Matanuska-Susitna Borough

Facility Design Criteria Manual

July 1, 2009

Matanuska-Susitna Borough
350 E. Dahlia Avenue
Palmer, Alaska 99645

FACILITY DESIGN CRITERIA MANUAL

Matanuska-Susitna Borough (MSB)

Message to the Designers:

This document applies to all MSB facilities except for school district facilities which have a separate design criteria manual. This is a guide for professional designers and tradesmen qualified in their specific field. It is not intended to replace good judgment or sound engineering practices. It is rather to list preferred types of materials and equipment and to identify those types that should be avoided based on problems experienced on Borough projects. There is no rigid prohibition of using products not listed in this manual, but deviating from preferred products within each type listed must be approved by the MSB. Designers will discuss proposed deviations with the MSB Project Manager before committing to their use in a specification. Where the manual clearly states do NOT use a specific product, it is unlikely the product would be accepted under any condition. All references that require MSB approval will be coordinated with the MSB Project Manager prior to including in a specification.

This revised edition supersedes all previous editions, to include undated copies.

Please discard any outdated copies. To obtain a copy of the current edition, please contact the appropriate MSB Project Manager.

Keith Rountree
Director of Public Works

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GENERAL PHILOSOPHY OF DESIGN

All MSB facilities are public property and are normally obtained entirely at public expense. For this reason the MSB will construct facilities that provide maximum benefit to the public for the money expended. Facilities will be available to the public for reasonable public purposes that do not impair the facility's intended use.

To obtain maximum benefit in a facility, the design will address the following major areas of concern:

Design program - Does it follow design criteria and meet space/functional requirements for this project?

Security - Provide a protected and defensible place for employees, public, and public property.

Health - Provide a safe and healthy environment for the public and employees. Ensure all ADA requirements are met.

Durability – Use appropriate materials, finishes and equipment to provide a long useful life.

Maintainability - The building will be able to be kept clean and in good repair without excessive maintenance costs.

Cost Control - Are the design and materials free of extravagance? This is not to deny a reasonable premium for aesthetic benefit but designers are discouraged from expensive extravagances. Likewise, materials that have a high initial cost are acceptable provided there is appropriate compensation in the form of long useful life, low maintenance or vandal resistance that would justify the difference.

Design Quality Control - Is the design thoroughly reviewed by MSB staff and the Design Committee at appropriate stages of development? For major projects, a value engineering process is encouraged and may be required by the MSB on a case by case basis.

Adherence to this manual - A key purpose of this manual is to assist designers in covering the above areas of concern by prescribing specific standards for components of the facility. Minimum standards are identified for quality of materials, standardization of components, and performance standards for equipment. While adherence to these standards does not necessarily guarantee a successful design, deviation from it will expose the designer to liability should the deviating component or detail fail.

Leadership in Environmental Energy Design (LEED) - The MSB, in an effort to promote "Green Building and Green Infrastructure" within its realm of responsibility is requiring these two concepts be addressed as they would apply within all architectural design and design/build projects. It's understood that one or both concepts may or may not apply to every project. Designs will address each of these concepts separately. The concept of Green Building is to maximize energy efficiency and conservation methods and techniques. The areas for consideration are, but not limited to, indoor air quality standards, maximize waste reduction, and, promote recycling. Discussion of the Leadership in Energy and Environmental Design (LEED) program and the rating to which is applicable/obtainable and/or the minimum principles

recommended will be addressed. The Architect will address if applicable, in percentages, the cost increases and savings the owner could expect in both the construction phase and in maintaining, and operating the facility as well as life cycle costs. An effort to promote the retention of native vegetation, protect water quality methods and techniques, conserve local soils and maintain natural green spaces will be addressed. The Borough's design and design/build projects will maximize the retention of natural vegetation on building sites and minimize disturbances to water bodies and riparian habitat, if at all possible. The areas for consideration, as they apply, are buffers along water bodies, wetlands functions, flood and erosion prevention, wildlife habitat, fish passage, forest health, connectivity with other green spaces, trail corridors, and parks and recreation. Designs will implement green infrastructure strategies and Best Management Practices for Development Around Water bodies (MSB Ordinance 05-023) in design and project construction. Discussion of conservation easements with a certified land trust, conservation platting restrictions and/or land use covenants as they apply to the site will be addressed. Designers will follow the requirements set forth in MSB IM 07-310 for LEED certifications.

Permitting, Land Use, and Roads – Designers must ensure contractual documents follow and require adherence to federal, state, and MSB permitting, land use, and road requirements.

DIVISION 1 GENERAL REQUIREMENTS

Review and enclose as part of specifications the latest MSB boilerplate for general conditions. The MSB must approve any modifications.

1-01 SUMMARY OF WORK

A. Clearly defines scope of project and work limits.

B. Provide schedule of owner-furnished equipment.

C. Provide for coordination of owner-furnished-contractor-installed items such as blocking, inserts, templates, etc., storage and staging of equipment furnished by Borough.

D. Identify construction schedule for completion of spaces, fire alarm systems, sprinkler systems, etc. and responsibilities for beneficial occupancy. Schedule is to indicate number of calendar days from date of Notice to Proceed to Substantial Completion.

E. Designers shall review and obtain approval for the project from state and local agencies. (i.e., Department of Education, State of Alaska Fire Marshal, Departments of Environmental Conservation, etc.) Review list with Owner during schematic design phase.

F. Comply with all the current laws, rules and regulations of the State of Alaska Administrative Code for all Matanuska-Susitna Borough (MSB) designs. The following contain requirements applicable to the MSB construction work:

1. All mechanical and electrical work shall comply with the codes, guidelines, or latest adopted edition, as applicable to the project and as recognized by the State of Alaska and any local municipal building department that may have jurisdiction. *Only those codes formally adopted or codified are mandatory.*

    a) Electrical Code

    b) Fire Code

    c) Mechanical Code

    d) Building Code

    e) Plumbing Code

    f) Underwriters Laboratory, UL, or approved equal (as referenced)

g) American National Standards Institute (ANSI) (as referenced)

h) American Society for Testing and Materials (ASTM) (as referenced)

G. Include a section within General Requirements (Division 1) covering Modification Procedures (01035) depending on the complexity or special needs of the particular project. Coordinate carefully with the Mat-Su Borough General Conditions Article 12. Include standard Form(s) provided by MSB where appropriate.

1-02 MEASUREMENT AND PAYMENT

A. Use lump sum as basis of bidding to the maximum extent possible. If additional site work is anticipated but scope cannot be clearly defined, or if unit prices are required for some other specific reason, review project with Owner to determine best method of establishing unit pricing in specification.

1. Use of AIA documents G702 and G703 for pay requests and G703 for schedule of values is preferred but not required.

1-03 PROJECT MEETINGS

A. A mandatory pre-construction meeting will be held with the Owner. The Architect, General Contractor and representatives of all the major subcontractors shall attend. The General Contractor will review the schedule for construction and identify any materials that will require longer than average lead times. Other items to be discussed include schedule, communications, chain of command, etc.

B. A time and schedule for 'on site' job meetings to review progress and discuss problems or items needing special coordination should be established in Division 1, Progress Meetings. Frequency shall be as appropriate for the size and scope of the project.

1-04 QUALITY CONTROL

A. The Contractor shall obtain and pay for all testing that may be necessary to qualify materials for use in the work. This shall include material quality tests, mix designs, equipment and plant calibrations, optimum moisture, and maximum density curves, and other similar texts required to qualify materials for compliance with the specified standards for field control tests. This may vary at the discretion of the MSB Project Manager.

B. The Contractor shall coordinate with the Owner for testing schedules.

C. The Borough shall pay for additional field testing performed to monitor construction control of materials used in the work. This includes slump, air and cylinders on concrete work, density tests, and other similar control tests. Failing tests shall be retested and the costs of additional testing shall be borne by the Contractor.

1. For concrete slabs on grade to receive membranes of any kind, wood flooring, liquid applied flooring or any adhesive applied finish specifications will call for independent testing immediately prior to and during the flooring installation. Tests will include moisture content, moisture migration and alkalinity. Concrete specifications for these slabs must call for low water/cement ratio and use of water reducing admixtures. Specification of capillary layer of sub grade material should be considered. Provide minimum 10 mil. polyethylene or equivalent vapor retarder under all slabs on grade regardless of flooring manufacturer's requirements. Use wet curing methods, control joints, etc. to control cracking, curling etc.
2. For exterior siding materials, specify materials with proven durability and vandal resistance.

1-05 TEMPORARY FACILITIES AND CONTROLS

A. Contractor shall make provisions for temporary power, lighting, heating, ventilation, plumbing, toilet facilities, and communications during the course of construction.

B. Unless project constraints dictate a different approach, the MSB will assume all utility costs after the date of substantial completion for the phase of the project which has been completed.

C. Construction barriers: Architect to review design in regards to extent and location of construction barriers, area for materials storage, and area(s) to be utilized for construction staging. The Architect will review the proposal with the MSB Project Manager. Specify types of barriers and provide details for construction if required.

D. Security: The Contractor shall be responsible for on site security both during and after hours of construction for both new construction and renovation work in an existing facility. The MSB will provide the Contractor with keys as required upon request.

E. Noise and Dust Control: The Architect is to review the design with the MSB and make provision in the drawings and specifications which outline the extent of noise and dust control barriers which are to be provide, if any. Contractor must be required to coordinate the construction of barriers with Owner.

F. During times when employees and the public require access to a facility, access shall have priority over construction unless provisions are made and agreed to by the MSB. The Architect shall coordinate with the MSB and will provide an outline of acceptable work hours in the specification for the Contractor. The Contractor shall make necessary accommodations in the work schedule to minimize interference in normal routines.

G. The specifications shall note that the General Contractor is responsible to ensure that all temporary power is to be installed in a code approved manner and shall be disconnected and removed from the site at the completion of the project.

H. The specifications should note that the Contractor is responsible to return all areas which have been utilized for construction purposes, to original condition if these areas have not been covered elsewhere in the construction documents.

I. All new construction projects and large additions shall require a project sign. Architect to design sign based on requirements provided by the MSB.

1-06 SUBSTITUTIONS

A. There are to be no substitutions allowed to specified products prior to bid.

B. Specifications shall require the Contractor to submit any requests for substitutions on a pre-approved Request for Substitution form which is included in the specification. The request must be received by the Architect at least (10) working days prior to the time of bid closing. The Contractor shall certify in the Request for Substitution that the proposed substitute product(s) will:

1. Perform adequately the functions required by the drawings and specifications.
2. Be similar and equal in performance to that specified.
3. Be suited to the same use and function as specified.
4. Be equal or exceed all other specification.

C. Specifications shall dictate that it is the Contractor's responsibility to indicate any deviation in the substitute products performance, appearance or quality from the originally specified material, equipment or detail. No substitute shall be ordered or installed without the written approval of the Architect, who shall be the judge of quality and who may require the contractor to furnish additional data regarding a proposed substitute product.

D. It is the responsibility of the Architect to review all substitution requests with the MSB and to discuss the advantages and disadvantages of each to the Owner. Where appropriate due to lower cost material or labor savings the substitution request shall include monetary credit to the owner if approved.

E. The Owner shall give final approval of any substitute product.

F. The Architect/Engineer must review any changes in furnishings with the Owner.

G. References to the phrase "or equal" in drawings and/or specifications shall be amended to read "or approved".

1-07 PROJECT CLOSE-OUT

A. The specifications shall dictate that the General Contractor and each Sub-Contractor provide the Owner with an original set of marked up record drawings which shall become the property of the MSB along with as-builts. Drawings shall also include actual locations of major conduit runs, piping and underground utilities. Architect/Engineer shall deliver them with reproducible versions and prints to the Borough.

B. Based on Contractor furnished mark-ups the Architect/Engineer shall prepare and submit a full set of reproducible versions and four (4) full sets of prints of record drawings and one PDF copy to the MSB. Include actual location of major conduit runs, piping and underground utilities.

C. The Architect/Engineers are to provide a complete list of O&M requirements in one location of specifications, and are responsible to review this list with the MSB prior to bidding the project.

D. Specifications shall require the Contractor to submit (4) four copies of the operations and maintenance manuals which includes the following information:

1. Product data
2. Parts numbers and illustrations
3. Maintenance information for all serviceable products and equipment installed
4. Names and addresses of replacement suppliers.
5. Special cleaning and care instructions for all finish materials.
6. List of all spare parts which should be maintained on hand.

E. Specifications shall require the General Contractor to coordinate with the appropriate Sub-Contractor, Architect and Owner to provide Operations and Maintenance training seminars for all systems to all maintenance personnel, and other appropriate MSB Public Works personnel.

F. Specifications shall dictate that all Operations and Maintenance Seminars are to be scheduled a minimum of two (2) weeks in advance. Operations and Maintenance Seminars shall include a thorough hands-on demonstration of system(s) by the contractor. The General Contractor, Sub-Contractor, MSB maintenance personnel, Architect, and Engineer, are to be present.

G. Specifications shall require the Contractor to fully test all alarms, electrical, communications, and mechanical systems to confirm they are fully operational in accordance with the design. (e.g., actual fire test of fire alarms).

H. The general requirements portion of the specifications shall require the Contractor to neatly store, separate and identify all spare parts and maintenance materials which are required in other portions of the specifications. The Contractor shall be responsible to turn these items over to the Owner at the end of the project.

I. The specifications shall dictate a time limit for completion of punch list items. The General Contractor shall ensure that each item on the punch list has been completed by providing the Architect with a copy of the original punch list on which each completed item on the punch list has completed. The Architect will re-inspect the project only when the items noted on the punch list have been completed.

2-01 SUB-SURFACE INVESTIGATION

A. Include site survey information in contract documents. Note all pertinent existing utilities, buried tanks, wells, etc. The Owner will require A/E to furnish soils and survey data under extended services. Soils Report shall be made available to bidders and contractors but not bound in bid documents.

2-02 EARTHWORK

A. Drawings and specifications shall indicate which, if any, on-site materials may be used for construction and shall also indicate any limitations regarding the usage of any on site materials.

B. Specify that no stumps, trees, brush, nor any other vegetation shall be buried on site. Under special circumstances this requirement may be waived in writing by the MSB.

C. Drawings and specifications shall require Contractor to mark all major underground utilities with permanent markers. Marker is to name utility and will identify depth of burial at property lines, entry into buildings and at changes in direction.

D. Coordinate all demolition with MSB and review all materials that are to be salvaged and discuss the available options for site storage. Special requirements for disposal of regulated wastes or abandonment of well or tanks shall be noted.

E. Clearly define Utility Locates as a Contractor responsibility.

2-03 PAVING AND SURFACING

A. All exterior play slabs, walks, ramps, and etc. that receive asphalt paving or concrete shall be placed on N.F.S. material. Extend N.F.S. material min. 6" beyond edge of slab at bottom of excavation.

B. Minimize all curbs in concrete. Raised curbs are not conducive to snow removal. If curbs are required, utilize rolled curbs except at the edge of a sidewalk. Do not allow medians or islands in parking areas except where absolutely essential for traffic control.

C. Asphalt curbs are not permitted.

D. Review use of speed bumps or other traffic speed control devices with MSB before specifying in documents.

E. Provide a paved pad of an appropriate size for dumpsters. Provide conduit, junction box and panel space to support future addition of a compactor)

F. All walks, steps & entrances shall have a slip resistant broom finish and shall slope to drain.

G. Provide curb cuts to achieve an accessible route in conformance with "preferred" options in ADA guidelines.

H. Expansion joints are required at locations where concrete sidewalks interface a building.

I. Confirm specification of wheel stops, bike racks, flag poles, etc. (and all site related appurtenances) in written specifications as well as notes on drawings. Provide clear indication to Contractor as to location, orientation, height, depth, color, and number as appropriate.

2-04 DRAINAGE

A. Contract Documents shall identify areas that are to be utilized for the stockpile of snow. Provisions must be made to allow for the drainage of these areas.

B. Maintain positive drainage away from buildings. Finished floor elevation is to be a minimum of one foot above surrounding grade.

C. Provide (1 ½%) to (3 ½%) slopes in all parking lots and drive.

D. Do not interfere with natural drainage of adjacent properties. Recommend a site visit when it is raining and observe actual drainage patterns.

E. Asphalt recreational areas shall be well-drained -- generally 1-1.5% minimum slope.

F. Dry wells are typically not allowed by ADEC. If they are to be considered, verify ADEC approval early.

G. Dry wells are to be provided with fully insulated and heat taped waste lines. (Coordinate with electrical engineer.)

H. Furnish an overall site drainage plan for the review and approval by the MSB.

2-05 SELECTIVE DEMOLITION (Non Hazardous Materials)

A. Discuss all items which are to be demolished with Owner in regards to salvage. The Contractor is to coordinate all items which are to be salvaged with Owner, otherwise the Contractor is to remove and legally dispose of all demolished items off site.

B. Require Contractor to photograph project prior to demolition and submit copy of photographs to Owner.

2-06 SELECTIVE DEMOLITION (Hazardous Materials)

A. Consult with Owner regarding potential hazardous materials requiring special treatment or abatement. Communicate specific regulatory requirements in writing, including Owner responsibility for hazmat survey, testing and abatement.

2-07 SITE IMPROVEMENTS

A. Drawings to indicate locations and types of required traffic signs.

B. All buried concrete, tile or plastic lines to be laid in compacted soil with proper grade & surrounded with minimum of 6" of sand.

2-08 LANDSCAPING

A. Contract Documents shall identify the planting seasons for each type of plant used. Avoid plantings that require more attention than watering, fertilizing and mowing. Design and install landscaping with due consideration of maintenance issues.

B. The Architect shall check with the MSB, prior to specifying the method of seed placement, to determine which areas are to be maintained to ensure proper method of application.

C. Avoid placing large 2" plus stones around perimeter of buildings. (Avoid anything larger than D-1 gravel and less than 6".) These invite window breakage and sprained ankles.

2-09 FENCES AND GATES

A. Two inch 9 gauge (minimum).

B. Coordinate height and configuration of fences with MSB to achieve desired control. Typical fence height to be 6'-0" above grade.

C. Specify lightweight, swing type gates which are adequate in size, and located in appropriate areas to allow for snow and equipment removal except vehicle gates shall be of heavy pipe frame construction. Do not use pipe sockets in ground for pivots; use freeze-proof detailing.

D. All components of chain link fence system to be of heavy gauge galvanized steel components.

E. Fence fabric shall be specified barbs up knuckle down.

2-10 RESERVED FOR FUTURE USE

2-11 SITE FURNISHINGS

A. Exterior benches, planters, handrails, fences, barricades, walkways, etc. shall not be constructed of wood. (Pre-cast, cast in place concrete, steel, HDPE are acceptable materials.)

B. All MSB facilities that are public use will have a bike rack provided

3-01 CAST-IN-PLACE CONCRETE

A. Provide compacted Non-Frost Susceptible (NFS) fill to a minimum depth of 6'-0" below all entry slabs to prevent heaving at doors. Consider heated slabs at all main entries. Provide where budget will allow.

B. Color (if used) in exposed concrete shall be integral. Paints or stains will be approved by the MSB.

C. Apply sealer to all exposed concrete.

D. Specify a non-slip broom finish on exterior sidewalks, ramps, and stairs.

E. See 1-04-C. If there is any question provide the vapor retarder. Coordinate detailing to satisfy requirements of flooring manufacturer and provide for proper curing of the slab. Add sand layer if necessary to assure compatibility.

F. In Fire Stations, a permanent finish such as "Perma Shine" is preferred if budget allows.

G. Designers will take extra precautions to prevent vapor transmission through concrete slabs. Under slab design will be discussed with the MSB prior to inclusion in a specification. Saw cut control joints as soon as practicable.

