equipment such as electron microscopes.

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Elevator manufacturer to provide equipment and installation warranty and maintenance services for at least one year after acceptance. This requires routine monthly inspection, emergency calls, and all parts and labor required to maintain the elevator in first-class condition. UAF maintenance specifications are available from the Project Manager. Owner-caused call-outs will be invoiced to the University at the agreed-upon rate.
- 1.02 Use of existing and new elevators during construction:
- A. The Designer and Project Manager will ensure that contract language defines liability for UAF or Contractor-caused operational deficiencies during the construction phase. Include provisions for the protection and repair of existing cab, frame, and door surfaces. Include consequences for the repair of damages.
 - B. Specify load-carrying limits and consequences for exceeding those limits. All UAF freight elevators are classified as Class A-General Freight Loading. This classification limits any single piece of freight to a maximum of 25 percent of the rated load of the elevator. Pallet jacks, both manual and powered, are not permitted to be used to load/unload any elevator. If there is a need to move loads exceeding this limit, contact UAF Facilities Services Labor Shop to coordinate. Tests may be performed before and after construction to establish undue wear and tear during construction.
- 1.03 Standard university elevator features include:
- A. Closed-loop door operators.
 - B. All parts and equipment shall be non-proprietary or be readily serviceable and available by third-party vendors. Special equipment or tools necessary for the repair, adjusting, or troubleshooting of the operation of any related equipment shall be included in the project. Provide diagnostic tools that are not self-destructing or self-resetting and will become the property of the owner.
 - C. Electronic scanning type door protection.
 - D. Independent service.
 - E. Emergency battery lowering unit on hydraulic elevators.
 - F. Tamper-proof door interlock.
 - G. Minimum 15% spare conductors in traveling cable. Traveling cables will include communications wiring (coax, twisted pair, Ethernet).

- H. UAF elevator number engraved on the car operating panel.
 - I. Run/Stop key.
 - J. Floor lockout switch keyed to the UAF master for access to university restricted areas.
 - K. Provide work tool and software for proprietary controllers. Provide (1) set of spare controller boards for any boards that are not readily available from third-party vendors. Submittals will include an itemized list of spare components to be provided.
 - L. New or replacement sills will be nickel-silver alloy for all elevators with a capacity of 2500 pounds or more.
 - M. Provide large machine numbers on drives, controllers and disconnects.
 - N. Provide cab pads and vandal-resistant hangars for all elevators.
 - O. Provide flush-mounted, vandal-resistant buttons and bezels.
 - P. Maximum Machine Roomless (MRL) elevator roping will be 2:1.
 - Q. Beam will be installed in the overhead of all elevator hoistways that is capable of supporting the weight of the fully loaded car.
- 1.04 Multi-stage telescoping twin-post equipment will not be installed at UAF.
- 1.05 Designers will include in their design documents the following items:
- A. All work depicted in elevator space drawings will include sheet notes requiring that:
 - 1. Subcontractors coordinate all electrical, mechanical, and plumbing installations with the elevator contractor.
 - 2. All hoistway penetrations are fireproof sealed.
 - 3. Remove unused devices/connectors on hoistway surfaces.
 - 4. Bevel all hoistway horizontal surfaces not on the loading/unloading side that exceed 4 inches to an angle not less than 75 degrees from horizontal. The elevator support framework is not included in this requirement.

5. No equipment can be installed in elevator car, hoistway, or machine room that is not directly related to the elevator operation.
 6. Coordination of pit ladder size and installation location will be coordinated with the elevator contractor.
- B. See ASME A17.1, Sec. 2.8 for restrictions on installation of equipment in hoistways and machine rooms. Examples: wiring/raceways/cables, steam and water piping, risers, return piping, traps, valves, ducts, sprinklers and alarms.
- C. Provide two phone lines and one Ethernet cable to controller in elevator machine room to accommodate cab phone and future remote monitoring by elevator maintenance contractor. One of the phone lines will be a two-way "800" line for remote monitoring by the elevator contractor.
- D. Inspector will not issue a certificate of operation if the cab phone is not connected to an emergency responder. Contract managers need to identify the destination for the phone and coordinate the connection and programming prior to inspection.
- E. Review provisions of NEC Art. 620 for compliance with elevator work.
1. GFCI receptacles in elevator pit and machine room. If pit sump pump is installed, provide separate simplex (bulls-eye), non-GFCI receptacle for sump pump.
 2. Elevator pit light switch location is subject to hoistway door operation and pit ladder location. Electrical to coordinate with elevator contractor.
 3. ASME A17.1 requires minimum pit illumination of 10 foot-candles at pit floor. Use LED light fixtures mounted horizontally on pit wall.
 4. ASME A17.1 requires NEMA 4 fixtures and wet location wiring on all electrical equipment mounted less than 48 inches AFF in hoistways with sprinklers.
 5. All machine room disconnects (power, lighting, pit equipment) require labeling that provides location of panel, panel number and breaker number.
 6. Car light disconnecting switch/breaker will be capable of being locked in the open position. Consequently, the upstream overcurrent protection should not be located in the machine room. See NEC 620.53 for car light disconnecting means.

- F. Comply with applicable Fire codes and standards:
1. Fire Sprinklers and fire/smoke detection are required in accordance with current building and elevator code. Where one differs from the other, request direction from the Authority Having Jurisdiction.
 2. Upon activation of machinery space heat detector, elevator shunt trip activation will have a programmed delay based on the AHJ policy at the time of acceptance.
 3. Coordinate penetrations through rated assemblies under 07 84 00 Fire Stopping
- G. Pit sump and automatic pump required if Firefighter Service is installed, pit is subject to groundwater intrusion or if sprinkler is installed. Sump pumps will be indirectly connected to the plumbing system per the Uniform Plumbing Code. UAF prefers that a dedicated discharge receptacle be provided. The receptacle will be furnished with a grated cover to prevent deposition of foreign materials that can clog the drain.
1. Elevator code and plumbing code do not direct the discharge, but the local water utility will not be receptive to the possibility of oily discharge. Hydraulic elevators require a hydrocarbon switch on the sump pump that opens the pump motor circuit when it detects oily products.
 2. All pits with a sump will have a high water level alarm installed to notify maintenance personnel of pump activation.
 3. Install drain tee and ball valve in pit to allow drainage of pump discharge line after testing or any operation. Location of drain tee and accessories will be coordinated with elevator contractor to guarantee clearances.
 4. Install sump grate that is flush with pit floor and supports a minimum of 300 pounds.
 5. Specify cast bronze pumps unless otherwise approved.
 6. Sumps, sump pumps, and discharge receptacles will be capable of accommodating diversified discharge loads of at least 50 gpm per elevator. NOTE: Dual elevators in a shared hoistway will require accommodation of at least 100 gpm discharge rate.
- H. UAF discourages the installation of hoistway venting. If required by IBC or the AHJ,

the vents will use low-temperature, low-leakage dampers and be controlled. Provide for a freeze stat alarm under Division 23 in the pit to alert FS Maintenance of possible freezing conditions.

- I. Pit ladder will be provided by the Contractor. See ASME A17.1 for specific requirements. Ladder must comply with OSHA standards.
- J. Hoistway and machine room shall have all holes and penetrations fire caulked to meet fire rating of hoistway to include the top of the hoistway, where the ceiling meets the walls.
- K. If structure must be rated, cementitious mono-coating or intumescent paint must be used. Sprayed-on fiber insulation shall not be applied to any surface of the hoistway to achieve the required fire rating of the hoistway. The intent is to ensure the hoistway is not contaminated.
- L. Entrance to machine room shall be located off a public corridor or through a mechanical equipment room. Entrance shall not be through an office, classroom, or restroom.
- M. 10 lb ABC type fire extinguisher will be located and mounted in machine room by the door.
- N. Install switched lighting and GFCI outlet in hoistway overhead for any hoistway that has a machine-room-less (MRL) elevator installed.

PART 2 - PRODUCTS

2.01 Controllers:

- A. Major manufacturers: Otis, ThyssenKrupp, and Schindler
- B. Independents: Virginia Controls, ERM, Minnesota Elevator, GAL Galaxy.
- C. All subject to approval by UAF.

2.02 Door operators:

- A. ThyssenKrupp Elevator
- B. Otis.

C. G. A. L.

D. No alternate brand requests, No substitutions allowed

2.03 Elevator Cars and Operating Systems:

A. Hydraulic

B. Traction

2.04 Acceptable manufacturers of major Machine-Room-Less equipment:

A. Otis

B. ThyssenKrupp

C. Schindler

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Design by a NICET Level IV certified fire protection technician, fire protection engineer, or mechanical engineer registered in the state of Alaska with substantiated experience in fire protection design. Each drawing and the cover of each set of calculations is signed and dated by the NICET-certified technician or engineer.
- 1.02 Consultant to comply with the requirements of NFPA 13 Owner's Certificate. Consultant to provide a performance-based specification with, at a minimum, the following information in the bid documents:
- A. Building Floor Plan Layout
 - B. Building Cross Section, including ceiling construction and non-metallic pipe protection
 - C. Location and rating of firewalls
 - D. Location of concealed and small spaces, enclosures in which no sprinklers are to be installed
 - E. Occupancy classes
 - F. High temperature sprinkler information
 - G. Location of dry pipe systems or other non-wet-based systems
 - H. Pipe type and schedule consistent with Part 2 of this design standard
 - I. Proposed valves, alarms, and test connections and locations
 - J. Product requirements for pipe, valves, alarms, and other appurtenances
 - K. Definable features of any system outside of a standard NFPA 13 Wet Pipe System
 - L. Location and type of standpipes
 - M. Provisions for inspection and flushing
 - N. Clear indication of the extent and connections to any existing water or sprinkler systems if applicable
- 1.03 Consultant to require, at a minimum, the following information to be submitted by the contractor:

- A. Building Floor Plan Layout
 - B. Building Cross Section including ceiling construction and non-metallic pipe protection
 - C. Location of concealed and small spaces
 - D. High temperature sprinkler information
 - E. Capacity of dry pipe system
 - F. Pipe type, schedule, and cutting lengths
 - G. All valves, alarms, and test connections
 - H. Product data for sprinklers, valves, alarms, and other appurtenances
 - I. Provisions for inspection and flushing
 - J. Clear indication of extent and connections to any existing water or sprinkler systems if applicable
- 1.04 Ordinary Hazard Group 1 occupancies are the minimum allowed on campus. Exceptions such as 13R or 13D in residential occupancies require approval by AHJ. (Designers allowed to use LH sprinkler spacing in typical LH areas while providing OH hydraulics out to the branch connections.)
- 1.05 Hydraulic calculations for each zone will demonstrate that the required pressure is a minimum 10% lower than the supplied pressure at the design flow rate.
- 1.06 An NFPA-compliant sprinkler system shall be installed in all UAF buildings where required by code or where an adequate water supply is available. Coordinate elevator sprinklers with Division 14 and 26, NFPA 13 and 72, and ASME 17.1. Exemptions allowed in codes are authorized. The intent is to follow all State of Alaska amended codes or standards. This requirement is intended for new construction and not intended for existing UAF buildings.
- 1.07 Consultant shall evaluate sprinkler supply and demand and determine the need for a fire pump. Notify Facilities Services when calculations indicate need for fire pump. Coordinate emergency power supply with Division 26, FS/DDC, and the FS Division of Utilities.
- 1.08 Provide justification for dry pipe or preaction systems prior to design.
- 1.09 If the existing system is being upgraded or extended, the consultant shall show the

necessary as-built condition within the contract documents. Consultant shall investigate the existing condition of the system and make recommendations to the Facilities Services as to its replacement, renovation, or upgrade.

- 1.10 Consultant to provide horizontal force factor in bid documents for use in NICET Designer’s analysis of horizontal bracing
- 1.11 Special Construction features:
 - A. Pipe main drains outside building to a point clear of building foundation. Make provisions for draining inside the building during cold weather. Size interior drain system for full flow during winter draining.
 - B. Main drain discharges to have large capacity interior catch basins to contain the large flow rate of a 2-inch main drain. Catch basin to have a strainer basket to catch the rust and scale and have a 4-inch waste connection.
 - C. Zone building by floor to the extent possible, by wing if the building layout dictates.
 - D. Install Control Valves Assemblies so each zone can be isolated from the rest of the system. Co-locate control valves whenever possible. Floor drain or catch basin receptor is to have adequate capacity to accept the high flow rate of drains. It is preferred that these devices be located in utility spaces.
 - E. Locate inspectors test ports at the farthest point of each sprinkler zone. Discharge all test ports to an appropriate location near a floor drain or outside of the building.
 - F. Ensure access to all serviceable equipment especially inspectors test points.
 - G. Install piping and valves to allow for a full forward flow test of the backflow preventer. Require full flow test to be witnessed by FS/DDC and description of testing and results in the project O&M Manuals.
- 1.12 Written review and approval of the entire fire protection system design and arrangement from the following authorities are required:
 - A. Design engineer of record
 - B. Authority Having Jurisdiction following revised submittal process in Division 1
 - C. Facilities Services

PART 2 - PRODUCTS

- 2.01 All products shall be third party independent, (e.g. U.L or F.M.) listed, labeled, and specifically approved for the fire protection application where they are used. Test or pressure gauges must include manufacturer or calibration dates within one year of the substantial completion date.
- 2.02 Backflow preventer assemblies must be listed by the Foundation for Cross-Connection Control and Hydraulic Research. Backflow prevention valves: Febco, Watts, or Ames, no alternate brands, no substitutions.
- 2.03 Piping to comply with NFPA 13. CPVC pipe permitted one (1) inch OD and above only and only in residential applications with a protective covering. Threaded Schedule 10 and Polybutylene pipe are not permitted.
- 2.04 Sprinkler heads:
- A. For concealed spaces and crawlspaces, use standard upright sprinklers with plain finish.
 - B. For unfinished areas such as storage rooms, mechanical rooms, and utilidors, use standard pendent type, plain finish, with wire protectors.
 - C. For finished areas, sprinkler heads shall be semi-recessed, chrome-plated pendent type with chrome escutcheon.
 - D. It is permissible to reuse existing sprinkler heads as long as the heads will not be directly removed from piping and in any way physically impacted by construction activities. The consultant will review the potential impacts with UAF FS/DDC and provide clear direction in the bid documents on which existing heads can be reused.
 - E. In high-end specialty-use occupancies, consult with FS/DDC on the use of full-concealed or semi-recessed sprinklers with a finish other than chrome or a corrosion-resistant finish.
- 2.05 Flex sprinkler hose with threaded end fittings for sprinkler head installations shall be stainless steel braided and equivalent to 1-inch schedule for flow and pressure drop. Flexible sprinkler heads **shall only be allowed** in certain retrofit situations or when passing through an infrangible wall or ceiling system.
- 2.06 All control valves, main and zone, should be equipped with tamper switches and provide for locking with a chain or other valve lockout device.

PART 3 – EXECUTION

- 3.01 Provide for required air or hydrostatic testing of all new and modified systems unless otherwise exempted by NFPA.
- 3.02 Require access panels to areas of concealed piping for purposes of inspection and maintenance.

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide the following equipment, in the indicated sequence, at each main domestic water service to each building:
- A. Main isolation valve after tee off main line, with the other half of the tee going to the fire suppression system
 - B. Strainer with manual blowdown and stainless-steel screen.
 - C. Double check backflow preventer or reduced pressure backflow prevention assembly (minimum 1 union or flanged connection).
 - D. Tee for upstream connection of PRDV (pressure reducing valve) and water meter bypass
 - 1. Bypass shall be line size and include pressure gauges upstream and downstream of bypass isolation valve.
 - 2. Pressure gauges shall be isolated by gauge isolation valves.
 - E. Isolation valve
 - F. PRDV
 - G. Water meter with union connections.
 - 1. Owner will furnish a 2-inch Badger Recordall compound series meter for the contractor to install.
 - 2. Install per UAF Domestic Water Detail. Contact FS/DDC Project Manager for current detail.
 - 3. Coordinate with Division 26 for installation of conduit and wiring.
 - 4. Indicate as such on drawings.
 - H. Isolation valve
 - I. Tee for downstream connection of PRDV and water meter bypass.
- 1.02 Where sprinkler system entrance to building is separate from domestic water system entrance, provide sprinkler system double check backflow preventer separately under Division 21

- 1.03 Provide area floor drains at all mechanical/utility rooms, restrooms, shower rooms, drying areas, laundry rooms, and laboratories. Slope floors uniformly from the wall to the drains.
- 1.04 Install trap primers on all floor drains. See Section 22 40 00 for trap primers.
- 1.05 Provide diaphragm or piston style water hammer arrestors at hot & cold service to all fixtures. Pipe riser tubes not allowed. Single water hammer arrestor may serve banks of fixtures.

PART 2 - PRODUCTS

- 2.01 Reduced Pressure Backflow prevention valves:
 - A. Febco, Watts, or Ames. No alternate brands, no substitutions.
 - B. Must be listed by Foundation for Cross-Connection Control and Hydraulic Research.
- 2.02 Strainers shall have manual blow down valve and stainless steel screen and vacuum breaker equipped hose thread connection.
- 2.03 Pressure Reducing Valve: WATTS brand, 0-200psi, bronze construction. Provide minimum 3 inch round 0-200 psi pressure gauges.
- 2.04 Water Meter: 2-inch diameter, 150 lb. flanges. Register to display gallons. Badger Recordall Compound Series meter. Owner Furnished Contractor Installed. No alternate brands; no substitutions.
- 2.06 Gate valves not allowed for line size less than 3 inches, utilize full port ball valves. Use rising stem gate valves for valves 3 inches and greater.

PART 3 – EXECUTION

- 3.01 Provide a cleaning and disinfection specification for domestic water piping in accordance with current adopted codes and regulations. Require submission of all results to UAF and if required, Alaska DEC (i.e. utilidor, building service entry up to the first backflow).
- 3.02 UAF Facilities Services and Consultant shall obtain necessary construction permits and approvals to operate from ADEC and/or appropriate Utility prior to construction on any public water system (i.e. utilidor, building service entrance).
- 3.03 Coordinate with Division 26 to provide conduit and wiring for water, steam condensate, and other called for meters.

END OF SECTION

PART 1 - GENERAL

1.01 Obtain equipment numbers from FS/DDC prior to Design Development

PART 2 - PRODUCTS (*NOT USED*)

PART 3 - EXECUTION

3.01 Identify all piping per ASME A13.1 Latest Edition "Scheme for the Identification of Piping Systems."

- A. Piping identified and flow direction indicated at each access panel, on both sides of all wall penetrations, within sight of all valves, and every 25 feet along piping. Labels shall be visible from the normal approach.
- B. Where piping is lagged with fabric or other material that an adhesive is not effective at holding the label, strap-on or snap-on style labels shall be used.
- C. Any piping lacking a specified color scheme by ASME A13.1-2007 shall have user defined colors.

- 1. Sanitary waste

Background: Safety Purple

Lettering: White

- 2. All others as directed by FS/DDC.

3.02 Identify valves, air handlers, and other equipment by building, system, type of service and unique ID number. Facilities Services to provide ID number to the consultant coordinated with the existing ID system.

3.04 Contractor to provide plastic laminated valve schedule and one-line diagrams for piping and instrumentation, indicating instrument and valve ID numbers, mounted in noticeable locations in the mechanical room.

3.05 Contractor to provide and install a minimum 2-inch high phenolic labels with the unique equipment name and number. Lettering on the label shall be in Helvetica Medium or Calibri Font, at least 3/8 inch letters.

3.06 Valves serving equipment within sight of the operator need not be tagged for service.

END OF SECTION

PART 1 - GENERAL

- 1.01 Protect insulation against damage during and after construction.
- 1.02 Provide ASJ vapor retarder jacket for all fiberglass mechanical insulation regardless of service. Water vapor permeability: 0.02 Perm or less. Coordinate more restrictive Perm requirements with project needs and, as available, from basis-of-design manufacturers.
- 1.03 Provide a metal jacket for all calcium silicate insulation and on all insulation subject to foot traffic. (i.e. low low-mounted horizontal piping in mechanical rooms.)
- 1.04 Provide canvas lagging on all piping and ductwork in mechanical rooms and mechanical spaces requiring access for service, which is in reach of normal activities and wear and tear. In general, lag all piping and ductwork below 10 feet. Where a metal jacket is provided, canvas lagging is not required.
- 1.05 In public spaces, provide metal or canvas lagging as directed by FS/DDC. Coordinate finish with FS/DDC depending on project requirements.
- 1.06 Provide drawing detail of building vapor retarder connection to all penetrations, including but not limited to: duct and plenum insulation vapor retarder jacket, piping insulation vapor retarder jacket, conduits, heating oil piping, etc.
- 1.07 Consider fan location to minimize the length of the outside air intake duct or size of outside air intake plenum.

PART 2 - PRODUCTS

- 2.01 As regards product descriptions, the use of military standard (MilSpec) descriptions is unacceptable. The product should be described in plain language that is readily understandable to the Owner and Contractor. ASTM and ANSI references used in the description of a product are acceptable.
- 2.02 Utilize fabric fabric-covered insulation blanket with snap buckles for all valves and fittings not covered with standard pipe insulation. Provide a vapor retarder on both sides of blanket for chilled water and domestic cold water. Coordinate with FS/DDC Project Manager as to whether the owner will furnish the jackets from FS/Maintenance.
- 2.03 Piping insulation (except refrigerant piping – see below): semi-rigid molded fiberglass insulation with ASJ vapor retarder jacket. R-value of all insulation shall meet or exceed current ASHRAE 90.1 and USGBC LEED standards, whichever is more stringent. Staple and seal seams to provide tight vapor barrier.
- 2.04 Refrigerant suction and hot gas piping insulation: ½ inch thick closed cell insulation, preformed by the manufacturer specifically for the size of pipe or tubing on which it is to

be installed. Vapor retarder properties inherent in insulation.

- 2.05 Duct insulation: semi-rigid fiberglass insulation with ASJ vapor retarder jacket on the outside of the ductwork. R-value of all insulation shall meet or exceed current ASHRAE 90.1 and USGBC LEED standards, whichever is more stringent.
- 2.06 Lagging:
- A. Metal Jacket: 22 (approx.03 mil thickness) gauge embossed aluminum with metal bands
 - B. Canvas Lagging: cotton fabric with fire-retardant lagging adhesive compatible with insulation vapor retarder jacket. Cut, not torn, edges folded neatly over insulation ends to conceal insulation.
- 2.07 Preformed plastic insulation covers and inserts: PVC cover with fiberglass insert. Both are pre-formed by the manufacturer. Do not use PVC Corners on steam piping.
- 2.08 Sound Lining: Where sound lining of ductwork is required, provide flexible liner made from glass fibers bonded with thermosetting resin.
- A. Airside surface and factory edges protected with the manufacturer's protective coating.
 - B. Rated for use in airstreams with velocities up to 5000 fpm and temperatures up to 250 degrees F.

PART 3 - EXECUTION

- 3.01 Design insulation system for easy access at expansion joints, flexible piping, pump connectors, test plugs, sensors, and meters. Consider removable/replaceable insulation blocks or blankets.
- 3.02 Insulate valve bodies, unions, strainer bodies (leave blow-down valves exposed), control valves, check valves, in-line pump bodies with oversized insulation the same thickness as adjacent piping. Where insulation blankets are applied to larger valves and piping accessories, additional insulation is not required.
- 3.03 Insulate all domestic and lab water piping (hot, hot water recirculation and cold).
- 3.04 Piping systems conveying fluids below ambient temperature, including rain leaders, chilled water, and cold water.
- A. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible

connections, pump bodies, and expansion joints. Thickness as determined by ASHRAE 90.1, but not less than 1 inch.

- B. Secure factory-applied ASJ with pressure-sensitive adhesive self-sealing longitudinal laps, butt strips, and outward clinching staples. Seal entire lap, including staples, with ASJ vapor retarder tape or vapor retarder mastic.
 - C. Insulate fittings, joints, and valves with molded insulation of like material and same thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- 3.05 Insulate drain bowls, discharges, and rain leaders. For leader piping, insulate the entire length of the run inside building to prevent condensation. Interior insulation to be one-inch thick fiberglass with vapor retarder jacket. Ensure adjacent building vapor retarder is adequately coordinated; provide detail(s) for tie-in. Exterior insulation: Refer to Division 33
- 3.06 No plumbing vents where subject to freezing temperatures, except vent through roof (VTR). Insulate VTR from the top to a point 6 feet inside the building vapor barrier. Flash and weather seal as appropriate for specified roof construction. Insulation to be one-inch thick fiberglass with vapor retarder jacket. Ensure adjacent building vapor retarder is adequately coordinated; provide detail(s) for tie-in.
- 3.07 Outside air intake ducts: minimum of 3-inch rigid fiberglass insulation with vapor retarder jacket and canvas lagging. Ensure adjacent building vapor retarder is adequately coordinated, provide detail(s) for tie-in.
- 3.08 Relief and exhaust ducts at wall penetrations and louvers: minimum of 1.5 inch rigid fiberglass insulation with vapor retarder jacket and canvas lagging. Ensure adjacent building vapor retarder is adequately coordinated; provide detail(s) for tie-in.
- 3.09 Supply Air: minimum of one-inch of flexible fiberglass or as thick as required by ASHRAE 90.1 with vapor retarder jacket.
- 3.10 Pipe hangers: Outside insulation on chilled water, recirculated cold water, high pressure steam (upstream of control valve tree), and generator exhaust piping. Provide hanger inserts where weight of pipe may crush the fiberglass insulation. All other locations install hangers directly in contact with piping and with insulation over hangers. Seal insulation jacket around hanger/hanger rod with thermal insulation coating.
- 3.11 Insulate all hydronic heating piping except that individual branch piping which serves single terminal unit equipped with 2-way control valves or slab heat piping with glycol temperatures 105 degrees and lower. Thickness as determined by ASHRAE 90.1 but not less than 1 inch.
- 3.12 Extend test plugs, sensors, valve stems, and other devices mounted on insulated pipes

above insulation on stand-offs and stems. "Dishing" the insulation is not permitted.

3.13 Use double-wall construction within air handler housings for insulation (sound and thermal). Air handler inner wall may be perforated steel if required for acoustical dampening.

3.14 Sound Lining:

- A. Prior to installation in ductwork, apply the manufacturer's provided sealant to all cut edges where glass fibers are exposed, regardless of orientation to the airstream in final installation.
- B. Provide protective nosing, same depth as lining thickness at all lining edges subject to impingement of air and as required by SMACNA, most current edition.

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide floor cleanouts on main waste piping installed above finished spaces at all levels to facilitate maintenance. This requirement is in addition to the code-required cleanouts.
- 1.02 Consultant shall review the need for acid waste piping and acid neutralization systems with the owner before specifying these systems. In most cases, a waiver will be sought on this code requirement from the State of Alaska, especially in renovations.
- 1.03 Coordinate selection of allowable domestic waste piping with Facilities Services. Cast iron is preferred, but some projects require copper DWV for space constraints, and some will work well for ABS.
- 1.04 Where borosilicate glass acid waste piping is scheduled for demolition, confirm with FS/DDC whether or not it is to be salvaged, in part, to the Owner.
- 1.05 Consultant shall review vertical waste stack placement and coordinate with structural and architectural to ensure the required horizontal slopes of waste piping can be achieved within the ceiling space.

PART 2 - PRODUCTS

- 2.01 Sanitary sewer piping, above grade:
 - A. Cast iron pipe: hubless, service weight. Cast iron fittings. Joints: Neoprene gaskets and four-band stainless steel clamp-and-shield assemblies. This also applies to cast iron vent piping where offset below floor level, up to and including any supplemental cleanouts.
 - B. Copper pipe: DWV. Fittings: cast bronze or wrought copper. Solder joints.
 - C. ABS pipe: Schedule 40 ABS DWV where allowed by code; not in spaces requiring non-combustible construction such as plenums, rated shafts, etc., and not in spaces where noise from ABS risers will be a concern. Fittings and joints shall be ABS with the manufacturer's recommended adhesive.
- 2.02 Sanitary sewer below grade:
 - A. Interior below grade:
 1. Cast iron pipe: hubless, service weight. Cast iron fittings. Joints: Neoprene gaskets and four-band stainless steel clamp-and-shield assemblies. This also applies to cast iron vent piping where offset below floor level, up to and including any supplemental cleanouts.

2. Schedule 40 ABS DWV on approval by FS/DDC

- B. Exterior below grade: Refer to Division 33

2.03 Domestic water piping, above grade:

- A. Copper tubing: Type L, hard drawn. Fittings: cast bronze or wrought copper. Solder joints. Within the specifications include this statement is included: "Mechanical or press-fit joints such as Propress or Sharkbite are specifically not allowed."
- B. Ductile Iron: Schedule 40 cement-lined AWWA rated for domestic water service. Joints: Grooved fittings. Refer to Division 21 for piping after the backflow preventer for fire service.
- C. PEX-A allowed for residential hot and cold water. No polybutylene pipe allowed.

2.04 Domestic water pipe, below grade:

- A. Copper type K: soft drawn, provided with corrosion protection.
- B. HDPE: Certified for domestic water supply, SDR17 or better, sized to pressure class. Joints: welded.
- C. Ductile Iron: Schedule 40 cement-lined AWWA rated for domestic water service. Joints: Bell and Spigot.

2.05 Storm water piping, above grade:

- A. Cast iron pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and four band stainless steel clamp-and-shield assemblies.

2.06 Storm water pipe, below grade, within 5 feet of building: (refer to Division 33 beyond 5 feet)

- A. Cast iron pipe: hubless, service weight. Cast iron fittings. Joints: Neoprene gaskets and four band stainless steel clamp-and-shield assemblies.

2.07 RO (reverse osmosis) and DI (distilled/deionized) water piping, above grade:

- A. Polyvinyl chloride (PVC) pipe and fittings: Schedule 80, socket type, solvent joints.

2.08 Acid-resistant waste and vent piping, above grade:

- A. Pipe: UL classified flame-retardant polypropylene or plenum-rated CPVC. Use of borosilicate glass is limited to retrofit situations only, as approved by the UAF FS/DDC Project Manager.
- B. Fittings: same material as pipe.
- C. Joints:
 - 1. Glass: Compression-type bead-to-bead and bead-to-plain end coupling. Outer shell, bolt, and nut formed of stainless steel. Inner seal ring of PTFE (Teflon).
 - 2. Polypropylene: Mechanical joints for above-grade, fusion joints for below-grade.
 - 3. CPVC: solvent-weld (glued) joints for above and below grade.

2.09 Compressed air (plant) above grade:

- A. Copper tubing: Type L, hard drawn. Fittings: cast bronze or wrought copper. Joints: brazed preferred, silver solder allowed.
- B. Galvanized steel pipe: Schedule 40. Joints: Malleable screwed fittings.

2.10 Flanges, unions and couplings:

- A. Pipe size 2 inches and under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe size over 2 inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping. Neoprene gaskets for gas service: 1/16 inch thick preformed neoprene bonded to fiber.
- C. Dielectric connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- D. Grooved fittings: Galvanized fittings to accompany galvanized piping. Couplings and fittings: standard manufacture grooved fittings with gaskets compatible with system pressure, temperature range, and fluid. Grooved fittings allowed only at water service in mechanical rooms or in utilidor. Victaulic, Gruvlok, or equal.

2.11 Gate valves:

- A. Up to 3 inches: Not permitted; use ball valves for isolation service.
- B. Over 3 inch: Use butterfly or gate valves.

2.12 Globe valves:

- A. For throttling service.

2.13 Ball valves:

- A. Up to 3 inches: Bronze two-piece body, full port, and forged brass, chrome-plated ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends.
- B. Over 3 inches: Cast steel, two-piece body, full port chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, flanged. Seat material to be compatible with liquid handled.
- C. RO and DI water: Polyvinyl chloride (PVC) end entry, or socket type for 1 inch and smaller, with Teflon seats and Viton seals.

2.14 Swing check valves:

- A. Up to 2 inches: Bronze swing disc, soldered or screwed ends.
- B. Over 2 inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

2.15 Spring-loaded check valves:

- A. Iron body, bronze trim, spring-loaded, renewable composition disc, screwed, wafer, or flanged ends.

2.16 Water pressure reducing valves:

- A. Up to 2 inches: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded and single union ends.
- B. Over 2 inches: Cast iron body, bronze fitted, elastomer diaphragm and seat disc, flanged.

2.17 Relief valves:

- A. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

2.18 Lab Process Piping:

- A. Interior Propane: Steel pipe, ASTM A53, scheduled 40 black. Fittings: ANSI/ASME B16.3 malleable iron. Joints: Threaded up to 2-inch, welded above 2-inch.
- B. Exterior Propane: Steel pipe, ASTM A53, scheduled 40 black. Fittings: ASTM A234 forged steel welding type. Joints: Welded to ASME B31.9. Provide jacket meeting AWWA C105, two layers of 10-mil polyethylene tape.
- C. Lab Vacuum: Copper tubing: Type L, hard drawn. Fittings: cast bronze or wrought copper. Joints: brazed.

2.19 Circulation Pumps for Domestic Water: Wet Rotor, bronze or stainless-steel housing (volute) with stainless trim.

2.20 Specify hangers and associated hardware to be compatible with the piping material, system being conveyed, weight, insulation type, and seismic design category.

- A. Where applicable, such as the hanger on a cold water copper pipe, provide separation between dissimilar metals. This may include wrapping copper pipe in a dielectric tape, the use of epoxy-coated (preferred) or copper-plated hangers, or any other combination of material that prevents electrolysis and corrosion.

PART 3 – EXECUTION

3.01 Provide cleanouts for water closets, urinals, drinking fountains, janitor sinks, lavatories, floor drains, sinks, etc. Wall cleanouts are preferred. Cleanouts may be provided at the end of ganged runs, such as water closets and lavatories, where appropriate.

3.02 Provide cleanouts for water closets approximately 6 inches above the flood rim of the highest device in the gang served.

3.03 Provide cleanouts for every urinal per UPC 707.0, Cleanouts.

3.04 Where cleanouts are installed with nipples (barrel fittings) and where horizontal waste piping connects to vertical waste piping, provide wye and combo wye fittings to facilitate maintenance.

3.05 San tee crosses are specifically not allowed.

- 3.06 At floor-mounted mop sinks, extend the vent up the wall in size equal to the waste pipe to an accessible wall cleanout, then reduce the vent to a size appropriate for fixture.
- 3.07 Make every effort to avoid offset vents below the floor. To the greatest extent possible, follow the guidelines to route waste piping from the floor drain to the vent, then to the waste main. Where the floor drain is within five feet of the vent take-off, oversize the vent take-off same as for mop sink, and provide a cleanout in the wall.
- 3.08 Install plumbing piping to maintain a minimum 1-inch clearance from all other piping and ductwork. Where piping or ductworks are insulated this requirement applies to the surface of insulation.
- 3.09 Below-grade, 4 inches and larger waste piping may be run at 1/8 inch per foot with the approval of the AHJ. This is also true for gangs of wall-mounted water closets where connected by 4-inch waste piping in an adjacent plumbing chase. Suspended waste piping of all sizes must be run at ¼ inch per foot.
- 3.10 Isolation valves:
- A. Provide isolation valves in all domestic and lab piping at each bank of toilets, break rooms, individual toilet rooms, laboratories, and other areas as prudent for service isolation.
 - B. For multi-story buildings, provide isolation on each different system at each floor level and if appropriate, each zone or wing of the building.
- 3.11 Hot water circulation:
- A. Provide hot water circulation lines to the ends of hot water mains and provide a flow adjustment valve on each recirculating line branch. Minimum pipe size: ¾ inch. Minimum flow: ½ gpm. Size combined hot water circulating piping for a maximum 4 foot/second flow velocity.
 - B. Balancing or flow control valves shall be NSF/ANSI 61 certified.
- 3.12 Provide sleeves for all pipes passing through ceilings and floors, etc. Sleeves shall be at least 1 inch above the floor finish. Size sleeves to allow for insulation and fire stopping/acoustical sealant as required under 07 84 00 Firestopping.

Where riser clamps may interfere with sleeves at floor penetrations or with structural elements between floors, provide specific instructions and details to eliminate conflicts. Provide additional instructions and details for new or existing piping passing through existing floor openings, including penetrations where holes were not cleanly cut but must now be sleeved and sealed to achieve a rated penetration. Where sleeves are retrofitted,

provide a sleeve welded to a plate. For new construction, provide sleeves cast into the slab.

END OF SECTION

PART 1 - GENERAL

- 1.01 Avoid use of sewage lift stations whenever possible.
- 1.02 Include provisions and configuration for planned, safe, drain-down of force main.
- 1.03 On larger installations, flooded suction lift stations, with pump and motor in adjacent drywell, are preferred. Submersible pumps are allowed in smaller installations, Flyte brand preferred.
- 1.04 All lift stations: duplex, sized for 100% redundancy, with auto-alternator and high level alarm back to Building Management System (DDC).
- 1.05 Lift station discharge piping: Mechanical restraint required. Friction couplings are not acceptable.
- 1.06 Use resistive conductor level control system. Float-type control is discouraged.
- 1.07 Review need for pre-flush lift stations

PART 2 - PRODUCTS

- 2.01 Acceptable manufacturers:
 - A. Paco (no record of use)
 - B. Flyte
 - C. Meyers (no record of use)
 - D. Goulds
 - E. Vaughn (used at Hess Village in 2024)
 - F. Smith and Loveless (used at Ben Atkinson in 2023)
 - G. No Alternate Brands, No Substitutions.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Generate hot water at 140°F and deliver all potable hot water to the point of use at 120°F, except for commercial kitchens, where it should be per the equipment manufacturer's requirements. Temper hot water at public restroom lavatories in accordance with local code but not more than 105°F.
- 1.02 Circulate all hot water main lines to maintain temperature.

PART 2 - PRODUCTS

- 2.01 For larger applications: Semi-instantaneous steam-fired hot water heater. Self-descaling unit using helically wound coils. ASME rated. AERCO with an electronic control valve. No Alternate Brands, No Substitutions.
- 2.02 Avoid electric water heaters if possible. Indirect water heaters are discouraged because of the need to circulate glycol heating fluid in the summer months. For a small application with available steam, use a brazed-plate heat exchanger with an adjacent hot-water storage tank and circulation pump.
- 2.03 Mixing valve or tempering station: Provide as needed. Review with FS/DDC

PART 3 - EXECUTION

- 3.01 Install temperature and pressure sensors/gauges on hot water discharge lines.

