ALASKA SCHOOL DESIGN AND CONSTRUCTION STANDARDS

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1 – PURPOSE AND USE

A. Introduction

In 1993, the Alaskan legislature created the Bond Reimbursement and Grant Review Committee with AS.14.11.014 and identified the committee's purpose. Among their many tasks, the committee was charged, through DEED, with the development of criteria intended to achieve cost effective school construction in the State of Alaska.

Powers granted to DEED provide broad authority for the State to revise a project's scope and budget if the costs are excessive and to reject projects not in the state's best interests. These Standards have been developed to make these determinations more transparent; to provide consistent, clear information for School Districts and Design Professionals, and to establish a uniform level of quality and cost for all of Alaska's public-school buildings.

The Standards recognize the need to consider the long-term operations and maintenance of a school facility rather than focus solely on initial construction cost. Therefore, these Standards not only consider the initial cost of construction but also operations and maintenance expenses, by looking at design and construction decisions on a life cycle basis.

One of the major objectives of the State is to address as many projects as possible within the limited financial resources at both the State and local levels. To this end the State wants to avoid unnecessarily expensive designs, unapproved assemblies, and products that carry premium costs. The Design and Construction Standards are intended as a starting point for architects, engineers, and other design professionals, along with school districts, to develop solutions to meet the needs of individual school communities. The information is provided to allow the planning, design, and construction process to proceed most efficiently—without undo restriction on the design of facilities—focusing efforts on the creation of the best possible educational environments for each project

B. Use of the Standards

These standards are available to the public and will made available to school districts and designers prior to start of design. They are also intended to be used in conjunction with other guidelines developed by DEED including the Model Alaskan School, Commissioning, and Design Ratio publications.

They are the culmination of standards, "best practices," accepted procedures, statutory and regulatory requirements. They will apply to all new school construction and new additions to existing buildings. Renovation to existing facilities will adhere to the Standards, whenever possible, as approved by DEED.

2 – DESIGN PRINCIPLES

A. CLIMATE ZONES

School construction in Alaska encompasses a wide range of climates, differences in school size and the logistics of building in remote areas with limited construction seasons. Design principles must be adapted based on these factors. The following climates and regions are identified, and where applicable, appropriate design principles based on region and climate are provided within the Standards. It remains the responsibility of designers to adapt and/or adjust the standards and design principles based on individual site conditions.

Climate Zones based on Building Energy Efficiency Standards (BEES),

Table A301.1(1) Climate Zones for Alaska by Census Area

B. SITE DESIGN

1. General Site Planning
2. Playgrounds and Athletic Fields
3. Circulation
4. Playgrounds and Athletic Fields
5. Utilities and Services

6. Landscaping

7. High-Performance Site Principles

C. BUILDING DESIGN

1. General

The overall building design, footprint, configuration, and structural grid should be simple and straightforward, without complex geometries. Where appropriate, provide multi-level buildings to reduce the overall footprint and to decrease the exterior surface and roof area. Interior and exterior walls should be straight, with relatively few curves. Avoid complex configurations with unnecessary corners and changes of materials.

2. Exterior Envelope

a. Roofs – Low Slope (less than 1 in 12)

1. Design Guidelines
    a. Low slope roofs to be exposed membrane over coverboard, insulation and vapor retarder. Protected membrane systems such as Inverted Roof Membrane Assembly (IRMA) are prohibited.
    b. Roof Assemblies shall be fully adhered systems. Mechanically attached systems may be used when conditions do not allow for fully adhered.
    c. Slope of the surface membrane to be 3/8 inch per foot to drain minimum is preferred, 1/4 inch per foot minimum. Calculate slope of valleys at tapered crickets to maintain positive drainage.
    d. Wherever possible, achieve roof slope by sloping the structure to reduce the quantity of tapered insulation.
    e. Roof drain systems, roof drains, scuppers, rain leaders, storm drains, dry wells….
    f. Parapets and transition detailing. Minimize roof penetrations through the membrane. All roof penetrations shall be made by certified installers with approved roofing manufacturer's details.
    g. Mechanical equipment…curbs, safety railings
    h. Skylights and Clerestories….
    i. Avoid discharging water, snow, and ice along the face of any wall. Stormwater and snowmelt should be kept away from all entrances, sidewalks, and roadways.
    j. Minimize complex and multiple roof levels in the building design.
    k. Design required roof hatches for maintenance large enough to accommodate individuals equipped with full emergency gear or service personnel with supplies and toolboxes.
    l. Design roof access with regular stairways or alternating tread stairs, not by ship's ladders or exterior roof ladders.