DIVISION 4 MASONRY

GENERAL COMMENTS

1. Specifications are to ensure a sealer be applied to all exposed masonry.

2. Raked joints in CMU walls are not permitted. Joints that are raked are subject to collection of gum and trash. Tool exposed to view joints to a concave profile except where fabric, cork or other flexible materials are to be applied over masonry. In that specific case, joints are to be flush with face of CMU.

3. CMU coursing is to be flush with the finish floor of each level. Do not design block coursing to vary from standard nominal 8", 6" or 4" coursing. (i.e. do not start CMU course 1/2 module from finish floor)

DIVISION 5 METALS

5-01 GRATINGS AND TRENCH COVERS

A. Non-slip stainless steel, aluminum, or galvanized metal grates with catch pans placed outside all entrances. Avoid very tightly spaced grates which get very slippery.

B. Entry grates must be removable and be designed in small panels less than 50 lbs each.

C. Grates to comply with the Americans with Disabilities Act.

D. Review Quality Assurance/Quality Control requirements for inspections and/or certifications required by UBC at steel fabrication plant as well as on site. Identify responsibility of the parties, owner, contractor, fabricator, and test lab. In particular, describe how each structural weld and bolted connection is to be inspected, tested, and documented. The MSB expects each structural connection, (i.e. bolt/weld) will receive an inspection.

E. At a minimum, metal handrails are to be shop fabricated and shop finished. On-site fabrication must be approved by the MSB. Field application of paint is not acceptable. Clear anodized aluminum or stainless steel preferred. For exterior railings(only) unpainted heavy galvanized coating is preferable to any paint finish. Coordinate within Division 9.

5-02 TREADS AND NOSINGS

A. Provide abrasive coated nosings at interior concrete stairs where specified finish is exposed concrete. (Non-slip patterned resilient treads are the preferred stair finish at interior occupied spaces.)

6-01 ROUGH CARPENTRY

A. Specifications shall make provisions for backing for all wall mounted items, including but not limited to handrails, grab bars, hooks, door stops, wall hung lavatories and toilets, peg boards, chalk and tack boards, cabinets, gym-equipment, toilet partitions, toilet accessories, drapes, wall to wall and wall to ceiling intersections to support sheetrock, and movie screens. Blocking shall be clearly noted on drawings or noted in specifications.

6-02 TRIM

A. Provide resilient base trim in gyms and dressing rooms (except where tile occurs).

B. Secure applied trim with screws or other positive vandal resistant attachments.

6-03 PLASTIC LAMINATE

A. Plastic laminates may be used in areas such as entryways, custodial closets with mop sinks, restrooms, or showers.

B. Draw and specify plywood for backing of plastic laminates in wet locations (No particle board).

C. Plastic Laminate over wood or other porous substances will be approved by the MSB.

GENERAL ROOF DESIGN COMMENTS

1. Preferred MSB roofing assemblies - New Construction in priority order:

   a. Pre-formed metal roofing assembly
   b. Exposed Membrane Roof Assembly - 60 mil, reinforced EPDM, TPO, or PVC
   c. Protected Membrane Roof Assembly - 3 ply SBS Modified Bituminous Membrane
   d. Protected Membrane Roof Assembly - 60 mil, reinforced EPDM
   e. SBS Modified Asphalt Shingle Roof (Malarkey Alaskan Shingle or approved equal) DO NOT USE SHINGLES IN HIGH WIND AREAS OR ON SLOPES LOWER THAN 4:12

2. If alternative roofing assemblies are considered, the Architect is required to consult the MSB before committing to any particular roofing assembly. It is the responsibility of the designer to submit the roof design and detailing to the MSB for review.

3. 'Dead level' roofs shall not be permitted. Minimum slope shall be 1/4" per foot except where roofing manufacturer requires greater slope for warranty.

4. In general, roofs shall be designed in a manner that does not shed water or snow onto or around walkways, entries, vestibules, loading/unloading zones, play grounds, or other areas which are subject to pedestrian or vehicular traffic.

5. The Architect shall submit dew-point analysis of roofing assembly to MSB during design and reconfirm via submittals review/approval process.

7-01 VAPOR BARRIER/DAMP PROOFING

A. Damp proofing is required at all exterior foundation walls. Waterproofing is required if one or more of the following conditions are present:

   1. The building has a basement and the native soils are not well draining.
   2. The site has a high water table
   3. The site is poorly drained.

B. An Air Infiltration Barrier (i.e.Tyvek or building paper) is required and will be directly behind the siding. Use of Tyvek does not change exposure classification required for sheathing.

7-02 INSULATION

A. Require the installer to maintain a minimum of a 3" airspace between top of insulation and bottom of roof sheathing or decking. Verify adequate ventilation.

B. Fiberglass batt insulation in metal stud walls must be full width between studs. Do not allow partial width installation due to sagging of insulation.

C. Specifications are to require the Contractor to call for an insulation and vapor barrier inspection in each area at least 24 hours in advance of G.W.B. installation.

D. Specifications are to require a minimum 8 mil positive air/vapor barrier caulked with acoustical sealant and stapled or sealed with V.B. tape. Provide clear details for construction.

E. Minimum R-Value for walls and ceilings at energy efficient public facilities should be R -19 at walls and R-38 at Roof/Ceiling assembly. Average R-38 vs minimum R-38 in the roof will be approved by the MSB.

7-03 MEMBRANE ROOFING ASSEMBLIES

A. Membrane roof design shall conform to NRCA Roofing and Waterproofing Manual.

B. Continue expansion joints at roofing membrane wherever they occur in the structural system of the building. Curbs for expansion joints are to be detailed to a height of at least 8" above the membrane surface. Make sure all louvers, windows or other wall penetrations are at least 8" above top surface of roofing assembly including pavers.

C. Locate roof drains at point of maximum deflection (mid-span) if possible.

D. Paint or etch surface of pavers over all roof drain locations on Protected Membrane Roof Assemblies.

E. All roof drains and down spouts except below protected membrane roofing system will have auto-traced self-limiting heat tape (thermostatically controlled). Coordinate power requirements with the electrical engineer.

F. Roof drains to terminate in one of the following methods:
   1. Municipal storm drain system.
   2. Daylight at remote location. Be aware of potential for drain line freeze up at daylight locations and make provisions to heat trace the pipes. Coordinate with both civil and electrical engineer.
   3. Drywells with clean-outs. (Refer to Section 2 for discussions on drywells.)

G. The use of overflow scuppers is acceptable provided:
   1. The scuppers are not placed to discharge onto or near walkways, entrances, etc.
   2. The scuppers are thoroughly detailed.
   3. If downspouts and/or collector boxes are to be considered in a design, they are required to thoroughly detailed and fully heat traced.

4. Details for scuppers and downspouts are to be reviewed by the MSB.

H. The use of scuppers as the primary means of draining a roof is generally prohibited. However, if scuppers are considered a reasonable solution for a small portion of a particular project, the Architect is to do the following:
1. Review the roof and scupper design with the MSB.
2. Thoroughly detail the scuppers and down spouts
3. Specify the installation of heat trace at all scuppers
4. Keep scuppers to a minimum and place at locations that will not be a maintenance problem for the MSB.

I. Roof systems will have a 20 year guarantee/warranty where available. Options regarding the length of warranty to be discussed with Owner.

J. On projects with large areas requiring either a new roof or re-roof, specifications are to require a pre-roofing conference. Attendees are to include, a representative of the MSB, the General Contractor, the Roofing sub-Contractor, and any other person(s) the Owner, Architect, or Contractor deem necessary.

K. Exposed membrane roofs must have reinforced walkway matting placed at access points, equipment and commonly used maintenance paths.

7-04 PRE-FORMED ROOFING AND SIDING

A. The design of sloped metal roofing systems shall be such that snow and water runoff does not fall on or near sidewalks, entries, loading and unloading zones, playgrounds, parking areas or other places which are frequented by either pedestrian or vehicular traffic.

B. The design and specifications for pre-formed, pre-manufactured roofing systems should be based on the manufacturer's published details and specification guide. Deviations from the manufacturer's standard details or specifications should be carefully considered and engineered and thoroughly discussed with the MSB.

C. Specifications shall dictate that the manufacturer of the roofing system provide uplift calculations for the proposed roofing system which have been stamped by a structural engineer, licensed by the State of Alaska.

D. Shop drawings must be checked thoroughly and actual application monitored in the field continuously by qualified personnel throughout the roofing process. Discuss extended A/E services with the Owner.

E. Pitched metal roofs shall be designed to either shed snow or to retain snow. If the design Intent is to shed the snow then accommodation must be made to minimize or eliminate the potential of injury from sliding snow. If, on the other hand, the intent is to retain the snow on the roof, the design should employ a mechanism, such as a warm gutter system with an interior drain to catch shifting snow and ice rather than sole reliance on snow clips.

F. Skylights are not permitted in pre-formed metal roofing assemblies and are generally discouraged.

G. No gutter seams shall be allowed over any exit ways or walkways.

H. Gutters are required over all pedestrian ways where water can be expected to drip from building. Examples are: entryways, garage doors, loading docks, and sidewalks.

7-05 ASPHALT SHINGLE ROOFING

A. Asphalt shingles are to meet the specifications of ASTM D 3462-96a standard requirements.

B. Specify asphalt shingles to be hand tabbed.

C. Asphalt shingles are to have a minimum of a 20 year warranty.

D. Draw or specify either closed or woven valleys, do not allow open valleys.

E. Specify a minimum 235 lb. SBS modified asphalt shingle.

7-06 FLASHING AND SHEET METAL

A. Parapet cap flashing shall be designed to drain back onto the roof deck on flat roofs.

B. Gutters are required over all pedestrian ways where water can be expected to drip from building. Examples are: entryways, garage doors, loading docks, and sidewalks.

C. Continuous gutters with no seams will be used.

7-07 ROOF ACCESSORIES

A. The use of skylights is strongly discouraged by the MSB. Consideration of skylights in a design must be first reviewed with the Owner.

B. Provide roof access hatches with ladders inside buildings. Roof access hatches must be lockable.

C. Sills of clerestory windows are to be a minimum of 24" above top of roofing material.

D. Clerestory windows shall be designed such that ventilation air or convection currents from adjacent radiation will pass across the glazing to prevent condensation and ice build-up.

7-08 EXTERIOR SIDING

A. Use of wood siding is discouraged due to ongoing maintenance issues. Synthetic materials must be checked for adequate durability. Do not use materials that are brittle, or so soft they can be scratched with a ballpoint pen. Materials should have an impact

resistance at least equivalent to the heaviest grade of anti-vandalism reinforced Exterior Insulation and Finish Systems (EIFS) available.

B. EIFS may be considered provided designer can demonstrate a sufficiently impact resistant finish is specified for the full height of walls.

C. Do not use (EIFS) Exterior Insulation and Finish Systems in locations which are subject to heavy abuse such as loading docks, receiving areas, and other areas in which vehicles are in close proximity to the building.

D. High traffic and loading dock areas shall have a CMU or concrete finish.

E. Require a blower door test to verify integrity of the building envelope as soon as it is complete to verify building integrity meet acceptable standards.

GENERAL COMMENTS - DOORS

1. Draw and specify standard size doors throughout a design.

2. Door glazing is to be half height maximum typically, (including entry doors). If the design warrants a large amount of glazing in a door discuss this with the MSB.

3. Provide glazing in all doors for the following uses
   a. Offices
   b. Conference room(s)
   c. Classrooms

4. Do not specify or schedule aluminum entry doors.

5. Require double doors for gyms and equipment storage rooms. Verify height and width. Verify width and height of opening will handle largest piece of equipment to be used or stored in the room.

6. Verify floor structure at door sills extends far enough to support mullions and bottom frame anchors.

8-01 WOOD DOORS

A. On exterior applications, wood doors are generally NOT acceptable due to lack of resistance to abuse/weather. Use of wood doors interior or exterior will be discussed with the MSB prior to committing to their use.

B. There have been significant problems with fire rated "solid core" wood doors because of insufficient rails and stiles for hardware. Once the hardware comes loose, it is nearly impossible to repair. Specify additional wood back-up at specified points of attachment for butts, door closers and knobs.

C. Specification shall require manufacturer's of solid core wood doors to provide special packaging of doors during shipment to protect from moisture.

8-02 METAL DOORS

A. Schedule metal doors exclusively at all public corridors and exits.

B. All exterior metal doors and frames are to be insulated and include thermal breaks.

C. Specify heavy-duty steel jambs and doors for entry ways.

D. Provide key operated removable center mullion on exterior and corridor doors. One removable mullion per bank of doors.

E. Grade III, model 2 seamless design is preferred at all locations subject to high frequency use, extreme environmental conditions and high abuse areas. Provide galvanized doors and frames at all exterior and wet locations. No Narrow Stiles.

F. Doors over 36" in width, door pairs and oversize metal doors require a minimum 14 Ga. metal frame, gauges are to be heavier where recommended by SDI. Specify fully welded frames for all applications. Do not allow knockdown or telescoping frames.

G. Provide continuous hinges on all oversize doors and at high frequency use entrances. Do not use aluminum geared type. Use barrel type, preferably stainless steel. See section 8.07.

H. Provide required fire rated doors in accordance with NFPA 80.

8-03 SPECIAL DOORS

A. Provide adequate bracing of overhead door roller channels and verify engineering with a registered engineer and/or manufacturer of door assembly.

B. Discuss options available for keying and locking overhead doors with the Owner. If it is determined that the overhead door is to be lockable, key the lock into the master key system. Verify locking mechanism will be accessible. Use standard components, no field expedient or locally fabricated components.

C. Specify insulated overhead doors for exterior use and carefully detail heads and jambs to help minimize heat loss.

D. Side coiling doors or grills are not to be considered.

E. The use of pocket doors is discouraged by the MSB due to:
1. Non compliance with the ADA
2. High maintenance

E. The use of dutch doors is discouraged. Designers are encouraged to solve the problem of partial access in other ways if possible. If dutch doors are considered within a design, consult with the MSB.

G. Coordinate or require coordination of power operated doors with electrical design and work.

8-04 ENTRANCE SYSTEMS

A. The MSB requires that entry doors NOT be designed with glass in bottom half of doors.

B. Provide a metal grating and catch basin outside of entry (preferably under overhang). Catch pan to be design with a minimum 6" space for snow and mud, below bottom of grate. Catch basin to N.F.S. material to promote drainage. (Refer to Division 5 for additional information on grate requirement.) DO NOT use smooth surface gratings. Serrated is preferred to linear grooves.

C. Entry mat material to be reviewed with MSB Prefer "Interface" brand entry mat or equivalent.

D. Aluminum entry systems will be approved by the MSB.

E. Provide reinforcement at doors and frames for all surface applied hardware such as pulls, push bars, continuous hinges, etc.

F. Utilize the heavy, top-mounted parallel arm style closer at entries - (See section 8.7 Door Hardware Specification Guide). Reinforce all doors with closers to permit machine screw attachment of closers. (No hex bolts or sheet metal screws.)

G. Entrances to high traffic areas are to be designed as ultra high abuse areas and all components should be as maintenance-free as possible. Consider materials which do not need to be finished, (i.e. concrete or CMU) even eliminate painting if possible. - (See section 8.7.1 Door Hardware Specification Guide for acceptable heavy duty hardware components.)

H. Exterior doors shall have between minimum 3/8 inch / maximum 1/2 inch clearance between the bottom of the door and the top of the finished threshold to allow for gravel, frost heaving, etc.

I. Eliminate building overhangs at entrances that necessitate sprinkler systems in unheated areas if possible.

J. Utilize continuous hinges at all entrance doors. See Section 8.7 Door Hardware Specification Guide. (Stainless steel barrel type only)

GENERAL COMMENTS - WINDOWS

1. Sliding windows are not acceptable and are not to be specified. Preferred operator type is awning. Casements are acceptable. However, operators should generally be kept to a minimum. All windows will be double pane

2. Carefully detail windows to prevent infiltration of air and dust

3. All glazing to be at least 36" above finish floor. Exceptions are to be discussed with the MSB.

4. Walls that incorporate windows as the main body will be discussed with the MSB.

5. Specify glazing systems where window glazing is easily removed and replaced.

6. If operable windows are used to provide any portion of required ventilation investigate cost/benefit ratio for using mechanical means (i.e. security vs. ventilation) for all.

7. Insulated vinyl windows are preferred.

8-05 METAL WINDOWS

A. Specify a baked on, or electrostatically applied factory finish on metal windows.

B. Metal windows are required to be thermally broken.

8-06 WOOD WINDOWS

A. Wood windows will be approved by the MSB and will be either vinyl or metal coated.

B. Specifications are to dictate that the wood used in the fabrication of wood windows be treated with a preservative.

GENERAL COMMENTS - DOOR HARDWARE

1. Floor mounted door stops are generally not acceptable.

2. Closer mounted door stops are not acceptable.

3. Use hold open closer arms vs. wall or floor holders. (As required by Code).

4. Bottom shoe of mullions shall attach to interior floor slab vs. exterior.

8-07 DOOR HARDWARE SPECIFICATION GUIDE

1. BUTTS
   Acceptable Manufacturer's: Stanley, Hager, Lawrence, McKinney
   Types:
   a) Extra heavy four ball bearing butts:
      (Exterior vestibule, Toilet room, Gymnasium, and other high frequency doors.)
   b) Anchor Hinge
      (Doors with built in stop on closers or with overhead stop)
   c) Standard two ball bearing butts
      (other standard use doors)
   Sizes:

1-3/4"	Exterior and vestibule doors - 5"x 4-1/2"
1-3/4"	Interior doors up to and including 36" - 4-1/2"x 4-1/2"

   For Interior doors over 36" and 1-HR+ rated doors- use continuous hinges or pivots only.

1a. CONTINUOUS HINGES
   Provide continuous hinges on all oversize doors and at high frequency use entrances. Do not use aluminum geared type. Use barrel type, preferably stainless steel. Acceptable Manufacture's: Pemko, Stanley, Zero

2. MAGNETIC HOLD OPENS
   2a. Standard Duty Magnetic Holders (Standard Locations.)
   Acceptable Manufacturers: LCN, Norton, Doromatic, Dorma

2b. Heavy Duty Magnetic Holders, (Public Toilets, mid corridor doors, and other selected locations)

Acceptable Manufacturer: Architectural Builders Hardware 2000 series
Acceptable Substitutions: As approved
Features Required: 1. Minimum of 400# holding power
2. Separate keyed release switch

Key Switch
Acceptable Manufacturer: Locknetics 643-05, Von Duprin KS920
Acceptable Substitutions: As approved

3. LOCKSETS
Acceptable Manufacturer: Schlage "L" series
Acceptable Substitutions: As approved
Design: 6L

4. EXIT DEVICES AND PUSH BARS
Acceptable Manufacturer: Von Duprin or Precision
Acceptable Substitutions: None
Types:
Single Exterior Doors - 99 series with dead latching function, cylinder dogging night latch. Do Not Use Narrow Stile Doors
Single Fire Doors - 98L-Fx994L
Pairs of Fire Doors with Mullion - 2 each 98L-Fx994L x KR9954 mullion
Pairs of Fire Doors without Mullion (cross corridor) - 2 each 9847L-F x 994L (Metal Doors)

5. DOOR CLOSERS
Acceptable Manufacturer: LCN
Acceptable Substitution: None
Types: (Cold weather fluid at all exterior doors)
In swing doors: 4041 or for abused area 4041T or 4041 x 3077
Out swing doors: 4041 x 3077

6. DOOR PULLS, MOP PLATES, KICK PLATES
Acceptable Manufacturers: Quality, Builders Brass/Trimco, Signature Brass, Rockwood
Features Required: Plates shall be beveled (4) edges. No offset pulls, straight only.