END OF SECTION

PART 1 - GENERAL

- 1.01 Restrooms and utility rooms shall have floor drains at lowest point.
- 1.02 Provide exposed flushometers.
- 1.03 In general, provide wall-hung restroom fixtures with floor-mounted supports. Unless otherwise coordinated, accessible urinals shall be wall-hung.
- 1.04 Water closets, lavatories, and urinals shall be color: white, unless approved otherwise by FS/DDC.
- 1.05 Hose Bibbs/Wall Hydrants.
 - A. Building Exteriors: Install recessed freeze-proof 1-inch hose bibs w/ $\frac{3}{4}$ inch hose connections on exterior building walls to provide an outside water source. Provide a minimum of one bib per side of building, maximum of 150 LF between bibs. Provide isolation valve in supply piping on warm side of building envelope and label within 15 feet of hose bib. Pitch pipe from isolation valve to drain at hose bib. Provide and locate bibs to minimize attached hoses crossing pedestrian walkways.
 - B. Roofs: Provide one recessed freeze-proof 1-inch hose bib with $\frac{3}{4}$ inch hose connection per 20,000 square feet of roof area. Locate in penthouse wall or other appropriate location. Provide isolation valve in supply piping on warm side of building envelope and label within 15 feet of hose bib. Pitch pipe from isolation valve to drain at hose bib.
- 1.06 Provide wall-hung, ADA-approved stainless-steel drinking fountains, dual height for both ADA and standard access. Provide drinking fountains with integral chillers and bottle filling stations less filtration. Where applicable, design building with central filtration or provide a retrofit filtration kit, less the alarm. .
- 1.07 Water hammer arresters: PDI certified. Isolation valves not required if fixture or group of fixtures are suitably isolated.
- 1.08 Flushometer valves: For urinals, provide battery-powered, automatic infrared sensor-type flushometer valves. 120-volt, hard-wired flushometer valves are not allowed. Provide all automatic flushometer valves with secondary flush capability in the event of primary automatic flush failure. All water closet flush valves shall be manual type with oscillating handle.
- 1.09 Lavatory and water closet fixture supports must be installed to allow "Zero" deflection under 500-pound load. This includes upward loading and side to side loading as well as

downward loading. Coordinate specific design with FS/DDC.

- 1.10 Require that all flush valves and supply stops be securely supported in plumbing chase to prevent movement at wall penetration.
- 1.11 Urinal floor-mounted fixture supports must be installed with upper and lower bearing plates as well as bracing at the top of supports to prevent movement. Top bracing to be connected firmly to the wall framing. Where installed in aged concrete, two ½ inch anchor bolts installed diagonally from each other at the base plate are acceptable. Where installed in new concrete, provide four ½ inch anchor bolts, one at each corner of the base plate of each floor-mounted support. Where possible it is desirable to provide 2 inch by 12 inch dimensional substrate or ¾ inch treated plywood substrate behind urinals at chase walls for supporting replacement urinals without opening tiled wall surfaces. Coordinate specific design with FS/DDC.
- 1.12 Where practical, provide softened and/or filtered water upstream of water coolers. UAF prefers centralized softening and filtering located in a mechanical space. Coordinate provisions of each project with FS/DDC.
- 1.13 Provide a local floor drain located near emergency shower in each lab.
- 1.14 Consultant shall confirm that water pressure available at top of each cold water main is between 125% and 150% of minimum required for proper flushometer valve operation.
- 1.15 Specify for contractor to provide one spare of each type of faucet, flushometer, and filter. Additionally, require contractor to provide 6 spare cartridges required by each faucet type on the project. Where separate hot and cold cartridges are required, provide six of hot and six of cold.
- 1.16 Provide automatic flush valve operators at urinals, do not provide automatic flush valves at water closets.

PART 2 - PRODUCTS

- 2.1 Acceptable manufacturers - Base all designs on latest models similar to below:
 - A. Vitreous China Fixtures - general (see specific fixture for preferred basis of design):
 1. American Standard
 2. Kohler
 3. Sloan

4. Caroma Sydney Smart II 305 Dual Flush floor mounted flush tank in student residences. In retrofit or remodel, where space is not adequate for Caroma identified above, American Standard Cadet floor mounted flush tank may be considered. Coordinate fixture model as required for ADA compliant resident units. Coordinate selection and closet flange installation with FS DDC.

B. Flush valves:

1. Flushometer Valve Body:

- a. Water Closet (1.6 gpf):

1. Basis of design: Sloan Royal Model 111.
2. Zurn Z6000-WS1.
3. Delany 402.

- b. Urinal (0.5 gpf):

1. Basis of design: Sloan Royal Model 186.
2. Zurn 6003-EWS.
3. Delany 451.

- c. No Alternate Brands, no Substitutions.

2. Automatic Operators:

- a. Basis of design: Sloan Royal SMO. Exposed, battery powered, sensor activated.

- b. Zurn Exposed ZER6000-CPM. Exposed, battery powered, sensor activated.

- c. Delany Flushboy Ultra SideArm. Exposed Battery Powered Sensor Activated.

- d. No Alternate Brands, no Substitutions.

- C. Water closet seats:
 - 1. Church
 - 2. Bemis
 - 3. Olsonite

- D. Fixture carriers:
 - 1. Jay R. Smith
 - 2. Zurn
 - 3. Wade
 - 4. Josam

- E. Mixing valves (pressure balanced):
 - 1. Bradley
 - 2. Powers
 - 3. Symmons

- F. Electric water coolers:
 - 1. Basis of design: Elkay (See specific model below)
 - 2. Haws
 - 3. Oasis
 - 4. Halsey Taylor

- G. Faucets:
 - 1. Lab and classroom sinks:
 - a. Chicago

- b. Water Saver
 - c. TS Brass
 - d. No Alternate Brands, no Substitutions.
 - e. Refer to Division 11 for further laboratory faucet requirements.
2. Lavatory: Single handle, ceramic disc cartridge, commercial series, NSF/ANSI 61 certified, ADA compliant, ASSE 1070 (integral tempering)certified, with smooth chrome plated metal body:
- a. Basis of design: Chicago 420-T-CP
 - b. Watts LavSafe P1070A5
 - c. Powers TempTAP 115A5
 - d. No Alternate Brands, no Substitutions.
3. Kitchen: Single handle, ceramic cartridge with adjustable temperature limit stop, NSF/ANSI 61 certified with smooth chrome plated solid brass body. ADA compliant. 9" swing spout with or without deck plate. 1.5 gpm aerator.
- a. Basis of design: Moen 8707 (w/ side spray)
 - b. Basis of design: Moen 8701 (w/o side spray)
 - c. American Standard
 - d. Chicago
 - e. No Alternate Brands, no Substitutions.
4. Coffee/Break Room: Polished chrome plated, premium metal, fixed, high-arch supply spout, with magnetic docking, pull-down spray head. Single handle, faucet mounted, ceramic disc valve, NSF/ANSI 61 certified, ADA compliant.
- a. Basis of Design: Kohler K-596 Simplice, Pull-down sink faucet.
 - b. Moen

- c. American Standard
 - d. No Alternate Brands, no Substitutions.
5. Shower, handheld shower, and tub: Rotary shower valve, single ADA-compliant handle, chrome plated with memory stop, autodrain, pressure-balanced with adjustable limit stops and integral stop valves. Utilize a pressure-balancing mixing valve upstream of the shower valve to temper water to 120F.
- a. Basis of design: Moen Single Handle with 1222HD Cartridge, Commercial Series or Moen-approved series with the correct cartridge.
 - b. Chicago
 - c. Symmons
 - d. No Alternate Brands, no Substitutions
6. Janitor and service sinks:
- a. Chicago with XT Cartridge, such as 1100 or 897, with smooth chrome finish
 - b. Moen commercial m-Dura 8232
 - c. Symmons Service Sink S-2490
 - d. No Alternate Brands, no Substitutions.

2.2 Water closet - wall mounted:

- A. Fixture: wall hung siphon jet vitreous china closet bowl, with elongated bowl rim, 1-1/2 inch spud, china bolt caps.
- B. Seat: Solid white plastic, open front, extended back, brass bolts, without cover.
- C. Floor mounted carrier: adjustable cast iron frame, integral drain hub and vent, adjustable spud. Lugs for floor attachment, threaded fixture studs with nuts and washers. Wall mounted, stud grabber fixture supports not allowed. (Note: Where

fixture is mounted beyond the manufacturer recommended distance from the carrier, installation must include additional support elements as provided by the carrier manufacturer, not field fabricated.)

2.3 Water closet - floor mounted:

- A. Fixture: Floor mounted. Siphon jet vitreous china elongated bowl & vitreous china flush tank.
- B. Flush valve assembly: with ball cock/flapper flush assembly, supply tube and stop valve.
- C. Seat: Solid white plastic, open front, extended back, brass bolts, with or without cover depending on application.

2.4 Urinal:

- A. Fixture: vitreous china, wall hung, blowout urinal with shields, integral trap, 3/4 inch top spud, steel supporting hanger, 14-1/2 inch depth.
- B. Floor mounted carrier: cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger on top bearing plate, bearing studs on bottom bearing plate.
- C. Basis of Design: Kohler K-25048-ET Stanwell Blowout Urinal.

2.5 Lavatory

- A. Fixture: vitreous china lavatory, oval, front overflow, seal of putty, caulking, or concealed vinyl gasket. Solid surface may be used on approval by the FS DDC Project Manager. Coordinate specific size of fixture with FS DDC Project manager.
- B. Trim: Supply and waste fittings per paragraph 2.20 and 2.21 below, water economy aerator, single lever handle. Pop-up drain for residential, grid drains for public. Where pop-up drain is not available integral to faucet, (Chicago 420-T-CP), provide ADA spring loaded pop-up drain. Moen 140780, or equal.
- C. Provide self-rimming when using plastic laminate countertops (namely residence life). Otherwise, utilize under counter mounted sinks.

2.6 Lavatory - wall hung:

- A. Fixture: Vitreous china, wall hung, size as appropriate, 4 inch centers for trim,

overflow.

- B. Trim: Supply and waste fittings per paragraph 2.20 and 2.21 below, water economy aerator, single lever handle. Pop-up drains for residential, grid drains for public. Where pop-up drain is not available integral to faucet, (Chicago 420-T-CP), provide ADA spring loaded pop-up drain. Moen 140780, or equal.
- C. If the project desires monolithic concrete sinks, coordinate with FS/DDC. Items to consider are the profile, proximity of faucet outlet to sink wall, structural support system, and waste/drain.

2.7 Shower:

- A. Provide 2-inch drains with stainless steel strainers integral with the base provided by Division 10 Compartments and Cubicles.
- B. See Section 10150 for receptors and for compartment walls.
- C. Shower valve (and Mixing valve when required) and shower head:
 - 1. Rotary shower valve: chrome plated with memory stop, pressure balanced & adjustable limit stops and integral stop valves. See Faucet product specifications above.
 - 2. Shower head: chrome plated with 2 ½ GPM flow restrictor.
 - 3. Specify the assembly to have the autodrain feature.
- D. ADA accessories: where designated with in-line vacuum breaker with wall and hand-held shower head with minimum 69-inch flexible stainless steel hose, wall connection with flange, and two hooks.

2.8 Electric water cooler - ADA:

- A. Fixture: ARI 1010; ADA accessible, wall mounted electric water cooler with stainless steel top and grille, recessed chiller, elevated anti-squirt bubbler with stream guard, automatic stream regulator, mounting bracket, refrigerated with integral air cooled condenser; capacity of 8 gph of 50° F water with inlet at 80° F and room temperature of 80° F, 1/5 hp compressor.
- B. Provide associated bottle filling station as required. Coordinate project specific need with FS/DDC.

- C. Basis of Design: Elkay Model EZSTLG8WSLK

2.9 Janitor mop sink:

- A. Fixture: 30 x 30 x 10 inch high heat molded resin/stone basin, floor mounted, with one inch wide shoulders, stainless steel strainer. Stainless steel basin may also be accepted subject to project manager approval.
- B. Trim: exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; 21/2 feet of ½ inch diameter plain end reinforced plastic hose, hose clamp, mop hanger. See Faucet product specifications above.

2.10 Counter mounted sink - Type 1 (coffee/break room sink):

- A. Fixture: single compartment 15" wide by 22" by 6-½" deep outside dimensions, 18 gauge thick, Type 304 stainless steel, self-rimming with bottom pads or undercoating, ledgeback drilled for trim. ADA compliant.
- B. Trim: See Faucet product specifications above. 3-1/2 inch crumb cup and stainless steel drain.

2.11 Counter mount sink- Type 2:

- A. Fixture: single compartment, 18 gauge, 18 - 8 stainless steel, self-rimming with undercoating, 20 x 17 x 4½ - 6½ inch outside dimensions, ADA compliant, satin finish, radius corners.
- B. Trim: See Faucet product specifications above., 3-1/2-inch crumb cup and stainless steel drain.

2.12 Counter mount sink - Type 3:

- A. Fixture: single compartment 15 x 15 x 6 inch outside dimensions, 18 gauge thick, Type 302 stainless steel, self-rimming with undercoating, ledgeback drilled for trim.
- B. Trim: See Faucet product specifications above., 3-1/2-inch crumb cup and stainless steel drain.

2.13 Service sink:

- A. Fixture: 22 x 18 x 12 inch deep, porcelain enameled (inside only) cast iron roll-rim

sink, with 9 inch high back, concealed hanger, chrome plated strainer, cast iron P-trap with adjustable floor flange.

- B. Trim: exposed wall type supply with lever handles, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; 5 feet of ½ inch diameter plain end reinforced plastic hose, hose clamp, mop hanger. See Faucet product specifications above.

2.14 Emergency Eyewash and/or Shower:

- A. Overhead shower mount. Flush-mounted with ceiling tile if possible. Standalone wall mounted, recessed or surface unit. Countertop or sink-mounted units allowed on a case-by-case basis, review with UAF EHSR&M.
- B. Provide tempering valves, preferably having multiple eyewash/showers on one tempering valve.
- C. Guardian, HAWS, or Water Saver Faucet Co, no substitutes, no alternate brands.
- D. Provide a floor drain in the vicinity of the shower and in locations where discharged water easily and directly flows to the drain.

2.15 Eyewash:

- A. Sprays with cover caps.
- B. Valve: Individual tempering valve or a water tempering station for serving multiple eyewash stations.
- C. Redundant sensors fail-safe.
- D. Circulating pump for multiple eyewash stations manifolded off of a single water tempering station.
- E. Maintain code-compliant (adjustable) water temp within 5 seconds of opening safety device valve.
- F. Install with an integral safety shower in most locations. Recessed or semi-recessed, Guardian, HAWS, or Water Saver Co, no substitutes, no alternate brands.

2.16 Hose Bibb/Wall Hydrants

- A. Provide 3/4 inch CW supply to each bib and integral vacuum breaker, Jay R Smith, Series 5509, or equal.

2.17 Floor Drains:

A. Plywood floors:

- 1. Cast Iron body with wide floor flange. Jay R. Smith DX 3212, or similar, with appropriate features and threaded to hubless adapter.
- 2. For light weight construction such as residential or remote with expected life of 25 years or less, consider ABS plywood floor drain with stainless steel flange and stainless steel grid strainer.

B. Concrete Floors:

- 1. Cast Iron body. Jay R. Smith 2005, or similar, with appropriate features

2.18 Trap Primers:

- A. Flush valve trap primers are preferred in some applications as are automatic trap primers. Coordinate project specific trap primer applications with FS/DDC during design.

2.19 Supply Stops & Supply Tubes:

- A. Quarter turn supply stops with fixed handle operators only.
- B. Supply tubes in visible locations: Chrome plated brass tubes installed in a neat and workman like manner.
- C. Supply tubes in concealed locations (behind casework doors or behind other protective covers): Stainless steel braided flexible tubes are acceptable in addition to above.

2.20 Water Softener:

- A. Fully packaged commercial potable water softener systems, sized for the building needs. Specify the require output in grains of hardness, considering the use in the building.

B. Provide particulate filters ahead of the softener to prolong its life.

C. Acceptable Manufacturers are limited to:

1. Ecowater
2. Kinetico

2.21 Tail Piece, Trap and Trap Arm for Sinks and Lavatories:

A. Polished, chrome plated, drawn brass tubing not less than 17 gauge.

B. Provide with polished, chrome plated, brass or stainless steel escutcheon with spring clip at wall penetration.

PART 3 - EXECUTION

3.01 Provide backflow preventers at all laboratory plumbing and all faucets with hose thread connections.

3.02 Provide accessible isolation valves for services to each isolated fixture or battery of plumbing fixtures.

3.03 Provide trap primers with isolation valves. Install on walls in mechanical spaces, and behind wall-mounted access doors in public spaces. In some instances, accessible ceilings above is acceptable but should generally be avoided. Indicate size of access doors on Drawings. Coordinate application with FS/DDC and Division 8 during design.

3.04 For projects where multiple emergency eyewash/showers are installed, specifically in research labs, provide flow alarms on the tempered water loop to indicate flow either by device or by zone of devices. Connect the alarm to a local strobe light in the nearest public corridor. Connect the flow alarm to the Building Management System and provide an override timer for weekly testing and maintenance. This practice intends to allow for monitoring of water flowing during an actual emergency:

A. Providing early indication to UAF Fire and Police so EMS can be activated, especially in the case of a late night event.

B. Providing Facilities early indication of water flowing in a laboratory or mechanical room where flooding may occur

C. Providing indication of a water flow in the event of a malicious activation

D. Providing records of testing.

END OF SECTION

22 40 00 - 12

PART 1 - GENERAL

- 1.01 Obtain most current parameter of the central plant furnished DI water from UAF Facilities Service Division of Utilities Water Treatment Plant. If central plant DI water is used in the facility, provide filters and add minerals as needed at the point of use instead of at the point of connection for the building. Provide a pressure-regulating valve where incoming pressure exceeds filter pressure limits.
- 1.02 Provide FS/DDC with analysis as to the estimated flow for the facility to ensure existing central plant capacity is not exceeded.

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION

- 3.01 Install DI water piping to maintain a minimum of 1 inch clearance from all other piping and ductwork. Where piping or ductworks are insulated, this requirement applies to the surface of insulation.

END OF SECTION

PART 1 - GENERAL

- 1.01 TAB services to be part of the overall construction contract for small projects. For large projects UAF Facilities Services may contract the TAB services independently or through a Commissioning Agent for system testing and balancing.
- 1.02 Show all balancing points on the as-built drawings. Seal all duct penetrations with reusable "snap caps".
- 1.03 Submit the final TAB report in accordance national air balancing standards with the O & M Manuals prior to system inspection for Substantial Completion. Hold Substantial Completion inspection only after the TAB Agent has certified that all systems are performing properly and to specification.
- 1.04 Consultant will prepare the TAB specification for inclusion in the contract documents regardless of who is providing the services. For new construction or large renovations, ensure the specification requires system-wide or building wide holistic balancing.

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION

- 3.01 Include the following as direction to the TAB Contractor: "As part of the Draft TAB Report, summarize work observed that does not conform to the Contract Documents and conditions that do not allow the system to be balanced in accordance with the Contract Documents. Include opinions on why work or conditions do not allow the system to be balanced, collect data to support those opinions, and recommendations for corrective action that would allow the system to be balanced in accordance with the Contract Documents."

END OF SECTION

INSTRUCTIONS TO DESIGNER

GENERAL

- UAF uses Siemens Industry, Inc. (SIEMENS), Building Technologies Division under a single-source, brand-name-only Direct Digital Controls (DDC) contract. All building systems shall be fully compatible with both the Siemens APOGEE (pre-2025) and Desigo systems (post-2025 and any buildings migrated)
- As part of the contract with UAF, Siemens will support the Consultant and/or UAF during the design development. UAF fully expects the Consultant to engage Siemens' local Fairbanks office during all major design stages, from 35% through 100%. Siemens will provide design review comments alongside UAF DD&C and FS and will participate in comment review sessions as appropriate. Siemens' goal during design development is to help provide UAF with the best value system with respect to the project goals and UAF standards, and to minimize DDC-related changes post-bid.
- The Consultant will use the attached 23 09 23 specification, and will provide selective editing as described below.
- Sequences of operations are to be provided under 23 09 93 for default sequence of operations, preferences, and standards.
- Consider metering and building dashboards when developing the specifications for Direct Digital Controls.

EDITS OF TEMPLATE 23 09 23 SPECIFICATION

- The consultant shall review and be familiarized with the attached specification.
- The consultant shall only edit select portions of the specification that are project-specific unique requirements. Any section that is not applicable will be formatted with ~~striketrough~~ font, and "N/A" will be appended to the section.
- The following sections will be addressed by the consultant as project-specific, and edits will be provided in the format described.

PROJECT SPECIFIC CONTENT TO BE EDITED

23 09 23 1.02.E. In this section, list specific additional scope of work items beyond DDC controls that will be covered under this section. For example, installation of 3rd party specialty control systems such as Greenhouse Controls or a Gas Detection System, or network integration to lighting, chillers, etc.

Consultant shall be mindful of scope expected to be addressed under the controls section (Siemens). While most times it is entirely up to the contracting tier during the bid process to cover all scope in the documents, and not important to the consultant to delineate responsibility amongst trades, it is important for UAF since the controls scope is directly contracted between UAF and Siemens.

23 09 23 1.03.A.2 Manufacturer installed VAV box controls. This is the default standard, but is impractical on very small (~20 VAV boxes or less) or quick-turn projects. Designer to confer with Siemens if manufacturer installed controls is practical for the project. If not, provide strikethrough font and add N/A. Same for second sentence of 23 09 23 1.03.B.1. Important- also be sure to correlate this requirement in the VAV box spec.

23 09 23 1.03.B.4 Airflow Measuring Stations (AFMS.) Designer to identify type of AFMS. If packaged with AHU or if it is a duct-section type necessarily installed by the sheet metal contractor, this spec paragraph is valid- leave as is. If however the AFMS is a duct-probe type, strikethrough 1.03.B.4 , add N/A, and specify AFMS type under 2.15 PROJECT SPECIFIC PRODUCTS. Basis of design will be Ebtron Gold series.

23 09 23 1.03.D.2 Fire Alarm interface. This section is valid if a new building, new DDC system, or new F/A system. Otherwise, the monitoring point described in this paragraph may already be existing. Confirm w/ Siemens. If existing, add sentence in **bold** font: "Existing monitoring to remain. No work required."

23 09 23 1.03.D Integration. Review need for network level integration between DDC and specialty systems such as lighting, chillers, etc. w/ Siemens. If network level integration is required, add paragraph for each such system under 1.03.D.3,4,5, etc. Integration protocol desired in order of preference and lowest cost of integration:

- Siemens APOGEE FLN, P1 protocol
- BACnet over IP, **BTL Listed**
- BACnet over MS/TP, **BTL Listed**
- BACnet over IP
- Modbus

Template for Network Integration, with fill in the blank items to be updated specific to the system underlined:

"1.03.D.3 Chiller System CH-1. Chiller provider to include all devices, programming, setup, and testing to allow Siemens APOGEE BAS network integration using BACnet over IP communication protocol. Chiller provider to submit points list w/ addresses, point names, descriptions, ranges/units, I/O types, commandability, and other applicable notes for use by BAS system integration programming. Chiller provider shall provide factory trained technician with ability to setup and commission integration interface to coordinate and work directly with Siemens BAS technician to complete the integration work. Integration network wiring provided by Siemens."

Please also include the above paragraph in the spec section of whichever system is to be integrated.

23 09 23 2.03 Workstation. Typically, only provided if large/new or complicated facility or if there is a special end-user function. Review with Siemens and UAF PM/Facilities Services. If not applicable, strikethrough and add N/A.

23 09 23 2.15 Project Specific Products. Under this section, list any specialty control devices or other products to be provided that are not covered elsewhere in the template spec. Do not add for example special temperature sensors for a specific project need under *2.07 Sensors*, add them under 2.15 Project Specific Products. Examples might include gas detection equipment, specialty control valves, airflow measurement stations, etc.

23 09 23 3.09 Training. Consultant to edit. Standard of 4hrs bldg.-specific training for small projects, 8 hrs for medium sized, 16hrs or more for large and/or complex projects. Confer with Siemens and UAF PM, then update Qty. in **bold** font, this section.

23 09 23 3.10 Special Conditions In this section, include any project specific conditions, such as LEED, additional commissioning requirements, metering and dashboard requirements, additional seasonal testing, etc.

ADDITIONAL NOTES FOR DESIGNER

- Prefer control valves to be installed on the SUPPLY side of coils or terminal units. Coordinate with your details on dwgs.
- For Siemens 3-way mixing valves, the bottom port w.r.t. the actuator is N.O. Coordinate with your details on dwgs.
- Steam Valves. Instruct on dwgs. that steam valves should be installed so that the actuator is rotated out of the vertical plane by 45 deg. Also, insulate the valve body.
- Control Valve Sizing. For modulating Hydronic valves, Siemens' nominal Cv ratings are: 0.4, 0.63, 1, 1.6, 2.5, 4, 6.3, 10, 16, 25, 40, 63, 100, 160, 250, 400. Design w/ nominal 3 psi or less pressure drop for terminal units of small coils, and 5 psi or larger if appropriate for proper control authority for large coils. Steam valves should be Linear.

SECTION 23 09 23 MASTER UAF SPEC
INSTRUMENTATION AND CONTROLS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Section 07 84 00, Firestopping
- B. Section 08 00 00, Access Doors
- C. Section 23 05 00, Common Work Results for HVAC
- D. Section 26 29 23, Variable Frequency Drives
- E. Division 26 00 00 Electrical
- F. 28 31 00 Fire Detection and Alarm

1.02 DESCRIPTION OF WORK

- A. This section specifies the requirements for the Building Automation System (BAS) to be installed in conjunction with this project. Refer to Division 01 11 00, Summary of Work.
- B. Pricing of this BAS system shall be determined using the UAF DDC Term Agreement between the University and Siemens Industry Inc. (SIEMENS). The BAS contract will be direct to the Owner or assigned to the General Contractor. See Bid Form and Special Conditions for clarification.
- C. Siemens shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems as defined in Project Documents.
- D. Siemens shall be responsible for all BAS and Temperature Control wiring for a complete and operable system. All wiring shall be done in accordance with Division 26 (except as clarified in this section) of the specification and all local and national codes.
- E. The specific additional items of work included in this section are:
 - 1. (List specific items)(PM to develop with Consultant)

1.03 WORK BY OTHERS

- A. Products provided by SIEMENS for installation by the Mechanical contractor:

1. Control valves.
 2. VAV box controllers. SIEMENS shall furnish VAV box controls to the VAV box manufacturer for factory installation at the expense of the box manufacturer.
 3. Wells for hydronic temperature sensors.
 4. Static and differential pressure sensors for piping systems.
- B. Products provided and installed by Mechanical contractor:
1. VAV boxes. SIEMENS shall furnish VAV box controls to the VAV box manufacturer for factory installation at the expense of the box manufacturer.
 2. VAV box controller enclosures will be provided by box manufacturer.
 3. Gauges, thermometers and thread-o-lets for SIEMENS furnished control sensor wells.
 4. Airflow measuring stations.
 5. Control and balancing dampers.
 6. Smoke and smoke/fire dampers with actuators.
- C. Electrical contractor provides:
1. Wiring of all power feeds through disconnects, starters, TT switches, and VFDs to electrical motors.
 2. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by SIEMENS.
 3. Duct smoke detectors including installation and wiring.
 4. Power wiring of all smoke/fire dampers.
 5. Stand-alone packaged controls and wiring of stand-alone packaged controls to their remote sensors and devices.
 6. Ethernet drop at or near designated BAS control panel.

- D. Products to receive integration under this section:
1. Variable Frequency Drives. (VFDs) The BAS shall use hardwired points for start/stop, proof, and speed control. The VFD shall also be connected to the BAS FLN. VFDs shall be factory-furnished with the appropriate communication hardware and software to allow communication over the SIEMENS FLN. Control wiring connections to VFD will be provided under this Section.
 2. Fire Alarm/Life Safety System. The DDC system shall monitor general alarm status of the fire alarm/life safety system via an alarmable point in the form of a dry contact. An addressable relay of the fire alarm system will be provided and terminated by Division 28, located next to the appropriate DDC panel. This Section will provide wiring from the relay to the DDC panel.

1.04 SUBMITTALS / O&M MANUALS

- A. All submittals will be bound in white D-ring binders with sufficient ring capacity available for future additions.
- B. Prior to beginning on-site installation, SIEMENS will submit the requisite number of sets of documentation containing the following in a quantity and format specified in Specification 01 33 00:
1. Sequence of Operations (Designer to provide electronic text version to SIEMENS)
 2. Riser Diagrams
 3. Control Diagrams
 4. Panel layouts
 5. Valve schedule
 6. Point Summary Report
 7. If applicable, a survey of existing building control components noting those devices proposed to be reused.
 8. Product Data
- C. The O&M Manuals will consist of the following:
1. Sequence of Operations
 2. Riser Diagrams

3. Control Diagrams
4. Panel layouts
5. Valve schedule
6. Point Summary Report
7. Enhanced Alarm Report
8. Commented PPCL (Program Code)
9. Product Data, including items reused from the existing control system as noted.

1.05 INSTALLATION SCHEDULING AND COORDINATION

- A. This is an existing facility and will require interface with an existing control system and the existing host computer system.
- B. Remove all controls-related pneumatic tubing and electrical conduit that is not reused as part of the new direct digital control and monitoring system.
- C. Patch holes in existing ductwork, at removed sensors that are not reused, with sheet metal patches of equal gauge or heavier. Seal airtight with adhesive and then screwed or pop riveted to the ductwork.

1.06 WARRANTY

- A. Upon completion of the project, as defined in the Contract Conditions, a warranty period of one (1) year shall commence. The warranty shall consist of a commitment by SIEMENS to provide, at no cost to the Owner, parts and labor as required to repair or replace such parts of the control system that prove inoperative due to defective materials or installation practices. The warranty expressly excludes routine service such as instrument calibration.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Management Level Network (MLN). Acceptable manufacturers and product are limited to the following:
 1. Siemens Industry Inc., Siemens APOGEE Insight and Siemens Desigo CC,
 2. No Alternate Brand; No Substitutions

- B. Automation Level Network (ALN). Acceptable manufacturers and product are limited to the following:
 - 1. Siemens Industry Inc., Siemens APOGEE, P2 and BACnet protocols (as application to an existing system in the project building).
 - 2. No Alternate Brand; No Substitutions.
- C. Floor Level Network (FLN). Acceptable manufacturers and product are limited to the following:
 - 1. Siemens Industry Inc., Siemens APOGEE, P1 and BACnet protocols (as application to an existing system in the project building).
 - 2. No Alternate Brand; No Substitutions.

2.02 NETWORKING COMMUNICATIONS

- A. The design of the BAS shall network an operator workstation(s) and standalone DDC Controllers. The network architecture shall consist of three levels; a campus-wide Management Level Network (MLN) Ethernet network based on TCP/IP and Siemens APOGEE protocol, a high performance peer to peer automation level network (ALN) and DDC Controller floor level local area networks (FLN). Access to the system shall be totally transparent to the user when accessing data or developing control programs.
- B. The design of the BAS shall allow the co-existence of new DDC Controllers with existing DDC Controllers on the same network without the use of gateways, protocol converters, or third-party interface devices.
- C. The control system installed under this project shall report to the University's Apogee Insight and or Desigo CC Host System (as applicable to an existing system in the project building) through the campus Ethernet system. This installation includes all work required on the host such as construction of the Master Point Database, Synonym Database, complete system graphics, etc.
- D. Management Level Network
 - 1. All PCs shall simultaneously direct connect to the Ethernet and Management Level Network without the use of an interposing device.
 - 2. The Management Level Network shall not impose a maximum constraint on the number of operator workstations.
 - 3. Simultaneous user access to network limited to number of sight licenses issued to user.

4. When appropriate, any DDC controller residing on the peer-to-peer level network shall connect to an Ethernet network without the use of a PC.
 5. Any PC on the Ethernet Management Level Network shall have transparent communication with controllers on the automation level networks connected via Ethernet as well as directly connected automation level networks. Any PC shall be able to interrogate any controller on the automation level network in addition to being able to download program changes to individual controllers.
 6. The Management Level Network shall reside on industry standard Ethernet utilizing standard TCP/IP, IEEE 802.3. The Ethernet system will be provided and maintained by UAF.
 7. Access to the system database shall be available from any client workstation on the Management Level Network.
- E. Peer-to-Peer Automation Level Network (ALN)
1. The system shall have the ability to support integration of third party systems (fire alarm, security, lighting, Variable Frequency Drives, PLCs, chillers, boilers) via a panel mounted open protocol processor. This processor shall exchange data between the two systems for inter-process control. All exchange points shall have full system functionality as specified herein.
 2. Data transfer via TCP/IP or RS485 (as applicable to an existing system in the project building).
- F. Floor Level Network (FLN)
1. This level communication shall support a family of application specific controllers and shall communicate with the peer to peer network through DDC Controllers for transmission of global data.

2.03 PERSONAL COMPUTER OPERATOR WORKSTATION (*SELECTABLE BY UAF*)

- A. A standard PC workstation shall be provided in the selected mechanical space for Remote Desktop or Terminal Services access to the UAF Siemens APOGEE Insight and/or Desigo CC Server.
- B. Workstation center will be equipped with appropriately sized uninterruptible power supply (UPS).

2.04 CONTROL PANELS

- A. All Terminal Equipment Controllers will be mounted in enclosed control panels with screwed, removable covers.
- B. All control devices located in exposed areas subject to outside weather conditions shall be mounted inside weatherproof enclosures. Location of each panel shall be convenient for adjustment service.
- C. Nameplates shall be provided beneath each panel face-mounted control device describing the function of each device. Nameplates shall have white letters engraved on blue phenolic plastic.
- D. All control panels shall bear a UL label compatible with the application.
- E. Control panels will not be installed in public areas unless otherwise noted. Control panels will not be recessed or installed on an outside wall where condensation can accumulate in the panel.
- F. All electrical devices within the panel shall be pre-wired to terminal strips with all inter-device wiring within the panel completed before installation of the system.
- G. All ALN level controllers will be provided with standby power to provide power quality and minimum 15 minutes operation. UPS manufacturer: Powerware or other manufacturer as approved the University.

2.05 ELECTRIC DAMPER AND VALVE ACTUATORS

- A. The operators shall have ample power to overcome friction of damper linkage, air pressure acting on the damper blades and differential fluid pressures, as applicable.
- B. Actuators up to 2 in. diameter: Electric-gear driven or electric-hydraulic drives.
- C. Actuators 2 in. diameter and above: Electric-hydraulic assist drives.
- D. Air damper operator mounting arrangement shall be outside the air stream wherever possible. The operators shall have external adjustable stops to limit the stroke.
- E. The operator arrangement shall be such as to permit normally open or normally closed positions of dampers and valves as indicated on Drawings. Terminal unit control valves for DDC application specific controllers may fail in place for baseboard, reheat coils, radiant ceiling panels, and similar applications.

2.06 AUTOMATIC CONTROL VALVES

- A. All modulating automatic control valves shall be fully proportioning with modulating plugs for equal percentage or linear flow characteristics. The valves shall be sized by SIEMENS and be provided with actuators of sufficient power for the duty intended. Valve body and actuator selection shall be sufficient to handle system pressure and shall close against the differential pressures expected to be encountered on the project. Pressure Independent Control Valves (PICVs) are acceptable. Butterfly valves are not acceptable unless otherwise noted.
- B. Valves - 1/2 in. through 2 in. diameter: Siemens Powermite or Flowrite series as appropriate for valve size, close-off pressure, and signal type.
- C. Valves - 2-1/2 in. diameter and above: Siemens Flowrite series with flanged connections. ANSI 125 class unless otherwise noted.
- D. Rural campus sites: For non-DDC zone valves, use standard Honeywell zone valve V8043E series with 18" leads. Cv=3.5, and max flow of 3gpm.
- E. Valves shall be selected for default maximum 3.0-PSI pressure drop through valve at design flow. Large flow coils may require a 5 psi or larger pressure drop for proper control authority. Submit requested pressure drop as part of valve schedule.
- F. Unless otherwise noted, heating valves shall fail normally open, cooling valves normally closed, and steam valves normally closed, with fail-in-place for terminal unit applications described under 2.05.

2.07 SENSORS

- A. Temperature
 - 1. Liquid Immersion, Duct Temperature Sensors: Siemens 1000 Ohm RTD 544-XXX series basis of design. For TECs or other I/O with special requirements, use Siemens standard 10k or 100k thermistors or other as appropriate and compatible with I/O.
 - 2. Outside Air Temperature Sensors: Siemens 536-768, range -58 deg F to 122 deg F.
 - 3. Where the sensor is used for sensing of mixed air temperature or air handler coil discharge temperatures, and/or the duct area cross-section is in excess of 14 square feet, the instrument shall incorporate an averaging element. Outside air sensing shall be accomplished using a sensing element and transmitter shielded from the effects of sunlight.

4. Sensors shall be furnished in scale ranges compatible with system operating range.
 5. Where sensors are used for sensing liquid temperatures, they shall be furnished with separable wells or appropriate material.
 6. Monitor VAV or terminal unit discharge air temperatures for applications with a duct mounted coil. Cooling only VAV box applications do not require discharge air temperature sensing unless otherwise noted.
- B. Humidity.
1. Standard accuracy: Siemens Q-Series, 2% with replaceable tip.
 2. High accuracy, regular calibrations expected: Vaisala HMW92, HMD60 or any other manufacturer meeting the requirements of the contract documents.
- C. Liquid Differential Pressure, Setra 231 Series with 3-Valve Manifold, or other manufacturer, the Consultant specifies that is equivalent to the Setra.
- D. CO2 Sensors: Siemens QPA Series (wall mount), QPM Series (duct mount).

2.08 THERMOSTATS AND ROOM TEMPERATURE SENSORS

- A. Electronic Room Temperature Sensors: Shall be thermistor type with 55-degree F to 95-degree F range. Optional features include: LED display, slider bar and night setback button. Covers shall be robust, of institutional quality, suitably finished. Covers will be sensing only unless otherwise noted to include optional features. Siemens Series 1000, white.
- B. Line-voltage Thermostats: Shall have bi-metal switches with a rating of at least 1.2 times the load they are handling. Covers will be sensing only.
- C. Rural campus sites: For non-DDC zone control, use standard Honeywell thermostat T87N1000.
- D. Provide locking covers or gym guards only as indicated on the Drawings.

2.09 PRESSURE GAUGES AND THERMOMETERS

- A. Shall be provided and installed by mechanical contractor.

2.10 RELAYS AND SIGNAL TRANSMITTERS

- A. All necessary relays and signal boosters shall be furnished to make the system a full and operable system as required by the Sequence of Operations.