2. Materials and Assemblies

a. Materials and installations of roof assemblies must be as recommended by the roof manufacturer to achieve manufacturer's warranty.
b. Exposed membrane type is EPDM, 60 mil, internally reinforced, color black or multi-ply, bitumen, built up roof. Other acceptable types include PVC, TPO.
c. Coverboard
d. Types of insulation and R-values – Expanded Polystyrene (EPS) R-Value = 4.17 per inch Extruded Polystyrene (XPS) R-Value = 4.17 per inch, Polyisocyanurate (Polyiso) = R-Value 5.6 per inch, Spray Foam…
e. Coverboards – oriented strand board, gypsum board

3. Guidelines based on Climate or Region
   a.

b. Roofs – Sloped

1. Design Guidelines
   a. Recommended pitch for major portion of is 3 in 12 to 6 in 12. Sloped roofs shall be a minimum of 2 in 12.
   b. Snow shedding…
2. Materials
   a. Standing Seam Metal Roof: Sheet material, 24 gauge minimum in portable roll formed or factory formed profiles. Finish of metallic coated by hot-dip process, 20 year warranty on the finish.
   b. Attachment: Fasten sheet metal roofing to supports with concealed clips at each standing-seam joint, no exposed fastener systems.
   c. Insulation types and R-values
   d. Soffits
   e. Ventilation
3. Guidelines based on Climate or Region

c. Wall Assemblies

1. Design Guidelines
   a. More
2. Materials
   a. More

d. Floors / Soffits

1. Design Guidelines
   a. More

3. Interiors

a. General

1. General statement if applicable

b. Flooring

1. Design Guidelines

4. Mechanical

a. General

1. The building mechanical systems encompass fire sprinkler protection, plumbing, and heating, ventilation and air-conditioning (HVAC) systems. These systems are for the purposes of life safety, health and sanitation, occupant comfort, and building longevity.
2. Mechanical systems shall be designed to conserve energy and water to provide low operating costs and reduce consumption of community resources.
3. The systems shall be integrated with the building programming, floor plan, and envelope to optimize building performance.
4. The systems shall be robust, expandable, and easily maintained.
5. Consideration shall be given during design to removal and replacement of all mechanical equipment, with appropriate coordination between disciplines to provide for this occurrence.

b. Fire Sprinkler Protection

1. Basic description and requirements
    a. NFPA 13
    b. FM Global
    c. NFPA 14
    d. AHJ, fire panel, FDC
    e. Community water supply
    f. Stored water
    g. Fire pumps
    h. Materials
    i. Methods
2. Special Systems
    a. Mist
3. Codes and Standards:
    a. IBC
    b. IFC
    c. NEC
    d. NFPA 13
    e. NFPA 14
    f. NFPA 20 – Pumps
    g. NFPA 22 – Water Tanks
    h. NFPA 25
    i. Local Jurisdiction Requirements

c. Plumbing

1. General Design Guidelines
    a. Water systems shall be designed to conserve water to the greatest extent practicable, without compromising system performance.
    b. All materials in contact with potable water shall meet the requirements of NSF-61 for materials in contact with drinking water.