7. OVERHEAD STOPS
Acceptable Manufacturers: Glynn-Johnson, Architectural Builders Hardware
Features Required: Stops must be constructed of stainless steel

8. AUTOMATIC FLUSH BOLTS AND COORDINATORS
Acceptable Manufacturers: Glynn-Johnson, Door Controls, Ives

9. DOOR STOPS:
Acceptable Manufacturers: Glynn-Johnson, Builders Brass/Trimco, Signature Brass, Rockwood

10. KEYING

Keying of locksets will be coordinated through the MSB maintenance staff. Mechanical rooms will be keyed to match the existing grand master key system.

11. LOCK CYLINDER CORES

a) Provide interchangeable (I/C) cores on all exterior entrance doors and interior doors with exit devices.

b) Coordinate all work with the MSB Project Manager to verify type and function and keying for all devices. Specifically include coordination with lockdown procedures for the facility in question.

c) Doors to mechanical rooms etc. will be keyed to match MSB maintenance master keys.

DIVISION 9 FINISHES

9-01 GYPSUM WALLBOARD (GWB)

A. Exposed GWB is to be screw attached only. Nailing will not be permitted.

B. Do not use GWB in wet or damp areas such as restrooms and shower rooms. Do not use GWB soffits at exterior unless covered by Cement Board, metal or other durable material.

C. Provide splash protection and water resistant GWB. when used near fountain or sinks.

D. In high traffic areas, GWB should be backed with 1/2 inch CDX plywood for impact resistance in corridors, entryways, and gymnasium up to 12 feet high where cost prohibits masonry or concrete.

E. Gymnasiums where GWB is used as either a wall or ceiling surface shall have a backing of 1/2" CDX plywood 12 feet high as a minimum.

F. GWB ceilings are acceptable if access panels are provided. Verify adequacy of access with MSB Maintenance Staff.

9-02 TILE

A. In wet areas waterproof GWB will not be allowed as a tile backer unless it is protected by a water proof membrane.

B. Provide 1/2" cementitious backer board, 1/4" Hardi-board, or 1/2" GP Dens-Shield on ceilings and vertical tiled areas. Maximum stud spacing is 16 inches c.c. (prefer 12 inches); support and reinforce all joints.

C. Provide tiled wall, floor and ceiling in all shower rooms.

D. Use thick set floors in all wet areas.

E. All ceramic floor tile must have a non-slip surface.

F. All specified tile shall be from current run stock. Tile which is not currently in production is not acceptable.

G. Extra (maintenance stock) tile to be delivered to the MSB maintenance staff at completion:

1. 1% field tile of each color to a maximum of 10 square feet.

2. 15 pieces of each special tile of each color used.

H. Thin set mortar is acceptable for wall and ceilings installations.

I. Provide quarry tile floors for large kitchen installations.

J. Warranty: Specifications shall require a five-year warranty on all ceramic tile installation.

K. Shower Rooms or other such wet areas shall have a chlorinated polyethylene (CPE) pan with fully welded seams installed on a sloped mortar bed within a thickset assembly.

9-03 RESILIENT FLOORING - VINYL COMPOSITION TILE

A. Vinyl Composition Tile is acceptable in wet areas except toilet rooms, kitchens and nurse spaces. However, the MSB prefers sheet goods where the hardness is not required because of high maintenance cost of tile.

B. Use of cutback adhesives are not acceptable.

C. Installation cleanup is to include damp mopping only. No wet mopping or application of any sealer or wax by contractor.

9-04 RESILIENT FLOORING - SHEET VINYL

A. Provide sheet vinyl with continuously welded seams in wet areas where tiled surfaces are not used. Consider heavier duty material where budget will allow.

B. Do not use cutback adhesives.

9-05 CARPETING

A. Direct glue-down installation of carpeting is strongly recommended.

B. Release type mastic is not acceptable for direct glue down carpet. (OK for modular)

C. Specification are to request all carpeting overruns, and scraps in excess of 2' square, be bundled, wrapped, labeled and turned over to the Owner at the completion of the project.

D. Specify a carpet which is multi-colored with sufficient space dyed yarns or patterning to disguise soiling and traffic patterns.

E. Colors are to be included on a color board to be presented to the MSB staff for approval.

F. Carpet manufacturer's written warranty shall be no less than fifteen years, non-prorated, against product failure covering freight, labor, and material in the following areas:

1. Edge ravel, wet or dry
2. Backing delamination, wet or dry
3. Loss of 20 lb, average tuft bind, wet or dry
4. Face yarn loss, no more than 10%
5. Static protection, 3.0 Kv @ 70 degrees, 20% RH

G. Carpets shall meet the following minimum requirements:

Construction:	Woven preferred, Tufted acceptable (Except see modular alternative)
Surface Construction:	Loop Pile
Face Yarn:	Dupont Antron Legacy or Dupont Antron Lumena or approved (Nylon only)
Face Weight Density:	6,000 minimum (calculated using pile thickness)
Face Weight	26 oz./sq. yd. minimum
Gauge:	1/8" minimum
Stitches per Inch:	8.0 per inch minimum
Backing Construction:	Must be impervious and unaffected by water
Backing Bonding Agent:	Thermoplastic composite (no latex or urethanes)
Width:	6' minimum
Warranties:	15 year minimum

F. Modular Carpet Alternative

Construction:	Non-cushioned Modular (Tufted Tip-Sheared)
Soil/Stain Protection	Manufacturer's top line applied product
Antimicrobial Treatment	Manufacturer's top line applied product
Yarn System:	Solution Dyed Type 6,6 Nylon
Tufted Yarn Weight:	20 Oz/Yd2
Machine Gage	1/12 in.
Pile Height	.21 in.
Pile Thickness	.143 In.
Stitches:	9.66/in.
Pile Density	5035
Total Thickness	.28 in.
Size:	18" x 18" to 36" x 36"

I. Use of carpet cushion is not recommended. Use of carpet on stairs is generally not acceptable.

J. Do not specify water soluble adhesives.

K. Require anti-microbial protection: Independent testing must indicate no growth and 90% reduction of organisms when tested in accordance with AATC Test Method 138 after 15 washings. Must pass GSA requirements for antibacterial and fungicide treatment. Must be applied throughout the carpet construction and must be insoluble in water.

L. Minimize number of seams in carpet installations, use only one color of carpet per room.

9-06 ACOUSTICAL TREATMENT (General Requirements)

A. Where Suspended Acoustic Tile (SAT) ceiling systems are utilized in acoustically sensitive situations, extend interior partition walls to structure above with acoustic insulation at entire wall.

B. Provide Suspended Acoustical Tile ceilings wherever practical.

C. Provide wall and ceiling mounted acoustical panels within Gymnasium space. Wall and/or ceiling surfaces in gymnasiums, multi purpose, offices, and conference rooms will be designed to help reduce reverberation and absorb sound.

D. Gymnasiums and Multi Purpose rooms are to meet the acoustic recommendations outlined in the general requirements portion at the end of the architectural portion of this document.

9-07 SUSPENDED ACOUSTICAL TILE CEILINGS (SAT)

A. Installation to conform to International Building Code (IBC).

B. Wherever possible, a minimum of 30 inches of clearance is required above suspended ceilings. This includes space requirements above light fixtures.

C. Suspended Acoustical Tile (SAT) ceilings are preferred for all spaces, except those which are subject to heavy abuse, i.e. gymnasiums. GWB ceilings are acceptable for special areas but will be discussed with Owner. Use washable type tiles in kitchens.

D. Do not use any concealed spline ceiling support assemblies.

E. Suspended Acoustical ceilings of any type are NOT acceptable in gymnasiums, multi purpose rooms and dressing rooms.

9-08 PAINTING

A. Corridors, kitchen, locker rooms, restrooms require special attention; durable finish such as semi-gloss Alkyd enamel or epoxy have performed well. Avoid high gloss wall finishes due to magnifying of defects. Rather, use slight texturing or other effects. Consider stipple texture in paint system.

B. All metal door jambs to be semi-gloss Alkyd enamel or epoxy.

C. Metal handrails are to be shop finished. Field application of paint is not acceptable. Coordinate within Division 5.

D. Semi-gloss enamel on interior wall surfaces.

E. Do not specify Semi-transparent wood stains.

F. All exterior wood will be back-primed before installation on building. Paint will be Fuller Obrien Weather King II or approved equivalent.

G. Select light colors for the base field color in all areas. Do not use dark colors that do not reflect light well.

H. Painted corridor surfaces (where necessary) are to be a washable semi-gloss paint. Prefer a surface that would not require painting in corridors.

I. Specifications are to require the Contractor to retain labeled samples of each paint color and type used throughout the project.

J. Public Safety Building (PSB) colors: Exterior – Burnt Tile, Exterior Trim – Spice Tone, Interior – Winter Cloud, Interior Trim – Burnt Tile.

K. Large bay floors will not be painted with the exception of striping.

9-09 VINYL WALL COVERING

A. DO NOT USE Vinyl-coated fabric wall covering, wall paper and other fabrics for corridor walls. Nor are they recommended for use in any other area.

C. Rolled vinyl wall coverings are not acceptable. If a vinyl wall covering is desired, provide a sheet vinyl wall covering similar Acrovyn, or Kydex, .022" min. thickness

9-10 RUBBER BASE

A. Specify pre-formed corners, inside and outside, for all rubber base or specify and enforce strict and detailed requirements for scribing and scoring field formed corners.

DIVISION 10 SPECIALTIES

10-01 COMPARTMENTS AND CUBICLES

A. Toilet Partitions:
   1. Specify homogenous plastic (HDPE etc.) toilet partitions that are scratch/vandal resistant in public facilities. Metal is acceptable in other areas.
   2. Toilet partitions will be braced at the floor and ceiling.
   3. Top rails in public use areas should be designed to discourage swinging or hanging on them in public use restrooms.
   4. All hardware on toilet partitions are to be stainless steel.
   5. Provide accessible hardware per ADA.

10-02 CORNER GUARDS

A. Provide corner guards on all GWB partitions in corridors and other high use areas. Corner Guards are not necessary on C.M.U. (CMU will use bull-nose corners where exposed to traffic)

10-03 FLAG POLES

A. Flag poles are to be 35' in height.

B. Specify tapered aluminum flag poles with built-in cord and lock mechanism.

C. Flag poles shall be cone tapered seamless aluminum with built-in metal braided halyard.
   1. Display lights for flag pole to be controlled by photo-cell and should also be tied into the DDC system.

D. Finish: All exposed aluminum surfaces shall have clear anodized finish.

E. Location: Near main entrance and accessed by sidewalk. Preferably on a raised portion.

10-04 IDENTIFYING DEVICES (SIGNAGE)

A. All signage is to comply with the requirements of the Americans with Disabilities Act.

B. Interior signage package to be coordinated with the final room numbering system.

C. All rooms are to be numbered, including all support spaces.

D. Designers will ensure dedication plaques are provided and installed by the contractor. Knox boxes will be provided by the MSB and installed by the contractor.

10-05 LOCKERS

A. Require well ventilated lockers in locker rooms.

B. Prefer fully recessed lockers. Provide sloping top lockers in corridors where exposed.

C. Doors will be min 14 gauge with full length piano hinge and a minimum 3 ½ in wide reinforcement welded to the inside of the door that encloses the lock bar.

10-06 TOILET AND BATH ACCESSORIES

GENERAL COMMENTS

1. The following toilet room accessories shall be Owner selected to match MSB standard to assure fit of paper products and replacement of damaged units and may be owner furnished on some projects:
   a. Soap dispensers
   b. Paper towel dispensers
   c. Toilet paper holders
   d. Waste receptacles
   e. Feminine napkin dispensers/disposals

2. The architect shall select other toilet room accessories which include, but not limited to:
   a. Metal framed mirrors
   b. Robe Hooks
   c. Shower curtains and curtain rods
   d. Accessible seating in showers and tubs

3. The Architect is to provide drawings, which clearly lay out the position of all toilet room fixtures and specialty items and devices. Drawings and/or specifications shall indicate blocking requirements for Owner and Contractor furnished specialties. Ensure the products are placed in locations which will comply with the Americans with Disabilities Act.

4. Each toilet accessory item shall be identified in the specifications or on the plans as to make and model to facilitate the coordination of blocking requirements.

DIVISION 11 EQUIPMENT

GENERAL COMMENTS

1. Carefully review each piece of equipment which is to be placed in building: verify size, storage, access, and power requirements, required water hookup, exhaust, code problems, etc. Provide list of all contractor-installed equipment to the MSB as part of the design development submittal.

11-01 INDUSTRIAL EQUIPMENT

1. Coordinate with electrical consultant to ensure provisions for a master shunt trip for all shop equipment.

2. Provide a separate room for shop dust collection equipment, provide acoustical separation. Coordinate dust collection system and shop equipment.

3. Shop equipment: Owner-specified, Contractor furnish and install. Coordinate size, type, etc. all work benches shall be equipped with compressed air with quick disconnect fittings, hoses and piping.

4. All shop equipment to be fitted with coil release on/off switch.

12-01 CABINETS AND STORAGE

A. Provide common key for common group cabinets in individual labs. Review keying of cabinets with the MSB Project Manager for approval.

B. Provide locking doors on all lab storage cabinets that are keyed to a master key system

C. Doors on all cabinets shall swing 180 degrees (typically).

D. Go over cabinet specification in detail with MSB Project Manager. High quality durable cabinets are required (plywood base, heavy duty edge banding, etc.).

12-02 WINDOW TREATMENT

A. Provide metal mini-type blinds in all windows.

B. Provide cloth drapes in rooms as required for acoustics.

12-03 RUGS, MATS, AND GRATINGS

A. Prefer secured (non-slip) but removable grating at exterior of main entries under overhang.

B. Prefer consideration of newer type synthetic walk-off mats at entries. SEE 8-04.C.

DIVISION 13 SPECIAL CONSTRUCTION

IN RESERVE FOR FUTURE USE

DIVISION 14 CONVEYING SYSTEMS

14-01 HYDRAULIC ELEVATORS

A. Coordinate carefully with electrical and fire protection sections.

B. Where holeless elevators are to be specified do not permit eccentrically loaded (single cylinder) type operation.

C. Specify both keyed and electronic keypad operation.

D Specify non-proprietary controller so that it can be maintained and reprogrammed by maintenance staff.

E. Prefer Otis Elevators, Thyssen-Krupp, etc.

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MECHANICAL SECTIONS

DIVISION 15 MECHANICAL

SECTION 15010 - ..... GENERAL

15-01 MECHANICAL REQUIREMENTS

A. Provide hose bibs every 100 L.F. around building perimeter. Provide for drain down of water supply lines not used during winter months. Provide isolation valves for each hose bib.

B. Boiler Room located at ground level. Floor sloped to floor drain. No pit type mechanical room.

C. Method of fuel storage is project and site specific and will be discussed with the MSB staff. Above ground storage is preferred.

D. All shop/utility sinks must have plaster trap for easy clean out.

E. Design ventilation for acceptable indoor air quality. Comply with ANSI/ASHRAE 62-1-989 Addendum. Consider C02 monitoring and control for heavy occupancy spaces.

F. Provide enough isolation valves to adequately isolate plumbing/heating fixtures and appliances for maintenance repair or replacement.

G. Brands will be per the MSB Preferred Materials List (Appendix A).

H. Comply with all the current laws, rules and regulations of the State of Alaska Administrative Code (hereinafter referred to as A.A.C) for all Matanuska-Susitna Borough (MSB) designs.

I. The following contain requirements applicable to the MSB construction work:

1. All mechanical and electrical work shall comply with the codes or guidelines, latest edition, as applicable to the project.

   a) National Fire Protection Association (NFPA)

   b) International Fire Code (IFC)

   c) International Mechanical Code (IMC)

   d) International Building Code (IBC)

   e) General Safety Code (OSHA)

   f) Uniform Plumbing Code (UPC)

   g) Underwriters Laboratory, UL, or approved equal

   h) American National Standards Institute (ANSI)

i) American Society for Testing and Materials (ASTM)

j) Institute of Electrical and Electronics Engineers (IEEE)

k) Insulated Cable Engineers Association (ICEA)

l) National Electrical Manufacturers' Association (NEMA)

m) EIA/TIA-606 - Administration for the Telecommunications Infrastructure of commercial Buildings

n) BICSI - Telecommunications Distribution Methods Manual.

o) IEEE Standard 142

p) SMACNA - HVAC Duct Construction Standards, Metal and Flexible

q) SMACNA - Industrial Duct Construction Standards

r) SMACNA - Fire Damper Guide

s) Industrial Ventilation, American Conference of Governmental Industrial Hygienist (latest edition)

1. NFPA Air Conditioning, Warm Air Heating, Air Cooling and Ventilating Systems, Pamphlet No. 90, 90A, 91, 96.

2. State of Alaska Department of Labor, Mechanical Inspection Division.

3. ASHRAE guide and SMACNA design guides are applicable for design and construction methods.

15-02 DESIGNS AND PROJECT PROCEDURE

A. The Architect and Engineer shall meet with the Project Manager at the completion of the schematic design phase to review approach, including locations for mechanical equipment, equipment chases, and accessibility. There shall be a utility chase provided for access that has ample working room. All control valves and VAV boxes will be in locations that allow servicing without interrupting normal functions. The corridor shall be specifically discussed at the design meeting.

B. The Architect/Engineer shall submit the following to the MSB Project Manager with design development drawings:

1. The total annual energy budget will be based on an ambient building temperature of 70 degrees.

2. Heating and ventilation system drawings: The locations of the supply and return air diffusers, heating elements, routing of the hydronic piping systems, ductwork and thermostats and heating plant shall be shown on the contract drawings. Arrangements

of equipment will be indicated. Provide preheat coils at make-up air if necessary for adequate indoor air quality.

3. Refrigeration and air conditioning systems, schematic and automatic controls for proposed design: All facility designs must be sized to accommodate mechanical refrigeration systems if they are added later. This includes showing space for future cooling coils in all air handlers, by providing blank spaces in the AHU.

4. Water systems. Include piping plans and isometric or schematic diagrams.

5. Drain systems. Provide piping plans, isometrics or schematic diagrams. Indicate slope of all piping that is not to be placed at ¼" per foot.

6. 35%, 65%, 95%, and final specifications and detailed drawings.

15-03 SPECIFICATIONS AND DRAWINGS

A. Do not repeat in the specifications items that are covered in standard forms of General Conditions or General Requirements. Refer, in each division, to the General Conditions and General Requirements (usually Division 1) and indicate that these items apply to the specific divisions of the work. The forms are available from the Project Manager. Note particularly general requirements, clauses covering materials, submittal's for approval, substitutions, shop drawings and guarantees.

B. The fundamental requirement is that drawings and specifications be complete, detailed, and accurate enough so that all bidders may prepare estimates on exactly the same work and construction may proceed with no misunderstandings on the work to be done.

C. Make each division of the specifications complete in itself. Avoid duplication and conflict between the specifications and the plans.

D. Avoid the use and specification of unusual materials, or those not available on the local market. Where materials may not be well known, include the name and address of either the manufacturer or local agent in the specifications.

E. Make scale of working drawings ¼, 1/8, or 1/16 inch to the foot, with preference given in the order mentioned.

F. Make schematics and diagrammatic details for each project large enough to be easily read. Scale boiler room and electrical room plans and elevations at ¼" minimum. Use ½" or larger if required to clearly show details of design.

G. Provide, on each set of plans, an adequate identifying legend of all symbols used. Identify and define all abbreviations used on the drawings.

H. Detail contract drawings for general mechanical installation so the installation drawings by subcontractors will have to be made only for special conditions, or in cases where equipment rearrangement is required.

I. Make sectional drawings of congested areas to show all mechanical work involved. Repeat, or refer to, such sections on the drawings for each affected trade.

J. Unless the system is very simple, provide separate drawings for plumbing and heating work. Separate specialty piping from plumbing and hot water piping drawings.