2.11 AIR FLOW HIGH AND LOW LIMIT THERMOSTATS

- A. Low limit thermostats shall employ an element of sufficient length to cover a complete vertical cross-section of the duct. Install multiple units if necessary. If any one-foot section of the element is subjected to temperatures below 35 degrees F (adjustable), the respective electric or pneumatic circuit shall open causing action to fans and dampers as required under the sequence of operation.
- B. High limit thermostats shall employ rod and tube type elements that extend approximately ten inches into the duct. If instrument is subjected to temperatures above 135 degrees F, action required by sequence of operations shall occur. Where high limit is required for fire protection, such thermostats shall be UL listed for fire protection.
- C. Shall be automatic reset with time delay and virtual lockout functions provided by DDC system programming.

2.12 AIR AND WATER FLOW PROOF DEVICES

- A. Provide current operated relays as standard proof devices. Pressure differential switches may be used as directed. Sail or Vane type flow switches are not acceptable.
 - 1. Provide solid-state, adjustable, current operated relay. Provide a relay that changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.
- B. Provide status device for fans, motors and pumps.
- C. RIBX series, basis of design.

2.13 ACCESS PANELS

- A. Access panels provided by Section 08 30 00.
- B. Coordinate access panel location with Owner and Section 08 30 00. Provide access to concealed control devices.

2.14 PNEUMATIC TUBING

- A. Provide color coded, flame retarded, crack resistant, polyethylene tubing for installation in concealed areas, in control cabinets and inside conduit raceways.
 - 1. Plenum Rated.
 - 2. Environmental stress crack resistance: ASTM D 1693, 0 percent failure in 48 hours.
 - 3. Acceptable manufacturers include, but are not limited to the following:
 - a. Dekoron FR.
 - b. Alternate Brand Request or Substitution Request not required.
- B. Concealed:
 - 1. Polyethylene connected with serrated brass fittings.
 - 2. Copper: Type "M" hard-drawn with solder joints or brass compression fittings.
- C. Exposed:
 - 1. Copper: Type "M" hard-drawn with solder joints or brass compression fittings.
- D. In Return Air Plenums:
 - 1. Polyethylene connected with serrated brass fittings.
 - 2. Copper: Type "M" hard-drawn with solder joints or brass compression fittings.

2.15 PROJECT SPECIFIC PRODUCTS

- A. (List specific items)

PART 3 - EXECUTION

3.01 RELATED DOCUMENTS

- A. Refer to General Conditions, Special Conditions, and Section 23 05 00, Basic Materials and Methods, and Division 26.

3.03 GENERAL

- A. Do not install control devices in locations where they are subject to damage or malfunction due to normally encountered ambient temperatures.
- B. Mount damper operators and other control devices secured to insulated ductwork on brackets such that the device is supported external to and clear of the insulation.

3.04 IDENTIFICATION

- A. Major Equipment: All major equipment, such as fans, pumps, control valves, dampers, heat exchangers, etc., will have the associated DDC point name included on the PMI ("Green") tag provided by UAF. Siemens will coordinate with UAF facilities engineering for the associated DDC point names to be included.
- B. Control Panels: All DDC panels, point expansion panels, and auxiliary component panels will be tagged with engraved phenolic labels, such as "PXCM-1" (DDC Panel, PXCM type, Node #1), or PNL-1 (auxiliary component panel #1).
- C. Terminal Equipment Controllers (TECs): TEC enclosures above ceilings or elsewhere will be labeled with the controller's DDC name, such as 981.110.TEC (Bldg 981, serving Rm 110). The label will be applied to both the outside and inside of the enclosure. Peel-and-stick type label will be printed from a portable label maker.
- D. Wiring
 - 1. All DDC panel input and output point wiring will be labeled with a computerized labeler with the point address at the device and control panel ends.
 - 2. TEC/DXR Room Temperature Sensors: RTS cable at sensor end will be labeled with the TEC name (described above.)
 - 3. TEC/DXR Reheat Coil and Baseboard Valves: At TEC/DXR end, label "RHV" or "BBV" or similar. At valve end, label with TEC/DXR name (described above.)
 - 4. TEC/DXR controlled VAV box damper actuator wiring will not be labeled if under same enclosure as TEC/DXR.
 - 5. FLN wiring will be labeled at both ends of a segment with the FLN # ("FLN-2" for example) and To/From the controller name of the TEC/DXR or control panel at the other end of the segment.
 - 6. ALN wiring will be labeled at both ends of a segment with "ALN" and To/From the controller name of the DDC panel or device at the other end of the segment.

7. 24VAC power trunk wiring will be labeled at all 24VAC consuming devices with the corresponding transformer number ("XFMR 1-5" for example.)
- E. Devices associated with DDC points (other than above) such as sensors, relays, CTs, switches, valve actuators, damper actuators will be labeled with the DDC point name. Peel- and-stick type label will be printed from a portable label maker.
- F. Room sensors will not be labeled for aesthetic reasons (but the associated wiring will be labeled per above.)
- G. Miscellaneous switches or other special function devices in public areas that have occupant interaction will be labeled with engraved phenolic labels or as directed elsewhere.
- H. UAF will provide system of equipment naming.
- I. Properly define BACNET or other integrated devices or controllers to match their equipment name.

3.05 SENSORS AND SWITCHES

- A. Pump motor load or fan motor load, etc., shall be sensed using digital current switch unless indicated otherwise. Where further used to distinguish between loaded or unloaded motor condition and belt or coupler breakage, provide and calibrate analog current switch.
- B. Protect averaging or capillary tubes where they penetrate duct with rubber grommet and seal with clear silicon. Support with capillary clips and maintain minimum 1-inch tubing bending radius.

3.06 WIRING

- A. Install, connect and wire the items included under this Section. This work includes providing required conduit, wire, fittings, and related wiring accessories. All wiring in exposed or inaccessible areas shall be installed in EMT conduit. Plenum-rated cable may be used in concealed, accessible areas only.
- B. Provide wiring between thermostats and unit heater motors, and all control and alarm wiring.
- C. Provide conduit and wiring between the BAS panels and the temperature, humidity, or pressure sensing elements, including low voltage control wiring in conduit or plenum-rated cable.
- D. Provide conduit and control wiring for devices specified in this Section.

- E. Provide conduit and signal wiring between motor starters in motor control centers and high and/or low temperature relay contacts and remote relays in BAS panels located in the vicinity of motor control centers.
- F. Provide conduit and wiring between the PC workstation, electrical panels, metering instrumentation, indicating devices, miscellaneous alarm points, remotely operated contactors, and BAS panels, as shown on the drawings or as specified.
- G. All wiring to be compliant with the Division 26 requirements (except as clarified in this section) and the NEC. Minimum trade size for control system conduit is ½”.
- H. Provide electrical wall box and conduit sleeve for all wall-mounted devices. Mount thermostats at 48 inches AFF unless otherwise noted.
- I. Use Scotchlok UY2 connectors for all splices. All splices and loops shall be contained in a gutter or junction box, not in the control panel.

3.07 TREND LOGS

- A. SIEMENS shall prepare trend logs for all points required to show system calibration and stability.
- B. These logs shall document building operation after the installation, balancing and calibration is completed and after the control system is fully operational
- C. Terminate commissioning trend collections. Setup ongoing trends required by UAF.

3.08 SUBSTANTIAL COMPLETION

- A. SIEMENS shall demonstrate complete and proper operation of all systems per the Sequence of Operations.
- B. Refer to Sect. 01 78 00 - CLOSE-OUT SUBMITTALS.
- C. The demonstration shall include, but not necessarily be limited to, the following:
 - 1. Review of the Trend Logs.
 - 2. Complete and proper operation of control systems including setpoints, valve positions, etc. shall be adjusted to artificially induce the sequences to occur.
 - 3. Access to all devices for required maintenance.
 - 4. Review of associated graphics on Host.
 - 5. Identify and configure alarms.

3.09 TRAINING

- A. xx (X) hours of on-site instruction will be provided by SIEMENS to familiarize operating personnel with the control system. Instructions will include:
 - 1. A brief description of the controls' sequence of operation.
 - 2. A discussion and explanation of all alarms, switches and gauges.
 - 3. A summary and explanation of steps to be taken in response to specific alarms or control malfunctions.
 - 4. Building walk-through to physically locate and examine all control devices and demonstrate control setpoint adjustment procedures.
 - 5. Instructions regarding adjustment procedures shall emphasize methods for continual building "fine-tuning"

3.10 SPECIAL CONDITIONS

- A. (List specific items)

3.11 SEQUENCE OF OPERATION – SEE 23 09 93

END OF SECTION

PART 1 - GENERAL (*Not Used*)

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION

3.01 STEAM TO WATER OR GLYCOL HEAT EXCHANGERS

- A. 1/3 – 2/3 control valve arrangement unless otherwise specified by FS/DDC.
- B. Lead/lag pumping.
- C. OSA temperature reset.
- D. Control valves fail closed on loss of power or control signal.
- E. Typical Sequence of Operations. Designer to use as a guideline:
 - 1. The hydronic heating system consists of one or more steam to glycol converters with steam valves arranged for 1/3 - 2/3 operation and VFD controlled lead/lag heating system pumps.
 - 2. The heating system is enabled in Heating Mode. When enabled the lead pump starts. At proof of flow, the converter steam valves operate. Pumps to cycle off and converter steam valves to close when not in heating mode.
 - 3. Operate $\frac{2}{3}$ steam control valve in 10% staged increments, trimming with $\frac{1}{3}$ steam control valve no less than 10% and no more than 90%.
 - 4. The glycol heating supply set point is maintained by modulating the converter steam valves in sequence. The glycol supply set point is reset based on outdoor air temperature.
 - 5. Upon loss of signal, fail 1/3 and 2/3 converter valves closed.
 - 6. Heating mode shuts down at 70F (adjustable) outside air temperature. Exceptions for systems utilizing heat exchanger & pumps for slab cooling. Then the system shall be enabled per cooling or heating mode.
- F. Typical points not monitored: Condensate Receiver Status, consultant to determine.

- G. Non-typical points to monitor: Steam Temperature, Steam Pressure, Heating Fluid Supply Temperature.

3.03 HYDRONIC PUMPING

- A. Lead/lag pumps alternate monthly.
- B. Pump A is lead in odd numbers months. Lead/lag status will switch on the second Wednesday of the month at 9:00AM.
 - 1. Lead pump runs on call to run. If no Proof is received after 30 seconds then Lead pump is OFF in emergency and a Maintenance alarm will be generated. Lag pump starts on failure of Lead pump. If Lag pump also fails then generate Critical alarm. If both Lead and Lag are off in Emergency then a Critical alarm will be generated and remote notification (RENO). Provide a manual reset toggle in programming to release all pumps from Emergency status to OFF in Normal status and restart Lead/Lag sequence.
- C. Typical points not monitored: (consultant to determine).
- D. Non-typical points to monitor: hydronic system differential pressure at the pump set and at a remote location in the system and the supply temperature and return temperature.
- E. DDC adjusts pump rpm via VFD to maintain system differential pressure setpoint.

3.04 CHILLED WATER PUMPS (Campus Chilled Water Loop)

- A. Typical Sequence of Operations. Designer to use as a guideline and only use decoupling pumps when indicated by FS/DDC. In most instances, a two-way control valve at the point of connection to the campus loop is all that will be required.
- B. The secondary chilled water system consists of two chilled water pumps with individual variable frequency drives. Chilled water system will be manually enabled and disabled seasonally.
- C. Lead/lag pumps alternate monthly.
- D. Pump A is lead in odd numbers months. Lead/lag status will switch on the second Wednesday of the month at 9:00AM.

1. Lead pump runs on call to run. If no Proof is received after 30 seconds then Lead pump is OFF in emergency and a Maintenance alarm will be generated. Lag pump starts on failure of Lead pump. If Lag pump also fails then generate Critical alarm. If both Lead and Lag are off in Emergency then a Critical alarm will be generated provide a manual reset toggle in programming to release all pumps from Emergency status to OFF in Normal status and restart Lead/Lag sequence.
- E. Disable pumping system when primary hydronic system pressure alarm is received.
- F. Typical points not monitored: (consultant to determine).
- G. Non-typical points to monitor: primary and secondary hydronic system pressure, supply temperature and return temperature.
- H. Monitor chilled water flow to the building by measuring GPM. This point may be used to limit the quantity of chilled water supplied to a building.

3.05 CHILLED WATER PUMPS (Building Chiller)

- A. Lead/lag pumps alternate monthly.
- B. Pump A is lead in odd numbers months. Lead/lag status will switch on the second Wednesday of the month at 9:00AM.
 1. Lead pump runs on call to run. If no Proof is received after 30 seconds then Lead pump is OFF in emergency and a Maintenance alarm will be generated. Lag pump starts on failure of Lead pump. If Lag pump also fails then generate Critical alarm. If both Lead and Lag are off in Emergency then a Critical alarm will be generated. Provide a manual reset toggle in programming to release all pumps from Emergency status to OFF in Normal status and restart Lead/Lag sequence.
- C. Seasonal operation.
- D. Call to run based on OAT.
- E. Monitor chiller flow by measuring differential pressure. Measuring GPM may be performed for energy monitoring/calculations.
- F. Non-typical points to monitor: primary and secondary hydronic system differential pressure, supply temperature and return temperature.

- G. DDC adjusts pump rpm via VFD to maintain system differential pressure setpoint.

3.07 HUMIDIFICATION

- A. Fail steam valve closed on loss of power or airflow.
- B. Adjustable high limit cut-out, hardwired to valve and monitored by DDC. Monitor humidity at the duct level for high-limit cut-out.
- C. Ramp up on start-up.
- D. Maintenance shutdown/start-up routine.
- E. Measure humidity at the room level based on percent needed, reset humidity setpoint levels to be lowest possible during winter.

3.08 UNIT HEATERS AND CABINET UNIT HEATERS

- A. Unit and Cabinet Unit Heaters will be controlled by DDC if they are serving spaces with exterior doors and/or have critical temperature monitoring needs. Units serving utility spaces without exterior or critical needs will be non-DDC controlled with line-voltage type thermostats.
- B. Coils on constant volume systems are typically wild flow, and systems on variable flow are typically controlled with control valves unless otherwise specified. Confirm preference with UAF Facilities Services. Provide control valves in small entry vestibules where solar gain provides sufficient space heating.
- C. Non-DDC Control Sequence: Line-voltage thermostat cycles unit heater fan (and valve, if applicable) to maintain space temperature setpoint, XX F. Thermostat has blank cover and concealed setpoint adjustment. Locking cover is non-typical.
- D. DDC Control Sequence: DDC controller monitors space temperature and cycles fan (and valve if applicable) to maintain space temperature setpoint XX F. Temperature sensor has blank cover with setpoint adjustment through DDC system. Locking cover is non-typical. If DDC control is through application specific controller (Siemens TEC), provide backup aux. temp sensor behind room sensor cover for backup control if the space temperature drops below 55F. If wet pipe fire sprinklers are provided in the space heated by a unit heater or cabinet unit heater, temp sensor shall alarm if space temperature drops below 40F.

3.09 VAV AIR HANDLER – SUPPLY/RETURN AIR ONLY:

- A. The air handling unit is scheduled for automatic operation on a time of day basis for Occupied, Unoccupied and Night modes. Within the Unoccupied mode, Night Heating is available when the perimeter heat fails to maintain a minimum temperature of 50F, adjustable. Modes are determined by operator adjustable schedule.
- B. When the outside air dry bulb temperature is below the economizer changeover value 75F, the heating coil valve, mixed air dampers, and cooling coil valve modulate in sequence without overlap to maintain the supply air temperature set point 55F. The cooling coil valve is closed when in Heating Mode. Minimum outside air damper position is a certain percentage of full flow volume, based on the facility type and system design parameters.
- C. When the outside air dry bulb temperature is above the economizer changeover value 75F and cooling is online, the mixing dampers are placed in the minimum outdoor air position and the heating valve is closed. Modulate the cooling coil to maintain the supply air temperature set point 53F.
- D. The air handling unit operates in Unoccupied mode as follows:
 - 1. The supply fan stops. The cooling coil valve closes, mixing dampers fully close to the outdoor air and the heating coil valve maintains set point as sensed by the nearest practical sensor location.
- E. The air handling unit operates in Night mode as follows: Heating is available when the perimeter heat fails to maintain a minimum temperature of 50F adjustable.
 - 1. Night Heating: The supply fan is on with the heating coil valve open to maintain a minimum discharge air temperature of 65F. The mixing dampers remain closed to the outdoor air and the cooling coil valve remains closed.
- F. Static Pressure Control:
 - 1. The supply fan variable frequency drive modulates to maintain a constant duct static pressure as sensed at sensor located at appropriate duct location in the field. When supply fan is an integral part of a variable air volume system and the building/portion of building is fully under DDC control, provide a duct sensor at or near the supply fan.

2. Upon initial startup of the air handling system, the supply fan speed slowly ramps to the desired static pressure set point. Upon shutdown of the air handling system, the supply fan variable frequency drive stops and the speed signal goes to zero speed.

3. Safeties:
 - a. Discharge high static cutout and supply fan VFD fault alarms de-energize the supply fan upon activation.

 - b. A low temperature detector (LTD) located downstream of fan de-energizes the supply fan when temperatures below 40F are sensed. Provide Auto-Reset with LTD Critical Alarm and RENO. Provide programming for fan lockout when auto-reset occurs 3-times in 30-minutes. All dampers go to their normal position after the fan is de-energized, preheat and /or heating coil control valves are controlled to maintain internal AHU or leaving air temperatures of 45F and 70F, respectively.

- G. The DDC system generates a VFD trouble alarm as reported by the VFD.

- H. Typical points not monitored: air filter differential pressure, coil temperatures, smoke sensors (UAF does not install smoke detection in most typical air handler units, but rather, executes fan shut down on general fire alarm).

- I. Non-typical points to monitor: total air flow or velocity.

3.10 VAV LABORATORY AIR HANDLER

- A. 100% Outside Air Supply, 100% Exhaust Air.

- B. System controls laboratory in conjunction with fully integrated laboratory control system. The air handler operates similar to the variable air volume system with duct sensor setpoints for supply and exhaust being maintained at a constant to ensure room laboratory controllers maintain lab level air volume requirements. See below for laboratory ventilation controls sequence of operations.

- C. Low temperature safety protects all associated HVAC systems.

- D. Typical points not monitored: air filter differential pressure, coil temperatures, smoke sensors (UAF does not install smoke detection in most typical air handler

units, but rather, executes fan shut down on general fire alarm)

- E. Non-typical points to monitor: total air flow or velocity

3.11 VARIABLE AIR VOLUME (VAV Boxes) PACKAGED SYSTEMS

- A. Application Specific Controller (Siemens TEC) have specific points and functions depending on the Application Number.
- B. Controlled within design required maximum and minimum supply air volume settings.
- C. Monitor room temperature sensors and air velocity sensors.
- D. In Unoccupied mode: system controls using night setpoint. May reset the Occupied mode for a predetermined time period upon a signal from the lighting control system.
 - 1. Cooling Only: Occupied mode –monitors room temp sensor and air velocity sensor, modulates SA damper to maintain room temperature.
 - 2. Cooling with Baseboard: Occupied mode – modulates SA damper in sequence with radiation valve to maintain room temperature, SA volume to remain at minimum when HW radiation valve is modulated.
 - 3. VAV with Reheat Coil: Occupied mode - modulates the SA damper in sequence with the reheat valve to maintain the room temperature, SA volume remains at minimum when HW reheat valve is modulated.
 - 4. VAV with Reheat Coil and Baseboard: Occupied mode - modulates the SA damper in sequence with the reheat and radiation valves to maintain the room temperature at set point, SA volume remains at minimum when HW reheat and radiation is modulated.
- E. Typical points not monitored:
- F. Non-typical points to monitor: auxiliary temperature sensor in air discharge from units with coils, VAV w/RHC, Duct RHC, FCU w/RHC or CC. Not applicable for Unit heaters or cabinet unit heaters.

3.12 BOILER CONTROLS

- A. Alarmable primary controller

- B. Avoid packaged controller on the Troth Yeddha' Campus.
- C. Outside air temperature reset
 - 1. Outside Air Temperature Supply Setpoint
 - 2. -10F 180F
 - 3. 50F 140F
- D. Staging for multiple boilers.
 - 1. Enable heating mode when outside air temperatures are below the system enable setpoint 65F (adjustable).
 - 2. Lead Boiler recirculation pump is enabled.
 - 3. One minute after proof of operation, lead boiler is enabled and is cycled as needed to maintain header supply temperature.
 - 4. On an initial cold start the boiler diverting valve modulates to ensure the return temperature remains within 5F of supply temperature. After reaching initial system supply temperature setpoint, the diverting valve remains in the full heating position.
 - 5. Lag boiler recirculation pump is enabled if main header temperature has been below setpoint for longer than 30 minutes or if lead boiler alarm is active.
 - 6. Lag boiler is enabled one minute after pump has proven on and is cycled as needed to maintain header supply temperature setpoint.
 - 7. On an initial cold start the boiler diverting valve modulates to ensure the return temperature remains within 5F of supply temperature. After reaching initial system supply temperature setpoint, the diverting valve remains in the full heating position.
 - 8. Boilers change lead every four months on the second Wednesday of the month after 9am.
- E. Enabling by DDC system unless approved packaged controller is allowed.

- F. Typical points not monitored: (consultant to determine).
- G. Non-typical points to monitor: Alarmable primary controller.

3.13 BOILER ALARMS – set up at substantial completion

- A. Use Carlin model 70200 Universal Oil Primary Control at remote campus sites.
- B. Provide relays or sensors as required for each individual alarm.
- C. Alarms:
 - 1. Flame Failure
 - 2. Low Water Cut Off
 - 3. High Limit Cut Off
 - 4. Low Return Water Temperature
 - 5. Low System Pressure

3.14 MAINTENANCE – provide typical list

- A. Equipment proof of failure – Pump A or Pump B

3.15 CRITICAL – provide typical list

- A. System failure – Pump A and Pump B

3.16 SPECIAL CASES – Designer to describe alarming

3.17 NON-DDC Systems – BACnet protocols as applicable to an existing system in the project building.

3.18 FREEZERS – Alarm individual freezers using dry-contacts provided on equipment. No gang alarming. Use L10-20 plug for NC contacts.

3.19 ELEVATOR SUMP HIGH LEVEL – Use in hydraulic elevators with hydrocarbon switch in sump. Use stand-alone level switch or pick up dry contacts in packaged pump high level alarm.

- 3.20 LIFT STATIONS – Use manufacturer supplied dry contacts
- 3.21 CHILLER INTERFACE – DDC system to provide enable, setpoint and staging signal. Manufacturer is to provide interface, gateways and current software. Use BacNet over IP.
- A. BACnet Specific Equipment Alarm Component Points
1. Enable
 2. Setpoint
 3. Mechanical Faults
 4. Staging
 5. Oil Pressure
 6. Discharge Pressure
 7. Suction Pressure
- 3.22 ROOM TEMPERATURE CONTROL – Facilities Engineers preference is for individual room control. Otherwise there are many control/operations problems.
- 3.23 EXTERIOR LIGHTING CONTROL – Each exterior lighting system will be controlled off one common campus control point.
- A. Upon failure of common campus control point refer to secondary astronomical clock program in Building Level Network.
- 3.24 DOMESTIC WATER HEATER – Recirculating control via occupancy schedule
- 3.25 HEAT TRACE – Control via DDC on seasonal schedule, On or Off based on outside air temperature
- A. Hydronic Heat Trace
1. Circulating pump, CP, runs continuously from September 1 to June 1 (adjustable)
 2. Glycol supply temp in heat trace supply temp setpoint, 80F, is maintained by modulating 3-way control as needed.

3. The following DDC points are available at the Host Room DDC Server and operator workstations:
 - a. Glycol Supply Temp (F)
 - b. Glycol Return Low Temp Alarm
 - c. CP Status (On/Off)
 - d. CP Failure Alarm
- B. Electric Heat Trace
 1. DDC Controller provides an enable signal to each electrical heat trace when OSA temperature is below 35F and above negative 10F (adjustable)
- 3.26 FIRE ALARM INTERFACE – hardwired input from Fire Alarm system to enable restart after fire alarm reset.
- 3.27 INTERIOR SPACE HEATING – SUMMER.
 - A. Designer should anticipate interior building spaces that will sub-cool during summer months when building heating system is seasonally disabled.
- 3.28 VOLUMETRIC OFFSET LABORATORY ROOM VENTILATION CONTROLS
 - A. Fume Hood Control: The fume hood controller calculates the total fume hood open area based on the fume hood’s fixed openings, bypass opening, leakage area and sash position as indicated by the sash sensor(s). The fume hood controller also continuously calculates the fume hood exhaust CFM required to maintain the average face velocity set point based on the total open area of the fume hood and the average face velocity (adjustable) set point. The fume hood controller uses a FUME HOOD EXHAUST TERMINAL to measure actual fume hood exhaust CFM and modulate the fume hood exhaust to control and maintain the required fume hood average face velocity using a proportional, integral and derivative (PID) closed loop control algorithm.

The fume hood controller maintains the fume hood exhaust CFM at the desired minimum set point value (adjustable) when the total fume hood open area results in less than the desired minimum fume hood exhaust CFM. This minimum

fume hood exhaust set point is set to the value recommended by the fume hood manufacturer to maintain adequate fume containment and dilution.

- B. Room Ventilation Control: The Lab Room Controller (LRC) receives the total value of the fume hood exhaust CFM set point via a totalizing device connected to any fume hood controllers and measures the actual room general exhaust CFM. The LRC calculates total room exhaust CFM by adding the room general exhaust CFM and the total fume hood exhaust set points together. The LRC modulates the room general exhaust to ensure that a minimum total room exhaust necessary to meet the required room ventilation rate is continuously maintained using a proportional, integral and derivative (PID) closed loop control algorithm.
 - C. Room Pressurization Control: The LRC uses airflow sensors in the ROOM SUPPLY AIR to continuously measure the actual ROOM SUPPLY AIR CFM. The LRC calculates the required ROOM SUPPLY AIR CFM necessary to maintain the predetermined FLOW TRACKING DIFFERENTIAL by subtracting the flow tracking differential CFM set point (adjustable) from the total room exhaust CFM. The LRC modulates the ROOM SUPPLY AIR CFM to ensure that the flow tracking differential CFM is always maintained by a proportional, integral and derivative (PID) closed loop control algorithm.
 - D. Room Temperature Control: The LRC measures the temperature in the room by means of the ROOM TEMPERATURE SENSOR and maintains the room temperature at the set point by adjusting the supply airflow and modulating the NORMALLY CLOSED (N.O.) HEATING VALVE using a proportional, integral and derivative (PID) closed loop control algorithm. Room supply air temperature is controlled to the room set point. The LRC temperature control loop calculates a supply airflow required for cooling TEMPERATURE CONTROL VOLUME. If the ROOM SUPPLY AIR is at its minimum limit and the room requires increased cooling beyond the amount of ROOM SUPPLY AIR CFM necessary to maintain the required FLOW TRACKING DIFFERENTIAL, the LRC increases the ROOM SUPPLY AIR CFM as well as the ROOM GENERAL EXHAUST CFM to maintain the room temperature set point and the FLOW TRACKING DIFFERENTIAL.
- 3.29 HEAT RECOVERY AIR HANDLER SYSTEMS – Consult with FS/DDC on means and methods of controlling heat recovery systems based on the type of system.
- 3.30 COMBINED SEASONAL HEATING/COOLING SYSTEMS – Consult with FS/DDC on means and methods of controlling building pre-heat, heating, radiant heating, etc utilizing the low-temperature central waste heat loop. The loop is seasonal: cooling in summer, heating in the winter. Plan for the system to be OFF in maintenance during the shoulder seasons.

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide HVAC zoning as much as practical for better control and energy management. Coordinate with control specifications.
- 1.02 Configure hand operated valves and drains on all branch lines of the heating system so any one zone can be turned off and completely drained, separately, without interruption of the entire system.
- 1.03 Provide all systems with automatic balancing (Griswold or equal) or manual balancing (B&G circuit setters or equal). Do not use balancing valves as isolation valves even if designed to be so used.
- 1.04 Since remote site systems are generally constant volume, provide only balancing valves for management of system flow. No automatic balancing valves.
- 1.05 Consult with FS/DDC on whether UAF or Contractor will provide hydronic system fluids, dyes, and inhibitors.

PART 2 - PRODUCTS

- 2.01 Hydronic heating: Use site-blended mixture of virgin polypropylene glycol, corrosion inhibitor and de-ionized (DI) water. Ethylene glycol may be allowed on certain heating applications such as combined radiant heating and cooling systems; consult with FS/DDC Project Manager.
 - A. Fill heating glycol systems with blend of contractor-provided virgin propylene glycol and Owner furnished DI water. DI water available on site or furnished by UAF Facilities Services. Contractor to provide NALCO 2837 corrosion inhibitor. For corrosion inhibitor concentration, see Part 3.
 - B. Fill plain water heating systems with campus DI water, available on site or furnished by UAF Facilities Services. Contractor to provide NALCO 2837 corrosion inhibitor. For corrosion inhibitor concentration, see Part 3.
 - C. Test glycol concentration with optical, automatic temperature compensating high impact vinyl housed device.
 - D. Freeze Protection: negative (-) 30F in coils, 0F in radiant systems.
- 2.02 Hydronic cooling with building chiller system: Use manufacturer blended and inhibited ethylene glycol and DI water.
 - A. Fill with contractor-provided pre-blended/inhibited ethylene glycol. Phosphate-based inhibitor. Dowtherm SR-1.

- B. Freeze protection level: For summer-only systems: 0F. For process cooling systems: negative 15F
- 2.03 Remote site hydronic heating systems: Pre-blended, inhibited, phosphate based, 50/50 propylene glycol. DowFrost HD, No Alternate Brands, No Substitutions.
- 2.04 HDPE make-up tank with jet pump. Basis of design is a Goulds J-5, two other manufacturers identified by Consultant. Consultant to use UAF standard detail edited for specifics such as size of tank and system pre-charge pressure.
- A. For systems less than 50 gallons, factory assembled glycol make-up tanks with on-board pumps are acceptable. Pump must be mounted on top of tank, not below. Axiom or Alternate Brand Request or Substitution Request required.
- 2.05 Air separators:
- A. Tangential flow air separators only. Bell & Gossett Rolairtrol, TACO, Amtrol, Alternate Brand Request or Substitution Request Required.
- 2.06 Expansion Tanks:
- A. Systems over 750 gallons: Provide estimated system volume and operating pressure to UAF DDC Facilities Engineer and Project Manager for direction. Bladder or diaphragm tanks: ASME or Non-ASME as determined by system requirements. Bell & Gossett, Amtrol, Wessels, or Taco. Alternate Brand Request or Substitution Request not required.
 - B. Systems up to 750 gallons: Plain Steel, Air over water tanks: ASME. Provide with air entry and drain fittings and site glass by same manufacturer as tank. Bell & Gossett, Wessels, or Taco. Alternate Brand Request or Substitution Request not required.
- 2.07 Thermometers:
- A. Solar digital only. Glass and alcohol/mercury thermometers are not allowed

PART 3 - EXECUTION

- 3.01 Install hydronic piping to maintain minimum 1 inch clear from all other piping and ductwork. Where piping or ductwork is insulated this requirement applies to surface of insulation.
- 3.02 Piping must be accessible for repairs. No piping buried under inaccessible flooring such as concrete slab on grade.
- 3.03 Provide access doors suitably sized for the required access. See associated requirements in

Division 08.

- 3.04 Provide sleeves for all pipes passing through ceilings and floors, etc. Sleeves shall be at least 1 inch above the floor finish. Size sleeves to allow for insulation and fire stopping/acoustical sealant. Provide fire stopping in accordance with 07 84 00.

Where riser clamps may interfere with sleeves through floors, or structure between floors, provide specific instructions and details as may be required to eliminate conflicts. Provide additional instructions and detailing for new or existing piping passing through existing holes in floors including those penetrations where holes were not carefully cut, but must now be sleeved and sealed to create a rated penetration. Provide sleeve welded to a plate where retrofitting a sleeve. For new construction, provide sleeve cast into the slab.

- 3.05 Provide manual coin operated air vents, or similar, with isolation ball valves on all high points of systems. Locate air separators at the most functional locations for the system. Where required due to system design, pipe discharge of high-capacity auto air vent to glycol make-up tank.
- 3.06 Pre-clean new and modified existing hydronic piping with trisodium phosphate (TSP) and flush three times before initial fill. Mix TSP to concentration recommended by product manufacturer for the specific application.
- 3.07 System solution: mix of glycol and DI water (not domestic water).
- A. Contractor to fill and test system and establish the residual corrosion inhibitor level as indicated below, while maintaining pH between 8.2 and 8.5.
1. Corrosion inhibitor concentration for new construction: 1000 ppm.
 2. Corrosion inhibitor concentration at 1 year, warranty period, and thereafter: 400 ppm.
- B. Sample glycol at substantial completion and at the end of the one-year warranty and have contractor adjust as needed.
- C. Install egg yolk yellow dye furnished by UAF Facilities Services for heating loops. Install blue dye furnished by UAF Facilities Services - Utilities for district chilled water glycol systems. Dye concentration: 2 oz per 55 gallons.
- 3.08 Require Contractor to provide documentation in project As-built Drawings stating total volume of each separate hydronic system.
- 3.09 For smaller buildings (less than 750 gallons volume), remote sites, and localized chilled water systems, UAF prefers plain steel, air over water expansion tanks using the principle

of air management. These systems frequently do not require dedicated glycol make-up tanks and pumps. Coordinate each application with FS/DDC.

- 3.10 For large buildings, UAF allows the use of diaphragm or bladder style expansion tanks using the principle of air elimination. These systems do require dedicated glycol make-up tanks and pumps. Coordinate each application with FS/DDC
- 3.11 Ensure that all expansion tanks, diaphragm, bladder, or plain steel are equipped with isolation and drain valves to isolate and drain the tank during system maintenance.
- 3.12 Require Contractor to confirm and adjust as necessary, diaphragm or bladder type expansion tank pre-charge pressure to pressure specified in Contract documents prior to connecting tank to system, regardless of any factory pre-charge.

END OF SECTION

PART 1 - GENERAL

- 1.01 Large or critical pumping systems: 100% redundancy (primary-secondary pumps, possibly with alternating lead-lag operation). Consider redundancy on other systems on a case-by-case basis.
- 1.02 Select the pump most appropriate for the design application within the certified pump curve, rated for the location and type of power supply/speed drive.
- 1.02 For large hydronic piping systems use base-mounted or vertical in-line pumps.
- 1.03 Each pump in parallel configuration: valve and pipe to allow for removal without interrupting system operation. Place unions and valves in accessible positions. Install pressure gauges with isolation valves on each side of pumps. Where a single pressure gauge serves both suction and discharge sides of pump, install a pressure gauge in manifold with isolation valve on each side.
- 1.04 No Dielectric components, nipples or unions on closed loop systems.
- 1.05 If radiant in-slab or in-wall heating is used, consultant will place a note on all applicable design drawings and specs warning of the tubing depth. Design of walls and decks with radiant tubing shall allow for the tubing to be at least 1 inch below the surface of the floor surface. Preplan all floor boxes, drains, in-slab conduits, etc, to make allowances for the tubing installation. In no case shall drill-in anchors be used near radiant tubes without adequate design provisions if the tubing is less than 2 inches from either the top or bottom side of a slab.
- 1.06 Mechanical compression fittings such as Propress, Sharkbite, or similar are not allowed.
- 1.07 On hydronic piping smaller than 1-½ inches do not provide unions, unless specifically coordinated otherwise.
- 1.08 Strainers are generally not allowed on hydronic piping, unless specifically coordinated otherwise.

Exceptions:
 - A. If required by an equipment manufacturer.
 - B. At pump suction for primary system pumps.
- 1.09 Pump motors must comply with DOE NEMA Premium Efficiency Standards where applicable. Specifications shall require proof of compliance with product submittal.

- 1.10 Where multiple, staged boilers are provided, they shall be parallel decoupled from the main heating system and isolatable for individual service. Each boiler shall be provided with a three-way diverting (or mixing) valve controlled to prevent thermal shock to the boiler.
- 1.11 Select all heating equipment based on -50F OSA (Outside Air) conditions unless specifically directed otherwise.

PART 2 - PRODUCTS

- 2.01 Base-mounted, vertical in-line and close-coupled pumps: Bell & Gossett, Taco, or Armstrong. No Alternate Brands, No Substitutions.
- 2.02 Rubber pump connectors not allowed.
- 2.03 Pumps with resilient motor mounts not allowed.
- 2.04 In-line circulators: wet rotor type, Grundfos, Wilo, or Bell & Gosset, No Alternate Brands, No Substitutions.
- 2.05 Equip all pumps of 3/4 H.P. rating and greater with magnetic motor starters with H-O-A switches and indicators; 208 v 3ph or 480 v 3ph. Use thermally protected integral manual motor starters with all pumps of less than 3/4 H.P. rating; 115 v 1ph. Consult with UAF FS on use of small pumps with integrated VFD.
- 2.06 Utilize PEX tubing for radiant with Oxygen Barrier, confirm PEX-A with UAF FS Engineering.
- 2.07 Generally, no grooved end piping on hydronic cooling or heating systems. Copper (Type L) or Steel piping with soldered or welded joints and fittings. On special case, FS/DDC may consider Victaulic only for grooved end piping. Must be approved and coordinated with FS/DDC.
- 2.08 Valves
 - A. Up to 3", ball valve
 - B. Larger than 3", indicating type
- 2.09 Specify hangers and associated hardware to be compatible with the piping material, system being conveyed, weight, insulation type, and seismic design category.
 - A. Where applicable, such as the hanger on a chilled water copper pipe, provide separation between dissimilar metals. This may include wrapping copper pipe in a

dielectric tape, the use of epoxy-coated (preferred) or copper-plated hangars, or any other combination of material that prevents electrolysis and corrosion.

PART 3 - EXECUTION

- 3.01 Locate isolation valves as close as practical to the isolated equipment to minimize drainage volume.
- 3.02 Where possible, locate all valves 3 inch size and smaller accessible from floor or working platform.
- 3.03 Locate valves larger than 3 inches in mechanical rooms where they can be operated from floor. Provide chain operators where valve handles are more than 6 feet-6 inches above floor.
- 3.04 Install pumps accessible and serviceable from floor or working platforms. Pumps larger than small "canned rotor" pumps shall not require ladder access.
- 3.05 Constant volume parallel pumps shall be installed with non-slam check valves.
- 3.06 Where radiant slab or wall heat is provided, coordinate need for and provide any necessary conduit for slab temperature sensing.
- 3.07 During installation of thermal mass (concrete) for radiant slabs, maintain continuous air pressure on radiant tubing for rapid detection of leaks. Air pressure: as recommended by tubing manufacturer. There may be applications where water is preferred for leak detection over air, coordinate on a project by project basis.
- 3.08 Where new or existing piping penetrates floor structures through new or existing floor penetrations see requirements indicated under Section 23 21 00, Paragraph 3.04 of this Design Standard.