c. Plumbing systems shall be designed to provide ease of maintenance including valves and equipment being readily accessible, having clearly indicated access locations, and clearly labeling piping, valves and equipment.
d. Coordinate with school district personnel to standardize on equipment to the greatest extent practicable.
e. All piping located in areas utilized as air plenums in the HVAC system shall be plenum rated.
f. Provide non-conducting dielectric connections using dielectric waterway fittings wherever jointing dissimilar metals.
g. Route piping in orderly manner and maintain gradient.
h. Install piping to conserve building space and not interfere with use of space.
i. Group piping whenever practical at common elevations.
j. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
k. Provide clearance for installation of insulation and access to valves and fittings.
l. Encase exterior cleanouts in concrete flush with grade.
m. Install unions downstream of valves and at equipment connections.
n. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
o. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, and vertical risers.
p. Use grooved mechanical couplings and fasteners only in accessible locations.
q. Avoid placing floor and wall cleanouts in locations visible to the general public for security and aesthetics. Install them in locations readily accessible to maintenance personnel.

2. Codes and Standards
   a. IBC
   b. IFC
   c. IFGC
   d. UPC
   e. IMC
   f. Alaska Drinking Water Code 18 AAC 80
   g. Alaska Food Code 18 AAC 31
   h. Local Jurisdiction Requirements

3. Connections to utilities
   a. Water meters
   b. Frost depth
   c. Heat trace
   d. Cleanouts

4. Pipe support and Identification

5. Storm Sewer
   a. Design Guidelines

i. Use cast iron dome strainers on roof drains rather than plastic.
ii. Install rain leader overflow discharge outlets in conspicuous locations.
iii. Insulate rain and overflow leader piping system in its entirety, including roof drain sumps.
iv. In climates subject to freezing temperatures, install electric heat trace in roof drains, overflow outlets, and the first 10-feet of piping penetrating the envelope of the building.

b. Materials Below Grade
i. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Hub-and-Spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
ii. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.
iii. ABS Schedule 40 Cellular Core (Foam Core) Pipe: Pipe and fittings shall be manufactured from ABS compound with a cell class of 42222 for pipe and 32222 for fittings as per ASTM D 3965 and conform with National Sanitation Foundation (NSF) standard 14. ASTM D 2661 Fittings. Joints: ASTM D 2235 solvent welded.
iv. PVC Pipe: ASTM D3034. Fittings: PVC. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

c. Materials Above Grade
i. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless-steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.
ii. ABS Schedule 40 Cellular Core (Foam Core) Pipe: Pipe and fittings shall be manufactured from ABS compound with a cell class of 42222 for pipe and 32222 for fittings as per ASTM D 3965 and conform with National Sanitation Foundation (NSF) standard 14. ASTM D 2661 Fittings. Joints: ASTM D 2235 solvent welded. Installation of ABS piping in return air plenums is prohibited.
iii. PVC Pipe: ASTM D2729. Fittings: PVC. Joints: ASTM D2855, solvent weld.

6. Sanitary Sewer
a. Design Guidelines
i.
b. Materials Below Grade
i. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
ii. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.
iii. Copper Tubing: ASTM B306, DWV. Fittings: ASME B16.3, cast bronze, or ASME B16.29, wrought copper. Joints: ASTM B32, solder, Grade 95TA; Flux: ASTM B813.
iv. ABS Schedule 40 Cellular Core (Foam Core) Pipe: Pipe and fittings shall be manufactured from ABS compound with a cell class of 42222 for pipe and 32222 for

fittings as per ASTM D 3965 and conform with National Sanitation Foundation (NSF) standard 14. ASTM D 2661 Fittings. Joints: ASTM D 2235 solvent welded.

c. Materials Above Grade
   i. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.
   ii. ABS Schedule 40 Cellular Core (Foam Core) Pipe: Pipe and fittings shall be manufactured from ABS compound with a cell class of 42222 for pipe and 32222 for fittings as per ASTM D 3965 and conform with National Sanitation Foundation (NSF) standard 14. ASTM D 2661 Fittings. Joints: ASTM D 2235 solvent welded. Installation of ABS piping in return air plenums is prohibited.
   iii. PVC Pipe: ASTM D2729. Fittings: PVC. Joints: ASTM D2855, solvent weld.