K. Provide space for soil, waste and vent stacks, water lines, ducts, etc.

L. Provide schedules on drawings for pumps, fans, boilers, heaters, diffusers, coils, grilles, convectors, and other items that are used in many sizes or types. List enough operating characteristics to define the items without questions, and include sufficient description for ordering of equipment replacement or parts.

M. Show all mechanical service and meter equipment and locations. The Project Manager will determine the source of utilities for the construction period and will establish rates to be paid for utilities provided by MSB during the construction period. (This condition applies only when an existing building is being remodeled and has the capacity to provide the service.) Include complete details on the drawings with cross sections for all fan rooms, mechanical rooms, boiler rooms, and similar spaces with a high concentration of electrical and mechanical equipment.

N. Provide isometric or equivalent detail drawings for complicated pipe connections.

O. Show complete duct and pipe sizing, including sizes and locations of all transitions. Pinpoint change in sizes, either by symbols or by indication of sizes, immediately adjacent to the point of change.

P. Show ventilation ductwork to scale dimensions for ductwork larger than 12". Do not use single line drawing in areas were interferences are possible with other trades.

Q. Do not imply responsibility of the contractor for elements of engineering design in specification paragraphs that require compliance with rules, regulations and codes.

R. Specify installations be made "in accordance with the manufacturer's recommendations" . Where a single type of material is acceptable and the method of application is uniform for all manufacture's products, the specifications should state the installation requirements explicitly and in detail.

S. Be specific as to the division furnishing automatic controls, control wiring, motors, disconnect switches, motor starters or other electrical equipment. Clarification is necessary both as to furnishing and installing. This may be done by a schedule on the Mechanical drawings showing in which divisions each item is specified and which trade installs the item. Include, as a minimum, the controls schematic diagrams, sequences of operation, specifications and DDC points list.

T. When specific brands and catalog numbers are used to specify a material, product, item, or service, it shall be followed by "or Owner approved equal."

U. If performance is used as the basis for specifying any equipment, product, or material, use the following guideline:

1. Specify desired characteristics, salient features, or user requirements.

2. Specify complete performance criteria, with minimum, maximum or variable conditions expected.

3. Specify tests and methods to be used in determining compliance, together with where and who will perform tests.

4. Do not include materials, methods of manufacture, finishes or dimensions, except where that may be critical to design or location.

Example: Supply Fan S-1

a) Single width, single inlet, backward inclined blade centrifugal, belt drive fan, clockwise rotation, top horizontal discharge.

b) Minimum capacity of "x" CFM at "y" static pressure, "z" fpm discharge or tip velocity, with noise level criteria if desired.

c) Fan to be tested by independent air balance company after installation and the cost included in the contract.

d) Weather proof construction and finish for exterior mounting on roof in a four by four foot square area.

V. Specify that pipe welders be qualified for the specific process to be performed and hold current certificate, issued by a recognized testing authority, for that process. Require welder certification be submitted for approval only if welding will be required for the project.

W. Specify that approval of submitted equipment will be given only to that of current manufacture at time of delivery and that all parts for normal maintenance or repair be available for a minimum period of five years.

X. For conformity on all Mechanical Drawings, indicate piping, and ductwork as follows:

1. Rising within a floor as "RISE"

2. Rising to another floor as "UP"

3. Dropping within a floor as "DROP"

4. Dropping to another floor as "DOWN"

5. Exposed at ceiling as "AT CEILING"

6. Concealed in ceiling as "IN CEILING"

7. Below floor as "IN CEILING BELOW" or "BELOW FLOOR"

Y. Show locations of duct static sensors and differential Pressure sensors.

Z. Monitor refrigeration unit temperatures.

15-04 AS-BUILTS

A. True as-builts are essential. This must be spelled out clearly in the contract documents and diligently pursued during construction by owner, designer, and contractor. Additionally, the MSB requires one set of reproducible "Mylars" for record purposes. The standard size for road projects shall be 24" x 36" and architectural projects shall be 30" x 42".

B. All as-built plans shall also include AutoCAD discs in the latest version for future plotting or use with later renovations.

C. All control, fire protection, and other specialty shop drawings must be included with the as-built plans, in AutoCad format.

15-05 OPERATION AND MAINTENANCE MANUALS

A. Require coordination with Section 01700 Project Closeout and with individual Sections within Division 15 Specifications. Verify specific O & M Manual requirements particular to each section are included in those sections that have such particular requirements.

B. Require hard-backed loose-leaf binders in multiple volumes where necessary so that all pages will rest on one side of the rings. Each volume must include table of contents for the volume and index tab dividers for each section within the binder.

C. Require a separate chapter for each section of the specifications with subchapters for each class of equipment or system. Require a table of contents for each chapter listing each major item with a page or mark number and require numbering each page for correct placement in the manual. Require identification of equipment with its associated nameplate, i.e., AHU-1, etc.

D. Require an Operating Sequence Narrative, typewritten in outline form. In each chapter describe procedures necessary to operate equipment covered by that chapter. Include procedures for start-up, shut-down and emergency operation. Where a particular sequence is required this must include a statement to that effect and instructions in numbered steps. Require a description of all adjustments necessary or optional.

E. Require Maintenance Instructions, typewritten or factory printed. In each chapter describe maintenance procedures for equipment covered by that chapter. Include a schedule of manufacturer's recommended preventative maintenance procedures. The PM schedule should be required to be a stand-alone document that can be used independent of the rest of the O& M submittal. Maintenance Instructions must include instructions for minor repairs that could reasonably be performed by persons qualified to operate the equipment and perform day-to day maintenance. Require inclusion of all information necessary to maintain the equipment, especially noting items necessary to maintain warranties in effect.

F. Require inclusion of manufacturer's descriptive literature for all equipment and all shop

drawings of specially fabricated items. These must be the final, corrected shop drawings.

G. Require inclusion of manufacturer recommended spare parts list for all equipment with replaceable parts.

H. Require a valve directory listing valve number, type, size, function and normal position for each numbered valve required by Section 15050 Basic Mechanical Materials and Methods.

I. Require Coordination of required training of owner personnel with instruction in the use of the completed and approved O & M Manuals.

15-06 ACCESS

A. Access for operation, maintenance, repair or replacement of any equipment or item is very important. With this in mind, the words access, accessible, etc., as used in this Standard, are defined as being for a 6 foot, 200 pound person with a 50 pound tool box to be able to operate, maintain, repair or replace such equipment or item.

B. The degree of access, or accessibility, will depend upon the importance, complexity, size and weight of the equipment or item. As an example, a ventilation damper, being a single item accessed infrequently or never after the initial setting, would require a lower degree of access than a complex control requiring maintenance or possible removal for repair or replacement.

C. Pay particular attention to access for all main, sectionalizing, or isolating valves, as they are usually operated under emergency conditions.

15-07 BUILDING UTILITY SERVICE LOCATIONS

A. Information regarding the location, size and elevations of existing utilities and service points will be furnished by Facilities Coordinator.

B. Do not start layout of any building utility system until this information has been received and discussed.

C. Keep heat pickup by ventilation air passing through plenums or ductwork to a minimum. Under summer conditions, endeavor to supply ventilation air to rooms in the building with a minimum temperature rise above outside air temperature. Avoid the following factors where practical:

1. Large electric motors located in air plenums or air streams.

2. Air intake off south wall of building where prevailing winds do not effectively provide air movement.

3. Plenums located next to hot spaces.

4. Ducts or plenums under non-insulated roofs.

5. Non-insulated plenums where substantial temperature differences exist.

6. Ducts passing though hot spaces.

15-08 SHOP DRAWINGS

A. Include in each division of the specifications a list of specific equipment for which shop drawings or catalog data will be required.

B. Specify the contractor to submit shop drawings or catalog data for the following items:

1. Fans, including drives
2. Heat exchangers
3. Tanks or receivers
4. Boilers and breeching
5. Control equipment
6. Heating and ventilating specialties
7. Unit ventilators
8. Flexible connectors
9. Vibration isolators
10. Heating and Ventilating units
11. Pumps
12. Fire protection systems

15-09 EXISTING EQUIPMENT

A. Reference in the specifications any existing mechanical or electrical equipment shown on the plans, or specified as being furnished by the "Owner", with regard to existing location, when available, who disconnects, moves, reconnects in the new location, and if any new parts, piping, valves or revisions are required for the new location.

15-10 BIDDING PROCEDURES

A. All Bidding Phase requests for substitutions must be received during the first 7 days of the bidding period. Requests for substitutions received after that time will not be reviewed during the bidding period.

B. Approval of items after the bid date and contract award shall only occur on an as needed basis and only with the approval and consent of the Owner.

SECTION 15050 - BASIC METHODS AND MATERIALS

15-11 MACHINERY AND EQUIPMENT ARRANGEMENTS

A. Arrange machinery and equipment for safe convenient access and for efficient operation. Refer to current OSHA, General Industry Safety Orders, and above for accessibility requirements.

B. Provide access to equipment, valves, or controls in spaces for maintenance personnel who make routine visits to the building. Locate the access so these visits will not disturb the occupants or normal functions of the building.

C. Locate machinery and equipment rooms with due regard for locations of outside utilities serving the building.

D. Unacceptable conditions in machinery spaces, with respect to machinery and equipment which require periodic inspections, maintenance, or adjustment are:

1. Less than 6' 6" headroom around machinery and equipment.
2. Less than 2' 0" walking space around or between machinery and equipment.
3. Vertical access ladders.
4. Access via crawl space.
5. Ceiling mounting of equipment requiring servicing.
6. Difficult or dangerous access to lubrication points.
7. Gauges and thermometers in locations that are hard to see or read.
8. Inaccessible main utility valves.
9. Insufficient lighting.
10. Heat build-up due to poor ventilation.

E. Locate machinery and equipment which may vibrate, or be noisy, so as to have the least possible detrimental effect on the occupants of the building; install with or on vibration isolating devices.

F. Arrange and locate machinery rooms so that heat and sound will not be transmitted to other parts of the building. Provide adequate ventilation to prevent excessive temperatures in the mechanical room and insulate, if required, to prevent heat transmission to adjacent spaces.

G. Location of access doors, electric panels, fire hose cabinets, dry standpipe valves, convector or supply and exhaust grilles, etc., located in public spaces are to be reviewed with the Architect for approval of appearance as related to other parts of the structure.

H. Provide escape exits where required by code. See OSHA, Vol, 1 and 2, General Industry Safety Orders, NEC, etc.

I. Provide doors, removable panels, and pathways for sufficient size to allow removal and replacement of all mechanical equipment in fan rooms, boilers and within the structure. Do not locate any valves in public spaces, but rather behind lockable access doors or in mechanical spaces that are accessible only to maintenance personnel.

J. Specify vacuum breakers on all hose bibs.

K. Valves controlling baseboard heat units should be located in ceiling space rather than behind book cases or other cabinetry. Best located in hall with VAV equipment.

15-12 UNDESIRABLE PIPE LOCATIONS AND CONNECTIONS

A. The following conditions are considered unacceptable:

1. Cold water lines near heat sources such as heating or hot water lines.

2. Water, waste, sprinkler, hydronic, or roof drain lines over live electrical components.

3. Soil or waste lines over food processing preparation, or storage areas.

4. Pipes under a concrete ground floor slab or in concrete walls. Drainage pipes are an exception where their location elsewhere is impracticable. Coordinate penetrations with structural design. Sleeve all pipe penetrations.

5. Valves installed in such a manner as to be inaccessible for maintenance or replacement.

6. Utility piping entering or leaving a building below exterior stairs, or concrete. Excavation for repair or replacement in these types of areas is expensive and inconvenient to the building occupants.

B. Permit no cross connection between a domestic water system and water which may be contaminated, except under certain conditions where backflow prevention devices are installed.

15-13 PIPE AND DUCT PENETRATIONS

A. Design and detail all utility pipes penetrating exterior walls with sufficient flexibility for all normal settlement of building or backfill. Take particular care with cast iron, ductile iron, and pressure pipe. Coordinate with Architect on compaction specifications of building backfill supporting utility piping entering or leaving the building.

B. Design and detail the manner in which pipes and ducts pass through roofs, interior walls, floors, and ceilings.

C. Design and detail pipe and duct penetrations so that a minimum opening remains after installation. Specify and detail effective fire seals for openings. Design to prevent frost blockage of air screens.

D. Where pipe or ducts are insulated, provide for continuous insulation through openings at all means of support.

15-14 STRAINERS

A. Show strainers ahead of all meters, regulators, pumps, controls or equipment that could be damaged or rendered inoperative due to foreign matter in the piping. Size screen opening for degree of protection required. Cover purging of lines and cleaning of strainers, at completion and before acceptance, in each division. Provide isolation valves and drain valves with hose fittings on strainers.

15-15 UNIONS, COUPLINGS AND NIPPLES

A. Show unions at all threaded connections to equipment, regulators, controls that may have to be removed or replaced and at all points where necessary for the disassembly of piping for maintenance.

B. Specify dielectric unions or couplings installed at any point where electrolysis might occur between piping of dissimilar materials. Specify temperature and pressure of pipe and contents that will be used so that manufacturer can provide a proper gasket and washer material to withstand the specified conditions.

15-16 CHANGES IN SIZES OF PIPE LINES

A. Specify reducing fittings wherever changes in sizes of piping occur. No bushings will be permitted.

15-17 MACHINERY GUARDS

A. Cover all moving equipment, such as fan belt drives and motor drive couplings, with guards.

B. Construct belt guards with an angle iron frame covered with 18 gauge expanded metal or wire mesh. Where guards are within four inches or less of the moving part, use ½ inch maximum openings and for greater than four inches use 2 inch maximum openings. Where it is necessary to change or adjust belts, check and lubricate bearings or take tachometer readings inside the guard, provide the guard with hinged or easily removable sections of sufficient size and location to perform such work. Use friction catches for maximum effect or two studs with wing nuts to secure such sections.

C. Specify all accessible fan inlets or exhaust openings be covered with wire mesh guards. Size mesh to give 90% free area minimum, with 2" maximum openings. Provide easily removable access panels, of same material, for bearing check, lubrication or tachometer readings.

15-18 CONDENSATION

A. Review the location of all piping and ducts in any atmosphere that would cause condensation due to the temperature of the contents in the pipe or duct in relation to surrounding temperature. Example is cold water pipe or cold air duct in warm ceiling space.

B. Specify proper insulation and vapor barrier for each condition.

C. Specify waterproof duct joints (soldered, welded, flanged, etc.) that may have an internal problem due to warm saturated air being exhausted. Example is a dishwasher hood exhaust duct. Pitch all waterproof ducts to a drain outlet.

D. Specify and detail drip pans, with drain piping, below all cooling coils.

E. Do not show or allow access doors to be installed in the bottom of any duct subject to internal condensation.

F. Coordinate with plumbing for location of adequate and accessible drains.

G. Specify and show all drip pan drains having concealed drain outlets with clear plastic section to permit observation .

15-19 ACCESS DOORS AND PANELS

A. To provide the degree of access requested above, the installed location of both the access door or panel and the concealed item it serves is important.

B. Coordinate with other trades on the location of concealed items and the Architect on location and size of access opening required.

C. Show approved locations and sizes on the Drawings for all anticipated doors or panels.

D. Include a sufficient number of additional doors or panels above those shown, with sizes, to cover situations not anticipated during design, but requiring access due to the installed location.

E. Review the indicated location of all concealed items and their accessibility during construction. If at any time it becomes obvious that access will be impaired, revise the location of the item or its access.

F. Show all access doors. Do not include such statements as, "Install access doors 'as required,' 'where required,' 'of sufficient size,' 'as directed,' etc.", in the specifications.

SECTION 15100 - VALVES

15-20 ISOLATION VALVES

A. Specify ¼ turn ball valves for all isolation up to 3".

B. Specify gate type for boilers where ASME requires gate valves, and Outside rising stem gate valves for fire sprinkler systems where required by NFPA 13.

C. Provide valves for isolating all parts of service piping systems, equipment and controls. In general, it should be possible to isolate separate floors, separate wings, all branches off of mains, toilet rooms, machinery rooms all heating zones, and other natural subdivisions of the building.

D. Show all valves on the drawings. Do not reply on a general note in the specifications or on the plans to "install valves 'where' or as required."

E. Make toilet room isolation valves accessible through locked ceiling hatch in restroom or inside janitors closet.

F. Do not specify combination isolation/balancing valves as isolation valves.

G. All isolation valves to be full port.

15-21 RELIEF VALVES

A. Provide relief valves wherever required by code, law, or to protect pressure vessels or equipment against dangerous pressure. The set pressure should be indicated on the valve and have externally operated level lift handles. Provide floor drain nearby for potential spills.

B. Specify A.S.M.E. certified relief valves to comply with boiler code or Unfired Pressure Vessel Code.

C. Show discharge piping of relief valves to glycol barrel or to 6" AFF if water, provided that a floor drain is nearby.

15-22 RELIEF VALVES

A. Use ball valves with hose end and cap.

SECTION 15121 - EXPANSION COMPENSATION

15-23 THERMAL EXPANSION

A. Arrange pipes and equipment with due regard for the effects of thermal expansion. Provide expansion joints or expansion loops as required to avoid noise or permanent physical deformation from this cause. Natural expansion loops are preferred over mechanical expansion joints.

SECTION 15140 - SUPPORTS AND ANCHORS

15-24 PIPE SUPPORTS

A. Support all pipes with common trapeze type hangers where possible. Comply with Earthquake Anchorage Standard.

B. Do not allow valves or equipment to support the weight of any pipe.

C. Provide special supports for plastic piping.

D. Isolate all non-insulated copper pipe from supports by means of a felt wrapping or manufactured isolating item.

E. Protect all insulated pipe from crushing at supports by means of a sheet metal shield outside the insulation, or pipe saddle secured to pipe.

F. Specify all concrete inserts with hot dipped galvanized finish.

SECTION 15190 - MECHANICAL IDENTIFICATION

15-25 IDENTIFICATION OF PIPE, VALVES AND EQUIPMENT

A. Identify all piping as to the contents and direction of flow. Use plastic wrap-around labeling

B. Identify all equipment with painted stenciled letters or Bakelite plates to correspond to the construction plans.

C. Label, stencil or otherwise identify heating coils, heating and ventilating units, boilers, fans, pumps, and other equipment in the mechanical room.

D. Designate on the plans all main, sectionalizing and isolating valves. Do this in a manner that easily identifies the valve and location for maintenance personnel in an emergency.

SECTION 15240 - VIBRATION , SEISMIC, AND SOUND CONTROL

15-26 GENERAL

A. One of the major sources of noise in a building is the mechanical and ventilating equipment, with two categories and standards as follows:

1. Health Hazard - Noise where impairment of hearing and physical injury may occur (damage risk).

2. Non Health Hazard - Noise producing an objectionable environment, interference, annoyance and nuisance. These conditions will adversely affect the intended use of space, i.e., studying, reading, conference, activities requiring mental concentration.

B. Standards

1. Health Hazard - This standard is recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), a national professional society, as follows:

Maximum Noise level for repeated eight hour exposure over a long period of time is 90 decibels as determined in the a-weighting network of a sound level meter.

It is established as a code with regulatory status by:

a) U.S. Department of Labor

b) State of Alaska, Department of Industrial Safety.

2. Non-Health Hazard

a) General

To insure proper acoustic performance of air handling systems design criteria, include the control of noises associated with the operation of the system in the specification. Standards are established and predicated on the maximum noise levels deemed as acceptable conditions for a given space or activity. These noise levels and the degree of application are also dependent on individual or group needs, responses, conditions, and sensitivity as the noise affects the intended utilization of a space and the ability of persons to performs productively in the given surroundings.

The following guides may be used for design standards:

1) ASHRAE Guide and Data Book

2) American Industrial Hygiene Association, Industrial Noise Manual

3) Handbook of Noise Measurement (General Radio Company)

4) Speech Interference Level (SIL)

This identifies excessive noise that produces annoyance and interference with normal and effective conversation and communication. The recommended standards are comprised of a series of values for specific types of environments, such as offices, classrooms, conference rooms, etc.