END OF SECTION

PART 1 - GENERAL

- 1.01 Refer to Division 33 for steam piping standards between the building service entry to the UAF Combined Heat and Power Plant.
- 1.02 Do not use steam as a direct air heating medium.
- 1.03 Size and grade all steam piping to prevent flashing and assure adequate return of condensate.
- 1.04 Do not install steam isolation valves in vertical piping without providing means to drain condensate from both sides of valve.
- 1.05 In general, standard Schedule 40 carbon steel for steam piping and standard Schedule 80 carbon steel for condensate piping. Use ASTM A53 Grade A Steel.
- 1.06 Install pressure gauges on both the high pressure and low pressure sides of all regulator stations. Variable loads are expected in buildings. Where design load exceeds 600 lbs. per hour, provide 1/3 and 2/3 steam control valve arrangements.
- 1.07 Install condensate meters on condensate return line after the condensate receiver.
 - A. Install per UAF standard installation detail. Contact project manager for current version.
 - B. Coordinate with Division 26 for installation of conduit and wiring for connection to metering network.
- 1.08 Drain valve required for each drip leg in utilidor and mechanical room.
- 1.09 Traps must have isolation valves and blow down leg and be easily accessible for maintenance. Install strainer on the inlet side of each trap. Install unions on both upstream and downstream side of traps.
- 1.10 Size drip legs to line size.
- 1.11 In utilidor runs, install drip legs with $\frac{3}{4}$ inch valved blow-down ahead of each expansion joint, isolation valve, and pipe bend. Install steam traps close to drip legs.
- 1.12 Provide final heat exchanger and pipe sizing calculations to UAF FS Utilities to verify existing steam piping can accommodate the load or if a utility piping upgrade will be required.

PART 2 - PRODUCTS

- 2.01 Traps: float and thermostatic steam traps by SARCO, TLV, No Alternate Brands, No Substitutions.
- 2.02 Building Isolation valves:
- A. Over 3 inch: Cast Steel body, bronze mounted (IBBM) flanged, ASME Class 150, rising stem, OS&Y, bolted bonnet, solid wedge disc, and gate valve with Teflon or graphite impregnated fiber packing.
 - B. 3 inch and under: Threaded, ASME Class 150, rising stem, union bonnet, solid wedge disc, gate valve. Bronze body, bonnet, stem and disc. Malleable iron hand wheel. Teflon or graphite impregnated fiber packing.
- 2.03 Condensate Meter: Owner furnished contractor installed, 1 inch Badger M70 disc meter with union connections.
- 2.04 Vacuum Breaker:
- A. Kadant Johnson or other manufacturer identified by the consultant, with stainless steel threaded vacuum breaker.
- 2.05 Condensate Receiver: Cast iron receiver with duplex, electric condensate pump return. Provide with integral gauges and NEMA rated control panel. Manufacturers: PACO, Bell and Gossett, or Armstrong. Alternate Brand Request or Substitution Request required. Terminus of condensate receiver vent will be determined by project specific needs and installation requirements of manufacturer. Operating range should be 10psi unless higher pressure required to overcome head pressure and ensure gravity flow back to the UAF FS Utilities, Atkinson Power Plant.
- 2.06 Expansion Joints:
- A. Packed Slip Expansion Joint: rated at 250psi, 400F, PTFE packing type designed for repacking under pressure, flanged for maintenance, Hyspan, Advanced Thermal Systems, Adscos Mfg. Alternate Brand Request or Substitution Request required.
 - B. Compensator: two ply stainless steel bellows, steel shroud, threaded under 2 inches, flanged over 2.5 inches, Hyspan, Metraflex, Adscos Mfg. Alternate Brand Request or Substitution Request required.

PART 3 - EXECUTION

- 3.01 Install steam and condensate piping to maintain minimum 1 inch clear from all other piping and ductwork. Where piping or ductworks are insulated this requirement applies to surface of insulation.
- 3.02 Provide union connections with space needed for meter (Approx 16.625 inches, confirm on project by project basis). Also provide 1 inch Y-type strainer upstream of the meter. Provide isolation valves on inlet and outlet of meter and full line size bypass with globe valve rated for steam condensate service. Consult with UAF FS DDC for current detail.
- 3.03 Provide conduit as necessary to route meter wiring to UAF FS Utilities, Atkinson Power Plant.

END OF SECTION

PART 1 - GENERAL

- 1.01 Design for low to medium pressure air distribution system.
- 1.02 Provide volume dampers at branch take-offs rather than at diffusers.
- 1.03 Design and locate supply and return air terminals to provide proper distribution through the space, minimize noise, and prevent drafts at all volumes of distribution. Locate terminals so that they are easily accessible at all service points including damper controllers, airflow sensors & coil valves.
- 1.04 Design duct installation to minimize ambient room noise from traveling room to room.
- 1.05 Design ductwork and distribution in classrooms to minimize noise and interference with smart classroom devices such as projection screens.
- 1.06 Require 24 inch deep working clearance for maintenance access in front of any control boxes on air terminals, fire smoke dampers, etc.

PART 2 - PRODUCTS

- 2.01 Construct general ductwork of galvanized sheet metal. Construct fume exhaust ductwork per Division 23 section on Fume Hood Exhaust System Ductwork.
- 2.02 Insulate ductwork in unconditioned spaces. Insulate outside air intake ducts and relief ducts connected to outside louver with rigid board type insulation applied to the exterior of the ductwork. Acoustical sound lining applied to the interior of ductwork is not acceptable for thermal insulation. Refer to Division 22 07 00 for further insulation details.
- 2.03 Specify motorized control dampers under Standard 23 09 23, Instrumentation and Controls for HVAC. Specify operation under Standard 23 09 93, Sequence of Operation for HVAC Controls.
- 2.04 Exhaust ductwork from wet areas such as multiple or gang showers shall have soldered joints and pitch toward building exterior. Cabinet fans not acceptable for shower rooms. Use utility style, with drain from scroll to appropriate receptacle.
- 2.05 Specify all fans per appropriate AMCA standards.
- 2.06 Spin-in fittings are allowed only on downstream side of VAV boxes and in low pressure constant volume systems.

PART 3 - EXECUTION

- 3.01 Design, fabricate and install all ductwork to SMACNA standards, most current edition. Seal and leak test according to SMACNA and ASHRAE standards. Require Contractor to notify the University for witness of ductwork leak tests and full inspection of ductwork prior to concealing beneath insulation.
- 3.02 Install ductwork to maintain minimum 3-inch clear from all other piping, ductwork, ceiling reinforcements, lights, T-bar, structure, etc. Where piping or ductwork are insulated this requirement applies to surface of insulation.
- 3.03 Make no ductwork bends greater than 90 degrees per bend.

END OF SECTION

PART 1 - GENERAL

1.01 Work included:

- A. This section covers selection and installation of variable volume terminal units.

1.02 General:

- A. General occupied spaces applications:

- 1. Provide variable volume terminal units for space ventilation and temperature control.

- B. Laboratory terminal units.

- 1. Provide variable air volume (VAV) terminal units for laboratory space ventilation and temperature control. Controls must be compatible with fume hood controls.
 - 2. In general, design using a volumetric-offset strategy for VAV control strategy. Consider pressure control strategy only when the application requires strict room pressurization monitoring and tight control such as animal holding suites.

- 1.03 Require 24 inch deep working clearance for maintenance access in front of any control boxes on air terminals, fire smoke dampers, etc.

PART 2 - PRODUCTS

- 2.01 Laboratory terminal units: Siemens, Phoenix, Alternate Brand Request or Substitution Request Required. Single blade dampers are the basis of design for supply, general exhaust and fume hood exhaust. Venturi style only required in specific applications.

- 2.02 Factory fabricated variable-air-volume terminal units complete with lined casing, volume control damper, pressure independent volume controller. Trane, Titus, Siemens, Alternate Brand Request or Substitution Request required.

- A. Provide units with damper assemblies for thermostatic volume control capable of full shut-off and constructed to prevent leakage in excess of 2% of rated air quantity at 1 inch static pressure.
- B. Key damper blades to shaft.
- C. Provide nylon fitted damper pivot points.

- D. Provide non-integral damper operator and linkage mounted externally on casing. Operator is to be of the same manufacturer as the control system. Coordinate operator requirements with Controls and Instrumentation section. Provide factory mounting of controls.

PART 3 - EXECUTION

- 3.01 Coordinate installation of variable-air-volume units with Standard 23 09 23, Instrumentation and Controls for HVAC. Specify operation under Standard 23 09 93, Sequence of Operation for HVAC Controls.

END OF SECTION

PART 1 - GENERAL

1.01 Work included:

- A. Laboratory fume hood ducts.
- B. Process or Capture hood ducts.
- C. Fume hood exhaust fans.

1.02 General:

- A. Ducts to be non-corroding material. All ductwork within the building envelope is to be under negative pressure at all times. Avoid flex connectors unless absolutely necessary; install and test to be air tight. Extend exhaust stacks above building vortex and provide low loss rain stacks.
- B. All duct, fan, and hood drains: corrosion resistant plastic, glass, or type 316 stainless steel.
- C. Exhaust fans: Locate fans immediately inside buildings near the exhaust termination or discharge. Control variable speed fan motors by inlet static pressure.
- D. Exhaust fans may not discharge onto or across pedestrian walkways.
- E. Exterior mounted fans only if approved by FS/DDC and FS/Maintenance. Design to prevent frost and ice buildup on exterior mounted fans, particularly on VAV ejector type fans that mix outdoor air with potentially very moist exhaust air.
- F. Consultant shall demonstrate that no cross contamination between exhaust fumes and air intakes shall occur. Design modeling may be necessary to demonstrate the avoidance of cross contamination (ASHRAE Applications Handbook 2003, Ch. 44, or current version.)

PART 2 - PRODUCTS

2.01 Chemical Laboratory Fume Hood Exhaust Ductwork:

- A. Interior Ductwork:
 - 1. Fume hood ductwork: shop fabricated single wall, uninsulated, Type 316 stainless steel. Elbows: smooth radius (die formed) or minimum of 5-gore elbows, 3-gore elbows not allowed. Welded joints on vertical risers and connections to fans.

2. Single wall, round spiral lockseam, Type 316 stainless steel ductwork may be used.
3. General practice is to use stainless up to a point of dilution with the lab general exhaust which is typically galvanized.

B. Exterior Ductwork:

1. Prefabricated double-wall, insulated, chimney stack. Liner: Type 316 stainless steel, jacket: aluminized steel. Insulation: 2 inch thick. Selkirk Metalbestos Model IPSC1, Heat Fab, Schebler, Alternate Brand request or Substitution Request required.
2. Small amount of shop-fabricated single-wall Type 316 stainless steel ductwork will be required for equipment connections and other miscellaneous applications.

2.02 Perchloric laboratory fume hood exhaust ductwork.

- A. Interior fume hood ductwork: uninsulated, welded single wall, Type 316 stainless steel. Slope is to drain back to fume hood. Provide with washdown system. Exhaust scrubber may also be necessary or appropriate; evaluate need for scrubber in lieu of or in addition to the standard duct washdown system.
- B. Exterior fume hood ductwork: insulated welded single wall, Type 316 stainless steel. Slope is to drain back to fume hood. Provide with washdown system. Insulation: 2 inch thick. Jacket: 0.020 inch thick embossed aluminum. Seal jacket with polyurethane caulk. Do not insulate the rainsleeve duct termination.
- C. Interior and exterior exhaust ductwork may also be constructed of unplasticized polyvinyl chloride. All washdown and insulation provisions indicated above still apply.
- D. Avoid horizontal offsets in vertical exhaust ducts and avoid long vertical exhaust ducts. Where long vertical runs cannot be avoided, additional provisions for duct washdown water removal may be needed due to the large volume of water produced by the numerous wash rings in the duct.
- E. Seal perchloric exhaust ductwork water tight to prevent perchloric acid laden water from leaking onto adjacent building materials or surfaces. If using PVC ductwork, use correct joint sealant materials and application procedures.

2.03 Radioisotope laboratory fume hood exhaust ductwork:

- A. Interior fume hood ductwork: uninsulated, welded, single wall, Type 316 stainless steel. Slope to drain back to fume hood. Provide with washdown system.
- B. Exterior fume hood ductwork: insulated, welded, single wall, Type 316 stainless steel. Slope to drain back to fume hood. Provide with washdown system. Insulation: 2 inch thick. Jacket: 0.020 inch thick embossed aluminum. Seal jacket with polyurethane caulk. Do not insulate the rainsleeve duct termination.

2.04 Process or capture hood ductwork:

- A. General: Non-combustible or per requirements for Class 1 air duct materials, or UL 181.
- B. Steel Ducts: ASTM A525 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz per square foot for each side per ASTM A90.
- C. Fasteners: Rivets, bolts, or sheet metal screws.
- D. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials, liquid used alone or with tape, or heavy mastic. Foster 30-02 or approved equivalent.
- E. Hanger rod: Steel, galvanized, threaded both ends, threaded one end, or continuously threaded.
- F. Capture hoods or connections to equipment: Hoods or hard ducted connections to equipment to be constructed from same material as ductwork. Upon request and where applicable, hoods may be constructed from welded stainless steel, 304 or 316 acceptable.
 - 1. Above Autoclaves and cooking equipment, provide stainless steel capture hoods
- G. For high temperature applications such as generator exhaust or fumes from certain high temperature ovens, consult with FS/DDC on the type, insulation and placement of exhaust ductwork.

2.05 Exhaust fans:

- A. Fabricate fans of materials resistant to the chemical in use, or that may be used in the future. Use appropriate lubricants for fan bearings, especially for perchloric acid fan bearings.

- B. Properly applied VAV exhaust fan systems may be used. Coordinate installation of VAV exhaust fan systems with Standard 23 09 23, Instrumentation and Controls for HVAC. Specify operation under Standard 23 09 93, Sequence of Operation for HVAC Controls.
- C. Specific project input needed from laboratory design professional.

PART 3 - EXECUTION

3.01 Installation - general:

- A. Provide openings in ductwork where required to accommodate thermometers, controllers, and fire protection system equipment. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage.
- B. Provide standard 45 degree lateral wye branch fittings unless otherwise indicated.

END OF SECTION

PART 1 - GENERAL

- 1.01 Select heat exchangers based on project size, specific application, and space available. Where plate and frame heat exchangers are used, keep the exchanger under 'minimal' load during summer months to prevent gasket leakage. Coordinate control requirements with Standard 23 09 93, Sequence of Operations for HVAC Controls.
- 1.02 Allow for cleaning of heat exchanger tubing and easy removal of tube bundle for shell and tube heat exchangers. Indicate minimum required tube pull space to remain clear in drawings.
- 1.03 Shell and tube heat exchangers or brazed plate heat exchangers are preferred. Plate and frame heat exchangers only on approval of FS/DDC and only on liquid to liquid mediums.

PART 2 - PRODUCTS

- 2.01 Plate and frame heat exchangers: Graham, Tranter, Paul Mueller. Alternate Brand Request or Substitution Request required.
 - A. Select plate and frame heat exchanges with only one steam inlet. Multiple inlets not allowed.
 - B. Plate and frame heat exchangers must be provided with factory fitted flanged nozzles welded to the main plate for connection to piping systems. Heat exchangers requiring flanged piping to bolt directly to the structural main plate are not allowed.
- 2.02 Shell and tube heat exchangers: Bell & Gossett, Taco, Alternate Brand Request required, No Substitutions.
 - A. Provide cast iron heads where possible.
- 2.03 Brazed plate heat exchangers: Bell & Gossett, SWEP, Alfa Laval, Taco. Alternate Brand Request or Substitution Request required.
- 2.04 All heat exchangers to be ASME rated, and labeled for the appropriate service.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

1.01 Work included:

- A. Piping, tubing and fittings.
- B. Piping specialties.
- C. Special duty valves.
- D. Refrigerants.
- E. Chillers.
- F. Refrigerant monitors.

1.02 General requirements:

- A. Reciprocating or open drive chillers not allowed for outdoor applications.
- B. Signed and stamped final refrigeration system drawings must be received for review prior to equipment installation for all custom refrigeration applications. This applies to all systems other than factory fabricated chest freezers. Drawings must include capacities and sizing of specialty valves. O&M manuals must include as-built drawings with installer's actual charge weights and pressures.
- C. All custom Ultra-Low (-40F and colder) refrigeration systems must be designed as cascading systems. Provide air dryer when possible.
- D. In order of desirability, from highest to lowest, (with the understanding that size precludes some styles of compressors/chillers), UAF Facilities Services prefers:
 - 1. Scroll compressors - preferable; these are limited in available size to about 60 tons.
 - 2. Screw compressors - acceptable above 60 tons.
 - 3. Centrifugal chillers - acceptable above 60 tons.
 - 4. Reciprocating compressors - discouraged, but may be considered above 60 tons.
 - 5. Steam absorption chillers – preferred by UAF Facilities Service, generally above 300 tons with adequate steam capacity

- E. Desired voltage for Ultra-Low (-20F and below) chest freezers is 120V at 15amps.
- F. Provide all Ultra-Low freezers with built-in set of Form-C (normally open - normally closed) contacts for remote alarming.
- G. Coordinate custom refrigeration system control system design with UAF Facilities Services. Control logic will incorporate Siemens Building Technologies proprietary control language.
- H. Provide for outdoor air-cooled condensing units: Cold weather, low-temp motors and crankcase heaters in compressors.

PART 2 - PRODUCTS

2.01 Chillers:

- A. Manufacturers:
 - 1. Trane
 - 2. York
 - 3. McQuay
 - 4. Alternate Brand Request or Substitution Request required.

2.02 Pipe and tubing materials:

- A. Copper tubing: Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, nitrogen charged, ready for installation, and have sealed end caps to protect interior of pipe until installed.

2.03 Fittings:

- A. Wrought copper fittings: streamlined pattern.

2.04 Joining materials:

- A. Brazing filler metals: Class B Ag-1 (Silver).

2.05 Valves:

- A. Solenoid valves: 250F temperature rating, 400 psig working pressure; forged brass with Teflon valve seat.
- B. Thermal expansion valves: Thermostatic adjustable, modulating type; size as required for specific evaporator requirements; factory set for proper evaporator superheat requirements.
- C. Hot gas bypass valve: Adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; wrought copper fittings for solder-end connections.

2.06 Refrigerant piping specialties:

- A. Strainers: 450 psig maximum working pressure; forged brass body with Monel 80-mesh screen and screwed cleanout plug.
- B. Moisture/liquid indicators: 450 psig maximum operating pressure, 200F maximum operating temperature.
- C. Filter-driers: 450 psig maximum operating pressure, steel shell, flange ring and spring. Furnish complete with replaceable filter-drier core kit, including gaskets, as follows:
 - 1. Standard capacity desiccant sieves to provide micronic filtration.
 - 2. High capacity desiccant sieves to provide micronic filtration and extra drying capacity.
- D. Suction line filter-drier: 350 psig maximum operating pressure, 225F maximum operating temperature.
- E. Suction line filters: 450 psig maximum operating pressure. Furnish complete with replaceable filter core kit including gaskets.
- F. Flanged unions: 400 psig maximum working pressure, 330F maximum operating temperature. Flanges and bolts shall have factory-applied rust-resistant coating.
- G. Flexible connectors: 450 psig maximum operating pressure, seamless tin bronze or stainless steel core, high tensile bronze braid synthetic covering. Stainless steel for all over 300 PSI.
- H. Hard braze all non-replaceable filter dryers.

2.07 Refrigerant:

- A. Select refrigerants consistent with current federal regulations that are readily available on the market and available to be shipped to Alaska.
- C. Refrigerants compatible with existing systems shall be discussed with UAF Facilities Services

PART 3 - EXECUTION

3.01 Installation, general:

- A. Refrigeration system acid-neutralizing agents are not allowed.
- B. Where refrigeration equipment is shipped in broken-down condition on skids and requires field erection of piping joints, contractor must submit manufacturer-approved assembly instruction with names of factory authorized assembly technicians performing the work.
- C. When equipment is placed at the construction site, the contractor must provide visual confirmation that the factory applied holding charge is still intact.
- D. Do not exceed or bypass manufacturer-designed and specified safety limits and equipment (pressure switches, oil safe switches, etc.).
- E. All refrigeration piping joints shall be nitrogen purged during brazing. Designated UAF Facilities Services personnel is to witness process.
- F. No aftermarket alterations of factory fabricated freezer equipment.
- G. All refrigeration systems requiring field assembly and field charging of refrigerant system shall be pulled down by triple evacuation method and back purged with dry nitrogen gas. Measure degree of vacuum with calibrated electronic meter. System specific evacuation requirements:
 - 1. Air conditioning systems & packaged design walk-ins (food coolers/freezers/cold storage):
 - a. Follow manufacturer's recommended evacuation and charging procedures.
 - 0
 - 2. Custom/Research/Performance Walk-in units:

- a. Triple pull-down of entire system to 500, 500, and 250 microns respectively.
- b. Each pull-down held for 1 hour with no greater than 250 micron rise in any test.
- c. Execute procedure using soft copper tubing, braided hoses not allowed.

3.02 Piping installation:

- A. Insulate suction and hot gas lines.
- B. Slope refrigerant piping:
 1. Install horizontal hot gas discharge piping with ½ inch per 10 feet downward slope away from the compressor.
 2. Install horizontal suction lines with ½ inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
 3. Liquid lines may be installed level.
 4. Reference manufacturers' standards.
- C. Install refrigeration piping to maintain minimum 1 inch clear from all other piping and ductwork. Where piping or ductworks are insulated this requirement applies to surface of insulation.
- D. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components. Install strainer upstream from TXV and in suction line upstream from compressor.
- E. Install moisture/liquid indicators in liquid lines between filter/driers and thermostatic expansion valves and in liquid line to receiver.
 1. Install moisture/liquid indicators in lines larger than 2-1/8 inch OD, using a bypass line.
- F. Install unions to allow removal of solenoid valves, pressure regulating valves,

expansion valves, and at connections to compressors and evaporators. No unions in main refrigerant piping.

- G. Install flexible connectors at the inlet and discharge connection of compressors. Purge with nitrogen at .2 CFH while brazing.

3.03 Pipe joint construction:

- A. Fill the pipe and fittings during brazing with an inert gas (i.e. nitrogen or carbon dioxide) to prevent formation of scale.

3.04 Valve installation:

- A. Install globe valves on each side of strainers and driers, in liquid and suction lines at evaporators.
- B. Install a full sized 3-way bypass around each drier.
- C. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.
- D. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
 - 1. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
 - 2. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
 - 3. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.
 - 4. Where external equalizer lines are required, make the connection where it will clearly reflect the pressure existing in the suction line at the evaporator outlet.

END OF SECTION

PART 1 - GENERAL

- 1.01 Locate outside air intakes as far above ground as possible to avoid dust and drifting snow and try to locate them on the cool side of building. Avoid locations near service entries or parking lots where they can pick up vehicle fumes or garbage container odors. Avoid air intake locations near fume hood exhausts, boiler and incinerator stacks, or other building exhausts. Avoid air intakes directly above black roofs.
- 1.02 No piping containing water or steam is to be located in fresh air intake. This includes drains.
- 1.03 Velocities:
 - A. Size outside air intakes for maximum 350 feet per minute air velocity in order to prevent hoar frost on outside air intakes.
 - B. Consult with UAF FS on filter bank velocities during initial design.
- 1.04 Provide adequate ventilation in mechanical spaces to maintain temperature less than 80F.
- 1.05 Locate floor drains adjacent to air handling units, especially with heating & cooling coils, for condensate drainage and coil pressure-wash cleanup.
- 1.06 Utilize internal vibration control and flexible duct connectors.
- 1.07 Provide adequate space to service and maintain AHUs (air handling units) and adequate provisions for equipment removal and replacement. Indicate minimum coil pull space required.
- 1.08 AHU: Select for 70% capacity to allow for future additions. (CONFIRM this design criteria with FS/DDC for each project.)
- 1.09 Minimize the entrainment of snow and rain in the outside air intake structures. In high wind areas, use exterior hoods designed to prevent entry of wind-blown snow. Accommodate the melt water that will discharge inside the building by designing water tight plenums & ducts pitched toward low point drains/floor drains. Provide capped drains where drains are required for snow melt plenums and coils other than cooling coils.
- 1.10 Provide heating, cooling and DX coils that have integral drip pans with trapped drains permanently piped to floor drains. Tailpiece and trap must be sized to overcome fan static/suction and include provision for a deep seal trap. Provide drain/drip pans downstream of coils, designed to operate against fan static.
- 1.11 Provide for cleaning of AHU interiors and coils. Space coils appropriately with wash down

pans and drains or design coils to "roll out" for cleaning. Locate coil cleaning drain pans upstream from coil for counter-flow pressure wash. Provide all cleaning drain pans with capped drain fittings suitable for hose connection. Do not connect with waste drainage from other coils.

- 1.12 Indicate maintenance access areas to be kept clear for maintenance and servicing. Do not design systems, specifically coils, motors, sheaves, and fan wheels/impellers, that will require significant building modification to remove.
- 1.13 For air handlers with width or height dimensions greater than 4 feet, provide interior lighting with compartmentalized switching. Coordinate with electrical engineer. Lights in cold plenums shall be suitable for cold areas.
- 1.14 Design exhaust air and relief air outlets in humidified buildings to minimize buildup of ice on discharge structures and adjacent building structures.
- 1.15 Review filtration strategies to ensure they meet UAF requirements and when indicated, requirements of other funding agencies or accreditation agencies.
- 1.16 Heat Recovery is a requirement of the University, even on fume hood exhaust. Discuss design of recovery system with UAF for best application. Run-around loop, Q-Dot, air-to-air, heat pump, and plate exchanger are all acceptable applications.
- 1.17 Provide dual rack summer and winter outside air filters adjacent to outside air preheat coil, winter rack downstream, summer rack upstream.
- 1.18 Provide filtration upstream of heat recovery coils on the warm (building) side of the coil.
- 1.19 Select all heating equipment based on -50F OSA (Outside Air) conditions unless specifically directed otherwise.
- 1.20 Consider redundancy when designing lab ventilation HVAC systems.
- 1.21 When district waste heat is available, place the cooling coil upstream of the heating coil.

PART 2 - PRODUCTS

- 2.01 Use bag type, high efficiency filters and 2-inch medium efficiency prefilters for all new buildings. Pleated prefilters. Properly analyze use of bag filters with VAV systems to ensure bag inflation and to prevent sagging. Some projects may have strict filter requirements (i.e. 85% filtration or better for NIH funded projects) that will need to be coordinated with the end user.
- 2.02 Construct air handlers with dual steel wall construction with acoustical/thermal insulation between walls. Inner wall may be perforated for acoustical control as required.

- 2.03 Consultant shall identify three manufacturers that meet the project requirements and UAF standards and may require Alternate Brand or Substitution Requests.

PART 3 - EXECUTION

- 3.01 Provide properly sized and positioned, tight sealing, hinged, factory fabricated, duct access doors at locations where cleaning, maintenance, and inspection are required such as back-draft dampers, adjustable dampers, and fire dampers. Provide access doors in ceilings and walls, where ducts are concealed, in accordance with Division 8 Access Doors

END OF SECTION

PART 1 - GENERAL

- 1.01 Equip and configure air coils with factory-fabricated, tight-sealing, hinged access doors, access space, and drain pans plumbed to the nearest drain to facilitate cleaning and other maintenance. Provide access for maintenance and removal. Drain/drip pans only required at main air handler coils and cooling coils, and as prescribed in current code.
- 1.02 New construction: Terminal reheat coils: size for and utilize 50 % propylene glycol.
- 1.03 Existing renovation: Consider existing systems and the cost to retrofit to glycol. In some cases, it could be unacceptably expensive or cause pipe-leaking problems.
- 1.04 Locate outside air preheat coil as close to building perimeter as possible. Provide vapor barrier jacket over outside air ductwork insulation to prevent condensation inside the building. Complete installation to comply with requirements of Division 22 Insulation.
- 1.05 Cover panels on entryway unit heaters shall not allow access to controls by non-service personnel.
- 1.06 Select all heating equipment based on -50F OSA (Outside Air) conditions unless specifically directed otherwise.
- 1.07 Wall mounted cabinet unit heaters are preferred for entryways.

PART 2 - PRODUCTS

- 2.01 Provide coils types that can be drained completely by gravity flow. Where manifold fittings are provided on factory coils that allow vent and drain installations higher and lower than system piping connections, provide vent and drain installations at these points rather than on piping.
- 2.02 All coils AHRI certified.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Achieve humidification through injection of central plant steam into the air handler rather than downstream ductwork. Steam grid injection system preferred with Steam Jacketed Dispersion tubes and Steam Separator. Provide minimum length of straight airflow for complete steam absorption as required by humidification equipment manufacturer. Steam control valve must be threaded or sweat pipe connection so as to make replacement and maintenance easy and less costly.
- 1.02 Consider humidification for special projects, (i.e. Instrument storage, museums, etc.) Design new facilities with proper vapor barriers designed for humidified spaces. Design of humidification systems shall consider existing conditions in retrofit of existing facilities.
- 1.03 Control of humidification by means of the building control system. Generally, setpoints shall be reset based on outside air temperature. Provide multiple averaging humidistats.
- 1.04 Use of UAF power plant steam, for space humidification in buildings, was tested and found not to pose any health hazards to building occupants. (UAF/FS Project Manager: See memo humidification air sampling March 2018 at end of section.)

PART 2 - PRODUCTS

- 2.01 Acceptable manufacturers: DriSteem and Armstrong. Alternate Brand Request or Substitution Request Required.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 UAF falls under the jurisdiction of the State of Alaska and its current adopted codes.
- 1.02 Facilities Services (FS) Division of Design and Construction is responsible for coordinating with the FS Divisions of Maintenance and Utilities.
- A. FS Utilities is responsible for the primary electrical systems on campus through and including the building service transformers.
 - B. FS Maintenance is responsible for the secondary electrical systems on campus.
- 1.03 Where no product listed by an approved national testing laboratory for the application is available, provide certification of performance, function and rating from a Facilities Services approved independent testing agency or laboratory.
- 1.04 Provide three spare fuses of each size and type for new transformers, distribution and control panels, motor starters, etc. Provide a wall-mounted spare fuse cabinet in main electrical room for all new work and where one is not present in existing facilities. Bussman SFC - FUSE-CAB 24WX30HXA12D, Cooper B-Line 242412 FC, or other manufacturer meeting the requirements of the design standards.
- 1.05 Main disconnects for facilities with a service greater than 75kVA where located inside the building:
- A. Shunt-trippable from a lockbox located per Fire Department requirements.
 - 1. Shunt trip shall be the KNOX-VAULT 4500 Series Power Shutdown, Brand Name Only.
 - 2. Key for shunt trip box shall be cored to the University Fire Department KNOX key.
 - 3. Shunt trip located per direction of the University Fire Department.
 - 4. Shunt trip may be flush mount or surface mount.
 - 5. Tamper switch not required.
 - 6. Shunt trip is not to be labeled.
 - B. Main disconnect shall be fusible switch, when possible.
 - C. Disconnect located exterior of the building envelope. Discuss final location with UAF FS and the Authority Having Jurisdiction.

- D. Power supplies (such as Emergency Power Supplies and Uninterruptible Power Supplies) inside the building envelope that distribute their power to other areas of the building shall have a shunt trip at the location of the building service disconnect that isolates the AC/DC output of that power supply to the room in which it is located.
- 1.06 Water, Condensate, and BTU Meters, and utility submeters: Provide conduits from the meters to the nearest Power Monitor provided under Division 26 Power Monitoring and Control.
- 1.07 The campus priority feeders and facility standby and emergency distribution systems shall serve only the following loads. It may be necessary to implement a layered, automated and/or manual load management scheme in the event of a power supply disruption in order to maintain system integrity or operation.
- A. Emergency egress lighting systems (including emergency lighting inverters and battery chargers).
 - B. Refrigeration equipment for preservation of specimens or research projects.
 - C. Selected HVAC equipment, such as heating pumps and other equipment as determined by Owner, whose operation is necessary to prevent damage to building and/or protect life or safety and/or support equipment for refrigeration or other equipment for preservation of specimens or research projects.
 - D. Fire Alarm and Powered Fire Sprinkler Components.
 - E. Fume Hood fans as required by NFPA 45
 - F. HVAC Direct Digital Control (DDC) panels.
 - G. Telecommunications' phone and network equipment as determined by FS/DDC.
- 1.08 Large buildings shall have at least two power distribution systems:
- A. Normal power for non-essential loads.
 - B. Priority(standby) power for essential services per requirements stated elsewhere in this document.
 - C. Provide redundant/ parallel distribution system, with redundant utility connections, for buildings where operations cannot be interrupted.

- D. Where there are two distribution systems in a building, a means of supplying one from the other shall be provided, preferably by a tie breaker featuring a Kirk key interlock.
- 1.09 Provide an external connection point for the portable generator to the highest priority power distribution system. High-priority loads include animal care systems, sensitive freezers with high-value specimens, and building heating systems. Review the lists of high-priority loads with program users, FS AVCFS, and the UAF Emergency Manager. Typically, this will be the emergency and/or standby power distribution system.
- A. Require demonstration of the operation of the automatic and/or manual transfer switches.
 - B. Size disconnect for pre-determined loads.
 - C. Disconnect/transfer switch to be four (4) pole, so that neutral connection will be switched.
- 1.10 Provide shunt trip disconnects and fire alarm interface for elevator machinery rooms when required by work in other divisions or by applicable codes such as (NFPA 13, 72, and ASME). Coordinate the requirements and location with other divisions.
- 1.11 Include 20% spare capacity in panelboards. Load branch circuits to no more than 80% capacity and provide a spare raceway of the count and size specified elsewhere in these design standards, to utilize spare capacity.
- 1.12 All DDC (BMS) control panels shall be provided with uninterruptible power supplies. The source may be a central or isolated battery backup with power conditioning. Design for a minimum run time of 30 minutes.
- 1.13 National Electrical Code (NEC) requirements for “Dedicated Equipment Space” shall apply to all operable electrical equipment. The intent is to widen the requirement of NEC 110.26 F to include equipment other than switchboards, panelboards, distribution boards, and motor control centers, to include disconnects, transfer switches, variable frequency drives, and similar equipment. Show all dedicated spaces on the mechanical and electrical drawings.
- 1.14 Equipment cover retaining screws: Screws or mating threaded holes or retaining devices that are stripped, damaged, or non-functional will be repaired or replaced at no expense to FS/DDC, such that equipment will retain the manufacturer’s designed arc fault explosion capability and listing.
- 1.15 Fasteners


- A. In wet or corrosive environments, all exposed fasteners, screws, bolts, washers, nuts, and anchors are to be commercial-grade stainless steel. Contractor to substitute manufacturer's non-stainless-steel fasteners, screws, bolts, washers, nuts, and anchors with appropriate stainless-steel substitute, unless approved otherwise in writing by the FS/DDC.
 - B. Fasteners shall not be installed in such a manner that they may cause damage to conductors or personnel, as in the case of self-tapping screws holding labels on the cover of a panelboard. Where installed, they will be replaced at no cost to FS/DDC with a type fastener acceptable to FS/DDC.
- 1.16 New buildings and existing buildings without lightning protection: Perform analysis to determine if lightning protection shall be installed. Install in accordance with applicable codes and industry standards.
- 1.17 Seismic restraint: Equipment to be seismically restrained per applicable codes and best practices.
- 1.18 Voltage Drop Minimums and Maximums:
- A. Maximum 5% drop from building service to outlet.
 - B. Minimum and maximum system utilization voltages shall not exceed the values given in the current revision of IEEE Std. 241-1990. Minimum acceptable voltage at outlet 110 V and proportionately for other voltage systems.
- 1.19 Phase rotation shall be ABC beginning at the secondary terminals of the building supply transformers with A=X1, B=X2, and C=X3. Phasing shall be an exact match at all 480V and 208V tie breakers. Where an existing installation is found to be other than ABC rotation coordinate with UAF.
- 1.20 As-built drawings: Require contractor to notate the location of exterior (underground) raceways and boxes off of the face of finish of the most adjacent building, in two directions (X and Y plane). For interior raceway and boxes, require contractor to as-built the location of homerun boxes (within 2 feet of the installed location), large junction boxes, any trapeze carriers with multiple raceways/pipes, etc, cable-tray, and conduit over 4 inches in diameter

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION

- 3.01 All materials shall be installed in a neat, orderly, and secure fashion, as required by these specifications and commonly recognized standards of good workmanship. The norms for execution of the work shall be in conformity with NEC, Chapter 3, and the

- National Electrical Contractors' Association National Electrical Installation Standards, for which the FS/DDC's judgment shall be final.
- 3.02 Install equipment, supports, and similar equipment with cutting edges or points removed or permanently protected.
- 3.03 Connections on conductors 60 Amperes or larger shall be connected using a torque wrench.
- 3.04 Protect all electrical equipment prior to and during installation. Equipment damaged will be replaced at the discretion of the FS/DDC at no cost to the University. FS/DDC will determine if accumulation of debris in equipment constitutes damage to the equipment. The term "damage" includes actions, such as construction debris in equipment, which may reduce the useful life of the equipment.
- 3.05 Unless otherwise noted, conductors from different sources, such as panels, shall not be contained in the same raceway.
- 3.06 Do not use multi-pole breakers to supply individual branch circuits where circuit trips may interrupt operation of critical equipment.
- 3.07 Exterior electrical enclosures: Doors shall be at least 6-inches above finished grade to allow doors to open after ice accumulation.
- 3.08 Arc flash labels: Use the following label format:

 WARNING	
PPE Level 2	Arc Flash and Shock Hazard Appropriate PPE Required
Location: MDP NL002	
Flash Hazard Boundary 9 ft 3 in Flash Hazard at 1 ft 6 in Shock Hazard When Cover is Removed 208 VAC Glove Class 00 Limited Approach 3 ft 6 in	
Date: 01/28/16	By: UAF
Changes must be reported to 474-7000	

Where UAF is name of the company performing Arc Flash and Shock Hazard calculations.
 Contact Project Manager for an electronic copy of the label.
 END OF SECTION

PART 1 - GENERAL (*Not Used*)

PART 2 - PRODUCTS

2.01 Use copper conductors throughout the entire installation.

2.02 Branch circuit conductors:

- A. 600 volt insulated
- B. Minimum size: #12 AWG
- C. Indoor - THHN, THWN, XHHW, or XHHW-2.
- D. Outdoor, underground, or exposed to temperatures 32°F or lower: XHHW, XHHW-2.
- E. #12 and #10 AWG: stranded or solid.