7. Domestic Water
   a. Design Guidelines
      i. Install water hammer arrestors complete with accessible isolation valve.
      ii. Install valves with stems upright or horizontal, not inverted.
      iii. Slope water piping and arrange to drain at low points.
      iv. Flush, clean and disinfect the potable water system in accordance with Section 609 of the UPC.

   b. Materials Below Grade
      i. Copper Tubing: ASTM B42, Type K, annealed. Fittings; ANSI/ASME B16.22, wrought copper. Joints: AWS A5.8, BCuP silver braze; Flux: ASTM B813.
      ii. Ductile Iron Pipe: AWWA C151. Fittings: Ductile iron, standard thickness. Joints: AWWA C111, rubber gasket with ¾ inch diameter rods.
      iii. PVC Pipe: AWWA C900.
      iv. High Density Polyethylene Pipe: ASTM D 3350 HDPE designation code of PE 4710 or PE 3608. The material shall meet the requirements of and shall have a minimum cell classification of PE445474C for PE 4710 and PE345464C for PE 3608. In addition, the pipe shall be listed as meeting NSF-61 and AWWA C901. Fittings: ASTM D3261 Butt Fusion Fittings. ASTM F1055 Electrofusion Fittings. ASTM D 3261 Flanged and Mechanical Joint Adapters.

   c. Materials Above Grade
      i. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ASME B16.18, cast copper alloy, or ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA; Flux: ASTM B813 or Press-Fit.
      ii. Chlorinated Polyvinyl Chloride (CPVC) Piping: ½" To 2": ASTM D2846, NSF listed, SDR 11, Schedule 40, Fittings: Solvent welded socket type. Larger than 2ASTM F441, NSF listed, Schedule 80, Fittings: ASTM F439 Solvent welded socket type
      iii. Polypropylene (PP-RCT), ASTM F2389. Pipe shall have NSF 14 and 61 listings for potable water use. The piping shall be extruded with a middle layer that has glass fiber content to restrict thermal expansion. Fittings may be either socket fusion through nominal 5 inch, electrofusion through 8 inch or butt fusion in nominal 2 inch

through 24 inch sizes. Electrofusion may also be performed in nominal sizes 10 inch through 24 inch by means of the use of electrofusion couplings as applied on butt fusion fittings and pipe

8. Hot water
   a. Safety
   b. Tempered
   c. Hot to kitchens
   d. Design Guidelines
   e. Materials

9. Insulation

10. Plumbing Fixtures
    a. Water conservation
    b. ADA
    c. Resilient
    d. Consistent with fixtures in district
    e. Common parts/manufacturers
    f. Design Guidelines
    g. Materials

11. Special Systems
    a. Arctic piping
    b. Groundwater lift stations
    c. Effluent Lift Stations
    d. Sewage lift stations
    e. Water pressure booster systems
    f. Water storage tanks
    g. Water treatment

d. Heating, Ventilation, and Air-Conditioning

1. General Design Guidelines
2. Codes and Standards
3. Pipe support and identification
4. Duct construction and support
5. Insulation
6. Fuel Systems
   a. Fuel Gas
   b. Fuel Oil
   c. Biomass
   d. District Heating (a.k.a. Waste Heat)
7. Hydronic Heating
   a. Piping and valves
   b. Terminal equipment and systems

c. Boilers
   i. General Requirements
      1.
      2. Install on 4” concrete housekeeping pads.

   ii. Materials

5. Electrical

a. General Design Principles

1. The building electrical systems encompass lighting, power, telecommunications, and electronic safety and security systems. These systems are for the purposes of life safety, user convenience, building and user security, occupant comfort, and educational delivery.
2. Electrical systems shall be designed in accordance with applicable codes and standards and shall conserve energy while also meeting the needs of the building and users.
3. The systems shall be integrated with the building programming, floor plan, and local District requirements to enhance and support the building’s usefulness and longevity.
4. The systems shall be robust, expandable where feasible, and easily maintained.
5. Design shall meet present needs, with consideration given to future. Spare capacity or the ability to expand in the future should be evaluated within budgetary constraints.
6. Electrical systems should be considered for replacement based on age, condition, availability of parts, availability of support, and obsolescence.
7.