5) Noise Criteria Curves (NC Curves)

This is a set of criteria used as comfort specifications and identifies minimum annoyance factors. Values of the curves show the maximum permissible noise level for each frequency band. Each curve applies to a specific type of environment.

b) General Practice

1) Where the noise level of an area is critical, such as a classroom, study area, music room, private office, etc., design for the maximum decibel rating based on the standards mentioned above.

2) Where a maximum noise level is designed and specified for an area or equipment, specify test method, test conditions and person(s) responsible for the tests and documentation of results.

3) Select and specify equipment having quiet operating characteristics at its design capacity and speed. Be particularly careful if it is installed in, near,

or on the roof above an occupied area. Size ducts and piping to have velocities below noise producing levels.

4) Specify and show acoustical treatment of ducts, pipes and equipment, if required, to meet the conditions.

5) Pay particular attention to the location and support of any possible vibration producing equipment to determine the degree of isolation necessary for the particular location.

6) Provide sound absorbing pads between equipment and structure where equipment is to be installed without vibration isolators, such as pumps, compressors, vacuum pumps, etc.

7) Place flexible sections in all connections between vibration producing equipment and building system it serves.

15-27 FLEXIBLE PIPE SECTIONS

A. Corrugated metal hose, with a braided cover, is preferred as a flexible section between vibration producing equipment and building or piping systems.

SECTION 15260 - PIPE INSULATION

FLAME/SMOKE RATINGS

All interior insulation shall have a UL listed composite fire and smoke hazard rating not exceeding:

1. Flame Spread 25
2. Fuel Contributed 50
3. Smoke Developed 50

15-28 COLD PIPE INSULATION

A. Domestic cold water, vents through roof, rain leaders and other cold piping other than refrigeration piping, shall have a vapor barrier permeability rating of 0.02 perm or less. Maximum thermal conductivity of k=0.25 BTU-inch/HR/FT2/degr @ 100 f. mean temperature. The insulation shall have a factory applied vapor barrier, flame-retardant, all service jacket.

B. Thickness Requirement: All pipe sizes = Insulation shall be 1/2" thick minimum.

15-29 HOT PIPE INSULATION

A. Thickness Requirement: All pipe sizes = Insulation shall be 1" thick

SECTION 15290 - DUCTWORK INSULATION

15-30 DUCTWORK

A. Outside air, relief air, combustion air, and exhaust air ducts shall have an average thermal conductivity of k=0.23 at 75 deg. F. mean temperature. All duct insulation shall meet the flame spread and smoke development rating requirements of NFPA 90A. The MSB does not want Foil-Scrim-Kraft (FSK) outer jacket. A complete vapor barrier must be maintained throughout the whole system. All insulated exposed ducts shall have a 6 oz. canvas jacket .

B. Rigid fiber board insulation is not to be specified.

SECTION 15300 - AUTOMATIC FIRE PROTECTION SYSTEMS

GENERAL CRITERIA

All sprinkler piping shall be ASTM schedule 40 or heavier, No "thinwall" pipe shall be allowed.

A. Design per NFPA 13 for zones and sectionalization valves to be located in the mechanical room.

B. Avoid the use of dry pipe sprinkler systems to the maximum extent possible.

SECTION 15400 - PLUMBING GENERAL

15-31 GENERAL CRITERIA

A. Provide ¼ turn ball type isolation valves for each plumbing group. Provide minimum 12" x 12" access doors to all valves that are inaccessible.

B. Clean outs must be properly placed, capped and noted on as-builts. Provide minimum of one clean out outside building. LOCATE ON ASBUILT. Provide access to all cleanouts, including carpeted areas. Do not put cleanouts in crawlspaces unless they are within 10' of an opening large enough to bring an electric snake machine. It is preferred to extend cleanout lines to the outside if the line is close to an outside wall and would be accessible from the outside.

C. Provide vacuum breakers for all hose bibs typically.

D. Provide showers with flow as designed by manufacturer, not to exceed 2.5 GPM.

E. Provide floor drain at the low point of all mechanical rooms.

F. Hose Bibs
1.) Provide interior valves for all exterior frost proof hose bibs.
2.) Provide vacuum breakers on all hose bibs.

G. Provide vacuum/pressure or pressure gauges as required to indicate operating pressures on both upstream and downstream sides of each pump installed.

SECTION 15410 - PLUMBING PIPING

15-32 PIPING TYPES

A. Use only copper pipes for domestic water supply, Type L rigid. Solder shall be lead free, and in conformance with the current plumbing code. Flux shall be code compliant B813 water soluble .Do not use Nokorode – Low Temperature.

B. No victaulic or mechanical fittings permitted except in sprinkler systems.

C. Sweat copper w/ unions.

D. All tubular pipes to be 17 ga. or better.

SECTION 15440 - PLUMBING FIXTURES

15-33 STANDARDIZED FIXTURES

A. Water Closets - For adults use wall mounted, back blow out American Standard or Owner approved equal.

B. Urinals - American Standard Trimbrook, Kohler Model 4970T, or Owner approved equal.

C. Lavatories, countertop self-rimming manufacturers shall be approved by the owner.

D. Lavatories, wall hung, shall be constructed of vitreous china with 4" back splash and drilled for 4" faucet centers. Manufacturer will be approved by the owner.

E. Flush Valves - Sloan Royal Flush Valves or Zum Aquaflush (closets and urinals). Use flush valves with exposed body on toilets and urinals except where Sloan infrared switched flush valves are installed in plumbing chases. The use of infrared switched flush valves is **NOT** encouraged and will be approved by the owner.

F. Faucets by Delta or American Standard, 4" commercial, or owner approved equal.

G. Service Sink: No.897 with wall brace and Vacuum breaker

H. Garage Faucet: No.305VB with short spout

I. Drinking Fountains: (Non-Refrigerated) Push button where no HCP required.

1. Recessed - EBCO Oasis PF210 with bubbler., Haws Mod. 2400 with bubbler, or Halsey Taylor #8880 with bubbler.

2. Semi-recessed - EBCO Oasis FLF-200 with bubbler, Haws Model1080 with bubbler and with VP-5 vandal plate, or Halsey Taylor #5801 with bubbler.

3. Accessible - EBCO Oasis FLF-140PM or DF14OPE with bubbler @ Haws Mod. 1175, with concealed integrated support system and bubbler, or owner approved equal.

J. Shower Fittings - Bradley 524-008 or owner approved equal.

K. Mop Sinks - Fiat model MSB-3624 W/889-CC Mop Hanger or owner approved equal.

L. Eye Washes - Side Wall mount - Haws Model 726OBT Recessed counter top - Haws Model 7301DM.

M. Shower stalls - Fiat 39" x 39" OD ADA accessible for handicap stall. Alternate accessible shower stall designs will be considered of discussed with MSB

SECTION 15450 - PLUMBING EQUIPMENT

15-34 HOT WATER HEATERS

A. Domestic hot water temperature system to provide 110 to 120 degrees F. For sanitary purposes i.e. dishwashers, etc., design reheat system to code required temperature levels. Both temperatures shall be monitored by the DDC control system.

B. Where the main system is to be fuel oil fired boilers, provide double wall vented coils with tanks for domestic hot water. It is preferred to use several of the smaller quick recovery "Amtrol" tank-coil units rather than one large water generator. Do not specify oil fired water heaters.

C. Where the heating system is gas, stand-alone natural gas fired water heaters are preferred. Specify A.O. Smith.

D. Domestic (recirculation) hot water pump is commanded on and off by the DDC system. The pump runs continuously when any building zone is in the occupied cycle and off at all other times.

SECTION 15484 - FUEL PIPING SYSTEMS

15-36 PIPING

A. Fuel oil piping shall be welded black iron for all pipe 2" and larger; threaded black iron ¾" up to 2", and brazed or flared type L or K copper for tubing smaller than ¾" and exposed in mechanical rooms where it cannot be damaged. Concealed fuel oil piping, or piping subject to damage shall be black iron.

B. Buried fuel oil piping shall be in double wall containment piping, with flexible inner carrier and outer containment piping, using specially manufactured and listed systems, such as Envirocon or equal.

SECTION 15500 - HVAC GENERAL DESIGN GUIDELINES

15-37 HEATING AND VENTILATING REQUIREMENTS

A. The MSB's most effective and efficient system to date is based on gas fired low pressure cast iron hot water boilers with lead/lag control, parallel plumbed to a duplex lead/lag circulating

pump system. For energy conservation reasons, the MSB requests all new designs to be based on the use of two individual boilers. Each boiler shall be sized to meet 80% of the total building design load. No modular bank type boilers may be used. The boilers remain hot, and a primary-secondary loop maintains boiler temperature. Three-way valves are NOT to be used for this purpose. Where gas is not available, oil fired boilers are to be used. The closed hot water system serves a baseboard perimeter fin tube radiator with zone controls. The circulation system will be two pipe, with positive shut off, repairable ball valves and separate balancing valves on each zone. All components will be rated for propylene glycol. No terminal equipment controllers or fan coil units will be placed in offices or conference rooms. Hydronic piping shall be routed in the ceiling spaces, utilidor; or mechanical chase above the room served. Control valves will also be placed in the chase or above the ceiling for fin tube and baseboard radiation. The primary heating system will be designed with water as the heating medium except for shops, storage, and high bay stalls. Areas that need freeze protection such as preheat coils and in-slab snow melt systems will be on separate glycol loops served by a plate-type heat exchanger.

B. The ventilation air system is supplied from an outside air grille, preheated as required, mixed with return air in a mixing box, filtered and transported to variable air volume boxes (or constant volume outlets, as appropriate) located above the ceilings in the control zones. The air is delivered to the occupied space through ceiling diffusers. The return air is removed from the occupied zones through ceiling mounted return air grilles into a return air plenum. From this the air is delivered to the central air system through the return or exhaust air fan. Control dampers are used to maximize the efficient use of the outside air. Due to high quantities of outside air typically used for free cooling, adequately sized relief air openings are essential.

C. Each room will have local control using individual room sensors that will operate fully modulating heating zone valves, and VAV damper operators. The VAV boxes will be mounted in hallways or mechanical chases above corresponding rooms where possible.

D. In determining total (fresh and recirculated) heating and ventilating air quantities to be circulated in a space, consider all the following factors which may affect the quantity and use. Use the largest resulting quantity in the calculations.

1. Air required per occupant basis, as prescribed by the UBC, i.e., CFM per occupant times number of occupants.

2. Air required on basis of type of occupancy.

3. Air required to heat or cool the space or control humidity.

4. Make-up air required for non-recirculated spaces, fume hoods, kitchen hoods, toilet rooms, shower rooms, locker rooms, or other special exhausts.

5. Air required for combustion in fuel burning equipment.

E. Determine the air volume necessary to heat a space on the basis of the temperature difference between the supply air temperature and the desired space temperature. In no case shall this temperature difference be greater than 35 degree (F). Air distribution patterns shall be considered such that there will not be any objectionable air currents

within the space.

Determine the air required to cool a space on the basis of an allowable temperature rise within the occupied space of not more than 20 degree (F) above the entering air temperature. All heat source gains and losses must be properly accounted for, with due regard for diversity and timing of intermittent loads. Report air changes rates exceeding 10 air changes per hour or 3 CFM per square foot of floor area to the MSB Project Manager for possible approval of mechanical cooling.

F. Provide mechanical ventilation for trash rooms, janitor rooms, restrooms, elevator machinery rooms, mechanical equipment rooms and electric rooms as follows:

1. Supply and exhaust for electric and elevator equipment rooms with quantities sufficient to prevent a temperature rise that would impair proper equipment operation. Filter supply air if it is not from the filtered building system.

2. Exhaust only for trash rooms, janitor closets and restrooms, providing a negative pressure in the room to confine odors.

3. Provide exhaust and make-up air to all elevator equipment rooms.

4. Provide sufficient supply and exhaust ventilation to mechanical equipment rooms to prevent temperatures above 90 deg F. Use a minimum of 1.0 CFM/SF for cool rooms and 2 CFM/SF for hot rooms. Never exhaust a boiler or furnace room in excess of supply air, because these spaces must be positively pressurized.

G. Provide the Architect with supply and exhaust air duct sizes and duct shaft space requirements, as soon as quantities have been determined.

H. All systems that contain an air handler with a coil in contact with outside air shall contain glycol. Large systems that have all coils in one area can be isolated using a plate and frame heat exchanger to avoid having to glycol the entire building.

I. Boiler room combustion air will be provided per manufacturer recommendations.

The boiler rooms need to have supplementary heat provided with a unit heater, sized for the room heat loss, which should include the combustion air heat load.

J. Locate make-up air intakes away from areas where vehicles are likely to sit with engines running. Consider how prevailing winds will direct such contaminants.

15-38 AIR CONDITIONING AND COOLING

A. Air conditioning, for occupant comfort only, will not ordinarily be authorized for MSB facilities, but may be added in the future. Where conditions indicate potentially high internal or solar heat loads, discuss air conditioning, or provisions for its future addition, with Project Manager. Discuss temperature and humidity control, where required to meet laboratory or process requirements with MSB Project Manger to establish clear understanding or operating limit, loads and control features required. Interface air

conditioning to direct digital control start/stop. Use only one thermostat per space. Consider using package rooftop units in place of central air and A/C unit to avoid conflict.

15-39 RECIRCULATION

A. Recirculation of 80% maximum general heating and ventilating air will be permitted for reduction of heating energy required, with the following exceptions:

1. Chemical laboratories
2. Noxious laboratories or rooms
3. Toilet rooms
4. Trash and garbage rooms
5. Custodial closets
6. Duplicating rooms using volatile solvents
7. Mechanical rooms
8. Electrical rooms

B. Discuss with Project Manager other areas where recirculation of the exhaust air may become a health hazard.

C. To reduce the number of exhaust fans and ductwork, recommend to and cooperate with the Architect on grouping or stacking of areas whose ventilation air is not being recirculated.

D. Where recirculation is used, install smoke detection equipment as required in governing codes

SECTION 15510 - HYDRONIC PIPING

15-40 DESIGN CRITERIA

A. Design all hot closed piping systems with a maximum pressure drop of 3 feet per 100 and a maximum velocity of 7 feet per second. Use type L copper pipe for all heat piping up to 4", including headers. Schedule 40 threaded or welded steel will be used above 4".

B. Provide for maintenance and repair work in the planning of hot water piping systems, with particular respect to draining the system when pipe joints are broken. Provide hose valves at all of the low points of the system to permit draining.

C. Show automatic air vents at high points in hot water piping systems. Show or specify a valve ahead of all automatic air vents to facilitate replacement

D. Control valves, flow valves, and Isolation Control valves for fin tube heating units shall be located above ceilings to the greatest extent practicable.

SECTION 15515 - HYDRONIC SPECIALTIES

15-41 GENERAL

A. The expansion tank shall be a pre-pressurized diaphragm expansion tank, welded steel, ASME construction (where required by size of boiler of tank) with a working pressure of 125 psig. The diaphragm shall be butyl rubber or other material suitable for use with corrosion inhibitors. The factory charge shall be 12 psig. Do not use plain steel compression tanks. Acceptable manufacturers: B&G, Amtrol, Taco, Armstrong. Each tank shall have separate shut off valves and valved drain taps.

B. The make-up water assembly shall be a bronze pressure regulating valve set at the pressure required to maintain system filled above highest point. Specify Watts 900 series backflow preventor where code permits, with Watts pressure reducing valves. Make-up water assembly shall have a valved line to by-pass pressure regulator.

C. Low water cut-off - McDonnell-Miller Series w/manual re-set as specified by boiler manufacturer design (Install auto air vent with shut off valve.)

D. Glycol Pump - Gould A03WS, BF035 or JOWLS with Square D pressure switch and expansion tank, or owner approved equal. Glycol tanks will be poly constructed.

E. Heat Transfer Medium will be compatible with the system and approved by the owner.

F. Plate Type Heat Exchanges – will be approved by the Owner.

G. Air Bleeders: Use Honeywell Braukmann EA 122A, Armstrong AAE750, or Owner approved equal.

H. Balancing Valve - B & G Circuit Setter II, or Owner approved equal.

I. Air Separator – Spirovent or Owner approved equal.

J. Circuit Setters – Taco, B&G, or Owner approved equal.

K. VFD flow control – Griswold or Owner approved equal.

L. General – Use only ball valves with hose x iron pipe adapter. No light duty boiler drains. No cast pressure reducing valves.

SECTION 15540 - HVAC PUMPS

15-42 PUMPS

A. Circulating pumps: Up to 3 HP--Grundfos or TACO

B. Over 3 HP--Base mounted Bell and Gosset 1510 series or owner approved equal.

C. Require Variable Frequency Drives for all heating pumps greater than 5 HP.

D. Specify two separate pumps, primary and back-up for each pump application. Do not specify double headed pumps, such as the Grundfos dual series. Include separate check and isolation valves on each pump assembly. Show pressure gauges of suitable range at the suction and discharge of each pump.

E. Specify bypass valves (Honeywell Braukmann) or equal between the discharge and the suction of all pumps that do not have sufficient flow when all control valves are closed to meet the pump manufacturer's minimum flow requirements.

SECTION 15556 - CAST IRON BOILERS

15-43 GAS FIRED HEATING UNITS

A. The heating plant shall be located to allow maintenance to the heating units without interruption of normal business. Consideration shall be given during the concept stages of the design to insure the height requirements for the boiler room are met as well as the replacement of heating units, sections of the heating units and other major components of the heating plant.

B. In addition to the codes and standards addressed above, the following codes apply:

1. ASME Boilers and Pressure Vessel Code, Sections IV & VI.

2. Provide all automatic boiler controls listed in Table 10-C of the Uniform Mechanical Code 1994 Edition, and in ASME CSD-1, latest edition.

C. Show and specify gas fired heating units under Mechanical of the contract drawings and Division 15 of the specifications. Primary heating units shall be low pressure hot water boilers. The design criteria shall be as follows:

1. The design shall be based on two separate heating units with a single unit capacity of 70% of the peak design heating load. The capacity calculations shall be based on the following:

a) Entering water temperature (EWT)	160 deg F
b) Leaving water temperature (LWT)	180 deg F
c) Propylene Glycol Solution (by volume)	50%/50%
d) Corrosion inhibitor concentration of sodium nitrate	1,200 ppm

2. The design shall consider that the heating plant may be shut down during the summer months.

   The design shall consider specifying primary heating units that are compatible with the existing MSB boiler systems. The MSB standard boiler system is a factory assembled, sectional wet base cast iron boiler suitable for forced draft firing with a insulated metal jacket, burner mounting plate, ASME safety relief valve, instrument panel, drain valve and a flange mounted gas burner.

3. Provide true HOA switch for control vs. enable switch only. HOA switch providing complete operational control from DDC to manual.

4. District prefers system with a primary loop and a decoupled secondary loop.

D. Acceptable Boiler Manufacturers: Weil-McLain and Burnham.

1. The MSB standard burner is based on a forced draft gas burner, sized to match the boiler rating and furnished by the boiler manufacturer as part of the complete boiler package. The burner shall be U.L./FM or ETL listed as a unit. Combustion and firing controls with self-diagnostic capabilities are requested for large boilers.

2. Set of dry contacts for flame failure monitoring.

3. Provide terminations for full DDC control. Ex. relays for on/off control or 0-10V/4-20Ma inputs.

4. Firing control: Fully modulating or LO-HI-LO. Wire aquastat HI LO on left and operating limit on right when using a dual aquastat.

5. Gas train is UL/FM and designed for 5.3" to 27.7" range of natural gas pressure.

6. Peripheral controls are reset operating temperature control, high limit manually reset control and auxiliary low water safety shut-off control.