2.03 Other than branch circuits:

- A. Feeder Conductors under 600 volts: XHHW, XHHW-2.

PART 3 - EXECUTION

3.01 Interlocked armored cable: When installing, attach pulling devices to the cable conductors, not the armor. Attach the armor to the conductors to prevent armor slippage during pulling.

3.02 Use screw terminals for termination of solid conductors #10 AWG and smaller. Use compression or clamp type terminals for stranded wire.

3.03 Conductors supplying vibrating or moveable equipment shall be stranded.

3.04 Branch circuit conductors:

- A. Factory color coded by integral pigmentation, with a separate color for each phase and neutral.
- B. Service and feeder conductors: Color-coded by prominent markings of colored plastic tape applied to the conductor ends in all enclosures. Color coding is as follows:

Conductor	208/120V	480/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White (with phase stripe)	Gray (with phase stripe)
Ground	Green	Green

- C. Neutral conductors shall have a color stripe matching the corresponding phase conductor.

3.05 Installation:

- A. Secure all conductor terminations, taps, and splices with solder-less, pressure-type connectors. Where appropriate, such as in outdoor installations, use a conductive corrosion inhibitor between the connector and surface.
- B. Do not use split-bolt connectors.
- C. Provide insulated equipment grounding conductor in all raceway systems.

3.06 Damaged Conductors: Where conductors have been damaged, at the discretion of FS/DDC:

- A. Conductor(s) will be repaired in a manner acceptable to FS/DDC and megger tested at no cost to FS/DDC.
- B. Conductor(s) will be replaced at no cost to FS/DDC.

3.07 Terminations for service conductors, feeder conductors, and branch circuits 60 A and larger:

- A. Megger all conductors prior to termination.
- B. Torque conductor connections and terminations to manufacturer's recommended values using a calibrated torque wrench and witnessed by FS/DDC. Torque wrench is to have been calibrated within one year of use.

- C. Contractor to provide a report, including, but not limited to:
 - 1. Megger readings of conductors, including minimum acceptable and actual values.
 - 2. Manufacturer's required torque values.
 - 3. Actual torque values attained.
 - 4. Personnel involved in terminations and witnesses.
 - 5. Equipment involved (manufacturer, model, serial number, etc.)
 - 6. Date work performed.

- 3.08 Acceptable means of meeting requirements for acceptable voltage drop:
 - A. Adjust transformer taps.
 - B. Oversize conductors to reduce voltage drop.

- 3.09 When conductors are oversized for voltage drop or derating and too large to fit on devices, reducing the conductor size near the termination is acceptable if overcurrent protection requirements are satisfied.

- 3.10 Nonmetallic (NM) sheath cable clamps, aka "Romex clamps", are not an acceptable means of strain relief for cords or low-voltage cables.

END OF SECTION

PART 1 - GENERAL

- 1.01 At a minimum, provide a 4/0 ground ring with four ¾ inch X 10-foot copper-coated ground rods for each transformer pad. Connect both the primary ground wire and the secondary neutral to this ground ring. Design and install per National Electrical Code (NEC) requirements.
- 1.02 Provide insulated ground conductors in all branch and feeder raceways.
- 1.03 Provide grounding system for communications systems.
- 1.04 Provide ground bus in all panels.
- 1.05 Provide ground system(s) for roof-mounted equipment, such as antennas, communication equipment, and/or HVAC equipment.
- 1.06 Provide a lightning protection system as required by Facilities Services. To the extent possible, provide NFPA and UL-listed system.

PART 2 - PRODUCTS

- 2.01 Bonding bushings (with jumpers), ground clamps, lugs, connectors, and other such hardware: Acceptable manufacturers: O.Z., T & B, or other manufacturers identified by the consultant. Provide at both ends of feeder raceways.
- 2.02 Bonding bushings shall be of the threaded type.
- 2.03 No split bolt connectors allowed.

PART 3 - EXECUTION

- 3.01 Terminate each equipment-grounding conductor on a separate terminal. Multiple conductors under a single lug are not permitted.
- 3.02 Telecommunications: Refer to telecommunications division(s).
- 3.03 Branch circuit equipment ground conductor shall be bonded to raceway or junction boxes at point of utilization. The intent is to bond to not only the utilization equipment but the raceway/junction box system to ensure electrical continuity of raceway system.
- 3.04 Raceways with feeders and branch circuits 60A or larger shall use grounding bushings at each end of raceway, including intermediate junction or pull box. Equipment grounding conductor shall be bonded to grounding bushing.

END OF SECTION

PART 1 - GENERAL

1.01 Definitions:

- A. For the purposes of this article, a “home run” is the raceway and conductors from the breaker panel to the first distribution box.
- B. For the purposes of this article, the “first distribution box” is the junction or outlet box in a work area or room from which circuit(s) may be distributed to one or more outlets or devices. The box may contain a plug, switch, or similar device.

1.02 As-built Drawings: Box locations to be accurate to +/- 2 feet.

PART 2 - PRODUCTS

2.01 Electrical Metallic Tubing (EMT):

- A. Steel compression connectors with insulated throats or bushings.
- B. Steel compression couplings.
- C. Rain or concrete tight compression fittings.
 - 1. In poured-concrete walls and floors.
 - 2. In locations subject to moisture.
- D. Acceptable for feeders when inside building and not subject to physical damage.
- E. Not allowed:
 - 1. Set-screw fittings
 - 2. Cast fittings

2.02 Rigid Metal or Intermediate Metal Conduit: Threaded hubs and connections with insulated throats only.

2.03 Flexible Metal Conduit:

- A. Steel or malleable iron fittings with insulated throat.
- B. Die-cast zinc or threaded inside throat fittings are not acceptable.

- C. Screw-in connectors and couplings are not acceptable (Example: Steel City XC846).
- 2.04 Liquidtight Flexible Metal Conduit: steel or malleable iron fittings with insulated throat.
- 2.05 Metal Clad Cable, Type MC:
- A. 480/277 Volt systems: Fixture whips only.
 - B. 208/120 Volt Systems:
 - 1. Allowed for 120V, 20 A or 15A convenience outlets.
 - 2. Shall not to be used to supply light switches unless containing integral low-voltage control cabling.
 - C. Shall not be used for home runs or for runs between rooms. Intent is for conduit to distribution box in an area (room) then use MC cable from box to final utilization outlet box/equipment.
- 2.06 Cor-line brand fittings or approved substitutes are acceptable for in-slab applications.
- 2.07 Outlet Boxes:
- A. Minimum size: 4 inch square or octagonal, 2 $\frac{1}{8}$ inch deep unless otherwise noted.
 - B. Provide 2 $\frac{1}{8}$ inch deep boxes when supporting lights and equipment, rated for the weight of the expected equipment.
 - C. Provide 2 $\frac{1}{8}$ inch deep boxes when mounted in concrete or masonry.
 - D. Provide 2 $\frac{1}{8}$ inch deep boxes or larger for all telecommunications wiring.
 - E. Provide cast aluminum or iron (galvanized) boxes for exterior or wet locations.
 - F. Not allowed to penetrate the building vapor retarder without written approval of FS/DDC. Where sheet metal boxes are allowed to penetrate vapor retarder, their exterior surfaces shall be sealed, and edges of vapor retarder shall be securely sealed to the face of the box. Raceways entering/leaving boxes shall be sealed with conduit sealants per requirements stated elsewhere.
- 2.08 Surface Metal Raceway:
- A. Components:
 - 1. Mono-systems SnapMark SMS3200 or SMS 4200 series.

2. Wiremold 700, 3000, 4000, 6000 series.
 3. Hubbell, HBL3000, HBL4750.
 4. No Substitutions
- B. Use Prefinished Surface Metal Raceway in colors that are available from the manufacturer.
- C. All parts of Surface Metal Raceway installation, including receptacle cover plates, to be of the same manufacturer as the multi-outlet assembly or manufacturer's recommendations.
- D. Provide Surface Metal Raceway manufacturer's transition fittings and boxes between Surface Metal Raceway and conduit and/or junction boxes.
- 2.09 Fire-stopping: Where raceways, cables (including communication cables), and other such items penetrate fire-rated walls, floors, or combination joint assemblies, provide firestopping meeting the requirements of 07 84 00 Firestopping. Consultant shall coordinate any references to firestopping with that division. When cable tray is used, provide firestopping systems that allow for cable to be installed in the future without demolition of the firestopping systems.
- 2.10 In-ground junction/pull boxes:
- A. Have a safety factor of 2.
 - B. In areas away from vehicle traffic such as dirt, grass, and landscaping: ANSI Tier 15.
 - C. In or near driving lanes, sidewalks, parking lots, and areas of similar usage: ANSI Tier 22.
 - D. Metal covers shall be bonded to the grounding system with a stranded grounding conductor secured with a grounding lug and of sufficient length to allow cover to be entirely removed from the box opening.
- 2.11 HDPE Conduit: HDPE conduit may be used for exterior applications upon approval of FS/DDC and FS/Utilities (if high voltage). Specify UL-listed conduit with fittings similar to Arcco Shur-Lock.
- 2.12 Cable Tray: Ladder tray for all power applications. Wire basket tray with center supports for communications and building automation. Provide for seismic bracing as required by applicable codes.

- 2.13 Provide flowable fill or cast-in-place concrete as cover material for exterior raceways when cover is required (e.g. medium voltage feeders). Install locator tape sufficient above fill.

PART 3 - EXECUTION

3.01 Abandoned raceways:

- A. Confirm with FS/DDC raceways to be abandoned. Seal the ends of each abandoned raceway if it penetrates to the exterior, thru firewalls and other similar interior locations.
- B. Meet applicable requirements for "Unused Raceways".

3.02 Unused Raceways:

- A. Label unused raceways left in place as to access points and terminations, and show on the as-built drawings. Provide dimensions to access points and terminations from a known building feature such as wall lines, column lines, etc.
- B. Provide "pull strings" in installed empty raceways for future conductor installation.
- C. Cap and stake empty raceways terminating exterior of the building and underground. Mark on the as-built drawings location based off building corners. Seal to prevent moisture migration as specified elsewhere.

3.03 Flush-mounted panelboards:

- A. Discuss the quantity of spare raceways stubbed into accessible ceiling space to maximize future utilization all spare breakers and spaces based on types of loads/spaces served and ease of access into panel. Minimum size: $\frac{3}{4}$ inch.
- B. At a minimum provide three (3) spare $\frac{3}{4}$ inch and one (1) 1 inch raceways stubbed into an accessible ceiling space and capped in the panel.

3.04 Minimum size home runs for lighting and receptacle circuits: $\frac{3}{4}$ inch.

3.05 Dust infiltration: In areas prone to high levels of dust (i.e. wood shop, soils lab, etc.):

- A. Seal raceway entering room inside of the room at the nearest feasible point where joints in the raceway between the seal and the room penetration do not defeat the purpose of the seal.
- B. Utilize weathertight boxes and covers.

- C. Utilize liquid tight flexible raceway where flexible raceway required.
- D. Utilize dust-tight fixtures and equipment.
- E. Seal raceways entering fixtures.

3.06 Air, moisture, and water infiltration:

- A. Where raceways penetrate building envelopes:
 - 1. Flex shall not be used to penetrate vapor retarder, air barrier, or moisture barrier.
 - 2. Provide solid blocking installed flat at all vapor retarder penetrations. On the interior face of the exterior stud wall, flat blocking installed at each penetration shall be a minimum of four (4) inches larger than the penetration. Locate the penetration at the centerline of the flat blocking. Secure vapor retarder to blocking.
 - 3. Seal the interior of the raceway inside of the building. Between point of sealing inside of raceway, normally at junction box or conduit, and vapor retarder penetration, seal joints (connectors and couplings) of raceway with vapor retarding tape, paint-on sealer or other means acceptable to owner.
 - 4. To reduce thermal transfer and ensure sealing of raceway, PVC with glued joints, or equivalent, is the preferred raceway where penetrations of building envelope are made above ground.
- B. Where raceways travel from one floor of a building to another, or between areas maintained at unequal pressure and/or humidity, seal the raceways to prevent airflow and/or humidity migration due to air/vapor pressure differential.
- C. Flex shall not be used to connect raceways in contiguous areas having differing environmental requirements such as humidity, pressure, temperature, or cleanliness.
- D. Where a raceway passes into or through an air intake duct, refrigerator, etc., install in such a manner to prevent the buildup of moisture or ice which would cause damage to the raceway or its contents.
- E. Where raceways penetrate the building envelope close to grade, landscape to prevent standing water from reaching the penetration in building envelope.

- F. Design raceways penetrating building so water will not enter the building through the raceway or through the penetration in the building wall or foundation. Raceway entering a building below grade shall be designed so that water in raceway will not flow into electrical equipment.
- G. Design raceways to encourage the drainage of water from inside the raceway. Conduit penetrating into electrical equipment shall be sloped to not allow water to flow into the equipment or be so configured to drain raceway before it enters electrical equipment.
- H. Conduit bodies shall not be buried or covered with soil.
- I. Seal feeder raceways at both ends where feeder runs between building floors or penetrates the building envelope.
- J. Seal raceways into/out of laboratory/research areas requiring special environments, such as animal quarters, walk-in environmental chambers, clean rooms, walk-in freezers or chillers, and BSL-3 labs.
- K. Use mechanical or expanding foam sealant in and around raceways penetrating building below grade to provide watertight seal.
- L. If the area within 6 feet of any sprinkler valve or fitting is considered a wet location, use weatherproof boxes.

3.07 On roofs:

- A. Horizontal runs on roof surfaces: Intermediate metal conduit (IMC) or rigid metal conduit (RMC) except where elevated 3 feet above roof surface or protected from damage.
- B. Secure horizontal runs of ½ inch conduit at least every 8 feet.
- C. At transitions from horizontal to vertical or seismic break:
 - 1. Secure conduits within 3 feet of the transition.
 - 2. Provide flexible transition to allow for movement.
- D. Provide drainage at low points of conduit runs.

3.08 Transitions between different types of raceway:

- A. Rigid conduit to flexible conduit: Use a manufactured one piece fitting for transitioning from rigid conduits, such as EMT, rigid steel conduit, and IMC, to a

flexible conduit when it is available. When such a one-piece transition fitting is not available, a field fabricated transition of connector / rigid coupling / connector will be acceptable. Example of one-piece transition fittings: O-Z/DEDNEY Transition Couplings for Rigid Metal Conduit and IMC to Flexible Metal Conduit Type CB.

- B. Rigid conduit to rigid conduit: Use a one-piece manufactured fitting. Example of one piece transition fittings: O-Z/DEDNEY Transition Couplings for Rigid Metal Conduit and IMC to EMT Type ETR.
 - C. Use manufactured transition fitting between conduit and recessed boxes and Surface Metal Raceway.
 - D. Use a junction box to transition from MC cable to conduit.
- 3.09 Do not route raceways on the floor unless specifically instructed by FS/DDC.
- 3.10 Provide low-voltage cable systems with a continuous pathway. Where multiple low-voltage systems are run along the same pathway, provide separate cable support/management for each system: J-hooks, conduits, or cable tray with dividers. Short discontinuous sections of conduit are not acceptable substitutes for J-hooks.
- 3.11 Install conduit bodies to make sharp changes in direction. "Goosenecks" are not acceptable.
- 3.12 Bushings:
- A. Metal bushing on raceways 2 inch and larger.
 - B. Grounding bushings on feeders and raceways containing circuits 60A or larger.
- 3.13 Not more than one box extension ring is allowed.
- 3.14 Flexible Metal Conduit and Liquidtight Flexible Metal Conduit:
- A. Install so as to prevent chafing or other damage to itself or other equipment.
 - B. Install so as to not interfere with access to surrounding equipment.
 - C. Provide slack connections to motors, vibrating equipment, or equipment that requires removal for maintenance:
 - 1. Maximum length: 6 feet.
 - 2. Minimum length: 18 inches.

- 3.15 Right of way: Give to ductwork and piping systems installed at a required slope.
- 3.16 Install raceways so as to not impede removal of, or access to, equipment, such as motors, fans, access panels, and control enclosures.
- 3.17 Surface Metal Raceway:
- A. Data/communications ports and power outlets as close as practicable. Maximum separation: 20 inches.
 - B. Raceway bases, covers, device fittings, plates and accessories shall be installed flush, tight and square.
 - C. Gaps between raceway segments, accessories, device plates, and cover joints shall not exceed 1/16 inch.
 - D. Protect raceway during and after installation. Raceway with scratches, deformities, or from different color lots will be rejected.
 - E. Bond each section together to provide electrically continuous system. Refer to "Grounding and Bonding of Electrical Systems".
 - F. All parts of the raceway shall be of the same manufacturer, style, and type.
- 3.18 Separation of raceways from other systems:
- A. Separation from heating system pipes, flues, other high temperature piping systems, and other heat sources:
 - 1. Minimum 6 inch from parallel runs of heating system pipes, flues, other high temperature piping systems, and other heat sources.
 - 2. Minimum spacing shall be increased if necessary to ensure that raceways experience no significant temperature rise from external sources.
 - 3. Raceways shall not be embedded in any spray applied insulation, fireproofing, or other materials that would restrict heat dissipation.
 - B. Separation from piping containing liquids: 6 inches
 - C. Separation from air ducts: 6 inches
 - D. Where conditions do not allow the separations stated above:

1. Minimum 3 inches separation from copper piping, or other dissimilar metal.
 2. Minimum ½ inch separation from other systems.
- 3.19 For outlet boxes flush-mounted in sound-rated or acoustically insulated walls: sealant pads are to extend to meet covering wall surface, or cover gaps around mud ring with pads and seal between gypsum board and box with acoustical sealant. The intent is to seal sound transmission from gaps in the mud ring or gaps between the box surface and the covering wall surface.
- 3.20 Mount outlets and boxes to be accessible after construction is complete by coordinating with other crafts.
- 3.21 Boxes and electrical equipment shall be installed securely fastened to the structural framing of the surrounding construction. Anchoring to sheetrock is not acceptable.
- 3.22 Metal bushings: for power conduits 2 ½ inch and above.

END OF SECTION

PART 1 - GENERAL

1.01 Equipment naming and labeling:

- A. Name equipment using the UAF labeling conventions supplied by FS.
- B. Coordinate with the FS/DDC project manager for numbers in UAF power distribution database to ensure that unit numbers are not duplicated.
- C. Phenolic name plates for equipment may be provided by FS.

1.02 Label all electrical distribution equipment with nameplates.

1.03 Label all conductors at the point of utilization and all conductors passing through pull or junction boxes with tags having clearly legible, machine-printed data identifying the panel and circuit number, or other appropriate identification.

- A. Exception: Conductors in a pull or junction box that contains only an individual branch circuit or a single multi-wire branch circuit whose conductors are terminated on a multi-pole breaker or contiguous breakers need not be tagged or labeled.

1.04 Indelibly mark the outside cover of each junction box with the breaker number and panel identity of the source of power to each circuit within the box.

1.05 Provide a typed directory with a clear plastic cover in all distribution panels. Number the terminals on terminal strips in the terminal enclosure to identify the origin, function, and destination of each conductor.

1.06 Color-code all raceway system junction boxes (except those visible in finished areas) by spray paint:

A.	Emergency	Yellow
B.	Fire Alarm and Fire Pump	Red
C.	Intercom-Telephone-Clock	Blue
D.	480/277V	Orange
E.	208/120V	White
F.	DDC System	Green
G.	Lighting Controls	Purple

1.07 Fire systems:

A. Per National Electrical Code requirements:

1. Provide a label at the fire alarm control panel which identifies the panelboard and circuit number that supplies the control panel.
2. Provide a red identification to the circuit breaker that supplies the fire alarm control panel and identify the circuit as required.

B. Provide a red phenolic label at the sprinkler system fire pump which identifies the source and location of the pump's power supply. Provide a red, per NFPA, label adjacent to the motor control/starter which identifies the source and location of the motor control/starter power supply.

1.08 Label shunt trip switches on exterior of building: "EMERGENCY ELECTRICAL DISCONNECT SWITCH INSIDE".

PART 2 - PRODUCTS

2.01 Nameplates: Melamine plastic, $\frac{1}{8}$ inch thick, black with white center core unless noted otherwise, with a matte finish and square corners. Minimum size: $\frac{3}{4}$ -inch X 2-inch
Minimum lettering: $\frac{1}{4}$ -inch.

2.02 Wire and cable markers: Wrap-on labels, cloth markers, or tubing type.

2.03 Outlets: Clear adhesive Mylar or plastic-type, minimum of 3/16-size with black letters by a Kroy lettering type device. Use a $\frac{3}{4}$

2.04 Underground Plastic Line Marker: 4-inch-wide plastic tape with metallic core with suitable legend describing buried electrical lines.

PART 3 - EXECUTION

3.01 Nameplate lettering: Aligned and engraved into the core.

3.02 Nameplate attachment:

A. Unless otherwise specified, attach nameplates using rivets. Mechanical fasteners must not have sharp edges or points that could damage conductors or injure personnel.

B. In general, adhesives for permanent fastening is not allowed except for permanent double sided foam tape, 1/32-inch by 1-inch.

1. Indoor location.
 2. On equipment which does not generate heat.
- 3.03 Distribution/Branch Panelboard Circuit Labeling:
- A. Provide typed directory cards in a holder with a transparent plastic cover: Odd numbers left and even numbers right.
 - B. Use room numbers from the finished construction - not necessarily as indicated on the drawings.
 - C. Provide circuit number labels on all ground, neutral and line voltage conductors inside the panelboard. Label within 6 inch of termination but so as to be visible without removing panel dead front.
 - D. Label conduits exiting panel with contained circuits:
 1. In utility areas label conduits where exiting panel.
 2. In finished areas, label conduits at closest accessible location, unless in the closest accessible location there is a labeled junction box.
- 3.04 Branch and Distribution Panelboard nameplates shall contain the following information:
- A. Line 1: Panel Name
 - B. Line 2: Source from which panelboard is fed
- 3.05 Disconnects, Starters, VFD's, Contactor nameplates shall contain the following information:
- A. Line 1: Load Served (use nameplate name of equipment) —Contact FS/DDC for naming convention guidelines and coordination.
 - B. Line 2: Panelboard and circuit number from which the device is fed.
 - C. Line 3: Voltage, Phase, and fuse size or circuit breaker.
- 3.06 Exterior underground power, control, signal, and communication lines:
- A. Install continuous underground plastic line marker located directly above line at 6 inch to 8 inch (150 to 200 millimeters) below finished grade.
 - B. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inch (400 millimeters) overall, use a single line marker.

- C. Install line marker for underground wiring, both direct-buried cables and cables in raceway(s).
- D. Label each underground conductor with its circuit number.

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide controls and necessary contactors or solid-state switches to allow the remote control of headbolt heater panels from the FS/Utilities.
- A. From the contactors or solid state switches provide a 1 inch raceway with control conductors to a 10 inch X 10 inch X 4 inch junction box, mounted on the wall of the closest utilidor below all existing cable trays.
 - B. Provide a ¾ inch conduit, for metering purposes, from the contactor or switch to the nearest utilidor cable tray.
 - C. Review load center design with FS/Utilities
- 1.02 Locate a Hand-Off-Auto (HOA) switch in the enclosure for the contactor. The HOA switch is to be key operated, or behind a lockable door. Coordinate with FS/Utilities for keying requirements.
- 1.03 On the contactor or above the panel board in vicinity of parking lot controlled, locate a status indicating light in sight of users that will light when headbolt outlets are energized. Lamp to be long-life LED. Light will be green when the panel is energized but the outlets are OFF and red when the outlets are ON.
- 1.04 Control of headbolt outlets: Provide a conduit from the headbolt contactor to the utilidor. All headbolt outlets are controlled by FS Division of Utilities from the Power Plant. Coordinate with the FS/Utilities.
- 1.05 Discuss with FS/Utilities and UAF Parking Services if outlets will be Integrated Power and Load Control (IPLC) type. Typically only used in small lots with minimal outlets where installing contactors and control wiring would be difficult.
- 1.06 PART 2 - PRODUCTS
- 2.01 Acceptable manufacturers:
- A. Square D / Schneider Electric
 - B. Siemens
 - C. General Electric
 - D. Westinghouse
 - E. Alternate Brand Request or Substitution Request required

2.02 Enclosures:

- A. Lockable.
- B. Oversized so as to be of sufficient size to install CTs and other required monitoring and control equipment. For example, an oversized enclosure for the Square D 200 amperage contactor would be 22 inch X 39 inch X 8 inch.
- C. Weatherproof, depending upon location.

2.03 Contactor:

- A. Mechanically-held type with pilot relay included to give 2-wire control.
- B. Provide at least one (1) normally open auxiliary contact for contactors.

2.04 Control fusing:

- A. On 480 volts systems: a control transformer with 2 primary fuses and 1 secondary fuse.
- B. On 208 systems: a single-control power fuse.

2.05 Indicator lights: LED (red when outlets are ON, green for OFF)

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Verify with FS/Utilities current models.
- 1.02 Master Building Meter:
- A. Supply Square D PM5000 series meter that is pre-installed in an enclosure by Square D.
 - B. If 5 or more IOs for sub-metering (I.E. water, steam, feeders) are required supply Square D PM8000 series meter that is pre-installed in an enclosure by Square D.
 - C. With each master building meter provide sufficient IO modules as needed for sub-metering.
 - D. Coordinate with Utilities for exact model number required for the project.
- 1.03 Building Power Sub-metering: Supply Square D PM5000 series meter that is pre-installed in an enclosure by Square D.
- 1.04 Circuit Breaker Metering/Monitoring: Supply Square D Micrologic Molded Case Circuit Breakers.
- 1.05 All Square D PM5000 & PM8000 meters to have Ethernet capability.
- 1.06 Metering Accuracy:
- A. Power monitoring system: Provide CT's and PT's suitable for revenue class metering per Alaska statute.
 - B. Submetering: To be not less accurate than required for revenue metering per Alaska statute if it may be used for billing purposes.
- 1.07 Provide:
- A. CT shorting block for each power monitor, shorting block to be Marathon No. 1504 SC, Alternate Brand Request or Substitution Request required.
 - B. A three pole fuse block for PT inputs to the power monitor.
 - 1. Fuse block: Bussman No. CHCC3DI, Alternate Brand Request or Substitution Request required.
 - 2. Fuses: Bussman No. FNQ-R-1, Alternate Brand Request or Substitution Request required.

- 1.08 Provide a 3/4 inch raceway:
- A. From all sub-meters in a building to the master building meter.
 - B. From the master building meter to the nearest communications hub room.
 - C. From sub-meters (steam condensate, water, etc.) to the meter being used to collect the data.
- 1.09 All wiring for CT and PT inputs to be stranded 12AWG. Where wire is connected across a hinged door, use flexible (41 strands or more) type SIS wire.
- 1.10 Provide CT mounting box for contractor-furnished, contractor-installed CTs. Coordinate with FS/Utilities prior to design development phase of project for CT can size and other requirements.
- 1.11 Submetering: Granular metering is needed for a numerical basis for decision making; usage history of sections of building, allow faster resolution of electrical issues, verification of changes in energy usage due to building modifications and change of use. Coordinate with FS/DDC for sub-metering of feeders and/or branch circuits by building FS Utilities data gathering system.
- A. All distribution panels, including MCCs, to be metered at the feeder level.
 - B. Loads 30kVA or larger.
 - C. Meter individual loads such as refrigeration units, chambers, larger chillers, spot coolers, or other equipment as determined by UAF FS.
 - D. Meter head bolt outlets.
 - E. Lighting panels: meter lighting panel feeders if lighting power is not monitored by other means. Lighting loads should be consolidated to single panels for ease of monitoring. Discuss branch circuit metering with UAF FS on an as needed basis.
 - F. Intelligent end-use equipment: obtain end-use metering information from end-use equipment such as VFDs, packaged chiller units, and similar equipment.
 - G. Where sub-metering is not installed, consider spacing equipment for future installation.

PART 2 - PRODUCTS

2.01 Current branch circuit monitoring is SquareD Insight. Verify manufacturer with UAF/FS DDC.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Based on occupant utilization criteria provided by UAF Facilities Services, the design consultant is to produce NEC-required electrical load calculations. The design consultant is to size the transformer primary and secondary conductors to this calculation. After providing this load calculation to FS/Utilities and FS/DDC, the group will make the final decision on the size of the transformer. It is imperative to involve FS in the decision because it involves energy conservation and circuit breaker switching.
- 1.02 Power Transformers: Copper windings only for all transformers unless authorized in writing by FS/Utilities and FS/Maintenance.
- 1.03 Locate oil-filled transformers on a concrete pad minimum.
- A. Sized for the transformer load.
 - B. Minimum of 4000 psi concrete 8 inches thick with #4 rebar each way, at 12-inch spacing.
 - C. Constructed on a minimum of 24 inches of non-frost susceptible fill.
 - D. Handholes or vault beneath or other means to allow sufficient room to meet NEC cable bending radius requirements.

PART 2 - PRODUCTS

- 2.01 Power transformers:
- A. Outdoor pad-mounted, oil-filled units with primary disconnect means and current limiting fuses.
 - B. Where the transformer cannot be located farther than 15 feet from nearest side to a non-combustible building wall or 25 feet from a combustible building wall, then replace the standard mineral oil with an approved less flammable fluid, clearances to buildings per Factory Mutual Data Sheet 5-4.
 - C. All transformers are to have two 2.5% FCAN and two 2.5% FCBN taps for adjusting voltage.
 - D. Transformer primary connections: 600 amp non-load break bushings unless otherwise noted or required.

2.02 Oil Filled Transformers:

- A. Rate oil-filled transformers for 65 degree C rise.
- B. Copper windings throughout.
- C. Rate fusing and connectors for the available primary fault current.
- D. Provide a liquid temperature gauge with temperature alarm contacts, along with magnetic liquid level gauge and oil sampling provisions. Temperature gauge to be suitable for cold weather operation.

2.03 Primary windings:

- A. Delta wound
- B. Voltage rated for available voltage
- C. Voltage adjusting taps
- D. Provide loop feed primary with (1) four position or (3) two position 400 amp loop feed switch for transformers of 225 KVA rating or less.

2.04 Consider losses when evaluating bids from transformer suppliers. Determine minimum losses acceptable to Owner.

2.05 Insulating oil for transformers: Certified non-PCB, suitable for -40 degree C.

PART 3 - EXECUTION

3.01 For loop feed transformers, any unused HV bushings to have insulating caps provided. The caps shall be rated for the primary voltage.

3.02 Provide a 12 foot loop of slack at all transformer terminations to allow later phasing changes and/or re-termination.

3.03 MC Cable Terminations:

- A. Provide heat shrink over exposed copper tape shields.
- B. Provide heat shrinkable breakout boots for moisture control.

END OF SECTION

PART 1 – GENERAL (*Not Used*)

PART 2 - PRODUCTS

2.01 Verify all part numbers with UAF Facilities Services for latest update.

2.02 SF6 switches:

- A. Four-way or six-way as required.
- B. 600 amps continuous load.
- C. 40,000 asymmetrical amps (momentary).
- D. Quick-change apparatus bushings to fit 600 amp non-loadbreak elbow connectors.
- E. With paneled floor frame for floor mounting.
- F. G&W RAM series, Brand Name Only, No Alternate Brands, No Substitutions.

2.03 600 amp non-loadbreak elbows connectors:

- A. 15kV.
- B. Aluminum or copper as required to match the metal of the bushing being connected to.
- C. Elastimold 655LR series, Alternate Brand Request or Substitution Request required
- D. Complete with all proper cable adapters.
- E. With test point.

2.04 Cabling:

- A. 15kV interlocked armored cable:
 - 1. 3 conductor.
 - 2. 220 mil EPR insulation.
 - 3. Copper conductors.

4. 15kV with grounding conductor.
 5. Interlocked aluminum armor.
 6. Overall PVC jacket, type MC, General Cable Duralox EP or other manufacturer identified by the consultant meeting this design standard.
 7. Heavy duty one-hole straps for MC cable supports along utilidor walls.
- B. Single conductor 15kV cable: Size as required for load, shielded, jacketed 220 mil insulation, copper conductors, General Cable Unishield EP, or other manufacturer identified by the consultant meeting this design standard.

PART 3 - EXECUTION

3.01 When installing type MC cable:

- A. Attach pulling devices to the cable conductors, not the armor.
- B. Attach armor to the conductors with tape to prevent armor slippage during pulling.

3.02 Proof test SF6 switches with high voltage D.C. per IEEE Standard 400 acceptance test procedures along with the high voltage cable. Follow all manufacturers' recommendations. UAF is to confirm use of independent testing agent, considering size/scope of high voltage work. Test cabling on the spool prior to pulling and again after pulling the cable into place.

3.03 Use heat shrink jacketing to protect the shielding where 15kV MC cables come into an enclosure for splicing or termination.

END OF SECTION

PART 1 - GENERAL

- 1.01 Installation of variable frequency drives in motor control centers is not allowed.
- A. EXCEPTION: UAF FS Utilities may utilize MCC mounted drives for utility specific loads.
- 1.02 UAF's preference is to not use motor control centers for non-industrial since long term availability of replacement parts has been an issue in the past.

PART 2 - PRODUCTS

- 2.01 Acceptable manufacturers are:
- A. Square D
 - B. Siemens
 - C. Cutler-Hammer
 - D. General Electric

PART 3 - EXECUTION

- 3.01 Indicating lights: Long life LED
- 3.02 Functional testing: Installer to perform a function check of each of the components (door latch, reset buttons, lights, etc.) of the MCC prior to FS/DDC acceptance. Sample checklist provided below.
- 3.03 Overloads: Solid State Type
- 3.04 Indicator lights: LED Type

Project: Sample Building

Room #: _____

MCC: Full UAF Name		Functional Checklist									
Bucket Location	Device	Door opens freely/ latches operate correctly	Breaker	Indicating Lights	HOA	AOB	Safety Permissive (at field device)	DDC Freq Control	DDC Start	DDC Stop	Comments
A2	15HP VT Drive, RF1A										
A4-5	Empty Bucket										
A6	P-28, P-10										
B2	P-11, P29										
B3	40 HP VT Drive, AHU-7, AHU-1A										
B4	40 HP VT Drive Bypass										
B6	5 HP VT, RF-3										
C2	5 HP VT Bypass										
D2	AHU7A Bypass										
D5	7.5 HP VT Drive, AHU-8, AHU-2										
D2-6	Gutter Door										

For each cell in the matrix, write "OK", initial, and date, when you are satisfied with the operation.
 Where cell is not applicable, write "NA" and initial.

MCC Bucket Location Chart:

Col/Row	A	B	C	D
1	A1	B1	C1	D1
2	A2	B2	C2	D2
3	A3	B3	C3	D3
4	A4	B4	C4	D4

END OF SECTION

PART 1 - GENERAL

1.01 Metering Hierarchy

- A. Whole Building Metering: As defined elsewhere.
- B. Panel/Submetering:
 - 1. All panel feeders.
 - 2. Major departmental equipment.
- C. Circuit Level Metering, including but not limited to:
 - 1. Lighting branch circuits.
 - 2. Food service kitchens.
 - 3. HVAC equipment.
 - 4. Computer labs.
 - 5. Freezer farms.
- D. End Use Level Metering: Obtain meter information from end use devices, such as VFDs and packaged equipment control systems.

1.02 Goal of Metering is to reduce energy consumption and costs of energy usage by:

- A. Monitoring discrete energy consumption.
- B. Validating effectiveness of energy savings measures.
- C. Enabling demand limiting and control.
- D. Providing building component energy usage to be used as basis for operational and design decisions.
- E. Determining costs for billing purposes at a departmental or funding level.
- F. Enable ongoing retro-commissioning of building systems.
- G. Monitoring human behavior and providing feedback which decreases energy usage.
- H. Real time monitoring and alarming of deviations from expected energy consumption.

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Provide integral GFCI protection for all 120-volt, single-phase, 20-amp or less, convenience outlets:
- A. Within 6 feet of wet locations such as lab, kitchen, and bathroom sinks, showers, wet bars, fume hoods, etc.
 - B. Where required by the programming needs.
 - C. Where safety issues may arise if such protection is not provided.
- 1.02 Provide a receptacle for each vending machine. Refer to 27 20 00 for data connection requirements. GFCI protection for vending machines shall be provided by the breaker.
- 1.03 Provide at least one 20-amp, 120V NEMA 5R receptacle (GFCI) outside the main entrance to the building, on a dedicated circuit.
- 1.04 Specify In-Use covers for exterior and wet areas.
- 1.05 Floor-mounted pedestals are not allowed. Use in-floor flush boxes when power (or data) is required in the middle of a room or other special application but in general avoid using floor-mounted outlets where possible. Coordinate cover with floor finish.
- 1.06 Under-carpet wiring systems are not to be used unless specifically approved by UAF.

PART 2 - PRODUCTS

- 2.01 General
- A. Devices shall have a minimum rating of 20A.
 - B. Devices shall be commercial or industrial grade.
 - C. Device color shall be white except as noted otherwise.
 - D. Faceplates shall be brushed or satin finish stainless steel, plastic faceplates are not allowed.
- 2.02 Special Receptacles Colors:
- A. Transient Voltage Surge Suppressor (TVSS) outlets: Grey with indicator light.
 - B. Task lighting controlled from switch: Brown, single or duplex.
 - C. Standby power: Black, twist-lock.

- D. Isolated Ground: Orange.
 - E. Surge Protection Receptacle: Blue
 - F. GFCI: White.
- 2.03 USB (Universal Serial Bus) charging outlets: each port will supply a minimum of 2.1A.
- 2.04 Duplex 120V outlets with integral USB-A and USB-C charger ports:
- A. USB ports shall be compatible with USB type 1.1/2.0/3.0 devices.
 - B. USB minimum output: 3A at 5VDC, 1.5A per USB connector.
 - C. Green indicator light showing USB power available.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 For motors shut down by the fire alarm system, refer to Division 28 31 00 Fire Detection and Alarm Systems. Meet building control systems requirements.
- 1.02 Preferably, use motor control centers only in industrial buildings. UAF prefers the use of combination disconnect/motor controllers as required by the project.
- 1.03 Variable Frequency Drives (VFDs) are required for all motors 25 hp or larger. This includes bypass starters for VFDs.
- 1.04 Guidelines to determine if monitoring of motor operation would require a VFD or power monitoring:

Motor	Condition	Result
Variable Volume pump/fan	Motor speed is controlled by VFD.	VFD will provide required information. No additional equipment or interface is required.
Constant speed motor \geq 25 HP	UAF requires soft start and motor monitoring.	Use VFD.
Constant speed motor < 25 HP	Is the motor critical to building operations or processes? If yes then→	Equip with VFD.
	Is procurement of replacement motor problematic? If yes then→	Equip with VFD.
	Will monitoring provide energy information to identify system problems? If yes, then→	Equip with VFD or meter circuit.
	Is motor status (HOA, trip and proof) important? If yes, then→	Equip with VFD.