b. Site Electrical

1. Building Service
   a. Service size shall be based on building load calculations. Spare capacity should be limited to 25% unless justification can be made for additional expense.
   b. Service type may be underground or overhead depending on site, but should attempt to reach the building in an efficient manner that reduces costs.
   c. Utility coordination should be performed early in the design process. Incoming service routing, District responsibilities, and estimated costs should be evaluated for impact on the project.
2. Site Lighting
   a. This lighting is for general use. Specific applications such as athletic fields, hockey rinks, and similar would be included in design of those site elements.
   b. Building-mounted lighting may be used for site lighting if practical, or as a supplement to pole-mounted lighting.
   c. Pole-mounted lighting should be designed for roadway, driveway, and parking areas per IES standards. Additional lighting should be considered for hardscape, playground equipment, sledding hills, and similar areas where use may require artificial lighting.

d. Poles should be located on the perimeter of parking areas to stay out of the way of snow removal paths as much as possible.
e. Consider providing conduit to new poles for signal wiring to cameras, wireless access points, etc., as design budget and need allows.
f. Lighting parameters including minimum lighting levels, glare, uniformity, and similar should meet IES standards where no local code is in effect.

c. Lighting

1. Fixture Selection
   a. Fixture types should be commonly available and cost effective to the extent possible. The use of custom fixtures, whether for general or decorative/accent lighting, should be limited to small areas of architectural interest and fit within budgetary constraints of the project.
   b. Fixture source should be LED for efficiency and life expectancy unless design criteria justifies use of alternate sources.
   c. Maintenance should be considered in fixture placement and selection. Fixtures should have field replaceable components, readily available replacement parts, and be installed in a manner that allows for access by local maintenance staff to clean, test, or repair.
2. Lighting levels shall be in accordance with IES standards and Alaska Statutes.
3. Emergency lighting/exit signs shall be provided in all code-required areas. Additional emergency lighting should be provided in areas with either increased risk of injury during an outage, or likelihood of persons unfamiliar with the space. These would include support spaces (electrical/mechanical/telecom rooms), large restrooms, conference/meeting rooms, kitchen, and similar.

d. Lighting Control

1. Design shall meet current codes at a minimum. Additional energy savings may be achievable with a more complex system but should be balanced with local maintenance capabilities and project budget constraints.
2. Minimum lighting control elements should include exterior photocell control, interior occupancy sensor control of applicable spaces, dimming of fixtures either through manual interface, daylight sensor input, or occupancy sensors, and multi-zone layouts for more functional use of spaces. Examples would be a separate teaching wall zone in classrooms, or multiple zones in a gym or multi-purpose room to allow for most lighting to be off while maintaining some visibility.

e. Power Distribution

1. System Capacity
2. Panelboards
   a. Distribution
   b. Surge Protection

c. Accessibility

3. Receptacle Spacing
4. Mechanical Coordination
5. Backup Power

6. Telecommunications

a. General Design Principles

1. Design principles apply as noted in Electrical.
2. In the absence of code requirements, design should follow BICSI or similar standards to the extent possible.

b. Site Communications

1. Utility Coordination

c. Telecom Rooms

1. Size
2. Spacing
3. Separation

d. Telecom Distribution

1. Cabling Pathways
2. Telecom Outlet Spacing
3. Equipment Coordination

e. Audio/Video Systems

1. Room Considerations
   a. Classroom
   b. Gym/MPR/Commons
   c. Band/Orchestra/Choir

7. Safety and Security

a. Electronic Safety and Security- General Design Principles

1. Design principles apply as noted in Electrical.
2. Except for code-required fire alarm systems, all other systems in this section are optional and should be considered based on budget, local District wants and needs, and area considerations such as likelihood of vandalism or intrusion

b. Fire Alarm System

1. Code Requirements
2. System Type
3. Additional Considerations above Code Minimum