7. Indicators and alarms include: power on, run, lock out, low gas pressure and high gas pressure. The lock out indicator shall have a provision for connection to a remote alarm or monitoring device.

8. Provide supply and return temperature wells for DDC. Also provide boiler pressure sensor.

E. Acceptable Burner Manufacturer: Peabody Gordon Piatt (preferred), Powerflame, or Owner approved equal.

1. The two primary heating units are to be plumbed to allow one boiler to be off line for service or repair without losing operating capacity to meet the load requirements as stated above.

2. Provide an electrical operated control valve which will close, shutting off gas to the burners, in the event that the temperature in the heater should rise above a safe point per burner manufacturers gas train design specifications.

3. Manual shutoff valve to shut off all gas service to the heating unit. The valve should be a safe distance from the burners per burner manufacturers gas train design specifications.

4. Specify low water cut-off wired in series with burner controls. Working pressure 50 psig. McDonnell Miller #63M.

5. Separately vent each piece of gas fired equipment to main vent, size according to American Gas Association Code. Main vent on roof needs to be shielded from weather.

6. Burner controls shall include a disconnect switch near burner.

7. The primary heating units shall be connected to a common manifold which is connected to hot water circulating pumps. Each boiler shall have a recirculator pump to return 25% of the boiler supply glycol or water back to the boiler return to prevent shocking the boiler. The recirculator shall operate whenever the boiler is enabled.

15-44 OIL BURNERS

A. The oil burner shall burn the specified quantity of fuel without objectionable vibration, noise, or pulsation with not more than 15% excess air and no CO in the products of combustion, and a maximum of No. 1 smoke as measured on the Bacharach scale.

B. The burners shall incorporate a stainless steel flame retention type combustion head for long life and efficient operation.

C. The burners are to be equipped with an external primary-secondary air ration adjustment, in addition to the total air volume adjustment such that it will be possible to adjust both the total air, and primary air-secondary air ration, without dismantling the burner.

D. The oil burners shall be of the mechanical pressure atomizing type equipped with the following:

1. Two-stage oil pump shall be provided for each burner.

2. Oil safety shutoff valve.

3. Oil pressure gauge to indicate the discharge oil pump

4. Pressure from the pump, and fuel oil suction gauge.

5. Fuel oil filter - General or approved equivalent, and fuel strainer.

6. Fusible-link-actuated oil safety shutoff valve for mounting in the oil supply line between the oil tank and the manual gate valve at the oil pump.

   Burner shall be factory assembled, control panel pre-wired, and the unit fire tested. For burners larger than 3 million BTUs, provide factory pre-wired control cabinet with large swinging door, door gasket, and locking key latch shall be supplied with and mounted on each burner. Cabinet shall house the flame safeguard control, Honeywell RM7800, burner motor starter, fuses, control switches, alarm bell, auxiliary alarm contact, control transformer, indication lamps and relays as required. Panel shall have the following indicating lamps:

   a) Power ON

b) Low Fire

c) High Fire

d) Flame Failure

e) Low water condition

7. Manufacturer: Peabody Gordon Piatt, Beckett, or Owner approved equal.

SECTION 15577 - PREFABRICATED CHIMNEYS & BREECHINGS

15-45 DESIGN CRITERIA

A. Provide separate stacks for each boiler where possible.

B. The chimney (stack) shall be prefabricated U.L. listed for application with the following features:

1. Listed for pressurized systems.

2. Stainless steel liner, and stainless steel outer jacket where exposed to outdoor weather.

3. Clean-out tee, insulating roof support, stainless steel flashing and counter flashing.

C. Acceptable manufacturers: Metalbestos, Van Packer, American Metal Products and Cleaver Brooks

SECTION 15590 - FUEL OIL HANDLING SYSTEMS

15-46 DESIGN CRITERIA

A. Fuel oil day tanks shall be UL-listed and shall be equipped with automatically alternating duplex fuel oil pumps. Tanks shall be equipped with suitable level monitoring to start and alternate pumps as well as provide "high level" and "low level" alarm contacts for the building wide DDC monitoring system. Tank will have a rupture/leak containment outer tank and necessary access for emergency manual fill. See Section 15484 for fuel oil piping requirements.

B. Fuel oil day tanks shall have the following minimum capacity for listed services:

1. Boilers: 50 gallons for every 2 million BTU gross Firing rate.
2. Generators: 25 gallons for every 75 KVA.

SECTION 15835 - TERMINAL HEAT TRANSFER UNITS

15-47 STANDARD TYPES

A. Unit Heaters - Trane or Owner approved equal.

B. Convectors - Trane or Owner approved equal.

SECTION 15855 - AIR HANDLER UNITS WITH COILS

15-48 GENERAL REQUIREMENTS

A. Air Handling Units - Packaged, totally enclosed air handling units should be considered for all applications which deliver 6000 CFM or more. Enclosed units shall be lined with a minimum of I" duct insulation to reduce noise transmission. Insulation shall be protected with minimum 20 gauge ¼ inch perforated metal lining. Units shall have adequately sized, well placed access doors for servicing of fan bearings, fan motor, damper actuators (if used), and shaft. Provisions shall be made for the removal of fan shaft, bearings, and motor, without removal of attached ductwork. Fan unit shall have spring isolation to alleviate sound attenuation, Motor mounting bracket shall be of a screw driven sliding plate design which has a minimum of 6" travel and can be secured in position. It is the owner's experience that AHU's typically do not have sufficiently long mixing air chambers to avoid air stratification, thus freezing coils. The designer must pay special attention to the mixed air chamber design selected in order to avoid stratification that can result in freezing of coils.

B. Provide adequate room to service and maintain air handling units (pull coil, filters, service controls, and fan shaft).

15-49 HEATING COILS

A. Propylene Glycol is preferred as the heating media for tempering and zone reheat coils.

B. If glycol is selected, specify extended surface type glycol coil with copper tubing and copper or aluminum fins.

C. Size, specify and accept only coils having 8 fins per inch spacing. Use of this spacing reduces early coating and eventual plugging with airborne dust and facilitates cleaning when necessary. (See ACCESS)

D. To prevent electrolytic or galvanic action, specify the coil header material shall be compatible with coil material and brass pipe from control valve to header.

E. Size coil using coil manufactures or ASHRAE approved software. Size based on EWT = 180 deg F, LWT 160 deg F and 50% propylene glycol solution.

F. Preheat coil calculations to consider mixed air temperature using 72 deg F return air.

SECTION 15860 - FANS AND SPECIAL EXHAUSTS

15-50 FANS

A. Specify only fans meeting Air Moving and Conditioning Association (AMCA) standards for construction and SCFM ratings.

B. Show all connections between fans and ductwork with a flexible section.

C. Specify safety guards where moving parts are exposed.

15-51 FAN DRIVES

A. Rate V-belt drives at not less than 150% of motor nameplate rating.

B. Specify motors of five (5) horsepower and less be provided with an adjustable pitch motor sheave having the midpoint of the adjustment range equal to the specified RPM requirements of fan.

C. Specify motors larger than five (5) horsepower and drives with more than two (2) belts, be provided with a non-adjustable sheave providing the specified RPM required for the fan, and with a variable frequency drive where appropriate. (Where speeds can be reduced to accommodate reduced loads).

D. After tests have been performed on the ventilation system, or as soon as ascertainable, specify that the Contractor will be required to make, without cost, one change in the size of the nonadjustable sheave and belts to obtain the desired air quantities.

15-52 MOTORS

A. General

1. Note the environment and type of duty a motor is to be installed in, such as dusty, wet, damp, high temperature, continuous or intermittent operation, starting torque, etc., and specify a motor with frame and characteristics to meet those conditions. Specify high efficiency motors.

B. Voltage

1. Specify motors of less than ½ HP as single phase, 60 cycle, with 115/230 voltage rating for 120 volt service and 200 volt single voltage rating for 208 volt service.

2. Specify motors of ½ HP and larger as three phase (where three phase is available), 60 cycle, with the following requirements:

   a) 200 single voltage rating for 208 volt service.

   b) 230/460 or 460 single voltage rating for 480 volt service for motors less than 125 HP

   c) 460 single voltage rating for motors 125 HP and larger.

15-53 BEARINGS

A. General

1. Specify that the installer of any equipment having bearings of any type is responsible for the protection and proper lubrication of the bearings before operation of their equipment. Give special attention to bearings in any equipment that has been

delivered to the job site, or installed, in advance of completion. Specify bearings with a useful life of 200,000 hours.

B. Motors

1. Fit 1-1/2 HP and above, driving air handling equipment, with regreaseable ball bearings having both a grease fitting and relief plug for purging during lubrication.

2. Less than 1-1/2 HP driving air handling equipment and other mechanical equipment such as pumps, compressors, vacuum pumps, etc. may have bearings as normally furnished by the equipment manufacturer.

C. Fans

1. Smaller than 24", self-aligning, provide greaseable enclosed ball bearing, with pillow block mounting.

2. 24" and larger, self-aligning, provide babbitt lined sleeve, with ring oiling.

3. Industrial (sp 27"), heavy duty, self-aligning greaseable enclosed ball bearing, with pillow block mounting.

D. H & V Units - enclosed, greaseable self-aligning ball bearings, accessible for inspection, maintenance and lubrication if required.

E. Special (forced draft, induced draft) - discuss with Project Manager.

F. Others - typical for unit specified.

G. Bearing Lubrication

1. Show or specify all bearing lubrication points as being both visible, and safely accessible after installation of equipment.

2. Where extension pipes are needed to meet this requirement:

a) Vent oil lubricated bearings and extend oil fill pipe for easy access. Install at proper elevation to indicate oil level in bearing.

b) Extend both supply and purge pipes for greaseable ball bearings. Fit with proper lubricating fitting, and fill each pipe with proper lubricant before installing.

H. Maintenance Information

1. Include the following requirements in the Operations, Inspection or Maintenance section of each Division having equipment with regreaseable or oil lubricated bearings.

a) Equipment and its type of bearing.

b) Replacement number, name or size of bearing.

c) Recommended type of lubricant and lubrication period.

d) Proper belt tension on belt driven equipment and instrument for obtaining it. This will help prevent excessive bearing wear or failure.

SECTION 15890 - DUCTWORK

15-54 DUCT SYSTEM DESIGN

A. In addition to the codes and standards addressed elsewhere, the following latest edition or revision of the codes and standards apply:

1. SMACNA - HVAC Duct Construction Standards, metal and Flexible

2. SMACNA - Industrial Duct Construction Standards

3. SMACNA - Fire Damper Guide

B. To reduce static and velocity head loss, turbulence and noise in the ventilation system, observe the following:

1. Do not use plenums for connecting fans, or main ducts, to several branch ducts.

2. Do use properly designed transitions, radius turns, or turning vanes in square elbows, extractors at outlets for volume control, etc.

3. Show sufficient duct and splitter dampers to properly balance the completed system.

C. Ductwork for systems operating within the range of two (2) inches water column positive to two (2) inches water column negative shall be hot-dip galvanized steel sheet per ASTM Standard A 525. Ductwork shall comply with U.L. Standard 181, Class Zero.

D. Rectangular ducts shall have a metal thickness and reinforcing in accordance with Table 1-5 of SMACNA HVAC Duct Construction Standards with reinforcing as shown on Tables 1-10, 1-11 and 1-13.

E. Round ducts shall have a metal thickness in accordance with SMACNA Table 3-2 with all seams and joints constructed to Figures 3-1 and 3-2. Specify round ducts in lieu of rectangular ducts wherever possible.

F. Install turning vanes in all elbows on supply ducts where a center line radius elbow equal to at least 1.5 times the duct width cannot be used. Turning vanes are to be constructed in accordance with SMACNA HVAC Duct Construction Standards.

G. Provide plenums constructed of double wall insulated steel with a thickness of 2 inches. Construct in accordance with SMACNA HVAC Duct Construction Standards Section VI (6). Single wall construction must be approved by the Project Manager.

H. Design pressure for plenums and casings shall not be less than any of the following:

1. The highest point of the fan static pressure curve at design rpm multiplied by 1.23 and considered to be negative or positive depending upon location relative to the fan.

2. For single walled plenums, lined or unlined, for low pressure/velocity systems: 2 inches W.C. positive and negative.

3. For double wall plenums for any type system: 6 inches W.C. positive and negative.

I. Flexible duct shall be used for connections to air diffusers and returns in lay-in ceilings. The flexible duct shall not exceed 10 feet length with one 90 degree bend or a large radius 180 degree curve in addition to the connection at the diffuser. All connections between the flexible ducts and metal ducts or collars shall be in accordance with SMACNA HVAC Duct Construction Standards Section III (3). Support the flexible duct at connections to air outlets or returns to maintain minimum recommended bend radius.

J. Acoustic characteristics shall not be less than the following:

BAND, Hz	125	250	500	1000	2000
Loss dB	8	12	29	35	36

K. Acceptable Manufactures: Thermoflex (Type M-KE), Wiremold, Genflex.

L. Provide volume dampers at each low pressure duct main and branch as necessary for air balancing. Do not use splitter dampers and extractors to control the volume of air.

15-56 DUCT AIR VELOCITIES

A. Do not exceed supply and exhaust ventilation air velocities recommended by ASHRAE for the type of building and designated use.

B. Size ducts for maximum selected velocity only at the fan. Reduce this velocity to the minimum acceptable as air quantity and pressure decreases in relations to distance from fan.

C. The following shall be used as the MSB design standard for air velocity.

Component	Air Velocity fpm
OSA Intake	350
Filter	400
Coil	500
Main Trunk	1000
Distribution	800

15-57 SHEET METAL DUCTWORK

A. Specify galvanized steel for ductwork and plenum chambers.

B. Conform to fabrication and supporting practices established in the SMACNA manuals for sheet metal work.

C. Support all exposed ducts from concrete inserts with rods bolted to duct angle stiffeners or to set angle or channel cradles. Support vertical risers at each floor level with intermediate guide support midway between floors.

D. Specify specifically designed hardware for manual dampers, plenum doors and access doors, such as the "Ventlock" line, manufactured by Bent Fabrics, Inc., DuroDyne Corp. equivalent or equal.

E. Specify all high humidity room, dishwasher or range hood exhaust ducts to have water-tight and grease-tight seams and joints, either by soldering or welding. Pitch duct to hood and provide for condensate drainage.

F. Specify installation of capped instrument test holes on each side of heating coils, fans and units with duct connections. Extend to outside insulated ducts. Location to be visible and accessible for taking accurate measurements of static pressures and air velocities.

15-58 ACCESS PANELS AND DOORS (VENTILATION)

A. Show sufficient access panels, at accessible locations in ducts, to permit cleaning interiors. Pay particular attention at points where ducts are directly connected to louvers, screens, coils, H&V units, etc., and at any point in range hood exhaust duct where grease could accumulate.

B. Specify the following warning sign be stenciled in 1" minimum high red letters on opening side (or both on walk thru) of any access door or panel between areas or in ducts where there is a positive or negative differential pressure above .50 inch W.C.

WARNING: DOOR (OPENS) (CLOSES) ABRUPTLY UNDER (POSITIVE) (NEGATIVE) PRESSURE

C. Show a double door (air lock) entrance to any supply or exhaust plenum where the pressure differential is sufficient to be a hazard for maintenance personnel opening or closing a single door. Provide a method for equalizing air pressure between zones during use.

SECTION 15910 - DUCTWORK ACCESSORIES

15-59 AIR FILTERS

A. Design and detail filter bank leak tight and structurally stiff to prevent deformation or breathing action, with maximum static pressure.

1. Building Ventilation

a) Determine efficiency, type and number of filters required by building air requirements, occupancy, location of filters and available filter space.

b) The standard filter is based on the FARR 30/30, 2-inch with the average efficiency of 25% to 30% filter media on ASHRAE Test Standard 52-192.

c) Where a filter bank is used, limit its height to 8 feet where possible. Where necessary to have a greater height, provide for servicing the upper filters by specifying a roll-around aluminum scaffold of sufficient height, or catwalk with guardrail, specified and detailed.

d) Provide adequate illumination on each side of bank for servicing.

e) Specify that the system shall not be operated during construction without the filters in place. Where the static pressure at the time of balancing would affect the results, clean or replace the media before balancing or acceptance.

f) Specify dial type draft gauges for all filter banks, with scale range to suit static conditions anticipated.

g) Specify a sign is to be posted below each gauge giving clean and dirty readings anticipated with the installed filters.

15-60 DAMPERS

A. Show accessible dampers at major divisions in all duct systems to permit balancing of air quantities. Each supply outlet and each exhaust branch must have a damper control. In addition, damper the main duct runs to permit proper divisions of air quantities in the duct systems.

B. Specify locking quadrant type damper operators for exterior insulated ducts.

C. Use dampers which are integral parts of supply or exhaust grilles only for minor air balancing, provided the adjustment required will not cause noise in occupies areas.

D. Fire Dampers/Fire-Smoke Dampers

To prevent any misunderstanding during installation of the ventilation system, conform to the following:

1. Receive from the Architect, floor plans indicating all fire partitions in the building.

2. Show fire dampers or fire/smoke dampers in all ducts penetrating the fire partitions, as required by The Uniform Building Code and State of Alaska's Fire Marshal's office. Do not make a general statement such as, "Install fire dampers 'where', 'as required by applicable codes."

3. Specify fire or fire/smoke dampers meeting one of the following requirements:

a) U.L. fire-rated and listed.

b) Having been manufactured conforming to specifications established as a result of testing in accordance with nationally recognized test methods and standards.

4. Show dampers installed in an accessible location, or provide access to each fire damper for maintenance and fusible link replacement. (See ACCESS)

5. Detail fire damper installation in accordance with Sheet Metal Institute "Fire Damper Guide."

SECTION 15936 - AIR INLETS AND OUTLETS

15-61 GENERAL CRITERIA

A. The building ventilation supply air inlet location is critical to minimize the intake of ground level dirt, leaves, noxious exhaust gases, etc. Preferred location is at an elevation to limit such intake. Do not locate in vicinity of loading docks or near areas with idling buses.

B. Exhaust possibly contaminated air and other non-recirculated air vertically, at roof level, with high velocity for dispersion and dilution. Exhaust recirculated quality air at any point where the discharge will not be objectionable.

C. Early discussion of these locations with the Architect and the Project Manager will prevent later design changes.

D. Arrange louvered supply and exhaust openings to exclude rain and snow, or safely dispose of it. Design for a maximum air velocity of 500 feet per minute through the net free open area.

E. Do not locate low exhaust outlets where air will blow on plantings, as they will not survive under continuous air currents.

F. Screen or louver all ventilation air inlets. Screen exhaust outlets only where required for safety. Do not specify or show any screen with smaller than 1" minimum mesh.

G. Provide duct access from within the building for maintenance and cleaning of all louvered or screened openings from the inside.

In areas with high humidity such as swimming pools etc., locate supply and return air dampers in areas free of glaciation that would freeze dampers.

15-62 GRILLS, REGISTERS AND DIFFUSERS

A. Coordinate supply air register, diffusers and return air grills with Architect to insure comparability with design. Select the type and design characteristics from the latest manufacturer's data. Design standards shall be based on the latest edition of ASHRAE Fundamental Handbook Chapter of Space Air Diffusion using the Air Diffusion Performance Index, ADPI.

SECTION 15975 - DIRECT DIGITAL CONTROL SYSTEMS

15-63 DESIGN CRITERIA

A. DDC (Direct Digital Controls) will be manufactured by Automated Logic (No substitutions). Specify the DDC system to perform the following functions:

1) Furnish power for sensors and controls up to and including interposing relays.

2) Monitor the status of equipment items.

3) Provide for remote adjustment of control equipment set points.

4) Provide interface communication with the building fire alarm system.

5) Design system to fail safe. This includes dampers, pumps, and heating valves.

6) Communicate with other DDC units directly along a common bus.