PART 2 - PRODUCTS

- 2.01 Acceptable manufacturers:
- A. Schneider (Square D)
 - B. Eaton
 - C. General Electric (ABB)
- 2.02 Enclosure Sizing: Where appropriate, size enclosures to contain interposing relays for the fire alarm system and building control system and/or other monitoring and control systems.
- 2.03 Pilot lights: Long-life LED type.
- 2.04 Single-phase motor starters:
- A. Single-phase motor starters: Motor starting switches or AC magnetic starters.
 - B. Motor starting switches: Thermal or solid-state overload, red pilot light and toggle handle and lock-off hasp.
 - C. Magnetic starters: Overload protection in each phase.
 - D. Include Hand-Off-Automatic switch, red pilot light, and overload reset button in front cover.
 - E. With a 120-volt coil and control circuit, control circuit derived from a separate control transformer in each starter enclosure, except for 120-volt motor starters.
 - 1. Size control power transformer to operate an interposing relay.
 - 2. Equip with two auxiliary control contacts, each convertible normally-open or normally-closed.
- 2.05 Combination magnetic starter /disconnects: Combination magnetic starter/disconnects to incorporate a circuit breaker, disconnect switch, and a magnetic starter into a common enclosure.
- 2.06 Overload Relays: Solid-state type, for motor starting switches and magnetic starters. Provide overload relays in each ungrounded motor circuit conductor and size to correspond with the full load current of the motor as stamped on the motor nameplate.

- 2.07 Energy-efficient motors are specified as standard. Run a life cycle analysis on motors that are used infrequently (such as process fume hoods that are on/off) to determine if the added cost is warranted.
- 2.08 Provide and verify manufacturers' and suppliers' certification that motors driven from VFDs are VFD compatible and suitable for use in the specific configuration (wire length, voltage, VFD, frequency). Reference section 26 29 23 Variable Frequency Drives and 23 09 23 Instrumentation and Control for HVAC.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Variable Frequency Drives (VFD), also known as adjustable frequency/adjustable voltage drives, control variable torque loads driven by standard NEMA B design squirrel cage motors.
- 1.02 VFD designed and selected for, and totally compatible with, the specific motor and associated mechanical load controlled.
- 1.03 Protection against input undervoltage, input overvoltage, input phase loss, output short circuit, output ground fault, and overtemperature. The VFD shall display all faults in plain English. Codes are not acceptable.
- 1.04 VFD capable of catching a rotating motor, operating forward or reverse, and bringing it up to full speed in the forward direction.
- 1.05 Provide hand, auto, start, stop switches to start and stop the VFD and keypad arrows to determine speed reference.
- 1.06 Provide digital keypad/display to set parameters and faults, and to indicate output frequency.
- 1.07 Provide speed control via analog input signal such as 4-20 ma or 0-10 VDC and a digital input for an enable signal.
- 1.08 The VFD shall include the capability to communicate with the Siemens Floor Level Network.
- 1.09 VFD shall function with the front keypad removed.
- 1.10 Provide wrap-around bypass for each VFD unless otherwise noted.
- 1.11 Fuse protection of the VFD shall limit the available fault current to factory recommendations to protect the control circuit from damage.
- 1.12 For critical equipment, provide redundant drives in single VFD controller. Discuss critical equipment (e.g. fans for animal quarters, fume hood fans, heating pumps) with FS/DDC.

PART 2 - PRODUCTS

- 2.01 Acceptable variable frequency drives and manufacturers:
 - A. ABB ACH 550 Series
 - B. Danfoss Graham VLT 6000 Series
 - C. Yaskawa drives
 - D. Allen Bradley Power Flex 400

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

1.01 General Description:

- A. The emergency power supply (EPS) includes: AC inverter, storage battery with rectifier/charger, transfer switch, bypass switch, control circuitry, output circuit breakers, monitoring and alarms, cabinet(s), microprocessor controller, fax/modem, alpha-numeric display, dry alarm contacts and the necessary wiring and components for a complete system.
 - B. The uninterruptible power supply (UPS) includes: AC inverter, storage battery with rectifier/charger, transfer switch, bypass switch, control circuitry, output circuit breakers, monitoring and alarms, cabinet(s), microprocessor controller, fax/modem, alpha-numeric display, dry alarm contacts and the necessary wiring and components for a complete system. It may also require an Emergency Power Off (EPO) with remote shunting capability.
- 1.02 The EPS and UPS is to supply a trouble alarm to the building's DDC system, transmit test and status reports via email, and allow remote access of status via Ethernet.
- 1.03 Provide built-in display and keypad located inside the system cabinet for user initiated on site viewing of operational status.
- 1.04 Power EPS networking equipment from the EPS unless networking equipment has other backup power source (central UPS).
- 1.05 Provide a central UPS for the following building-wide applications: communications system including VOIP phones, security systems, card access (electronic locks), and building direct digital controls (a main panel only).

PART 2 - PRODUCTS

2.01 Acceptable EPS vendors are limited to the following:

- A. Hubbell Dual-Lite "Spectron LSN" System
- B. Vertiv (formerly Liebert)
- C. Myers Emergency Power Systems
- D. Manufacturer identified by consultant meeting the basis of design
- E. No Alternate Brands; No Substitutions

2.02 Acceptable UPS vendors are limited to the following:

- A. Schneider/APC Galaxy (Basis of Design)
 - B. Eaton
 - C. Vertiv (formerly Liebert)
 - D. No Alternate Brands; No Substitutions
- 2.03 Communications: Ethernet connection.
- 2.04 Load transfer switch rated for transfer of full system load and be "no break" type.
- 2.05 Battery: Maintenance-free sealed lead-calcium cells with a minimum 10-year life.
- 2.06 Construction and installation for local seismic conditions.
- 2.07 Electronic controls shall have password security. User is able to set own password.
- 2.08 Review sizing with FS/DDC to ensure unit has adequate spare capacity for future loads, up to 20% is recommended. The initial sizing of an EPS or UPS should apply load diversity and avoid oversizing that leads to large units that require expensive maintenance and battery replacement cycles. Size UPS for 30 minute run time unless otherwise specified or if connected to loads that require continuous operation (data centers).
- 2.09 EPS and UPS capable of handling mixed loads of lighting, electronics, and motors.
- 2.10 Provide a maintenance bypass switch.
- 2.11 When circuit breakers are integral to the unit, provide at least 2 normally off (NOFF) circuits.
- 2.12 Output compatible with all types lighting systems, such as incandescent, fluorescent, HID, LED and analog and electronic drivers/ ballasts.
- 2.13 Factory startup and training for UAF FS staff.
- PART 3 - EXECUTION
- 3.01 Each ungrounded conductor will have a separate associated grounded conductor. Label grounded conductors with associated ungrounded conductor circuit number.
- 3.02 Supply the system load from the highest priority campus feeder available.

- 3.03 Thoroughly clean cabinets, batteries, controls, etc. of system of dust and debris before energizing system.
- 3.04 FS/DDC shall witness installation of barriers in all battery-powered systems.
- 3.05 EPS: In addition to (or in conjunction with) manufacturer's acceptance tests, perform a simulated 90-minute power outage for verification by FS/DDC of operation of each emergency luminaire, exit sign, and other supplied equipment.
- A. Prior to test, the contractor is to provide an as-built drawing of the reflected ceiling plan that includes the emergency lighting system and exit signs.
 - 1. Use the reflected ceiling plan to verify operation of each emergency egress luminaire and exit sign.
 - 2. Verify the circuit supplying emergency luminaires and exit signs match supplied as-built drawing.
 - B. Create a building-wide outage such as opening the building's main breaker(s) followed by a building-wide walk-through with lighting as-built drawings to verify the entire system performs as intended. FS maintenance staff and DDC staff will participate in this test and walk-through.
- 3.06 UPS: In addition to (or in conjunction with) the manufacturer's acceptance tests, perform a simulated power outage for verification by FS/DDC of the operation of each supplied equipment.
- A. Prior to the test, the contractor is to provide an as-built drawing of the connected loads.
 - B. Create a building-wide outage such as opening the building's main breaker(s) followed by a building-wide walk-through with standby system as-built drawings to verify the entire system performs as intended. FS/ DDC and UA OIT will participate in this test and walk-through.
- 3.07 Telecommunication:
- A. Provide two data connections: one for outgoing messages, one for future local interface CPU.
 - B. Fixed IP address. Coordinate with owner.
 - C. Program email addresses for status notifications: Contact Owner.

- 3.08 Leave as-built drawing of equipment powered by the system with the unit at the time of final acceptance, as there may be delays in as-built information being delivered to UAF, This will allow UAF maintenance to have this life-safety information if an event occurs.

END OF SECTION

PART 1 - GENERAL

1.01 Lighting design:

- A. Reference "UAF Facilities Services Guidelines for Average Illumination Levels". Note that UAF guidelines do exceed current IES guidelines for some areas based on our experiences with maintenance and user needs.
- B. It is recognized that these standards are updated irregularly, and lighting technology is changing rapidly.
- C. Design lighting levels in a building with contiguous areas having average illumination levels differing by not more than a factor of 3. The intent is to provide "even" lighting throughout a building.
- D. In lobbies, corridors, and hallways, emergency lighting shall serve as night lights.
- E. Use LED fixtures with 4000K color, CRI greater than 80 for general illumination of classrooms, corridors, restrooms and offices. For residential and other relaxed spaces, use 3500K LED fixtures.
- F. Use LEDs rated for the temperature and controlled by switches provided by the manufacturer of the unit for walk-in freezers and chillers. Follow this guidance for interior areas of similar low temperatures, such as large outside air intakes and air handlers.
- G. Use linear LED lights in continuous rows in restrooms to prevent shadowing in stalls unless stalls are built full height.
- H. Provide light sensors to extinguish or dim lights when sufficient daylight is present. Coordinate with architects for appropriate windows and window treatments to promote daylight harvesting and glare control
- I. In remodels, compact fluorescent luminaires shall be replaced with LED retrofit kits. Do not specify screw in or plug-in LED bulbs.

1.02 Lighting controls:

- A. The goal of lighting controls is to promote energy savings and flexibility for the intended users and for future repurposing. Office and instructional spaces are to be provided with 0-10V dimming.
- B. Provide daylight harvesting in areas with exterior windows.
- C. Occupancy or vacancy sensors are required for interior lighting.

1. Individual offices and instructional spaces shall be equipped with vacancy sensors if the building is equipped with a central lighting control system; wall switch-based vacancy sensors are not allowed in offices or instructional spaces due to the number of nuisance work orders generated by obscured sensors. Otherwise, use ceiling-mounted occupancy sensors and manual dimmer switches.
 2. Public use spaces, such as hallways, restrooms, lobbies and reception areas shall have "auto on" and "auto off" occupancy sensors with no manual controls typically
 3. Exceptions:
 - a. Electrical rooms shall be manually controlled
 - b. Mechanical rooms shall be manually controlled. Exceptions will be considered on a case-by-case basis.
 - c. If a central lighting control system is present, utility spaces will use manual switching, with automatic OFF after 8 hours.
- 1.03 In public areas, such as corridors, use fixtures that provide diffuse light. The intent is to avoid irregular illumination of vertical surfaces ("cave" or scalloped effect). Use louvered fixtures only where glare control is required.
- 1.04 Lenses/Louvers:
- A. Polystyrene lenses are prohibited.
 - B. For 2x2 or 2x4 grid ceilings, volumetric style lay-in troffers are the preferred style of lens.
- 1.05 Restroom Light control:
- A. Provide occupancy sensors.
 - B. Where there are interior partitions, use ceiling-mounted ultrasonic or dual technology sensors.
 - C. Dual technology microphonic/passive IR.
 - D. No off switches to be accessible by users.
 - E. Set occupancy sensor delay to 15 minutes.

1.06 Occupancy/vacancy sensors:

- A. Ceiling-mounted ultrasonic, infrared, or dual technology sensors except for small rooms such as partitionless restrooms and storage closets.
- B. Sensors mounted in corners of rooms are discouraged due to shadowing in coverage zones due to obstructions installed during and/or after construction.
- C. Occupancy sensors shall activate lighting immediately upon entry or sensor failure.
- D. Stand-alone Sensors shall have an electronic timer adjustable from 30 seconds to 20 minutes time-out and a separate adjustment for detection sensitivity.
 - 1. Set sensor timers at 20 minutes for offices, public areas, labs, classrooms, and storage areas.

1.07 Provide sufficient lighting in crawl spaces, pipe chases, and utilidors.

- A. When control switch is located outside these areas, provide a lighted switch or pilot light to indicate when lights are on. Label switch to indicate that the illuminated state of lighted switch or pilot light indicates whether the area lights in illuminated area are on or off.
- B. Provide guards on all luminaires of this category where they are likely to come in contact to personnel or tools moving in the area.

1.08 Provide for convenient luminaire cleaning, re-lamping, repair or replacement.

- A. Provide catwalks, overhead access, winches or lowering mechanisms for fixtures mounted in hazardous or other locations not readily accessible.
- B. Do not install lights where scaffolding must be built for maintenance.
- C. Lights in stairwells shall be:
 - 1. Accessible from a 6-foot ladder and no higher than 10 feet above the landing.
 - 2. Not be over or near stair treads or railings to avoid personnel working off-center of ladder.

PART 2 - PRODUCTS

2.01 Occupancy/vacancy sensors: Hubble, Wattstopper, Leviton, Lutron

- 2.02 Centralized Lighting Control Systems: Wattstopper, Lutron, or Aquity
- 2.03 Light sources:
- A. New interior lights shall be LED fixtures, or existing fixtures shall be retrofit LED tubes.
 - B. Source color temperature: 4000 to 4100 Kelvin.
 - C. Color Rendering Index (CRI) in excess of 80.
 - D. LED retrofit tubes shall be type B ballast bypass, minimum 2000 lumens with at least 200-degree beam width, product of Phillips, Sylvania, Cree or GE.
 - E. Drivers shall be General Electric, Osram/Sylvania, Cree or Phillips.
- 2.04 In general, wattage of the ballast and lamp system should not exceed the product of the nominal lamp wattage times the number of lamps used in a normal configuration.
- 2.05 LED luminaires:
- A. LED and driver components may be replaced without replacing fixture.
- 2.06 Luminaires with air return path through lamp cavity are not acceptable.

PART 3 - EXECUTION

- 3.01 Lighting switches shall be installed at locations and heights dictated by the adopted code, unless otherwise noted by the FS Electrical Engineer.
- 3.02 Where occupancy sensors control lighting, install them ahead of lighting switches so they remain energized when the switch is off. The intent is to allow occupants to manually reduce or extinguish their lighting.
- 3.03 Light switches illuminated in off position:
- A. At least one light switch at the entry(s) to mechanical and electrical rooms.
 - B. All light switches in utilidor spaces.
 - C. Any space without natural lighting that does not have "Auto On" occupancy sensor controlled lights.
- 3.04 Not allowed: remote drivers.

- 3.05 Pendant-mounted luminaires with cords: Use a similar attachment method for the cord on all fixtures for uniformity of appearance.

END OF SECTION

PART 1 - GENERAL

1.01 Statements of Intent:

- A. In addition to areas required by applicable codes, provide emergency egress lighting:
 - 1. Where the exit path may not be obvious.
 - 2. Where hazardous materials or equipment are used.
 - 3. Where illumination is required to allow safe cessation of a process or project.
 - 4. Where hazardous machinery operates. Hazardous machinery does not include machinery where protective guards are installed over hazardous parts, such as rotating gears, as in a HVAC room, or cutting edges, as in a machine shop.
 - 5. In maintenance areas, such as electrical and mechanical rooms, to provide lighting for:
 - a. areas where equipment obstructs the egress path.
 - b. Emergency activities, such as inspecting equipment.
- B. Provide illumination levels sufficient to guide individuals to an exit path. Alternate methods of illumination, such as self-luminescent tape, are acceptable on a case-by-case basis.

1.02 Provide additional emergency light circuits for:

- A. Bathrooms with multiple stalls or wheelchair accessible compartments.
- B. Publicly-accessible special-use rooms, such as locker rooms, music practice, or rooms having risers or elevated walking surfaces, or similar trip hazards.
- C. Hazardous areas such as machine shops, labs, or chemical storage.
- D. At least one emergency light at central emergency power systems. These light(s) will not be nightlights and will be on a normally off circuit. A Generator Transfer Device may be used on a case by case basis as approved by UAF/FS.
- E. At least one emergency light in main electrical distribution rooms and large mechanical rooms for egress lighting. These lights will not be nightlights and will

be on a normally off circuit or switched. A Generator Transfer Device may be used on a case by case basis as approved by UAF/FS.

- 1.03 The emergency lighting system SHALL be designed so that the yearly 90 minute load test of the buildings EPS or Emergency Generator can be conducted during normal working hours (M-F 8 am - 4:30 pm) without interruption to the building or the activities of its occupants.
- 1.04 Provide a battery-powered central inverter power source.

PART 2 - PRODUCTS

- 2.01 Refer to Division 26 Central Battery Systems for central inverter type emergency power supply systems.
- 2.02 Where a central emergency power supply is not utilized, use stand alone battery powered, with local or remote heads emergency lighting units:
 - A. Microprocessor controlled testing and diagnostics.
 - B. Automatic 1-minute self-test at least every 28 days and 30 minute self-test every 6 months.
 - C. Manual initiation of test with selectable 1, 5, 30, or 60 minute test duration.
 - D. Possess visual indication of:
 - 1. AC power status.
 - 2. Self-diagnostic test cycles.
 - 3. Unit malfunctions, including at least faults on battery, charger, transfer, and lamp.
 - E. Maintenance-free lead-calcium batteries with 10 year life or other acceptable battery with same life as a minimum.
- 2.03 Not Acceptable:
 - A. Emergency batteries located inside individual fixtures
 - B. Recessed, flip-out-when-activated type fixtures.
- 2.04 Photoluminescent materials used to mark egress paths:
 - A. Resistant to solvents, hydrocarbons, detergents, and corrosive liquids.

- B. Non-combustible.
- C. Indoor service life expected to be at least 25 years.
- D. Accepted for safety markings by AHJ.
- E. Non-electric.
- F. Not radioactive.

2.05 Exit signage text color:

- A. Green in residence halls
- B. Non-resident halls: green is preferred, but in facilities with mixed colors match the predominant color.

PART 3 - EXECUTION

- 3.01 Where lights must be dimmed or turned off for presentations, it is preferred the lighting is controlled via a lighting control system. If a control system is not provided, emergency egress lights may be connected to a normally off emergency power circuit.
- A. For an emergency luminaire that is connected to a normally-off circuit, label: "Emergency Light, Normally Off".
- 3.02 It is intended that large facilities have a central emergency power supply. Therefore, it is preferred that where a central emergency power supply is not utilized, fixtures be laid out as though there were such a supply. Run the conductors supplying "Future Emergency Lights" to a central location where they can be connected to a central emergency power supply when it is installed.
- 3.03 Testing method: Create a building-wide outage such as opening the building's main breaker(s) followed by a building-wide walk-through with lighting as-built drawings to verify the entire emergency lighting system, including the EPS, performs as intended. FS Maintenance and DDC and the UAF AHJ will participate in this test and walk-through.

END OF SECTION

PART 1 - GENERAL

- 1.01 Campus-wide Exterior Lighting Master Plan: This plan should be referenced when designing any exterior lighting on campus. Where there may or will be an overlap/apparent conflict between the Master Plan and these standards, discuss with FS/DDC Facilities Engineer
- A. Primary building entrances to use illumination as an identification/wayfinding means of the entrance.
- 1.02 Minimize light pollution.
- A. Avoid architectural lighting aimed into the sky.
 - B. Eliminate glare and light trespass by use of sharp cutoff luminaires and shields. Special consideration should be given to luminaires located at the top of or on hillsides to prevent glare to passersby below the hillside.
- 1.03 Exterior lights shall be provided with dusk till dawn controls as well as timer-based control, and the ability to override controls for troubleshooting and special events remotely:
- A. Luminaires on buildings: Lighting circuits to be controlled by the building's Building Automation System (BAS).
 - B. Luminaires on poles: Prior to 2025, most exterior pole-mounted lights were controlled via a contactor controlled through the BAS system or were continuously powered (no contactor) and controlled by the ROAM node system. The ROAM node system is obsolete and UAF is developing a new control system to mimic its function.
 - C. Evaluate motion sensors for multi-level control along pedestrian pathways.
- 1.04 Provide lighting for covered walks, stairs, canopies, and ramps. Ensure lighting at street crossings provides vertical illumination of pedestrians without causing driver glare.
- 1.05 Buried wiring:
- A. Discuss with FS/DDC whether conductors are to be in a raceway, type of raceway, or direct buried. Most circuits will be in HDPE with rigid steel transitions.
 - B. Install detectable warning tape above conduit or buried conductors.

- C. Under roadways and/or other traffic, including pedestrian areas: corrosion-protected rigid conduit with junction box at each end. Consult with FS/DDC whether the conduit is to be a metal or non-metallic type.
- D. Provide an insulated ground conductor with all circuit conductors.

1.06 Mounting and poles:

- A. Luminaires and freestanding light posts shall be of a design matching the existing luminaries in the area, as approved by the Campus Master Plan Committee.
- B. Luminaire mounting height:
 - 1. On buildings: not higher than 25 feet.
 - 2. Poles: not higher than 30 feet, preferably not more than 25 feet.
- C. Fixed base type poles with four anchor bolts per pole. All anchor bolts double-nutted to facilitate pole alignment and adjustment.
- D. Concrete bases shall extend a minimum of 30 inches above finished grade. Bases shall be set back a minimum of 2 feet from the edge of sidewalks or roadways to the edge of the base. These standards are intended to reduce the likelihood of damage to the poles from snow removal and grounds keeping equipment.
- E. Poles round tapered or round straight aluminum. Finishes of poles anodized light grey or dark bronze (West Ridge is Dark Bronze only). Other finishes may be allowed but must be approved through the Exterior Color Selection process.
- F. Grounding and bonding:
 - 1. All poles shall have a grounding lug capable of accepting up to a #4 AWG.
 - 2. Raceways, pole, base, luminaire, and other non-current-carrying parts bonded together and grounded to lug.
 - 3. Install supplemental ground rods as needed.
- G. Provide a base plate cover concealing anchor bolts and pole base plate.
- H. Provide poles with suitable hand hole at base. Minimum size 6 inch X 6 inch. Variations to be approved by FS/DDC.
- I. Provide 120 volt outlet on pole as requested.

PART 2 - PRODUCTS

- 2.01 Some areas of campus such as West Ridge have an established fixture style and pole color. Confer with FS/DDC on style, size, color, and shape.
- 2.02 Controls: Identify all equipment, components, and wiring.
- A. Control exterior building mounted lighting by BAS signal.
 - B. Provide a hand-off-auto switch in exterior lighting power circuit(s).
 - 1. The Hand position shall bypass the BAS/Campus-wide control signal and turn "on" the lighting normally controlled by BAS.
 - 2. The Off position shall bypass the BAS/Campus-wide control signal and turn "off" the lighting normally controlled by BAS.
 - 3. The Auto position shall cause the lighting to be turned "on" and "off" by the BAS.
 - 4. All contactors: Mechanically held, electrically operated.
 - 5. Mount H-O-A switches in contactor covers.
 - C. Pole mounted lights shall have a twist lock socket for individual control via a photocontrol or wireless networked control system. Circuits for pole mounted lights shall be otherwise unswitched.
- 2.03 Exterior luminaires:
- A. Light source: Light Emitting Diodes (LED)
 - 1. Minimum 70,000 hour life
 - 2. Light to be 4000 Kelvin with 80 CRI for general purpose lighting.
 - 3. Lights shall be 3000 Kelvin, 80 CRI in residential areas such as Hess Village and Cutler Apartments to avoid the sleep disrupting effects of blue wavelength light.
 - B. LED Driver:
 - 1. Multi-volt input: 120V to 277V. Note that some circuits are 480V.
 - 2. Power factor >0.9.
 - 3. Efficiency >90% at full load.
 - 4. Life to equal or exceed listed life of LED components.

- 5. Adjustable Output Current is preferred to allow replacement of existing drivers via external component change or programmable interface.
 - C. Optically clear, tempered glass lens, heat and impact resistant: Horizontal with no vertical revealed component.
 - D. Install fuse and fuse holders, sized as recommended by luminaire manufacturer, at base hand hole location.
 - E. Utilize shields and/or sharp cut-off configuration to reduce:
 - 1. Night sky light pollution.
 - 2. Glare from fixtures on hillsides.
 - 3. Trespass illumination into interior spaces of buildings.
 - F. Not acceptable:
 - 1. Bollard type lighting.
 - 2. Underground luminaires or luminaires mounted in a road or sidewalk except as specifically directed by FS/DDC.
 - G. Maintenance features:
 - 1. Toolless entry.
 - 2. Captive screws and fasteners.
 - 3. Captive ballasts.
 - 4. Captive lenses.
 - 5. Toolless electrical connections.
- 2.04 Power:
- A. 208V lighting circuits to include neutral for future convenience outlets or other 120V loads.
 - B. TVSS protection on each circuit.
 - C. Consider:
 - 1. Light poles near buildings to include convenience outlets.
 - 2. Light pole use for Wireless Internet Access Points and security cameras needing power

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Communications systems are expected to be important over the life of campus buildings. In order for new communications technologies to be installed and maintained cost-effectively, provide adequate physical infrastructure within campus buildings. This infrastructure includes riser systems, conduit, cable trays, and utility closets.
- 1.02 The recommended distribution infrastructure is designed to be general purpose and flexible enough to accommodate a variety of technologies. Space is needed for cable installation and interconnection and for electronic equipment in support of various communication technologies. Most communications utilities can share the same spaces since the physical topology and wiring requirements are similar.
- 1.03 Lay out the communications raceway system to conform to programmed use of space. Verify layout with OIT and UAF Facilities Services. Allow adequate and appropriate space for local switchgear.

PART 2 - PRODUCTS

- 2.01 Fire-stopping: Where raceways, cables (including communication cables), and other such items penetrate fire-rated walls, floors, or combination joint assemblies, provide firestopping meeting the requirements of 07 84 00 Firestopping. Consultant shall coordinate any references to firestopping with that division.
 - A. When cable tray is used, provide firestopping systems that allow for cable to be installed in the future without demolition of the firestopping systems.
 - B. A product similar to the Hilti Speed Sleeve is preferred for labs where pressurization control is important.
- 2.02 Cable Tray: A center-hung basket tray is preferred for all communications systems except for utilidor runs and vertical runs, which shall be ladder tray.

PART 3 - EXECUTION

- 3.01 Riser system: The riser system is a raceway system leading from the MDF room to each IDF room carrying fiber or copper data cabling.
 - A. At each IDF room, the intent is to provide 4-inch conduit sleeves of the appropriate number extending and stopping 6" to 12" above the floor finish. Conduits shall be bonded to the cable tray system in the room. Firestop conduits in accordance with Division 7 – Firestopping. Cast-in-place fire-rated sleeves may be provided in new construction applications as approved by FS/DDC
 - B. Within the MDF and IDF room, riser cabling may be carried in a cable tray unless

otherwise specified by FS/DDC and/or the UA System Office OIT.

- C. Where riser cabling is routed under the slab or through foundations, provide rigid conduit.
- D. Enclose risers in areas where aesthetics are an issue, providing appropriate pull boxes and pull strings.
- E. In certain retrofits, conduit will be used in lieu of cable tray where data/comm switches are located outside of an MDF or IDF room.

3.02 Raceway general:

- A. Conduit or approved cable tray is required between the MDF and each IDF. Conduit or approved cable tray is required from the IDF to each floor distribution point. J-hooks may be used in locations where applicable, considering the cable plenum rating, number of cables, and specific application.
- B. In certain areas such as where security is a concern or damage from misconduct may occur, conduit is used to support and protect horizontal cables from the communication outlet location or Cabling Access Point to an IDF, as well as interconnecting IDFs, MDFs, and the UAF network.
- C. Conduits from a single communication outlet shall be a minimum of 1/2-inch EMT. Conduits from a standard faceplate (three ports) shall be minimum 3/4-inch EMT.
- D. Maximum size of a single conduit not to exceed 4-inches. If the number of horizontal cable bundles requires additional conduit beyond 4-inches, then install additional 4-inch conduits to accommodate.
- E. Any conduit carrying horizontal cable(s) will have a maximum of 270 degrees of bend. A 50' length of conduit with two (2) 90-degree bends is considered equivalent to 270 degrees of bend; install a pull box in the conduit run.

3.03 Cable trays general:

- A. If large numbers of horizontal cables run to a central location, use cable tray to collect the cable bundles and route them to the IDF.
- B. Bond all feeder conduits directly to the cable tray. Bond all cable trays to a grounded conduit.
- C. The conduit opening must face toward the cable tray.

- D. The use of conduit and pull boxes for routing large groups of horizontal cable bundles is permissible only when it is not possible to use a cable tray.
- E. A cable tray may be routed through other spaces if sufficient corridor space is not available.
- F. Size main distribution cable trays with a minimum of 20% spare capacity.
- G. Use (multiple) 4 inch raceways for cable tray transitions through firewalls. Increase number of conduits as needed for spare capacity of 20%. Indicate on the drawings that the conduits must be fire sealed prior to substantial completion.

3.04 Open cable trays:

- A. Open cable trays may be used inside of IDFs, MDFs, and ceilings.
- B. All conduits terminating at an open cable tray must terminate at the near side of the tray and above the tray.
- C. The preferred termination of conduit horizontal distance is 6 inches and the preferred termination of conduit vertical distance is 3 inches.

3.05 Pull boxes:

- A. Minimum pull box size for a single horizontal cable bundle 6" X 6" X 4".
- B. The use of electrical boxes that do not maintain the minimum bend radius not allowed. LB joints are not recommended.
- C. Security screws securing the lids for boxes mounted in public areas.

END OF SECTION

PART 1 - GENERAL

- 1.01 Each building will have at least one Main Distribution Frame (MDF). The MDF will be connected to the Intermediate Distribution Frame (IDF) with multimode and single-mode fiber as directed by the Office of Information Technology (OIT).
- 1.02 The campus includes two designated Satellite Hub Rooms (SHRs), which serve as primary backbone aggregation and cross-connect facilities for inter-building telecommunications infrastructure. Additional SHR-designated spaces shall not be created without approval. Where additional distribution rooms are required, they shall be designed and constructed in accordance with MDF requirements and function as building-level distribution points. SHRs shall include sufficient fiber patch panel capacity to terminate and manage the campus primary backbone cabling system.
- 1.03 Size and Quantity:
- A. The minimum size requirement for the IDF room is 100 square feet per 300 circuits up to 150 square feet for up to 600 circuits.
 - B. Where individual cable runs exceed the maximum length of 90 meters, an additional(s) IDF will be required.
- 1.04 Physical requirements and demands of the MDF:
- A. MDF rooms should be sized for the primary networking cabling and switches to support the building, the UPS unit for the building communication system, and the cooling equipment.
 - B. Each MDF will contain patch panels, and flexible wire management necessary to collect all the communications cabling and distribute them to the necessary communications equipment in the MDF. Include an adequately sized cable tray in the MDF to serve the equipment.
 - B. The electronics necessary to provide data communications over the wiring will be in the MDF.
 - C. MDF in existing buildings requires a minimum ceiling height of 8 feet. New construction and, where possible in existing buildings, the ceiling height is 10 feet. Leave the ceiling open to structure unless otherwise required by the building code.
 - D. Coordinate placement with UAF Facilities Services.
 - E. Room walls will be painted off-white and bare concrete floors will be painted light gray and sealed.

1.05 Environmental requirements for the MDF:

- A. Room temperature is 65 degrees Fahrenheit plus or minus 10 degrees. The humidity range is 10-90% (non-condensing).
- B. Active air circulation is required to dissipate heat from the electronics.
- C. Accommodation must be made in the event building cooling and ventilation is reduced.
- D. No water, steam, or sanitary piping or connections allowed in the room.
- E. The room shall be fully sprinklered per NFPA 13 and Division 21 Fire Protection. Exceptions may be approved by the Authority Having Jurisdiction.
- F. Avoid materials that produce static electricity and provide antistatic flooring materials

1.06 Security requirements for the MDF and IDF rooms

- A. Provide card access to communications rooms. Where card access is not provided, provide a manual lockset keyed to the network management control key.
- B. In shared rooms, the portion of the room containing the equipment must be partitioned off with access only available to OIT personnel.
- C. MDF and IDF rooms must be accessible through public spaces. Passage through any assignable or otherwise occupied space is not permitted. Access through electrical rooms will not be acceptable nor will access to electrical rooms through communications rooms be acceptable

1.07 Power requirements for the MDF:

- A. Install a UPS sized by UAF Facilities Services and OIT. Coordinate the incoming voltage and the connector type of UPS with the design. Provide a properly sized outlet or disconnect in the room for powering the UPS. Obtain panel number from FS/DDC, typically considered an SL or CL panel convention.
- B. Label receptacles and termination box covers with panel and circuit numbers.
- C. Consider in design a manual override switch to cut power to the equipment inside the room, with the approval of OIT.

- D. Install an additional convenience outlet, not powered by the UPS, for use by temporary equipment.
- E. Install a 2-inch x 18-inch grounding bar mounted in the room with a stranded copper 6 AWG cable attached to a building structural ground or building grounding electrode system.

PART 2 - PRODUCTS

- 2.01 Due to rapid changes in network electronics, OIT will ensure that contemporary equipment is specified for each project.

PART 3 - EXECUTION

- 3.01 After installation, protect all patch panels and electronic equipment from construction debris.

END OF SECTION

PART 1 - GENERAL

- 1.01 As a minimum, each communications outlet faceplate location identified should be capable of supporting three (3) network devices. However, there may be circumstances that require more, or less, devices at any one location. UAF Facilities Services Division of Design and Construction (FS/DDC) and the UAF Office of Information Technology (OIT).
- 1.02 OIT will assist in identifying network locations. It is left up to the designer to coordinate the correct number of communication cables and ports at each location to accommodate the University's needs.
- 1.03 Locations of communications ports:
- A. One communications port for each vending machine position.
 - B. DDC (Direct Digital Control) panel: two communications port inside of panel
 - C. Elevator: See Elevator Division
 - D. Fire Alarm Panel: inside Fire Alarm Panel (UAF has moved to a dedicated pair of fiber connection.)
 - E. Life Safety Emergency Power Supply: two; location dependent upon model/brand EPS.
 - F. Point of Sale (POS) devices
 - G. Menu boards and digital signage (shuttle tracker, etc.)
 - H. Copy readers
 - I. Security cameras
 - J. Smart classrooms (podium (minimum 3), monitors, touch panels, etc.)
 - K. Parking kiosks (moving to cellular)
 - L. Wireless access points
 - M. Alertus beacons

1.04 FS/DDC responsibilities:

- A. Define the communications needs of the building or space. Working with the user group, determine the needs of the various programs in the facility. Also determine the quantity of fiber connections.
- B. Coordinate construction schedule, specifically:
 - 1. When the wiring is ready to be cross-connected.
 - 2. When the building will be turned over to the user.

1.05 OIT and UAF Facilities Services responsibilities:

- A. OIT: In conjunction with FS/DDC and user, determine locations for telephone and network communications outlets.
- B. Cross-connect the wiring once the contractor has landed the wires on the terminals.
- C. Work with users to provide the handsets they request.
- D. Coordinate installation of hub room equipment.
- E. Coordinate activities with FS/DDC Project Manager.

1.06 Contractor responsibilities:

- A. Run communication cabling within building.
- B. Land wiring on communications patch panels, racks, and field jacks.
- C. Label all cabling at both ends
- D. Test each connection and provide a report

1.07 All new construction will be Voice Over IP(VOIP).

1.08 All wiring will terminate on patch panels.

PART 2 - PRODUCTS

2.01 The communication cable will meet Category 6a (or better) industry standard specifications and will be plenum rated unless otherwise directed.

2.02 Communication cable:

- A. The jacket must be a soft, user-friendly jacket that is easy to strip and resists kinking.
- B. The white common pairs must have a co-extruded stripe for easy identification of the white common. The stripe must be a permanent part of the dielectric that cannot be removed until stripped.
- C. The cable must contain a Rip Cord for easy cable entry.
- D. The cable jacket must have sequential footage markings.

2.03 If fiber optic cable is required, meet the industry standards for multimode fiber set forth by OIT

PART 3 - EXECUTION

3.01 Grounding:

- A. Telecommunications Bonding Backbone (TBB): All grounding and bonding shall be done in accordance with TIA/EIA standards.
- B. Location and method of grounding communications systems must be clearly indicated in design documents.
- C. Equipment racks are to have separate grounding conductor to common grounding bus. Do not "daisy-chain" grounding connections between racks so that removing one grounding conductor will interrupt the ground path for more than the intended piece of equipment.

3.02 Communications outlet faceplates – General:

- A. There can be more than one (1) communication cable per communications outlet faceplate.
- B. In new construction, and where feasible in existing buildings, install the communications outlet mounting box and its associated conduit in the walls with the faceplate back surface flush to the wall at 18-inches AFF.
- C. Mounting the faceplate in an extra-deep double duplex receptacle box is preferred.
- D. In surface-mount applications, mount the faceplate to the appropriate metal raceway back box.

- E. Whether surface or flush mounted, the proper clearance on all sides of the faceplate is 4 inches and 2 inches in front. Do not install faceplate in areas where obstacles will restrict access to it.
- F. It is permissible to mount the faceplate on or into cabinetry or desk units, provided the mounting service is permanently affixed to the floor.
- G. In areas where a faceplate provides wall phone service, mount outlet box and faceplate at the standard outlet height. Provide an additional ½ inch conduit (or equivalent capacity metal surface raceway) from the outlet box to a 2 inch x 4 inch utility box (or equivalent metal surface raceway box) at the wall-phone height.

3.03 Faceplates in office areas:

- A. Minimum of one faceplate per occupant or one faceplate per 100 square feet of floor space.
- B. Locate communications outlet faceplates wherever work areas might be required over the life of the building, and located near power outlets.
- C. Locate faceplates below the desktop at an approximate height of 18 inches from the finished floor to the bottom of the mounting box.