7) Communicate with the Borough's Web CTRL Server over Borough provided TCP/IP network connection.

8) Specify battery backup for DDC RAM of at least twenty-four (24) hours.

9) Application Specific Controls

a) Control of central HVAC systems and equipment

b) Built-up air handling systems

c) Hot water systems

d) Terminal control units for offices or public areas (VAV Boxes, in-floor radiant heat, etc.)

i) Provide discharge air temperature sensors on VAV boxes.

e) Damper actuators

f) Valve actuators

g) Site lighting control

h) Electrical phase loss/phase reversal

i) KWH/KID monitoring

j) Generator

i) Run status

ii) Common alarm

k) Fire alarm common alarm

l) Fire alarm trouble

10) Graphics: The graphics shall reside in the Automated Logic workstation/server and shall include:

a) Building floor plans with links to HVAC equipment and their locations.

b) Mechanical Rooms with equipment layout and links to equipment schematics.

c) Equipment schematics showing the equipment internal components and the associated process variables, and actuator positions, status, and alarm conditions.

d) Links to the building control schematic drawings (in PDF format).

B. Equipment Control

1. Boilers

a. Enable and disable functions shall be manual, by the operator. Boilers should be controlled by DDC specifically including lead/lag.

b. Specify boiler flame failure monitoring, and run status.

2. Hydronic System Hot Water Circulating Pumps

a. Specify that one pump operate when outside temperature is less than 60 deg F or as commanded by the operator. The other pump shall be on standby. If tank/coil water heaters are used and are on the same loop as the hydronic hot water system or glycol system, operate pump continuously.

b. Specify that one pump shall operate for one week unless the pump fails, in which case the other pump shall become the lead pump. Provide weekly pump alternation. Provide both lead/lag alarm and pump alarm for the failed pump.

3. Domestic Hot Water Circulation Pump

4. Supply Air Fan

a. Specify safety shutdowns if unit discharge temperature falls below the minimum temperature.

16-64 HEATING AND VENTILATING CONTROLS - GENERAL REQUIREMENTS

A. General preliminary design for heating and ventilating control systems shall include provisions for full automatic control. The acceptable DDC system is manufactured by Automated Logic Corporation (No substitutions).

B. If VAV boxes are specified, the standard is to use electronic/electric actuators supplied by the automated controls contractor.

C. The electronic system, Direct Digital Control, shall be completely transparent with the Borough's existing Automated Logic hardware and software. Locate the control panels on the plans to avoid interference with other mechanical.

D. Show control diagrams on the drawings. Design power to all control panels as part of Division 16.

E. Describe in specifications all component parts of the system with a detailed narrative of the control sequence. Include in the specifications a point list showing each device describing the type of input and output and its relationship to the component that is being controlled. Specify all temperature setting, control device limitations and operating limits.

F. Use individual room heating and ventilating controls with room thermostats in all new construction and remodel areas. For areas having a low level of control, such as entries, use line voltage or 24 volt electric controls that will not be connected to the DDC system.

G. Divide large open areas, or rooms, into zones with separate thermostats for each zone exposure.

H. Specify completely waterproof thermostats for any rooms, such as kitchen dishwasher machine areas that have a surface finish and provisions for washing with steam or high temperature water.

I. Show thermometers near each controlled point for checking its operations.

J. There should be NO PNEUMATIC controls in new installations.

K. Specify system to operate as a low-voltage multiplexed data system Design system so a failure of the DDC shall cause all heating applications to go to full heat.

L. Specify coordination of controls between plumber, sheet metal worker and controls contractor, stating each specific work assignments.

M. Specify all programming to be included to implement the controls sequences and to implement the systems and features in the Web CTRL DDC system.

N. Specify the Borough Web CTRL Host CPU, located at the Borough Network Operations Center, to be updated to include all programming, graphics, database changes, and electronic O&M's installed under this design.

O. Require that all control points be demonstrated to the owner and engineer at substantial completion.

P. Specify electronic devices for the following applications:

1) Air Differential Pressure Sensors for the following:

a) Control air pressure high/low alarm.

b) Air duct static pressure sensing/high/low alarm.

c) Filter pressure monitoring.

2) Use current sensors for

a) Pump status monitoring.

b) Fan status monitoring.

3) Electric Thermostats

a) Electric room thermostats: Line or low voltage, two-position devices.

b) Unit heater thermostat: Amperage capacity sufficient to cycle fan without need for contactor.

c) Remote bulb thermostats: Precision snap acting, dust tight contacts; external adjustment by screwdriver slot or range adjusting knobs; operating temperature point in mid range of the instrument.

d) Freeze protection thermostats: 20-foot element.

e) High Limit Thermostats (fire stats, etc): Rod and tube type elements.

4) Pneumatic Devices

a) Static pressure reference head is to be located so outdoor static pressure is sensed though an orifice between two parallel plates mounted parallel to the ground.

5) Specify automatic control valves as follows:

a) Three way valves, mixing type: Two inlet ports and one common outlet port.

b) Control valves ½" through 2": Brass, or cast iron bodies with screwed connections.

c) Control valves 2 ½" and above: Cast iron with flanged bodies.

SECTION 15980 – INSTRUMENTATION

15-65 GAUGES AND THERMOMETERS

A. Show and specify gauges or thermometers in the following locations:

1. Differential gauges across main building air filter.

2. Pressure gauges at all pressure reducing valves to indicate both high and reduced pressures.

3. Pressure gauges at all pump suction and discharges, and at glycol fill stations.

4. Thermometers on hot water systems, domestic or heating, to adequately indicate supply and return temperatures.

5. Thermometers or thermistors connected to DDC on heating and ventilating systems to indicate temperatures at fresh air inlet, tempered supply and cooled air if used. The heating equipment locations shall include the boiler inlet and outlet and the heating coil inlet and outlet.

6. Provide other gauges and thermometers wherever needed to give pressures and temperatures necessary or desirable for maintenance and trouble shooting.

B. Specify pressure gauges with range that will read mid-scale at normal operating pressures.

C. Show all thermometers and gauges installed so that they are both visible and readable from an accessible and safe location.

1. Filter Differential Pressure Gauges

   a) Specify direct reading differential pressure gauges of the range appropriate for the pressure drop being measured. Specify one gauge for each filter bank.

2. Thermometers

   a) Specify pneumatic remote capillary or direct reading thermometers on both the supply and return hot water heating headers.

15-66 METERS

A. Meter the mechanical and electrical utility services to each building. Additional submetering may be requested by the Project Manager for special subdivisions within the building.

SECTION 15990 – TESTS

15-67 TESTS

A. Include tests of all mechanical and electrical installations by the Contractor to demonstrate compliance with the specifications. Include performance tests under simulated operating conditions, with the Contractor responsible for the cost of fuel, electricity or other utilities required to run such tests.

1. Piping tests

2. Heating and Ventilating tests and adjustments as outlined in Heating and Ventilating Division

3. Refrigeration tests and adjustments as outlined in Refrigeration Division.

4. Electrical tests as outlined in Electrical Division.

B. Require all mechanical and electrical systems to be commissioned prior to substantial completion. Provide data sheets to be completed at commissioning by contractor.

15-68 UTILITY SHUTDOWNS

A. Include the following in any specification serving new utility connections to existing buildings or new structures.

1. Request any shutdown of a building, or utility through the MSB Project Manger two (2) working days in advance.

2. Owner will arrange for the shutdown on requested time and date, if possible, or on alternate agreed time and do all the actual handling of valves and switches. Contractor shall be responsible for all other work, such as splicing, tie-ins, and connections shown on the drawings.

3. Schedule and execute such work that will cause major shutdowns, to be done after normal working hours or on weekends, unless approved otherwise.

4. Have adequate workers, materials and equipment available at approved scheduled time, to complete the work promptly and re-establish service with least interference to operations.

1. Exterior display and area lights shall not be ground mounted. Coordinate with electrical Engineer.

2. Lighting shall be provided at all entrances. Parking lot lights will be discussed with the MSB.

3. Actively coordinate with the local utility. Speak with the utility engineers regarding load, specific load and phase requirements, and construction schedule for each individual project. Send the utility engineer plans and follow up. Do no forget the telephone company, they need to be informed of entrance locations, number of lines, punch block panel, etc. Consider that local utilities are slow to respond and plan accordingly (long lead time for service).

4. On major projects (Greater than 70,000 SF) consider alternative energy means to minimize operating costs. This specifically includes fuel cells or other new and emerging technology where they can be shown to offer life-cycle cost benefits.

5. See MSB Preferred Materials List (Appendix A).

DIVISION 16 - ELECTRICAL

SECTION 16010 - .....GENERAL ELECTRICAL REQUIREMENTS

16-01 CODES

A. Comply with all the current laws, rules and regulations of the State of Alaska Administrative Code (A.A.C).

The following contain requirements applicable to the MSB construction work:

1. All electrical work shall comply with the codes or guidelines, latest edition, as applicable to the project, and as approved by the Matanuska-Susitna Borough or noted herein.

   a) National Fire Protection Association (NFPA)

   b) International Fire Code (IFC)

   c) International Mechanical Code (IMC)

   d) International Building Code (IBC)

   e) General Safety Code (OSHA)

   f) Underwriters Laboratory, UL, or approved equal

g) American National Standards Institute (ANSI)

h) American Society for Testing and Materials (ASTM)

i) Institute of Electrical and Electronics Engineers (IEEE)

j) Insulated Cable Engineers Association (ICEA)

k) National Electrical Manufacturers' Association (NEMA)

l) EIA/TIA - Telecommunications Building Wiring Standards.

m) BICSI - Telecommunications Distribution Methods Manual.

16-02 DESIGNS AND PROJECT PROCEDURE

A. The Architect and Engineer shall meet with the Project Manager and O & M staff at the completion of the schematic phase to review issues which include: lighting fixture types, equipment selecting panel locations proposed, alarm systems, and lighting controls planned. Adherence to brand requirements will assist in making this a smooth process.

B. The Architect and Engineer shall meet with the Project Manager and O & M staff on completion of design development drawings. Items and discussions to include:

1. Load calculations to substantiate service and generator sizing, including spare capacity as directed by Owner if in excess of 25%.

2. Lighting layout, including fixture types and designed illumination levels.

3. Planned electrical distribution system design.

4. Special system schematics.

5. Eighty percent (80%) specifications detailing all building components.

16-03 SPECIFICATIONS AND DRAWINGS

A. Do not repeat in the specifications items that are covered in standard forms of General Conditions or General Requirements. Refer, in each division, to the General Conditions and General Requirements (usually Division 1) and indicate that these items apply to the specific divisions of the work. Note particularly general requirements, clauses covering materials, submittal's for approval, substitutions, shop drawings and guarantees.

B. The fundamental requirement is that drawings and specifications be complete, detailed, and accurate enough so that all bidders may prepare estimates on exactly the same work and construction may proceed with no misunderstandings on the work to be done.

C. Make each division of the specifications complete in itself. Avoid duplication and conflict between the specifications and the plans.

D. Avoid the use and specification of unusual materials, or those not available on the local market. Where materials may not be well known, include the name and address of either the manufacturer or local agent in the specifications.

E. Make scale of working drawings 1/4, 1/8, or 1/16 inch to the foot, with preference given in the order mentioned.

F. Make schematics and diagrammatic details for each project large enough to be easily read. Scale boiler room, kitchen and electrical room plans and elevations at ¼" minimum. Use ½" or larger if required to clearly show details of design.

G. Provide, on each set of plans, an adequate identifying legend of all symbols used. Identify and define all abbreviations used on the drawings.

H. Detail contract drawings for general electrical installation so the installation drawings by subcontractors will have to be made only for special conditions, or in cases where equipment rearrangement is required.

I. Make sectional drawings of congested areas to show all electrical and mechanical work involved. Repeat, or refer to, such sections on the drawings for each affected trade.

J. Provide separate drawings for lighting and power work. Separate specialty systems from lighting and power drawings.

K. Furnish riser diagrams for special systems. Where practicable, show dimensions on the diagrams. Show clearances above ceilings, in walls and below floors where work is to be routed.

L. Provide schedules on drawings for lighting fixtures and other items. List enough operating characteristics to define the items without questions, and include sufficient description for ordering of equipment replacement or parts.

M. Show all electrical service and meter equipment and locations. The General Requirements, Division 1 should note that the Contractor will be charged the difference in the monthly utility cost for the previous year whenever the amount exceeds $200.00 in a single month. (This condition applies only when an existing building is being remodeled and has the capacity to provide the service.)

N. Do not imply responsibility of the contractor for elements of engineering design in specification paragraphs that require compliance with rules, regulations and codes.

O. Do specify installations to be made "in accordance with the manufacturer's recommendations" . Where a single type of material is acceptable and the method of application is uniform for all manufacture's products, the specifications should state the installation requirements explicitly and in detail.

P. Do be specific as to the division furnishing automatic controls, control wiring, motors, disconnect switches, motor starters or other electrical equipment. Clarification is necessary both as to furnishing and installing. This may be done by a schedule on the Mechanical or Electrical drawings showing in which divisions each item is specified and which trade installs the item. Include, as a minimum, the controls schematic diagrams, sequences of operation, specifications and DDC points list.

Q. When specific brands and catalog numbers are used to specify a material, product, item, or service, it shall be followed by two or more acceptable brand names, and concluding with "or approved equal."

R. If performance is used as the basis for specifying any equipment, product, or material, use the following guideline:

1. Specify desired characteristics, salient features, or user requirements.

2. Specify complete performance criteria, with minimum, maximum or variable conditions expected.

3. Specify tests and methods to be used in determining compliance, together with where and who will perform tests.

4. Do not include materials, methods of manufacture, finishes or dimensions, except where that may be critical to design or location.

S. Specify that approval of submitted equipment will be given only to that of current manufacture at time of delivery and that all parts for normal maintenance or repair be available for a minimum period of five years.

T. For all new construction, consider empty conduits to locations for future electrical requirements.

16-04 AS-BUILTS (Record Drawings)

A. True as-builts are essential. This must be spelled out clearly in the contract documents and diligently pursued during construction by owner, designer, and contractor. Additionally, the Matanuska Susitna Borough requires one set of a reproducible for record purposes. The standard size for road projects shall be 24" x 36" and architectural projects shall be 30" x 42".

B. All as-built plans shall also include AutoCAD drawings and PDF file on a CD for future plotting or use with later renovations. The CD shall include controls, fire alarms, clock intercoms, sprinkler and all other shop drawings.

C. Electrical as-builts must show actual circuit routing by complete point to point lines.

16-05 ACCESS

A. Access for operation, maintenance, repair or replacement of any equipment or item is very important. With this in mind, the words access, accessible, etc., as used in this

B. Standard, are defined as being for a 6 foot, 200 pound person with a 50 pound tool box to be able to operate, maintain, repair or replace such equipment or item.

C. The degree of access, or accessibility, will depend upon the importance, complexity, size and weight of the equipment or item. As an example, a branch circuit junction box, being a single item accessed infrequently or never after the initial installation, would require a lower degree of access than a system control panel requiring maintenance or possible removal for repair or replacement.

D. Pay particular attention to access and clearance for all main, distribution, or control, panel boards and enclosures per the National Electrical Code.

16-06 BUILDING UTILITY SERVICE LOCATIONS

A. Information regarding the location, size and elevations of existing utilities and service points will be confirmed in the field by the Electrical Engineer.

B. Do not start layout of any building utility system until this information has been received and discussed.

C. Coordinate in advance with local utilities to fully satisfy their specific requirements.

16-07 SHOP DRAWINGS

A. Include in each division of the specifications a list of specific equipment for which shop drawings or catalog data will be required.

B. As a minimum, specify the contractor to submit shop drawings or catalog data for the following items:

1. Computer Network
2. Electrical Distribution System
3. Fire Alarm System
4. Lighting Control System
5. Generator System
6. Such other as necessary to properly check compliance with the specifications.

16-08 EXISTING EQUIPMENT

A. Reference in the specifications any existing mechanical or electrical equipment shown on the plans, or specified as being furnished by the "Owner", with regard to existing location, when available, who disconnects, moves, reconnects in the new location, and if any new parts, piping, valves or revisions are required for the new location.

16-09 BIDDING PROCEDURES

A. All Bidding Phase requests for substitutions must be received during the first 14 days of the bidding period. Requests for substitutions received after that time will not be reviewed during the bidding period.

B. Approval of items after the bid date and contract award shall only occur on an as needed basis and only with the approval and consent of the Owner.

SECTION 16100 - BASIC MATERIAL AND METHODS

16-10 GENERAL

A. Description

1. Provide minimum 25% spare conduits; identified as spare and terminated for electric power, clock and speaker system, central T.V., and fire alarm system, etc. Terminate in entries and in other locations where future additions or improvements might take place. Conduit runs exceeding 75' in length between panels/j-boxes/outlet boxes shall be minimum 3/4" diameter. Coordinate with owner during design process for specific requirements,

2. Require Square D panel boards. Provide minimum 25% additional panel space. Minimum 24 positions in addition to a main breaker. All panels feeding general purpose outlet circuits within the building will have a transient surge suppression system across the input to the panel, from phase to phase and from phase to ground. Surge suppressor modules will indicate visually at local or remote point when service is required and will be easily replaceable when required, without disruption of power flow through the panel.

3. All exterior buried conduit shall be sloped for drainage and drains or weep holes provided at the low point and bedded in sand.

4. All horns, bells, lights etc. mounted exterior to the building shall be at ten feet height minimum and inaccessible to tampering or vandalism.

5. All heat tapes shall be on GFCI circuits.

6. All exterior electrical devices and their associates poles, posts, brackets and boxes shall be connected to a properly sized grounding conductor which shall be continuous to the feeding panel, then to the building ground rod system.

7. Flexible metal or Liquid-tite conduit may be used only in lengths not exceeding 6' in length. Flexible conduit shall not penetrate walls.

8. Metal-clad (type MC) cable shall not be used.

9. Provide conduit or surface raceway for all exposed wiring.

10. Provide thorough and complete inspection of all systems at completion of project.

16-11 PRODUCTS

1. Floor boxes to be concealed service or stage pocket style. Prefer no floor surface mounted receptacles, please consult owner, Consider sub-floor data/electric ducting design approach in office areas, computer labs and libraries.

2. Duplex receptacles shall be 20 amp rated by Bryant, Hubble or Leviton, Nylon face, 3-wire, self grounding.

3. Hand/Hair Dryers shall be Sloan Electronic Hand Dryer (sensor activated) model EHD-S 208 or owner approved equal. (Coordinate specification with Architect) Specifications are to note that such items are to be furnished by the General Contractor to the Electrical Subcontractor for installation.

4. Motors - Provide totally enclosed, fan cooled commercial grade - Leroy Somers, U.S. Motors, or owner approved equal. Specify 3-phase motors for all motors 5 HP or larger, if 3-phase is available.

5. Motor Starters - Square D, no substitutions with thermal overload protection (under/over voltage, phase loss/reversal relay). Provide over/under voltage and surge suppression on all boiler circuits also.

    a) Single Phase Motor Starters - Square D Class 2510, with red L.E.D. lights, or (Furnas).

    b) Magnetic Starters - Square D or with hand/off/auto switch.

    c) Motor starters to be electrically held. Mechanical/electrical unacceptable.

    d) For motors ½ hp or larger use combination starters, Square D 8538 or 8539 or owner approved equal.

    e) Control Voltage: Verify with DDC system requirements.

        1) Disconnects shall be located at control device in compliance with all applicable codes.

            a) Manufacturer - Square D, only (heavy duty).

6. Switchboard - Square D power logic with remote access capability to interface with DDC system for load shedding ability.

7. Panel Boards - Square D only.

8. Transformers

a) Exterior Use: Westinghouse, G.E or Square D pad mounted.

b) Interior Use: Sorgel 800 or Owner approved equal.