3.04 Faceplates in reception and open areas:

- A. Review number of faceplates on a case-by-case basis with OIT personnel with a minimum of one faceplate per 150 square feet.
- B. Locate faceplates at the standard height for outlet boxes, approximately 18 inches from the finished floor to the bottom of the mounting box.

3.05 Faceplates in laboratory areas:

- A. Minimum of one faceplate per 150 square feet of floor space.
- B. In all laboratory areas designated for use as "computer laboratories", one faceplate per computer station and one faceplate per network printer.
- C. Mount faceplates near electrical outlets and approximately 6 inches from the top of the bench surface/splash board to the bottom of the mounting box.
- D. Install additional faceplates near or above the ceiling for video distribution, placement of these faceplates determined by OIT personnel on a case-by-case basis.

3.06 Faceplates in classroom/conference areas:

- A. Two faceplates, one on the front wall and one on the back wall.
- B. Locate faceplates at the standard height for outlet boxes, approximately 18 inches from the finished floor to the bottom of the mounting box.
- C. Install additional faceplates near or above the ceiling for video distribution, placement of these faceplates determined by OIT personnel on a case-by-case basis.

3.07 Faceplates in residence hall areas:

- A. Minimum of one faceplate per occupant. If there are two occupants (double room), then two faceplates, installed on opposite walls.
- B. Mount faceplates near electrical outlets and approximately 6 inches from the top of the desk surface to the bottom of the mounting box.
- C. In apartment buildings and townhouses: Minimum of two faceplates per unit and faceplates must be located in different rooms (e.g., study and living area, study and bedroom(s), etc.).
- D. In general, residential facilities are moving to wireless antennas instead of wired connections. Coordinate with FS/DDC and OIT for current methodology.

3.08 Cabling access points:

- A. Use cabling access points to provide OIT services in areas where use of a faceplate is not reasonable, such as doorjambs and ceilings.
- B. OIT personnel in cooperation with representatives of Facilities Services and Safety & Security will determine the number and location of cabling access points for a building.
- C. If a cabling access point is installed to provide wall phone service, mount the outlet box at the standard outlet height and provide an additional ½ inch conduit from the outlet box to a 2 inch x 4 inch utility box at the wall-phone height.
- D. If the cabling access point requires an outlet box to mount a device, cover the outlet with a blank stainless steel wall plate and secure using two-pin type security screws until the device is ready to be mounted.

3.09 Wireless Access Points:

- A. Provide one (1) communications jack above the ceiling for connection to OIT provided wireless router(s). Coordinate location(s) with OIT to provide coverage throughout the building.

3.10 Terminate all fiber optic cable with SC type connectors unless specified otherwise by an OIT representative

3.11 Labeling: Provide in accordance with TIA/EIA-606-C. Label jacks and corresponding wiring to this standard: Floor#-Hub Room-Port#:

FLOOR#	HUB ROOM	PATCH#	DESCRIPTON
1, 2, 3, etc. B, P			Floor on which outlet port is located. This may be a number or letter.
	0,1, 2, etc, + Direction		Floor on which hub room located. Where there is more than one hub room per floor, add location: E=East, W=West, N=North, S=South.
		###	Unique three digit identifier of patch. (E. G. There will never be more than one port with the number 027.) Patch number will be at individual jack.
Sample 1: 1-1-023	Outlet port on floor 1, hub room is on floor 1, patch number is 023		
Sample 2: 2-1W-023	Outlet port on floor 2, hub is on floor 1 west side, patch number is 023.		

3.12 Terminate all fiber optic cable with SC type connectors unless specified otherwise by a OIT representative Test each cable upon installation and provide the results of those tests both written and electronically to the FS/DDC Project Manager.

3.13 Consultant to specify wire management raceway and hangers for all communication cabling. It is preferred to have all cabling in conduit, surface raceway, or cable tray. Raceway must be sized to leave 20% free board for future installations.

- 3.14 Terminate all fiber optic cable with SC type connectors unless specified otherwise by an OIT representative.
- 3.15 Provide a fiber link between the Building Management System main panel and the nearest fiber connection point in a Satellite Equipment Room. The intent is to tie into the Controls Host Room via the fiber link.

END OF SECTION

PART 1 - GENERAL

- 1.01 Scope: Emergency telephone equipment, cables, power wiring with raceways, junction boxes, bollards, mounting, and support structures.
- 1.02 Contact UAF FS for the latest version of the standard drawing of the emergency telephone. Confirm all part numbers are current with FS.

PART 2 - PRODUCTS

- 2.01 Emergency telephones: Provide one button auto dial emergency phone in a weather-resistant 912 OSHA yellow enclosure. Prior to 2025, the Ramtec Model R2A-S was specified. UA OIT should be consulted for the current brand and model.
- 2.02 Protected block: Exterior emergency telephones served by interior telephone backboards require protected blocks at the backboard.
- 2.03 Blue marker and strobe lights:
 - A. Marker light fixture: Gasketed liquid-tight with a malleable iron body and blue polycarbonate globe and guard. Marker light fixture: Appleton No. VA105OG, other manufacturer identified by consultant. Lamp: Solid state, similar to LEDtronics DEC A-19-OPB-120A, minimum 20,000-hour life.
 - B. Strobe light fixture globe: Clear, input voltage 120 VAC, operating temperature range -40°F to +149°F, 75-85 flashes per minute, 750,000-peak candlepower minimum, with lamp life of 2000 hours. Mount entire unit vertically on NPT nipple. Must be suitable for outdoor use. Signal light strobe: Federal Signal Corp. No. 131ST, other manufacturers identified by consultant.
- 2.04 Control transformer: 120 x 24 VAC, 50 VA, with primary fusing. Square D No. 9070KF50D23 with Type AP3 fuse block, other manufacturers identified by consultant.
- 2.05 One-shot timing relay: Time delay control relay: DPDT contacts rated 10 amperes at 240V a 24 VAC coil, be tube socket mounted, knob adjustable for 0.6 to 60 minutes, one shot, and be sealed within a case. Relay: Square D Class 9050, No. JCK48V14 with No. NR61 socket, other manufacturers identified by the consultant.
- 2.06 Component counting screws: All exposed screws used to mount components and retain stanchion access plates: Tamper-resistant pan head drilled spanner screws of stainless steel. Screws: McMaster-Carr Stock No. 94066A537 or 94066A542 (page 2176 of Catalog 97), other manufacturers identified by consultant.
- 2.07 Install surge protectors on telephone conductors at the emergency telephone input terminal as recommended by the phone manufacturer.

- 2.08 Prime stanchions and bollards and paint 912 OSHA yellow to match the emergency phone units.

PART 3 - EXECUTION

3.01 - SEQUENCE OF OPERATION

- A. Blue marker light: Turned on continuously when the photocell indicates darkened conditions. The marker light shall burn continuously without blinking. The operation of the marker light is independent of the operation of the emergency telephone or the clear strobe light. The lamp is to be a long-life Light Emitting Diode (LED) type.
- B. Clear strobe light: Turned on when the emergency telephone activation button is depressed. When on, the light will strobe continuously in daylight or darkness. The strobe light shall be turned off after a time delay of 3 minutes (time delay is set by adjusting One Shot Timing Relay). The strobe light operates independently of the blue marker light.
- C. Emergency telephone: The following sequence of operation describes the emergency telephone functional requirements and its relationship with other components. FS/DDC and OIT will do actual setting of configuration switches and telephone numbers; contractor installs and wires the phone only. The emergency telephone shall automatically dial a pre-programmed emergency number when the activation button is depressed. The emergency telephone will then remain on-line (activated) until the receiving station hangs up. When activated, a set of normal open contacts within the emergency telephone shall close and energize the strobe light. Operation of the blue marker light shall be independent of emergency telephone operation. The emergency telephone shall support remote testing (activation) by the emergency call receiving station and shall allow the receiving station to "listen-in" on the telephone's surroundings.

END OF SECTION

PART 1 - GENERAL

1.01 Audio Induction Loop Locations

- A. As required by applicable Codes, Regulations, and University Policy
- B. Auditoriums
- C. Conference Rooms
- D. "Smart Classrooms"
 - 1. List can be obtained from the UAF Office of Information Technology (OIT)
- E. Teleconference rooms
- F. Classrooms

PART 2 - PRODUCTS

2.01 Audio Source (such as a Microphone)

2.02 Induction Loop Amplifier (Driver)

2.03 Copper "Loop" Cable and Fitting Accessories

2.04 Signage

PART 3 - EXECUTION

3.01 Minimum Installation

- A. Audio Induction Loop shall be designed and installed in accordance to IEC 60118-4.
 - 1. International Electrotechnical Commission's standards for the performance of Audio Induction Loops
- B. Upon completion of installation, the contractor shall provide test results to show compliance with IEC 60118-4 in the following four (4) main areas:
 - 1. Field Strength
 - a. Capable of 400mA/m RMS with 1kHz sine
 - b. Variation of $\leq \pm 3\text{dB}$ over the required volume of use

2. Frequency Response
 - a. Field strength variation of $\leq \pm 3\text{dB}$ from 100Hz to 5kHz over the required volume of use
3. Background Noise
 - a. A-weighted background noise to be $< 47\text{dB}$
4. Subjective Test
 - a. Validation of system performance from hearing aid users

3.02 Provide signage including the following:

- A. Informing area has assistive listening system installed including standard symbology (see attached photo)
- B. Type of system
- C. Contact information for obtaining information on the system (UAF OIT)

END OF SECTION

PART 1 - GENERAL

1.01 Clock locations:

- A. Digital Clocks: Public areas such as corridors, building entrances, and large common areas.
- B. Analog clocks:
 - 1. Classrooms
 - 2. Laboratories
 - 3. Other occupied research spaces as requested by the users.

1.02 Clocks shall be provided and installed by Facilities Services.

1.03 Provide a 120V AC recessed outlet for the clocks as is practical. Where not practical, utilize battery-operated model(s).

1.04 Coordinate placement of clocks with placement of pendant-type luminaries to ensure visibility. Typically, clocks are hung near the front of the classroom and usually near a door, around the same elevation as the door head.

PART 2 - PRODUCTS

2.01 Acceptable manufacturers: Primex Wireless (primexinc.com). Other manufacturers compatible with UAF's existing 72MHz system may be accepted upon review with FS Maintenance.

2.02 Models used up through 2025, which sync to the 72 MHz transmitted signal located on the upper campus will become obsolete by 2029. Specify Primex PoE or Wireless AP syncing for new construction and large renovations.:

- A. Digital Clocks: 4 inch, 4-digit display, 120 V, 18 inch L x 8 inch H x 3 inch D, Red LED, 18-inch cord, single-sided.
- B. Analog clocks: 12.5-inch Black Traditional Series Clock, battery powered, UAF branded
- C. Analog clocks: 12.5-inch Black Traditional Series Clock, 120VAC, 18-inch Cord, UAF branded.

PART 3 – EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Coordinate the installation of door security access hardware with various divisions. Security access through a card access system intends to balance long-term risk with first-time capital cost, life-cycle maintenance and operations, and industry best practices, which move away from keyed entry into buildings and certain rooms within those buildings.
- 1.02 Research and coordinate door security access needs with UAF FS, UAF Police/Fire, UAF EHSRM, and the end users.
- A. Reminder to FS/DDC PM: Inform users that an annual support fee from UAF FS may apply to doors and key boxes not normally provided under an FS Maintenance and Operations function.
- B. Develop an overall security strategy that follows current best practices, institutional controls, accreditation requirements, and other regulatory requirements. Consider doors:
1. Needing immediate access control
 2. Requiring lockdown features
 3. Requiring data reporting for recordkeeping, accountability, special security circumstances, etc.
 4. Located off main corridors, consistent with Design Standard 08 70 00 Hardware
 5. Which are likely to need access control in the future
- C. Develop an information/decision matrix of:
1. General access levels by building, level, suite, and room
 2. Access time zones per access level, if time zones will be utilized.
 3. Doors for entry into the building and access into classroom, suites, utility spaces, and other such spaces that require card access instead of keying.
 4. Regulatory agency requirements, if applicable
 5. Evaluate and coordinate any signaling needed between door security and the intrusion system

6. Lockset type: hardwired or wireless based on application. Wired applications are more reliable for lockdown features and are required on exterior doors and interior doors after a risk review.

7. Other information as required

D. Upon completion of the above information matrix, UAF FS, along with other UAF departments responsible for the safety and security of building occupants, will coordinate the type of access, which will inform the type of hardware.

1.03 Coordinate division of work as follows

A. Project designer and construction contractor responsibility:

1. Design drawings, details, and specifications (designer) and submittals for product data, shop drawings, and sequence of operations.

2. Installation of raceway, boxes, wiring, hardware/software system related to work normally under Division 28. Installation of door hardware is covered under Division 08.

3. Coordination with Division 27 for network connectivity

4. Verification of the functionality of the hardware/software system and sequence of operations is working as designed, ahead of turning over the system to UAF for final programming.

B. UAF responsibility:

1. Access to the central server through coordination with OIT for firewall and network IP addresses.

2. Quality Assurance and commission assistance to ensure all input points and outputs function properly with the system

3. Programming access levels and user access into the system.

1.04 Typical areas needing access control are:

A. Classrooms, labs, suites, and similar spaces that have direct access off a public corridor.

B. Animal quarters, BSL-3 spaces, and similar spaces.

C. Childcare, Healthcare, and other institutional spaces

D. MDF and IDF rooms

- E. Elevators for access to mechanical spaces.
- F. All Exterior Doors
- G. Mechanical and electrical rooms, upon request by FS Maintenance
- I. Special equipment rooms as required by the user or some other agency

1.05 Consultant to request security access information from UAF FS before Design Development. Consultant to provide security access schedule to UAF FS for review before 65% design. Consultant to coordinate review of the contractor's security access submittal with UAF FS for final approval.

PART 2- PRODUCTS

2.01 Lenel, Brand Name Only

2.02 Door Hardware

- A. Door Hardware – Refer to Division 08
- B. Ensure all locksets fail secure unless otherwise directed.
- C. Power Supplies for 24VDC used for latch, strike, and QEL energization shall source enough current for steady state loads and in-rush current loads for devices powered by each supply.
- D. Power supplies for 24VDC used for latch, strike, and QEL energization on ADA entries shall include an appropriate relay module for controlling multiple latches, strikes, and QEL devices associated with these entries.
- E: Card Readers: shall be Schlage MTMS15, multi-function with magnetic strip card readers, unless on AD400 RF locksets, to support future implementation of smart card technology that will be the same across door controller types, Brand Name Only.

2.03 All security-related enclosures shall be furnished with a manufactured, supplied lock with key.

PART 3 – EXECUTION

3.01 Uninterruptible power is required whenever possible from a central building UPS. If a central building UPS is not available, power for door access control is normally taken from the nearest dedicated power circuit, and all power supplies will require battery backup.

3.02 Reference standard installation detail drawings available from the UAF DDC.

- 3.03 Access control and security systems shall be installed by a currently licensed/trained Lenel technician and authorized dealer/installer.
- 3.04 Where card access control is installed on entries with ADA door operators, the access control system shall control both the ADA push button and the door opener. UAF FS Card Access will program the logic functions necessary to perform the integrated controls, whose functions will depend on multiple factors, including door hardware, number of doors, and other factors.
- 3.05 Basic Exterior Door Functionality: Refer to Division 08 for additional information on specific hardware for each of these functionalities.
- A. ADA Locking: During normal business hours, the trim will unlock and remain unlocked until the end of normal business hours. After hours, the door will unlock for 30 seconds (adjustable) upon presentation of credentials. Upon activation of the ADA operator push button (or signal from the access control), the QEL device will retract the latch, and the latch monitor (LX) will send a positive signal to the ADA door operator to open the door.
 - B. ADA Non-locking: Upon activation of the ADA operator push button (or signal from the access control), the QEL device will retract the latch, and the latch monitor (LX) will send a positive signal to the ADA door operator to open the door.
 - C. Non-ADA Locking: During normal business hours, the trim will unlock and remain unlocked until the end of the normal business hours. After hours, the door will unlock for 30 seconds (adjustable) upon presentation of credentials.
 - D. Non-ADA Non-Locking: Not controlled by Division 28.

END OF SECTION

PART 1 - GENERAL

- 1.01 Fire detection, notification, and reporting ("Fire Alarm") system equipment for all new or renovated facilities.
- 1.02 All Fire alarm installations shall be made with new parts and materials. Exceptions may be approved through negotiations with UAF, specifically addressing the supplier's/contractor's warranty obligation.
- 1.03 Network all fire alarm system control panels within a single building to provide a single, comprehensive and complete system with all programming, signal, supervisory, and control functions available throughout the system at each control panel. This is subject to variation as building or building-complex design and use, fire separation features, and firefighting access will all influence the final design approval.
- 1.04 Initiation and indication coverage and features:
 - A. An approved fire alarm system shall be installed in accordance with the current adopted edition of the *International Building Code* and the referenced edition of the National Fire Protection Association's *National Fire Alarm and Signaling Code*. Additional initiation and indication coverage above the code required minimums, may be provided as approved by the Authority Having Jurisdiction when presented in a detailed plan of action, appended to the project plan review application.
 - a. UAF may choose to add initiation devices, namely smoke and heat detection, in boiler/furnace rooms, data/server rooms, breakrooms, copier rooms, and other high-hazard spaces for means of early detection of a fire event. This is especially true in locations without fire sprinkler coverage or on-site firefighting services (community campuses, remote locations, etc)
 - B. All residential facilities: Total (complete) fire alarm system protection, consisting of detection in all spaces, smoke detection with notification in each sleeping room, and manual activation means for use by occupants (pull stations) at each floor-level exit. Include Carbon Monoxide detection as required by the currently adopted code and State of Alaska regulations.
 - C. Non-residential facilities: Coverage consistent with intended occupancy and hazard. At a minimum, provide detection (either smoke or heat, or monitoring of sprinkler systems), manual stations, and notification as required by the currently adopted building code.
 - D. In general, if the facility is equipped with area-wide automatic detection, duct detection may not be required by code. The Authority Having Jurisdiction may

require duct smoke detection installed in supply air streams or return air streams not required by applicable codes. The intent is to install duct detection only for a specific risk and not for general detection purposes.

- a. In general, UAF wants to balance the requirements of code and property preservation. Where code does not require detection beyond duct detectors, UAF may elect to install room- or hazard-specific detection or area-wide detection. If a building is equipped with fire sprinklers, the requirement for area-wide detection is more easily waived.
- E. No duct detection in the exhaust air stream (i.e. fume hoods) unless specifically required by the Authority Having Jurisdiction.
- F. Thermal detection may be used in laboratories instead of smoke detection, especially when the laboratory will generate fumes, dust, etc. that may cause nuisance alarms. Dual technology detection is recommended for most research and teaching labs and support spaces.
- G. Monitor sprinklers, including all zone flow and tamper alarms and the exterior water flow bell.
 1. Monitor all switches, alarm or supervisory, separately by zone modules or intelligent interface devices, not paralleled or daisy chained. Use individual monitoring modules to monitor each device.
 2. Two switches may be monitored on dual-input devices such as HTRI-2D.
 3. Exterior water flow bell will be controlled by the fire alarm control panel via the aforementioned main flow switch.
- H. Fan shutdown bypass logic will be available to firefighters to restart fans during an alarm.
- I. The Building Automation System, Direct Digital Controls, will have a connection to the Fire Alarm system only for purposes of restart and outside air damper control. Exceptions to this may be approved processes where both the BAS and Fire Alarm system are fully integrated and listed for the process.
- J. Fan shut down: TRI Interface Module wired to a set of contacts that will disconnect the power at a motor starter or VFD. Per Siemens, inductive current should not be an issue if shielded conductors are used.
- K. Coordinate requirements for elevator recall, machine room and hoist initiation devices, and shunt trip control with Division 14 and Division 23 as well as applicable

NFPA 13, NFPA 72, and ASME requirements.

- L. LPG shut down: TRI Interface Module wired to a set of contacts that will close an automatic valve (by Division 23).

1.05 Function matrix: See sample below:

DESIGO FCP	Power On (Green LED)	Alarm Silenced (Red LED)	Audible (Yellow LED)	Supervisory (Yellow LED)	Trouble (Yellow LED)	Security (Yellow LED)	Panel LCD Display
Normal Standby	X						X
Any One Heat / Smoke Detector Alarm			X		X		X
Any Two Heat/Smoke Detector Alarm- Same Unit			X		X		X
Any Heat/Smoke Detect Or Alarm in Any Two Separate Units			X		X		X
Manual Station alarm			X		X		X
Silence Switch		X			X		
Trouble AI (Grounded or Open Circuit, Power or System)					X		

1.06 Proprietary / protected premises systems monitoring:

- A. All UAF fire alarm systems shall provide full Protected Premises notification to facility occupants, and shall be Proprietary Systems with automatic reporting to a supervising station (UAF Emergency Communications Center) unless specified otherwise.
- B. Non-Troth Yeddha’ campus facility systems will report to a specified public safety agency that has facilities that qualify as a listed Central station Service under NFPA 72. Where no qualified facilities or services exist, the fire alarm system shall report to the UAF Emergency Communications Center.
- C. Select system equipment to interface directly to the monitoring agency receiver equipment without modification.

- D. Include additional receiver equipment (hardware or software) required to expand the UAF Emergency Communications Center to monitor the new project facility as part of the project planning, and supply the project.
 - 1. Standard operating procedure on campus is to keep one open position available as a full-time spare.
 - 2. Determine installation, whether by contractor or by UAF personnel, in the design stage of the project.
- 1.07 Locate remote control consoles near main entrances for each building. However, firefighter access, weather protection, and informative display are all factors affecting UAF's determination of the final locations. Environmental suitability of the installation area is essential, including temperature degradation during extended electrical power interruption.
- 1.08 Signaling:
 - A. Operate all on-campus fire alarm systems in the "General Evacuation" mode when signaling, unless otherwise required by code. Indication shall be by the temporal sound unless otherwise specified by the AHJ. This eliminates the need for "Zone Coded" or "Voice Evac" signaling systems.
 - 1. Certain residential and high-rise facilities, as defined by the building code, shall utilize a voice evacuation system when required by code. When a voice evacuation system is used, the alarm tone shall be governed by NFPA and the voice message shall be approved by the AHJ.
 - 3. Provide mass notification system compliance if applicable and in accordance with current building code requirements.
 - B. Exterior horns: Equip all facilities on campus with an exterior audible/visual notification appliance located on the "street" or "front" or "public entrance" side of the building to warn away potential building visitors:
 - 1. Have the appliance sealed onto its mounting box, with a thermal/vapor seal within the conduit to prevent condensation from the building's conduit system, and a weep hole on the outside lowest point of the enclosure.
 - 2. Have the box mounted sufficiently off-plumb that any accumulating water will run to the weep hole.
 - C. Since stairwells are constructed of non-combustible material, sounds are not

absorbed by the construction. Audible devices will create an uncomfortable environment with acute effects on the evacuees. Install visual alarms in stairwells only as required by code.

- 1.09 Water gongs: All on-campus facilities equipped with water-flow fire protection systems will be equipped with a 120-volt alarm bell on the building exterior, located near the Fire Department Connection that sounds when water is flowing, stops sounding when water flow ceases, and is non-silenceable while sounding. If controlled by the same flow switch as the fire alarm water flow input, the exterior bell will use a separate set of switch contacts. Provide a dedicated power circuit for all 120-volt alarm bells.
- 1.10 HVAC bypass programming: Fan shutdown bypassing: Toggle-type logic function, such that fans may be restarted (and subsequently re-stopped) even with the system still in alarm.
- A. Bypasses are NOT automatically reset at midnight.
 - B. Troubles do NOT self-restore.
 - C. Troubles are NOT resounded/reminded after 24 hours.
 - D. No in-panel history, or a circular history with log full trouble suppressed.
 - E. Maximum delay reporting AC fail/brownout.
 - F. Supervisory inputs (tamper, etc.) are to be programmed Troubles.
 - G. Program all un-used inputs to TRIs/ICPs as Troubles, versus Alarms or Status Points.
- 1.11 Fire Alarm Control Panels: All major buildings will use a fully configurable, fully addressable system with descriptive event recording/readout configured for full interface with Siemens Network Command Center (NCC) in the University Emergency Communications Center (UDC). Provide interconnection modules, including the Desigo panel's fiber transmitter interface, and the NCC fiber assembly (at both the FACP and the NCC).

Major buildings are defined as those buildings requiring more than 50 fire alarm devices, buildings where code requires it to have building-wide fire suppression systems coupled with manual fire alarm boxes, or buildings over 25,000 square feet of assignable space.

- A. The interface to the University Emergency Communications Center will conform fully with all the features of NCC as defined in the Siemens NCC Installation and Operation documents:
 - 1. Include all acknowledging, silencing, unsilencing, disarming, rearming, output activation, output deactivation, and resetting, and time

synchronization.

2. Allow display of all signals generated by the facility's Fire Alarm Control Panel. Include building graphics for upload to the NCC when utilizing the Desigo system.

1.12 Small systems(non-major buildings):

- A. Small-facility projects not requiring fully configurable/fully addressable fire alarm systems may take advantage of emerging other technologies and sources, so long as they communicate adequately with the Silent Knight 9000 Receiver/9032 Line Card using BFSK 2/3 dialer format. Examples are the Silent Knight 5128 and 5104 Digital Communicator.
- B. Small systems without descriptive event readout will be broken out into zones that logically follow the facility's construction, and provide meaningful location information for responders.
 - A. In a facility with area-wide smoke detection, arrange zones such that smoke detectors may be deactivated en masse (by floor or other defined area) without compromising manual station and other automatic detection.
 - B. Buildings not requiring a manual fire alarm system as prescribed by the building code, where the University is requesting a system for property conservation or early notification of a fire in a remote location, designed to a small system configuration with code minimum initiation and indication devices.

PART 2 - PRODUCTS

2.01 Approved brands:

- C. Fully Configurable and Addressable Systems: Siemens Fire Alarm Control and Annunciator Systems, Desigo Fire Safety System (formerly XLS Firefinder) model. No alternate brands, No substitutions allowed. Use only the most current revisions of hardware and software.
- D. Non-Addressable, Manual Fire Alarm: Siemens Fire Alarm Control Systems, Autocall, Simplex, or other manufacturer as approved by UAF and capable of communications protocol to the receiver system in the UAF Emergency Communications Center.
 - a. Approval of an alternate brand shall be contingent on the manufacturer having a record of sales and installation in Alaska and at least one Alaska-based value-added representative (VAR) who can provide service to UAF

within 24 hours of a request.

- b. Obtain approval from these entities prior to proceeding with an alternate brand: UAF Authority Having Jurisdiction, FS Maintenance Director, FS DDC Director.

2.02 Graphic Annunciators shall not be used unless specifically requested by the UAF Fire Department and allowable within the project budget. UAF Fire Department prefers the use of Siemens Remote Control Consoles placed near the building entrance. If required, utilize a Siemens graphic annunciator: Submit display graphics and model number (size) for review and approval prior to ordering.

2.03 Acceptable manufacturers:

- A. Audible/Visual: Wheelock Series NS, Siemens, alternate brand request required.
- B. Manual Pull Stations: Wheelock, Siemens, alternate brand request required.
- C. Lexan Covers: Safety Technology International, alternate brand request required.
- D. Detection: Siemens for fully addressable systems, alternate brand request required. For non-addressable systems or manual fire alarm systems, utilize detection devices provided by the fire alarm control panel manufactures.

2.04 Any design requiring interconnection not covered in the manufacturer's instructions shall be shown in the planning drawings for review and approval and included in O&Ms.

- A. Possible interconnections to the fire alarm system include the Division 25 Building Automation System, Fire/Smoke damper control/testing system, Division 28 Security Access.

2.05 O&M shall include a product data, programming data, complete program listing in hard copy for all systems relying on programming for proper operation. O&M Manuals for fire alarm systems with descriptive event readout/recording shall also include a Word file on non -volatile electronic media.

PART 3 - EXECUTION

3.01 Audible bases: Where sleeping rooms are equipped with audible bases under the smoke detectors, arrange the audibles power circuit so that only the affected detector's base will sound in response to that detector's alarm condition until the next alarm logic state is reached, (i.e. adjacent room or a general area alarm device); general area audibles or strobes shall not annunciate when only a single room smoke detector is in alarm.

3.02 Power sources:

- A. Door Magnetic Door Holder power: Obtain operating power from, or interlock through, the primary power source for the FACP such that if the primary power is lost, the Magnetic Door Holder de-energize without requiring a functional operation by the fire alarm system.
- B. Fire/smoke damper hold-open power: Obtain operating power from, or interlock through, the primary power source for the FACP. Initiation of a general alarm will cause the dampers to lose power and fail shut. Power loss to the dampers without an alarm to also shutdown the Central Supply Fans not allowed. A fire/smoke damper control system such as the Ruskin Inspector system may be specified.

3.03 Box and conduit fill, zone counts, power supply and loop loading not to exceed 80% of maximum to allow for growth.

3.04 Megger installed wiring prior to landing on devices or modules with device-location splice points temporarily made-up to test the entire loop. Provide megger report to UAF.

3.05 Testing may include acceptance testing for certification upon commissioning; acceptance testing by UAF; any partial tests deemed necessary by contractor/supplier or by UAF. The contractor/supplier shall perform a 100% test of the system in its completed form prior to, and separate from, acceptance testing by UAF. Comply with AHJ fire alarm testing requirements as set-forth in permit issued by AHJ.

3.06 Sample program list:

- A. For those fire alarm systems made operable through programming by the contractor/supplier, submit a “first cut” or better (not planning notes) sample of the program listing, as complete as possible at the time of the submittal, for review and approval.
 - 1. As a minimum, include samples from every data and comment field in the program and a thorough cross sectional cut of device custom messages to allow UAF to approve or customize wording in time to have it appear in the final program version.
 - 2. When the program is not submitted for review prior to construction, any changes required by UAF will be accomplished at the contractor’s expense before the system is accepted by UAF. (See below for the Campus standard for Custom Messages).
- B. Submitted custom message (Zeus Point) listings may be in the condensed two-line-

per-device format, but O&M deliveries shall be in the older, 4- (or more) lines per device layout, to stay consistent with our other Campus systems. These listings will be posted in each FACP for use by responders of varying levels of training in their interpretation.

3.07 Wiring:

A. New Building Installations that will use the Siemens Desigo Fire Safety System (formerly XLS Fire Finder) Panel shall use the following wire types and wire sizes as a minimum requirement:

1. Signaling Line Circuits – 16Gauge Twisted Pair, T-Tapping is allowed on Signaling Line Circuits in a Class B Wiring format.
2. Notification Appliance Circuits – 14gauge UL Approved Single Conductor or 14gauge Twisted Pair FPLR, T-Tapping is not allowed in any format
3. Network H-net, X-net, Can Bus – 16gauge Twisted Pair T-tapping is not allowed

B. For Retrofits of an existing Siemens MXL or for additions to an existing Siemens MXL Panel the following wire types and wire sizes are as a minimum requirement (NOTE: MXL is no longer supported by Siemens as of the date of this standard)

1. Signaling Line Circuits – 16Gauge Twisted Shielded Pair, T-Tapping is allowed on Signaling Line Circuits in a Class B Wiring format.
2. Notification Appliance Circuits – 14gauge UL Approved Single Conductor or 14gauge Twisted Pair FPLR, T-Tapping is not Allowed in any format
3. Network M-net – 16gauge Twisted Shielded Pair T-Tapping is not allowed

3.08 Wet areas: Protect installations within 6 feet of any sprinkler valve or fitting in liquid-tight conduit and NEMA 4 enclosures.

3.09 Wire colors:

- A. For signal circuit pairs, the lighter of the two colors will be for the more POSITIVE polarity conductor, and the darker for the NEGATIVE (red is positive, black is negative).
- B. In polarity reversal circuits, the color scheme will reflect the ALARM or ACTIVATED state polarity, with the “normal supervision” or “standby” state opposite to the color code.

- 3.10 Class A and B wiring: Generally, UAF does not require Class A wiring for Initiating, Notification, or Signaling Line circuits. However, when Class A wiring is specified, pipe and run so that the path through the field is a loop, with the outbound and returning legs in separate conduit except for the short runs entering the FACP and field device enclosures on the enclosure’s mounting wall.
- 3.11 Program front panel function keys according to the following guidelines:
- A. F1: Audibles bypass.
 - B. F2: Fan shutdown/damper bypass—on a toggle so responding fire fighters can start/stop fans as needed for smoke control, even during alarm.
 - C. F3: Door release bypass—also on a toggle.
 - D. F4: Elevator recall bypass (shunt trips do not get bypassed).
 - E. ALT1 / F1. Waterflow switch bypass—on a toggle so it may be un-bypassed without resetting panel. (Tamper Switches do not get bypassed).
- 3.12 There will be not be a function key for unlocking magnetic held closed rear doors
- 3.13 Device custom messages shall conform to the following general format, using a maximum of 32 character spaces. Messages shall be approved through the Submittal process prior to final programming:
- A. For initiating devices:
 - 1. Message format: (device type)(device #.)(room/area)(application)(bldg name). Building name may be dropped for Desigo (formerly XLS) panels upon approved by the UAF Fire Department and UAF Facilities Services
 - 2. Examples:
 - a. FPT01-18 149 LAB HEAT DUCK.
 - b. ILI02-07 100M1 MENS SMOKE DUCK.
 - c. TRI03-01 CHEM BUNK (XX) DUCK (XX=pull/heat-specify).
 - d. TRI03-02 CHEM BUNK (XX) DUCK (XX=pull/heat-specify).
 - e. FPT03-13 100E2 ELEVPITHEAT BRKS.

- f. MSI03-16 100C13 NWHALLPULL BRKS.
- g. FPI04-10 100U1DUCSMOKE(XXX)BRKS (xxx=RF-X(RETURN FAN-X),SF-X(SUPPLY FAN X),OR AH-X(MIXED AIR HANDLER-X)AND SPECIFY THE NUMBER (-X)).
- h. TRI04-11 100U1TESTDUCT04-10BRKS.
- i. TRI05-19 GRG131TAMPR FLR-X BUNL (SPECIFY FLOOR (-X)).
- j. TRI05-22 GRG131SPRNK FLR-X BUNL (SPECIFY FLOOR (-X)).
- k. ILI06-07 243A LAB SMOKE BUNL.
- l. ILI19-06 200U6DUCSMOKE(XXX)BUNL (xxx=RF-X(RETURN FAN-X),SF-X(SUPPLY FAN-X),OR AH-X(MIXED AIR HANDLER-X)AND SPECIFY THE NUMBER (-X)).
- m. ILI19-10 200U6DUCSMOKEAHU-1BUNL.
- n. TRI21-01 200V1PROPANESHUTOFFART.
- o. TRI23-01 200U6AHU-3SHUTDOWNART.

B. For notification appliances/other modules:

1. Message format :(module type)(module #)(NAC circuit/loop/enclosure number)(area served)(usage)(bldg name).
2. Examples:
 - a. MMB253-4NACcktl lvl1So.sgnl LIB.
 - b. CSM4 21-2NACcktDlvl4Ea.sgnl LIB.
 - c. PSR-1 02 AudPwrTRBL relay WOODC.
 - d. MKB-1 251 MXL KEYPAD ARCHLTH.
 - e. MKB-1 250RCC-1No.EntrKPDARCHLTH.
 - f. CMI-300 NCC LINK ARCHLTH.
 - g. ALD-2I3&4 flrs1,2EASTZNSARCHLTH.

h. MOI1-7 North Ent Annun BUNL.

- 3.14 Pseudo-messages shall be descriptive, and end in a building name abbreviation common to other messages in the CSGM.
- 3.15 Do not install smoke detectors while substantial carpentry/masonry or other dust-generating efforts are not yet completed. Detectors installed in a dusty environment without protection will be considered “used” and will be replaced by the contractor with new parts at no cost to Owner.
- 3.16 Splices:
- A. Any splicing or distribution joins in or at the FACP or at riser nodes will be made on terminal strips in an appropriate enclosure.
 - B. In high-wall room applications, provide a distribution/isolation splice (wire-nuts in a pull-box) at a convenient height for any ceiling or near-ceiling mounted devices.
- 3.17 Boxes and covers:
- A. All boxes will be covered.
 - B. Install TRIs into the box specified on Siemens’ installation sheet, and apply the specified cover.
 - C. In Sprinkler Flow Switch enclosures, where 120VAC for the Water Gong is shared under the same switch cover as the TRI detection wiring use a separate entrance fitting and conduit (liquid-tight) for the high voltage.
- 3.18 Securely mount devices, appliances and module enclosures to the building or other substantial structure.
- A. Mounting to removable ceiling panels, wall finishes, sheetrock, or other insubstantial building components without code-approved hardware, hangers, and braces is not allowed.
 - B. Box extension rings used to adjust mounting height off the wall are limited to a single above-the-finish extension. If more clearance is required and a commercially provided support is not available, fabricate a welded, paint-finished steel bracket, and secure to building structure.
 - C. Stacking boxes to mount devices not allowed except as stated elsewhere in this document.

- D. Mark end of lines: Inconspicuously mark ceilings and wall boxes on visible surface trim to indicate EOL presence, using labels as prescribed in Division 26 of the UAF Campus Design Standards.

END OF SECTION

PART 1 - GENERAL

- 1.01 Waste disposal plan - Consultant determines type and amount of material for project wasting. FS/DDC coordinates with FS Operations for site; with UAF Police and Fire for truck routing. No contaminated material or construction debris may be wasted on campus. Consultant is to include in specifications requirements for final grading and compaction of site.
- 1.02 Avoid retaining walls where practical.
- 1.03 Structural backfill materials - minimum depths, adjust per soils engineer report:
 - A. Under paved streets - 18 inches of structural fill, 6 inches of crushed aggregate base course D-1.
 - B. Under parking lots – 18-24 inches of structural fill, 4 inches of crushed aggregate base course D-1.
 - C. Under independent concrete or asphalt walkways – 18-24 inches of structural fill.
 - D. Under walks immediately adjacent to streets or parking lots - 18 inches of structural fill, or per Geotechnical recommendations.
 - E. Use geotextiles to separate structural backfill from silt loess subgrade.
- 1.04 FS/DDC to determine if testing to be directly contracted by FS/DDC or required of the Contractor.
- 1.05 Consultant shall include an Erosion and Sediment Control specification in all projects regardless of its size to ensure contractors abide by the general Alaska Pollutant Discharge Elimination System (APDES) permit. If required by the APDES permit, the specification will require at least an Notice of Intent (NOI) and possibly a full Storm Water Pollution Prevention Plan (SWPPP) be submitted to the Alaska DEC. It will be the contractor's responsibility to pay for the permit application. UAF is required to be listed as a cooperator under the permit application and will submit a separate NOI after the contractor.
- 1.06 On all projects, require in the specifications that the contractor shall clean up any sediment that escapes this site and fixes areas that had rivulets or gullies created from erosion due to the project. UAF will require site cleanup and adequate seed germination or continuation of BMP measures regardless of the issuance of a Notice of Termination (NOT) from the Alaska DEC.

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION

- 3.01 Strip site area topsoil and stockpile in the designated area for site preparation.
- 3.02 Trucks & equipment on designated roads only. Require dust control and clean up on any campus road that the contractor utilizes.
- 3.03 Mechanical compaction is required in all fill areas around buildings and in trenches. Obtain optimum compaction in all soils.
- 3.04 Specify that cleated track vehicles are not allowed on campus paved roads without protection. Prior approval of FS/DDC required.

END OF SECTION

PART 1 - GENERAL

1.01 Summary:

- A. Exterior improvements are governed by the campus master plan and may require
- B. All roadways per the American Association of State Highway and Transportation Officials, (AASHTO) Standards for local roads.
- C. Roadway and parking lot signs per the Manual of Uniform Traffic Control Devices, Federal Highway Administration with Alaska Supplement. Colors of post and street name signs selected by UAF.
- D. Consultant shall provide standard DOT/AASHTO details for approval by Facilities Services for the following.
 - 1. Standard roadway and driveway geometrics.
 - 2. Standard details: Pre-cast concrete structures.
 - 3. Standard storm drain details.

1.02 Systems descriptions and requirements:

- A. General environmental conditions and requirements:
 - 1. Ambient temperatures extremes can range from -65 deg. F to +97 deg. F over the course of the year. Design exterior systems: caulking, moisture protection, asphalt, etc, to accommodate expansion/contraction and thermal stresses brought about by the extreme temperature range in Fairbanks. Use only proven methods and materials.
 - 2. Take particular care in areas with southern, eastern, and western exposures. Structures with these exposures will be subjected to daily freeze-thaw cycles during the full period of the spring thaw. Northern exposures tend to thaw last and freeze first: design to avoid icing.
- B. Vehicle access and circulation:
 - 1. Minimum traveled lane width for multilane roads- centerline to lane stripe or face of curb, 12 feet for streets. For single lane roads and driveways, traveled lane shall be a minimum of 20 feet from edge to edge of road.

2. Provide curb and gutter on most roadways and a minimum of a 2 foot wide paved shoulder beyond the travel lane.
 3. Minimum turn radius - AASHTO BUS 40.
 4. Grade in the direction of travel: maximum of 5%. Grade transverse to the direction of travel: a minimum of 2% and maximum of 4%. One-way streets or driveways may exceed these limits.
 5. Design roadway and parking lot structures sufficient to support an AASHTO HS20 or H20 design vehicle at all times of the year.
 6. Vehicle circulation paths and parking: include fire department and emergency vehicle access, maintenance vehicle parking areas, ADA-required accessible routes, ADA-required accessible parking areas, delivery and private vendor access, and user access and parking. All designs shall be compatible with the UAF Master Plan for Circulation and Parking.
 7. Automobile head-bolt heater outlets (HBO): Provide for all long-term parking spaces. Vehicle HBO Cords shall not cross walkways, drives or adjacent parking to reach the outlet. Refer to Division 26.
 8. Design parking lots for forward (straight) snow removal and drainage. Avoid acute corners, raised curb end islands, or peninsulas/planters at the end of parking lot.
 9. Where practical, design in a widened shoulder or separated path for bicycle access and circulation.
 10. Provide bollards or other physical barriers to protect buildings, tanks, and other structures from vehicle damage. Design bollards at garage doors to be 6 inches narrower than the garage opening.
- C. Pedestrian access and circulation:
1. Sidewalks: Minimum width: 6 feet. Preferred width: 8 feet. Separate roadway and sidewalk when practicable by 6 to 10 feet to allow for plantings. Minimum of 6 inch thickness. Concrete and reinforcing per Design Standard Section 32 10 00.
 2. Ski Trails and Bike Paths: Minimum width: 6 feet, 10 feet for skate-ski trails. Asphalt for Bike Paths, consult with UAF FS for current ski trail covering.
 3. Provide a 1 foot minimum clearance each side of the walkway to vertical

obstructions such as buildings, trees, light poles, etc.

4. Canopies/roofs: Where feasible, provide at exterior stairs and landings, ramps, and at the landings of building entrances and exits to prevent rain and the accumulation of snow and rain on these structures per applicable codes and OSHA regulations. Direct canopies/roofs runoff away from sidewalks or other pedestrian pathways. Provide minimum 15-foot x 15-foot area immediately adjacent to the protected area for equipment turn around. No snow or rain drainage is allowed on pedestrian walkways or parking spaces.
5. Provide handrails and guardrails on exterior stairwells and walkways as required by applicable codes and OSHA regulations.
6. Design walkways, hard landscaping, and adjacent facilities for UAF Facilities Services snow removal operations, snow storage areas, snow throw directions, maneuvering areas for snow removal equipment, and occasional use by maintenance and emergency vehicles.
7. Design pedestrian access and circulation such that snow melt will shed to a ditch, storm drain system, or curb and gutter system. Do not place paths in locations that will accumulate ice from dripping snowmelt from building exteriors, or adjacent landscaped areas.
8. Maximum Slopes: Where practicable, design to less than allowed in ADA/IBC to ensure constructability. 4.5% on ramps without handrail, 7.5% ramp slope with handrails, 1.8% cross slope. Deviations from these tolerances or the code required slopes must be approved by UAF.
9. Use tactile warnings all ramps used for intersections or ramp access. The basis of design is a yellow, cast-iron tactile warning device.
10. Snowmelt systems may only be used if proper drainage can be provided to avoid icing at the demarcation point between the heat and non-heated slab and must be approved by FS/DDC.

D. Drainage:

1. Do not connect year-round water flow sources to the storm drainage systems.
2. Size drainage structures for a 50-year design storm for the location of the project.

3. Site drainage: Design to prevent water flow and snow runoff from crossing over pedestrian paths.
4. Channel drainage in surface structures to the greatest extent possible - ditches, swales, etc. Structure side slopes: Preferred Maximum 4:1 but in no case greater than 3:1.
5. Avoid retaining walls when practical.
6. Grade exterior stair risers to positively drain water to the side unless they have an open structure such as grating. For open type risers, grade under the stairs to control drainage to a safe area and the ultimate point of departure. Install curbing or other features to provide positive prevention of drainage flowing onto the stairway from exterior sources.
7. Design for positive drainage away from all surface structures that are not intended to receive drainage such as building foundations, manholes, cleanouts, fire hydrants, valve boxes, light poles, junction boxes, conduit, etc.
8. Drainage paths and structures: Include entry and departure points and anticipated magnitudes of flow. Include locations of drainage discharge from the building to the site - including normal and overflow roof drains, foundation drains, and dry wells.
9. Drainage from roof drains shall be directed to an appropriately sized new or existing storm water system. Dry wells for the total roof drain flow are not allowed; consideration may be given for drywells or infiltration systems to receive incidental winter snow melt flow. Locate and design dry wells or infiltration systems to preclude ground saturation within the building foundation structural prism. Drywells shall have a vent and bypass with outfall onto a concrete or stone spillway, graded away from the structure. Infiltrator type drywells are preferred to reduce contamination from impermeable materials
10. Design all storm water systems to meet EPA and State of Alaska DEC criteria for the most current APDES Permit applicable to the Fairbanks Urbanized Area.
11. Install heat trace on the drainage pipe from a building out to the first storm drain manhole. Electrical heat trace is distance is under 35 feet, hydronic heat trace beyond 35 feet. Refer to Division 23 for control of heat trace.

- E. Consider snow removal procedures, maneuvering requirements, and storage for walkways, roads, drives, and parking lots:
1. Roadways and parking areas: Provide snow storage areas readily accessible to, and within 1000 feet of, the area from which snow is removed.
 2. Provide snow storage areas adjacent to walkways.
 3. Design snow storage area capacity for 2.3 cubic feet of packed snow for every 1 square foot of area from which snow is removed.
 4. Locate snow storage areas to protect structures, roadways, parking lots or walkways from spring snow melt.
 5. Provide adequate maneuvering space for snow removal equipment. Roads and lots are cleared with road graders and front end loaders. Walkways are cleared with motorized brush maintenance vehicles.
 6. Provide ramps or drives to all areas requiring snow removal, configure for access by snow removal equipment.
 7. Do not locate permanent bicycle racks, benches, and other fixed site equipment in areas of mechanized snow removal. Place light poles, raised manholes, transformers, and other similar structures at least 9 feet away from the roadway edge of pavement or face of curb and at least 6 feet away from the edge of sidewalks or walkways.
 8. Designate snow storage areas, and design roadways and parking lots to allow efficient removal of snow to those areas without damage to roadway or lot equipment or structures. Construct inside curb curves in street-side parking alcoves with a minimum 20-foot radius to the face of curb. In parking lots do not use curbs, bumper blocks, peninsulas, or similar structures that inhibit the straight push of snow to the storage area. Avoid 'hammerhead' or 'barbell' ends in parking lots.
 9. Design parking lots to allow efficient snow removal and to provide ADA-compliant access to engine heater receptacles. Provide barriers to physically protect headbolt heater outlet posts, area lighting standards, and other electrical equipment from vehicles and snow removal operations. Plan barriers for year-round ADA-compliant access to headbolt heater receptacles.
- F. Locate buried utility with adequate operational and maintenance access and such

that future excavation, using OSHA trench safety requirements, will not undermine permanent structures, require removal of substantial trees, or unduly block vehicle or pedestrian access. Design the utilities systems to resist the seasonal structural and thermal forces, i.e. frost jacking, shading, lack of snow cover, traffic loading, etc. Locate and dimension surface facilities to accommodate anticipated snow depths.

- G. Design refuse handling storage and disposal (dumpsters) to minimize visual exposure to students and the public, and for safe and efficient access by custodians and refuse trucks.
 - 1. Locate dumpsters to minimize dumpster/pedestrian conflict. In no case may dumpsters be closer to a building than code allows. Locate dumpsters within 75-feet of buildings when this can be accomplished without forcing pedestrian traffic next to dumpsters.
 - 2. The refuse truck maneuvering space requirements approximate those of an AASHTO SU design vehicle.
 - 3. Configure the path of refuse delivery to allow efficient snow removal and traction sand application with normal walkway snow removal motorized brush equipment. Where possible, cover path to prevent snow accumulation.
 - 4. Provide a minimum 10 foot wide maintenance access around and adjacent to the entire perimeter of the dumpster. Maximum grade 5%.

PART 2 - PRODUCTS

2.01 Site Furnishings, UAF standards: (confirm current model numbers with FS Operations.)

- A. Bicycle racks. Brandier International, Inc. - "Ribbon Rack No. RB11", other manufactures identified by the consultant.
- B. Trash can, 45 gallons, Rubbermaid #8442, "Ranger", beige with walnut panels, with rigid liner, Rubbermaid #3567, walnut/beige, other manufactures identified by the consultant.
- C. Benches. Brandier International, Inc. - "TF 2140-8" and "2028-8", other manufactures identified by the consultant.
- D. Bollards: HDPE sleeves with reflective tape over concrete-filled steel pipe.

PART 3 – EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Asphalt cement pavement surfaces for roadways, drives, parking areas, and bike paths.
- 1.02 Portland Cement concrete for sidewalks, plazas, gutters, and curbs.
- 1.03 Review design of curbs and gutters to reduce their size, profile, and extents in order to reduce damage during snow removal.
- 1.04 Provide for expansion joints, control joints, and construction joints in the contract drawings.
- 1.05 Design ADAAG compliant pedestrian pathways to allow for construction tolerances. Refer to Design Standard 32 05 00 for additional informations.

PART 2 - PRODUCTS

- 2.01 Ceramic or quarry tile not acceptable for exterior walkway use.
- 2.02 Concrete paving: Minimum 4,000 psi compressive strength with minimum 60ksi strength #3 bar at 12 inch on center both ways or WWF4x4 W2.1 x 2.1, 4 to 7 percent entrained air, and fiber mesh to control cracking. Stiff broom finish. Refer to Division 03 for additional concrete requirements.
- 2.03 2 inch minimum thickness of asphalt cement pavement meeting DOT specifications
- 2.04 When specifying expansion joints, utilize an approved outdoor urethane caulking or hot-applied asphaltic caulking over a bitumen expansion board. Specify the zip cap is removed prior to caulking.

PART 3 – EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Space trees and shrubs far enough away from buildings, sidewalks, roads, and other trees and shrubs to accommodate future growth, building maintenance, and snow removal. Anticipate ultimate drip perimeter and root expansion area for trees. Do not install planting beds in contact with the exterior wall.
- 1.02 Preserve existing trees: UAF Facilities Service will verify health of existing trees.
- 1.03 Grass planted slopes: 2:1 maximum grade for lawn care equipment operation in grassed areas. In no case shall the grade for maintained grassed areas exceed 4:1.
- 1.04 Mowing strips: Require concrete mow strips around buildings and retaining walls, 24" wide preferred. Wood, stone, or concrete are allowed for planting beds and trees. Avoid sharp inside corners. Informal lines and gentle curves provide easier maintenance. Inset flush with finish grade.
- 1.05 Grass/vegetation islands or separation strips: minimum width 12 feet. Non-vegetative coverings for islands or separation strips less than 12 feet wide.
- 1.06 Minimum exterior grades for drainage: Refer to 32 05 00 Exterior Improvements
- 1.07 Hose bibb: Frost-proof vacuum breaker irrigation type on building exteriors spaced maximum of 150 feet apart. Use water main pressure. 1-inch diameter minimum pipe.
- 1.08 Refer to UAF Campus Master Plan where applicable.
- 1.09 All new buildings shall receive landscaping. All landscape plans shall be approved by the UAF Landscape Master Planning Committee. UAF FS Grounds may be used to design and install landscaping for new buildings.
- 1.10 Call out for contractor to perform all grading and installation of sub base material. At its option, FS/Operations may complete topsoil and seeding after construction is complete unless otherwise directed by FS/DDC Project Manager. If a SWPPP is required for the project, the contractor shall seed the project per this design standard.
- 1.11 For all seeding, UAF requires a hydroseeding method with a tackifier as needed for slopes over 2:1.

PART 2 - PRODUCTS

2.01 CERTIFIED ALASKA SEED MIX

- A. Turf area to be mowed and maintained:
 - 1. 50% Bluegrass, 25% Red Fescue, 25% Annual Rye
 - 2. Fertilizer should be 17-17-17 or any ratio in the mid-teens to 20, as long as all three are the same.
- B. Non-maintainable areas (ditches and hill sides)
 - 1. 75% Brome, 25% Annual Rye
 - 2. Fertilizer should be 17-17-17 or any ratio in the mid-teens to 20, as long as all three are the same.

PART 3 - EXECUTION

- 3.01 Cobble/Bull rock: Sterilized soil and continuous black 10-mil polyethylene sheet or non-permeable geotextile beneath rock. Rock shall only be used for storm drainage applications routed away from pedestrian access areas. In no circumstances will rock be used for landscaping.
- 3.02 Mulch material: Use water-permeable weed block landscape fabric beneath mulch.
- 3.03 Top soil: Minimum of 6 inch compacted thickness for grass, additional thickness for planting beds, shrubs, trees, etc.

END OF SECTION

PART 1 - GENERAL

- 1.01 Adhere to local jurisdiction requirements and standards in addition to this standard. In some locations, the local water supply utility has required design standards that exceed the UAF design standards.
- 1.02 Consider continuity straps and anti-corrosion systems to control electrolysis in existing soil conditions. HDPE piping is preferred for direct-bury systems.
- 1.03 Place fire hydrants within the UAF utilidor system and avoid direct buried hydrants. If the hydrant must be direct buried, place gravel drains enveloped by geomembrane separation fabric for fire hydrants on direct buried waterlines and provide means to circulate the water to prevent freeze-up. Place a control valve in the utilidor. No Post Indicator Valves.
- 1.04 2-inch minimum size circulation line for fire hydrants on direct buried water lines. Monitor the circulation water pump status (on/off) via the campus building management system.
- 1.05 UAF Facilities Services and Consultant shall obtain necessary construction permits from ADEC before construction.
- 1.06 The water service entrance components should be placed in a warm, accessible location, preferably a building mechanical room.
- 1.07 Require the system installer to submit certification that all materials meet the Alaska DEC regulatory requirements. All systems shall be lead-free.

PART 2 - PRODUCTS

- 2.01 Ductile iron pipe with cement-mortar lining or HDPE pipe for direct buried site water systems. Only Ductile Iron with cement mortar lining is allowed inside the utilidor. Refer to Division 22. Grooved joints are allowed in the utilidor system only. Piping shall be certified for domestic water use.
- 2.02 Provide products for post-installation joint flexibility where thrust-restraining glands are installed: EBAA Iron, Inc. MegaLug, or Alternate Brand or Substitution Request required. Install in valve box.
- 2.03 Use dry barrel, self-draining fire hydrants: Mueller Super Centurion 250 A-423 or Waterous Pacer WB-67-250 with two (2) ports threaded to 2.5-inch fire hose thread and one (1) 5.25"-inch National Standard Pumper Hose. No Alternate brands; No Substitutions.
- 2.04 Resilient seat, non-rising stem, 2-inch square operating nut, mechanical joint or flange for direct buried valves: Mueller, Waterous, or Alternate Brand or Substitution Request required. Install in the valve box.

- 2.05 Insulate direct buried water systems with a minimum 3-inch-thick layer of spray-on urethane foam insulation, 2-1/2 lb./cu. ft. density. In utilidor, insulate the water line with 2-inch fiberglass insulation in accordance with Division 22 of these design standards.

PART 3 – EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 UAF Facilities Services and Consultant shall obtain necessary construction permits from ADEC prior to and post construction.
- 1.02 Place manholes approximately 200-feet apart to allow for cleaning.
- 1.03 Place a line size but not less than 4-inch diameter exterior cleanout on the waste main within 5-feet of the building.
- 1.04 Where drop-pipes are required due to severe elevation changes, install the drop pipe assembly inside of the manhole with a T-fitting where the main pipe enters the manhole and a 22-degree or 45-degree fitting on the end of the drop pipe, aimed in the direction of flow.
- 1.05 Direct buried waste piping shall be buried a minimum of four feet, six feet in gravelly soils. Insulate direct buried sanitary sewer systems and wrap in polyethylene sheeting or spray on a polyurea coating.

PART 2 - PRODUCTS

- 2.01 Pipe:
 - A. Ductile iron pipe with concrete lining , bell and spigot joints for gravity piping
 - B. HDPE with fused joints and fittings for site and force main sanitary sewer systems.
 - C. Construct drop pipes of the same pipe material but use mechanical joints and additional anchors and supports to support the weight of the drop pipe.
- 2.02 Manholes: Precast concrete construction rings and risers with evenly spaced ladder rungs. Provide insulation on the outside of manholes. Construct beaver slides and chutes in the field with approved grout or concrete and ensure they are smooth and the radius is the same inside diameter as the outlet pipe. Pipe knockouts are to be precast with an approved grout ring and boot. Field knock-outs are only allowed upon approval of FS/DDC and shall be fully grouted. Lids shall be stamped SEWER and be rated for AASHTO H20 loading.
- 2.03 Insulate piping, joints, and manholes with minimum 3-inch-thick layer of spray-on urethane foam, 2 ½ lb/cu. ft. density.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Install exterior cleanout on storm water leader within 5-feet of the building.
- 1.02 Design to the most current EPA/ADEC APDES Permit criteria. UAF Facilities Services shall obtain necessary construction permits from ADEC prior to and post construction.
- 1.03 Provide manholes at a maximum of 200 feet apart. Provide for a minimum of 12-inch to 18-inch of drop, invert to invert, of the inlet to outfall pipes.
- 1.04 All storm drainage outlets must drain to an area that will not flow over vehicle or pedestrian access. Outlet must also have a bar grate to prevent access by pedestrians.
- 1.05 For connections of a roof drain system to a storm drain system, provide heat trace (electronic up to 35 feet, hydronic beyond 35 feet) on buried leaders out to the first manhole or to the transition to 18-inch or larger storm drain piping. Refer to Division 23 and 26 for control of heat trace.
- 1.06 Bury piping a minimum of four feet below grade. Insulate only the heat traced portion of the direct buried storm drain systems with minimum 3-inch-thick layer of spray-on urethane foam insulation, 2-1/2 lb./cu. ft. density.
- 1.07 Provide a steam-thaw piping system in all storm drain systems: a) permanently mounted steam thaw pipe meeting Alaska DOT Standard Specification for Highway Construction or b) 3-inch steam thaw pipe guides install from just under the manhole cover into each culvert pipe entering and leaving the manhole. The latter solution enables UAF FS Maintenance to deploy thaw hose from a steam truck.

PART 2 - PRODUCTS

- 2.01 Minimum 18 inches in diameter culvert for underground drainage. 12 inches may be used in certain situations approved by the UAF FS/DDC Project Manager.
- 2.02 Acceptable pipe materials:
 - A. Spiral corrugated galvanized/aluminized steel pipe with annular end corrugations and gasketed joints.
 - B. Corrugated HDPE pipe with smooth bore liner. Gasketed joints.
 - C. Ductile iron pipe with cement mortar lining. Bell and spigot joints.
- 2.03 Manholes: Precast concrete construction rings and risers with evenly spaced ladder rungs. Provide insulation on outside of manholes only as required by FS/DDC. Allow min. 12-inch of free space between bottom of manhole and invert of inlet/outlet Pipe knockouts are to

be precast with approved grout ring and boot. Field knock-outs are only allowed upon approval of FS/DDC and shall be fully grouted.

- 2.04 Covers and Inlets: Cast Iron covers and lids rated for H2O loading. UAF prefers square box inlets with inlet grates in the curb. Round manhole inlets and preferred for road and parking lot applications. Manhole covers shall be stamped "STORM". In areas of high pedestrian traffic, specific heel-proof inlets.

PART 3 - EXECUTION

- 3.01 Wrap assembled joints on corrugated pipe with double wrap of filter fabric.

END OF SECTION

PART 1 - GENERAL

- 1.01 All steam and condensate shall be installed in a utilidor or utiliduct. No direct bury steam or condensate allowed.
- 1.02 Design piping systems for expansion and contraction. Review locations of expansion joints, anchors, and guides with UAF/FS Utilities during early design phases. Expansion joints should be placed in a location that allows for easy maintenance.
- 1.03 In utilidor runs, install drip legs with ¾ inch valved blow-down ahead of each expansion joint, isolation valve, and pipe bend. Install steam traps close to drip legs. Drip legs (mud legs) are to be line size but no larger than 8 inch.
- 1.04 Traps must have isolation valves and blow down leg and be easily accessible for maintenance. Install strainer on the inlet side of each trap. Install unions on both upstream and downstream side of traps.
- 1.05 Insulate all steam and condensate piping, fittings, valves and appurtenances. Provide blankets on items requiring maintenance such as valves and expansion joints.
- 1.06 Design condensate pipe to positively drain to the UAF Combined Heat and Power Plant (Atkinson Building). When gravity return is not possible, discuss use of a condensate return pump in a centralized location.

PART 2 - PRODUCTS

- 2.01 Isolation valves:
 - A. Over 3 inch: Cast Steel body, bronze mounted (IBBM) flanged, ASME Class 150, rising stem, OS&Y, bolted bonnet, solid wedge disc, and gate valve with Teflon or graphite impregnated fiber packing.
 - B. 3 inch and under: Threaded, ASME Class 300, rising stem, union bonnet, solid wedge disc, gate valve. Bronze body, bonnet, stem and disc. Malleable iron hand wheel. Teflon or graphite impregnated fiber packing.
- 2.02 Packed Slip Expansion Joint: rated at 250psi, 400F, PTFE packing type designed for repacking under pressure, flanged for maintenance, Hyspan, Advanced Thermal Systems, Adscos Mfg. Alternate Brand Request or Substitution Request required.
- 2.03 Schedule 40 carbon steel for steam piping and standard Schedule 80 carbon steel for condensate piping. Use ASTM A53 Grade A Steel.
- 2.04 Traps: float and thermostatic steam traps by Spirax Sarco or TLV, No Alternate Brands, No Substitutions.
- 2.05 Hangers and Supports: to the extent possible, piping shall be mounted on rollers and guides from a floor supported rack.

2.06 Insulation: Refer to Division 22. Ensure blankets use a snap buckle or similar connector that allows for ease of removal and reinstallation.

PART 3 - EXECUTION (*Not Used*)

END OF SECTION

PART 1 - GENERAL

- 1.01 Roof antenna installations must be approved by UAF Campus Master Plan Committee in accordance with the Exterior Building-Mounted Equipment Procedure.
- 1.02 Coordinate with FS/DDC for inventory labeling of installation.
- 1.03 Provide copy of FCC license or a statement of non-requirement.

PART 2 - PRODUCTS (*Not Used*)

PART 3 - EXECUTION

- 3.01 Ensure proper vapor barrier seal of any penetrations associated with the antenna.
- 3.02 Antennas shall not attach directly to the exterior cladding of a building.
- 3.03 Mark off “no go” unsafe areas around the antenna with guardrails and provide warning signage.
- 3.04 Provide information to update the UAF Antenna Inventory to the FS Asset Manager.

END OF SECTION

APPENDIX A: CLASSROOM DESIGN ELEMENTS

UAF has developed standard design details for various classrooms of different sizes and use. The consultant shall use these elements to the fullest extent when designing new or renovated classroom space.

Capacity and Furnishings:

There are six different categories for classroom capacity design. The consultant shall ensure that a good mixture of these sizes is provided based on recommendations from UAF. Classroom size is selected based on several criteria, including programs served, student type (undergrad vs. grad), and anticipated enrollment. For example, an undergraduate core required History 101 class will need a large classroom that can hold more than 200 students. A graduate-level engineering course with only 6 students will require a classroom of much smaller size.

Classroom capacity is also calculated on various metrics, including the current adopted building code and the layout of the furniture and its effects on exiting, ADA access, and other factors. Assignable area per student is normally based on the IBC Occupant Load factors for Group E Classrooms, or Group E Vacation Shops. From the calculation, the occupant load is based on the type of furnishings in the class. Tables and chairs may consume up to 25 square feet per student, whereas a rolling/swivel tablet arm chair (RTAC) (similar to Steelcase Node Chair) may only take up 15 square feet. The fixed seating area will need to be determined by the consultant based on the final furniture selection. The minimum assignable area per student shall be set forth by the building codes applicable to the room. The maximum assignable area per student shall be based on criteria provided by UAF and the current building codes.

Classroom A	< 15 students	Tables and Chairs Only
Classroom B	16 to 30 students	RTACs or Tables and Chairs
Classroom C	31-49 students	RTACs or Tables and Chairs
Classroom D	50-100 students	RTACs, fixed seating, or tables/chairs
Classroom E	101-200 students	Fixed seating or tables/chairs
Classroom F	> 200 students	Fixed seating only, sloped floor auditorium

DESIGN ELEMENTS:

Each classroom is designed to meet the basic Level 1 requirements for instructional features and equipment. Subsequent to a Level 1 classroom is an increase in instructional technology and features. The levels of classroom design shall be:

Level 1 - Collaboration Space: Supports device sharing on an in-room display.

Level 2 - Web Conferencing Space: Level 1 plus built-in camera, microphones, and speakers for web conferencing.

Level 3 - Classroom Basic Instructional Tools and Technology, plus smart podium or A/V control panel, is a permanent furnishing hardwired into building systems.

Level 4 - Classroom Level 3 plus web conferencing - camera, microphones, and speakers.

Level 5 - Classroom Level 4 plus sound reinforcement - stick and lavalier microphones for in-room amplification.

CLASSROOM LEVEL DEFINITION

LEVEL 1 Collaboration Space:

FEATURES:

- a. Lighting control: multiple switches for controlling individual lamps in a bank of lights.
- b. Blinds and/or Darkening Shades in a room with windows.
- c. Power outlets spaced equally around the room: Consider that outlets will be used for laptop computers and for various projectors, cameras, etc. Ceiling and floor outlets are also acceptable as long as they are flush-mounted with the finished floor material. Use at least the minimum quantity required by code. Provide power in the front of the room for the instructor's use. Provide an outlet for any wall-mounted outlets.
- d. Data Connections spaced equally around the room: As with the power outlets, consider the use. There does not need to be a data outlet for every common-use duplex power outlet. There should also be at least two data outlets at the front of the classroom for use with the provided technology. Provide at least one wireless access point in accordance with Division 27 of the Design Standards.
- e. Ability to share content from in-room computer or BYO Device through HDMI or wireless sharing.

EQUIPMENT:

Equipment provided by the owner that must be integrated into the design includes:

- a. Ceiling-mounted projector and wall-mounted screen or wall-mounted television screen, depending on the size of the room.
- b. Table for small class and instructor.
- c. Ability to share content from in-room computer or BYO Device through HDMI or wireless sharing.

LEVEL 2 Web Conferencing Space :

FEATURES All Level 1 Features

EQUIPMENT All Level 1 Equipment plus equipment provided by the owner that must be integrated into the design includes:

- a. All-in-one web conferencing unit with built-in microphone, camera, and speakers connected to the room network and display.

LEVEL 3 Classroom:

FEATURES:

- a. Lighting control: multiple switches for controlling individual lamps in a bank of lights.
- b. Markerboard: Install a minimum of one, but look for additional locations in the room. Boards may be installed on opposing walls. All boards shall have a corkboard-type tack strip at the top and a minimum 3" deep tray at the bottom. Coordinate tray install with projector screen.
- c. Blinds and/or Darkening Shades in a room with windows.
- d. Flooring will be selected by the project manager and user group per Division 9 of these design standards. Selection will be based on how the consultant is addressing sound attenuation in the room. Carpet is the preferred flooring.
- e. Provide proper sound and acoustical treatment to allow for proper noise levels within the room and to prevent those noises from being transmitted to adjacent classrooms.
- f. Power outlets spaced equally around the room: Consider that outlets will be used for laptop computers and for various projectors, cameras, etc. Ceiling and floor outlets are also acceptable as long as they are flush-mounted with the finished floor material. Use at least the minimum quantity required by code. Provide power in the front of the room for the instructor's use. Provide an outlet for any wall-mounted outlets.
- g. Data Connections spaced equally around the room: As with the power outlets, consider the use. There does not need to be a data outlet for every common-use duplex power outlet. There should also be at least two data outlets at the front of the classroom for use by the provided technology. Provide at least one wireless access point in accordance with Division 27 of the Design Standards.

- h. Provide a card swipe on the door from the corridor with lockdown capacity.
- i. Provide a wall-mounted clock in the back of the room.
- j. Adequate wall protection to prevent wall damage from tables and chairs. FRP panels or 6" wide (min) chair rails are acceptable.
- k. 10% seating shall be left-handed.
- l. 5% seating or at least two stations, shall be ADA accessible
- m. The teaching area is at least 8' from the front wall of the classroom to the first row of tables, RTAC's, or fixed seating. The teaching area will accommodate the lectern, small table, and drafting chair.
- n. Possibly consider speakers in the ceiling, coordinating closely with other ceiling-mounted appurtenances.

EQUIPMENT:

Equipment provided by the owner that must be integrated into the design includes:

- a. Ceiling-mounted projector and wall-mounted screen or wall-mounted television screen, depending on the size of the room.
- b. Lectern and/or small table for instructor. Consider a small table for class handouts.
- c. Standing Height Chair
- d. Ability to share content from in-room computer or BYO Device through HDMI or wireless sharing.
- e. Fixed podium (typically Owner provided) with Audio/Video equipment and other equipment such as computer, document camera, and speakers. Work with FS/DDC Project Manager if A/V equipment will be located in an enclosure, ceiling-mounted box, or control room. In labs, the podium should be built to mimic the lab casework.

LEVEL 4 Classroom

FEATURES: All Level 3 Features plus

- a. Increase the level of lighting control to allow the front of the room to be darkened for a video presentation.
- b. Data, power, and audio/video outlets for connection to a podium at the front of the room or A/V enclosure in the room. Number and location will be provided during design. Provide additional connection locations as directed by the FS/DDC Project Manager and UAF NTS.
- c. Capability for distance delivery with audio, video, and web conferencing.

EQUIPMENT: All Level 3 Equipment, plus equipment provided by the owner that must be integrated into the design, includes:

- a. Fixed podium (typically Owner provided) with Audio/Video equipment and other equipment such as computer, document camera, and speakers. Work with FS/DDC Project Manager if A/V equipment will be located in an enclosure, ceiling mounted box, or control room. In labs, the podium should be built to mimic the lab

casework.

- b. Two or more projectors/screens or TVs may be required to provide adequate coverage.
- c. Allow for ceiling-mounted microphones based on the room size.
- d. Additional A/V equipment includes 1-2 cameras, ceiling microphones, etc, as required for web conferencing.

LEVEL 5 Classroom

FEATURES: All Level 3 and 4 Features plus

- a. Lighting Control: master controls that offer various light programs from full lighting to theatre lighting, depending on room size and project requirements.
- b. An AV Enclosure will be used for rooms such as conference rooms, design studios, etc. A podium will be standard in regularly assigned classrooms (fixed in classrooms, lab casework style in class labs).
- c. Sound system built into the room with all controls adjacent to or built into the podium. Must be capable of connecting to microphones, wired and wireless. Must be capable of providing adequate sound levels throughout the room. Review the acoustics of larger classrooms and develop a speaker layout for the best audio delivery.
- d. Multiple projection screens or wall-mounted TVs. Screens in rooms that are multi-level or have ceiling heights over 8' shall be motor-operated with controls at the front of the class. A TV viewable by the instructor station may be required to allow the instructor to see the web conference participants.
- e. Audio/Video connections via a conduit (hardwired) between the TVs, speakers, microphones, and the affixed smart podium or A/V enclosure.
- f. Overhead projection will be from the podium to the ceiling-mounted projector onto the screen or onto the TVs.
- g. Provide for equipment cooling in the design of the podium or A/V enclosure.
- h. For Level 5 Classroom and above, consult with UAF for proper outlet placement and quantity. It may be desirable in an auditorium with chairs and table tops to provide a power strip on each table and a wireless data connection at the front of the room.

EQUIPMENT: All Level 3 and 4 Equipment plus

Equipment provided by the owner that must be integrated into the design includes:

- a. Additional A/V equipment includes sound-reinforced microphones for in-room amplification.

APPENDIX B: UTILITY COST AND AVAILABILITY

UAF operates the majority of its utilities on Campus. Steam and Electricity are derived from the UAF Co-Generation Power Plant. Potable and Fire Water is provided from the UAF Water Treatment Plant via College Utilities. Auxiliary utilities such as RO Water and Compressed Air are available from the UAF Power Plant. Storm Drains are constructed and maintained under the UAF Facilities Services Division of Maintenance and Operations. Sanitary Waste Treatment is provided by a private contract with Golden Heart Utilities and managed by the UAF Facilities Services Division of Maintenance and Operations. **ALL** of these utilities have an existing limited capacity.

The consultant shall obtain the current utility cost rates and availability during project scoping from the FS/DDC Project Manager. No project shall be moved into the design phase until UAF Facilities Services provides this information and agrees that adequate utilities exist to serve the project needs. If adequate utilities do not exist, it will be the project's responsibility to develop a plan for utilities expansion within the guidelines of the UAF Campus-Wide Design Standards.

APPENDIX C: *Reserved for future use*

APPENDIX D: UAF Division 1 Specifications

Certain Division 1 Sections are furnished by the Facilities Services. The Facilities Services is responsible for the final edit of these Sections, and the Consultant is responsible for ensuring that the Technical Specifications conform with, and do not conflict with, these sections. Draft Division 1 Sections, to be finalized by the Facilities Services during the development of bid documents, shall be provided to the consultant by the FS/DDC Project Manager. These are furnished to the Consultant for their use in assuring conformance within the bid documents. Other required Division 1 Sections are to be prepared by the Consultant, in consultation with the FS/DDC Project Manager.

The Division 1 Section may include:

DIVISION 01	GENERAL REQUIREMENTS
01 11 00	Summary of Work
01 23 00	Alternates
01 29 00	Payment Procedures
01 31 00	Project Management and Coordination
01 33 00	Submittal Procedures
01 41 00	Site Safety Requirements
01 42 00	References (To be prepared by Consultant – Includes definitions, reference standards abbreviations and acronyms used in the construction documents)
01 45 00a	Quality Control (Projects \$25,000 to \$500,000)
01 45 00b	Quality Control (Projects \$500,000 to \$5,000,000)
01 45 00c	Quality Control (Projects over \$5,000,000)
01 50 00	Temporary Facilities and Controls
01 60 00	Product Requirements and Substitutions
01 61 01	Asbestos Containing Materials
01 71 23	Field Engineering
01 73 29	Cutting and Patching
01 74 00	Cleaning and Waste Management
01 75 00	Starting and Adjusting (To be edited by Consultant with Owner)
01 77 00	Closeout Procedures
01 78 00	Closeout Submittals
01 79 00	Demonstration and Training (Not included; to be prepared by Consultant with Owner)
01 91 00	Commissioning (To be edited by Consultant with Owner)

APPENDIX E: APPROVED LIST BRAND NAME ONLY

<u>Approved brand name only material and equipment</u>	<u>Spec. Section</u>
Best and Schlage Mechanical Lock Sets	Div. 8
Best or Schlage Electronic Hardwired Lockets	Div. 8
Schlage Electronic Wireless Locksets	Div. 8
Best Keyways	Div. 8
LCN or Stanley Door Closers	Div. 8
Von Duprin or Precision Exit Devices	Div. 8
Von Duprin Removable Mullion	Div. 8
LCN Automatic Door Operators	Div. 8
KNOX Key Boxes and Shunt Trip Modules	Div 8 and 26
Badger Water and Condensate Meters	Div. 22
Aerco Steam to Water Heater	Div. 22
ArcticTherm or NALCO Glycol Inhibitor	Div. 23
Honeywell Control Valves for Rural Campus Only	Div. 23
Siemens Building Technology HVAC Instrumentation and Control	Div. 23/25
G&W Electric SF-6 Switches	Div. 26
Square D power monitors	Div. 26
Siemens Fire Alarm Control Systems	Div. 28
LENEL Access Controls	Div. 28

Brand Name Only products must meet requirements of the University of Alaska Procurement Regulations. For brand name only approval, the UAF procurement officer must make a written determination that only the brand item(s) specified and no other will satisfy the University's needs.