9. Surface raceway, where required will be Wiremold series 3000. Surface raceway will be discouraged wherever possible.

10. Occupancy/Motion Sensors - UNENCO Novitas, or owner approved equal.

SECTION 16120 - WIRE AND CABLE

16-12 GENERAL

A. All wire and cable shall conform to the latest specifications of NEC and/or the ICEA and shall be the products of Triangle, General Electric, Anaconda, or accepted equal. All wire and cable sizes noted on the drawings are for copper conductors and copper conductors shall be used throughout the entire installation. Conductors of No. 10 or smaller shall be solid, No. 8 or larger shall be stranded. Any conductors that extend below grade shall be suitable for wet locations (Type XHHW). The use of THHN below grade is not acceptable.

16-13 PRODUCTS

A. Branch Circuit Conductors

1. Branch circuit conductors shall be 600 volt insulated, minimum size No. 12 AWG, and shall have the following type insulation:

   Indoor - THW, THHN, THWN, or XHHW
   Outdoors in conduit - THW or XHHW
   Direct Burial - USE
   Service Entrance Conductors - XHHW

2. Nylon-jacketed conductors shall not be used in areas subject to ambient temperatures below 32° F.

B. Feeder Conductors

1. Feeder conductors entirely in dry locations - Type THW or XHHW.

2. Feeder conductors partially or entirely in wet locations - Type XHHW.

16-14 EXECUTION

A. Conductor Color Coding

1. Branch circuit conductors shall be factory color coded by integral pigmentation, with a separate color for each phase and neutral. Service and feeder conductors shall be color coded by prominent markings of colored plastic tape applied to the

conductor ends in all enclosures. Color coding shall be as follows and shall be consistent throughout the entire installation.

Conductor	208Y/120 Volts	480Y277 Volts
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

SECTION 16195 - EQUIPMENT IDENTIFICATION

16-15 GENERAL

A. Description

1. Identification - Electrical

a) Main Distribution Panel - At all disconnects identify by room number all sub distribution panelboards or sub panelboards, motor control centers and disconnects. All labels to be mechanically fastened, permanent laminated plastic placards with engraved lettering ¼" in height of contrasting color.

b) All branch panel boards shall contain directory cards in a holder with a transparent plastic cover. Directory cards shall be filled out with typed information showing the identity and location served by the appropriate branch circuit breaker. Where room numbers are used on directory cards, they shall be the room numbers used in the finished construction. Coordinate with the owner prior to construction of signs. Branch panel boards shall have a label denoting source of power supply by room number and disconnect number.

c) Floor plans with room numbers corresponding to panel index references must be displayed and posted on or immediately adjacent to the panel board. Additionally, 11" x 14" as-built copies of the above are to be duplicated and submitted in both project submittals and in the Owner's O&M manuals.

d) All disconnect switches, push button stations, selector switches, branch panel boards and distribution panel or distribution switchboard circuit breakers shall be labeled with engraved plastic nameplates consisting of 1/4 inch white letters on a black background. Mechanically fasten labels to panels. Panels shall be located in non-public areas. (See Numbering Sequence Below)

e) All conductors passing through pull or junction boxes shall be labeled with tags having clearly legible data identifying the panel and circuit number. Conduits and J-boxes shall be identifiable on the exterior surface as follows: red equals fire alarm and yellow equals emergency power. Acceptable

coloring methods are paint bands on 4 foot centers. SEE SECTION 16700 FOR ADDITIONAL COLORS.

A. ELECTRICAL PANEL PM - xxELPxxOl

1. GD General Distribution
2. MD Main Distribution
3. FA Fire Alarm
4. LG Lighting
5. EM Standby Electrical and Mechanical Systems
6. HB Headbolt Heater Outlets
7. EE Standby Electrical

B. HEAT TAPE IDENTIFICATION - xxELxHT01

1. R Roof Drain
2. F Fuel Oil Piping
3. W Water Line
4. S Sewer

C. TRANSFORMERS - xxELTxxOl

1. LQ Liquid
2. DY Dry Type

D. TRANSFER SWITCHES - xxELXxxOl

1. EE Standby Electrical
2. EM Standby Electrical and Mechanical Systems

SECTION 16200 - EMERGENCY ELECTRICAL EQUIPMENT

16-16 GENERAL

A. Description

1. Emergency lighting will be automatic and IAW all applicable codes.

2. Provide standby generator fed power and lighting to mechanical and generator rooms, restrooms, stairways, heat and water pumps, exits, corridor intersections assembly areas, all Direct Digital Control System cabinets and at least 1 fixture each per occupied space.

3. Standby generator to be designed, installed and tested in compliance with NFPA 110 (Level I to include remote readout to be consistent with NFP 110 Chapter 3, Table 3-5.5.5). Size standby generators to provide power to continue to heat, light, and provide water to the building for continued operation during utility power outages.

16-17 PRODUCTS

A. Standby Generator – Cummins Power Generation with microprocessor-based controls or owner approved equal.

1. Block heater: Kim Hotstart with replaceable elements or owner approved. equal.

2. Remote annunciation panel to indicate all fault shutdown devices including low oil pressure (alarm) and high temperature (alarm). Standby load main breaker to show trouble when breaker in open condition. (Same for mechanical load.)

3. Standard cooling system (radiator type) freeze protected to -60°F.

4. All flexible fuel lines to be made of stainless steel – NOT rubber

5. Operate at 1800 RPM at a voltage of 120/240V AC, single phase, 3-wire, 60 htz, full single phase output unless building requirements dictate differently.

6. Primary fuel source will be diesel.

B. Battery charger shall be external to generator and have the following alarm relays:

1. Energize to warn of low battery voltage.

2. Energize to warn of high battery voltage.

3. Energize to warn of AC failure on charger.

C. Transfer Switch - Shall be Onan OT111. Disconnect shall have 2 switches, 1 for motor load and 1 for lighting. Program transition will allow for motor load decay. Transfer switch shall have the following features:

1. Electronic digital exercise clock.

2. Voltage sensor for all phases.

D. All standby switchgear, when located in mechanical rooms, shall be located as far as possible from the boilers.

E. Exit Signs: Provide self contained, vandal-proof, L.E.D. with battery back-up, 120/277 Volt.

SECTION 16400 - POWER DISTRIBUTION

16-18 GENERAL

A. Description

1. Underground service shall be buried in rigid conduit from property line to distribution panel.

2. Square D power logic monitor to be installed on each distribution branch. Analog meters not acceptable. Power monitoring equipment to interface with DDC system.

3. Provide for a totally enclosed meter pedestal.

4. All mechanical systems shall be supplied from mechanical panelboards only. Other loads shall be supplied from lighting panelboards where possible. Do not locate panels in boiler rooms.

5. Kitchen panelboards shall supply kitchen equipment only.

6. Size electrical service and distribution equipment for intended future additions.

7. For facilities in excess of 50,000 square feet, provide 277/480V, 3 pole, 4W underground service, if available.

8. Provide readily accessible shunt-trip button to shut off all equipment in shop rms.

SECTION 16500 - LIGHTING

16-19 GENERAL

A. Description

1. Coordinate lighting system design with Owner prior to 35% submittal.

2. Lighting must comply with current State of Alaska regulations administered by DEC. Reference Code 18AAC30.340 "Lighting".

3. Provide simple but adequate fluorescent light in crawl spaces, pipe chases, and utilidors. In these areas, a lighted switch to indicate when lights are on is desired. Provide guards on all lighting of this category. Lighting will be florescent type wherever possible.

4. Provide controls to minimize power usage for parking lot lights, etc. by the use of efficient design, photo cell controls, solid-state time clocks, contactors, and the use of motion detectors for interior applications. Override switch required for maintenance. (Consult Owner)

5. HID lighting should be used only for large area, high-energy lighting or outside lighting. Prefer to use fluorescent 2-4-6 lamp depending on location with T-5 H.O> four foot tubes. Fixture and manufacturer variety shall be minimized. Where interior HID lighting is used in areas with special requirements such as conference rooms, ballasts are to be remotely placed in mechanical rooms.

6. Require vandal protection for all exterior lighting. Use high pressure sodium fixtures for exterior lighting controlled by photo cell/DDC system.

7. All ground mounted flood lighting shall be elevated at least 36 inches above ground level. Restrict maximum voltage to 120V. Circuit to be supplied from a 15 amp GFCI breaker. Notwithstanding this specification; ground mounted architectural or decorative lighting is highly discouraged.

8. Parking lots and vehicle loading/unloading areas pedestrian approaches, etc. shall be lighted by high pressure sodium fixtures. Fixtures shall be mounted on 100 mph rated, 36" diameter pedestals.

9. Provide separate night light at custodial entrance controlled by a motion sensor and photocell. (Also at front entrance gate if practicable)

10. The lighting systems shall be controlled by motion detectors in corridors and similar public spaces (connected to DDC system) NOT in offices etc.

11. Where possible, all lighting will be 277 VAC florescent with 48 inch tubes. Lighting fixtures to have energy efficient electronic ballasts. Incandescent lighting is discouraged. Office spaces shall have an over ride switch capable of turning lights off for events such as audio/visual presentations. Use (3 lamp or 4 amp) fixtures unless specific need requires deviation. All wiring for lights shall be J-box to light wiring. The MSB will not accept light to light wiring. Prefabricated modular connectors for light wiring systems are not acceptable. Fluorescent fixtures using "U" shaped tubes are to be avoided if at all possible.

12. If parabolic lighting is used in conference rooms, the designer needs to provide separate lighting to illuminate white boards and projection screens with a minimum uniform vertical illumination level of 50 foot candles.

13. Activation of the fire alarm system shall turn on all exterior lighting as well as all common area lighting, through the DDC system.

14. No underground junction boxes shall be allowed for site distribution, lighting, etc.

15. Provide safety chain or cable for all pendant mounted fixtures.

16. Provide self-contained emergency light in mechanical generator and electrical rooms. Make all self-contained Emergency Lights surface mount. Pro II preferred.

17. Provide wire guards for all fixtures and devices in gymnasiums and multi-purpose activity rooms.

18. In Renovation/Remodel work (where reasonable) replace 1st generation mercury vapor lighting with HPS or metal halide.

19. All mechanical rooms and kitchens shall have 1 – 20A, 120V receptacle fed from stand-by power and so labeled.

16-20 PRODUCTS

A. Keyed light switches shall be 20 amp, 120/277 volt specification grade by Hubbell or owner approved equal. All other switches shall be specification grade.

B. Florescent tubes shall be F32 T8/SP35 General Electric, or Owner approved equal.

C. Light fixtures to be supplied by Lithonia, Hubbel, or Day-Brite. Fixtures to have electronics ballasts compatible with T8 lamps (energy efficient). Provide rapid start type. Confirm selection of ballasts and lamps and extent of motion sensor control with Electrical Administrator prior to publication of bid documents.

SECTION 16600 - SPECIAL SYSTEMS

16-21 GENERAL

A. Description

1. Provide self limiting heat tapes listed for use in direct contact with water, on all roof drains that are exposed to freezing; wired with lighted key operated switch. Group and label all heat tape switches in single location, supplied from a GFCI circuit.

2. All classrooms, offices, and assembly area doors requiring closers will have a magnetic hold open device which will deactivate upon a fire alarm. Provide adequate support blocking in walls.

3. Headbolt Outlets (Where headbolt heaters are specifically approved by the MSB):

   a) Headbolt heater outlets shall be post mounted on 4 inch rigid steel conduit as detailed on Schematic #4. Conduit shall have approximate 6-5/16 inch square by 2-3/4 inch high, cast iron hot dip galvanized box arranged for mounting with set screws on top of a 4 inch rigid steel conduit post. Box shall have one opening at each side with tapped holes and configuration of an FS cast box to accommodate up to four receptacles, OZ-Gedney No. OCB 404SF, or approved equal. Single receptacles shall be NEMA 5-20R, self grounding with nylon faces, Hubbell No. 8310, or accepted equal, mounted horizontally. Weatherproof covers hall have one spring loaded hinged cover for single receptacles, drilled for four screw holes for horizontal FS mounting, Bell No. 1940, or accepted equal. Receptacles shall be in accordance with Federal Specification W-G596E-GEN. Configurations for headbolt heater outlets shall be as follows: 3 outlets per post - 3 single receptacles, 4 outlets per post - 4 single receptacles. Contractor shall submit headbolt heater post and associated equipment for acceptance. Provide blank

covers for unused openings. Balance loads by providing balanced phases to outlets.

b) The control functions to be provided include the cycling of headbolt heaters (30 minutes "on" and 30 minutes "off" adjustable). The automatic operation is to occur only during preselected days and hours and only when ambient air temperatures fall below a preset maximum. Cycling within the system is to be arranged so that one group of headbolt heater outlets is "on". The two groups of outlets in the system shall be installed such that both can be on simultaneously when ambient air temperature falls below a preset temperature. Headbolt controls shall be a function of the DDC system.

SECTION 16700 – COMMUNICATIONS

16-22 GENERAL

A. Description

1. Provide conduit with labeled pull wires installed for future installation of cables for television, video security systems, and computer networking. Provide cable trap when directed by Owner. Provide spare conduits for future expansion.

   a) Colors for J-Box covers: CCTV – blue, Intercom – green, computer – orange.

2. Provide provisions for connecting the telephone service to the following system:

   a) Fire Alarm (A 6 pair phone line shall terminate at the fire alarm dialer, not at the fire alarm panel).

   b) DDC control system.

   c) Power monitoring equipment.

3. Major assembly areas (gymnasiums, commons, conference rms) shall have built in sound reinforcement system to include microphone mixer with knobs for channel volumes plus master volume. AM/FM radio, cassette player and adequate speakers with a 200 watt, 2 - channel power amp. Microphone jacks will be provided at convenient locations. Include CD player and Behringer DSP 1124P Feedback Destroyer or equivalent. Provide wheeled portable rack with microphone mixer, Cd and power amplifier with portable speakers.

4. If specifically required by the MSB, television systems shall:

   a) Television distribution jacks will be properly located at 7' AFF. Provide a 20 Amp convenience receptacle adjacent to both TV jacks. Provide 1000 Mhz amplifiers to supply industry standard signal at each jack. All cables must be RG-6 Quad, 1000 Mhz Spec.

b) The television distribution system shall have 3 channels dedicated to in-house program generation (channels shall be #60 or above).

5. Provide computer network installed as follows:

a) Provide four unshielded four pair, EIA category 5e or better computer network data cables per room or office in conduit. Provide also a 2 pair telephone cable to each room. Two cables will run from computer cable wall jacks in each space to a central punch-down switch. Wall jacks shall be located in the spaces by the Architect, and clearly labeled as "computer network". All hardware shall meet EIA 568 level 5 specifications.

b) Network switches shall be located in an enclosed cabinet.

c) Switches-to-field wiring will be via modular jack field patch panel. Jack field will be clearly and permanently marked with cable/room numbers. Patch cables will have outer vinyl sheath crimped in the RJ45.

d) Closets for ethernet will consist of:

Closets will have a minimum of one electrical outlet, additional outlets dependent number of powered equipment. Closets will be located away from door entrance access areas and will have metal hardware racks

e) No hubs, switches, maus, or caus will be located in the ceilings or floors of the building.

f) Switches, Maus, Caus, and Routers:

g) The Borough supports the installation of Cisco router's and switches. Dumb hubs will not be used in any facility. Substitutions will need approval from the MSB IT department through the Project Manager.

6. Provide surge protected power receptacles at intercom/ phone/computer backboard. Power to be supplied from emergency power system and regular power. Provide UPS for intercom and phone system.

7. Locate PA system call stations directly adjacent to room light switches.

16-23 PRODUCTS

A. Television cable system by Blonder-Tongue System or Owner approved equal. Modulator by Blonder-Tongue or Owner approved equal.

B. Master clock slave clock and solid-state bell Program system by Rauland's Telecenter V or Owner approved equal.

C. When required, intercom systems shall be Rauland Telecenter ICS or functional equivalent.

D. The computer network switch controller shall be by owner approved. Coordinate with IT to verify whether switches are in construction package or provided separately as technology or equipment purchases.

E. Specify 1000 Mhz or better cable and distribution amplifiers.

16-24 INSTALLATION

A. Workstation to switch cable numbers will reflect the room number and port number eg...101A, 101B, 201A, 201B, etc. Switch to switch cable numbers will reflect our double digit standard eg...99, 88, 77, 66 etc.

B. Buildings are usually wired in a star topology, wires run from one or more central locations called wiring closets to wall jacks in each office area. Offices are generally given two drops. Multi-story buildings usually have at least one wiring closet on each floor. The wiring closets in a multi-story building are often connected in a hierarchy. Extreme cable distances may require an intelligent switch(s) or mau(s) to be installed in the furthest access points.

C. All MAUs, CAUs, switches or routers will be installed in the wall cabinets, away from door exits.

SECTION 16720 - FIRE ALARM AND DETECTION SYSTEMS

16-26 GENERAL

A. Description

1. Initiating Devices

a) Smoke detection throughout all paths of egress. This includes smoke detectors in larger rooms or intervening spaces in the exit path of offices or rooms such as offices within libraries, or exercise rooms off of gyms. The gym and library in that case shall be protected. Generally keep smoke detectors to a minimum using RA duct detector to cover large spaces where code permits.

b) Smoke detection of any sleeping areas. Intensive resource day care and areas for disabled persons may incorporate naps or rest times. These areas shall have smoke detection.

c) All doors opening into the corridor system will have door release magnets controlled by general alarm. The corridor side of the room doors, being part of the exit system, will have general area smoke detection to meet the requirement for door control on that side. When a waiver cannot be obtained for single side control of these doors throughout the building, then all rooms will be protected with full coverage, area smoke detection. Where the room environment is subject to smoke or dust, the door may be protected on the room side with a non system detector, 3' from the door, powered from the door holder circuit and having dry contacts to release the door magnet.

d) Supply air handling units shall have photo-electric type duct smoke detectors downstream of filters and motors and away from any humidifiers. Return air shall be sampled for smoke ahead of the filters. When return air is common to the mechanical room, protection may be provided by area smoke detectors in sufficient quantities to sample the volume of air at no flow to maximum flow. Very large mechanical rooms may contain return air sampling only where return air enters the mechanical room, and a few area smoke detector for building protection during night fan shutdown.

e) Manual pull stations shall be provided at every exit and where required under 2006 IFC and NFPA 101, 72. Stopper II vandal resistant covers shall be installed on all pull stations.

f) High temperature heat detectors shall be fixed temperature replacement element type. One hundred thirty five degree heat detectors shall be the intelligent type. Star Sprinkler Corporation or owner approved equal. Do not use rate of rise type.

g) Solid state interface modules to fan shut down circuits, sprinkler switches, heat detectors, etc. shall not be mounted higher than 6' in boiler rooms, utilidors, mechanical and electrical rooms and other potentially high temperature areas. These circuits are not rated for more than 135 degrees and can fail before high temperature devices can operate, Lower mounting height will keep them cooler.

h) Fire alarm shut down shall function as follows:

1) Individual control circuit for air handling units shall be zoned through the supplemental relay contacts of the fire alarm control panel.

2) No high voltage (non-class 2).

2. Horn circuits

A. Horn/strobe devices will be provided throughout the building in all occupiable spaces, restrooms, working spaces, mechanical spaces, corridors and exterior of the building. Consideration will be given to visibility per the ADA, however ADA maximum mounting heights may be exceeded to compensate for vandalism protection requirements.

B. Horn circuits shall be designed so that if one horn circuit fails, other circuits will still provide a minimum of 6db over ambient in occupiable areas. Corridor horn circuits shall be 96db full power horn strobe units in sufficient quantity to provide the 6db level in the connecting rooms through closed doors. They shall be on a separate circuit from the rooms. Rooms will have mini horn strobe units.

C. Assembly areas and areas such as gyms, auditoriums, cafeterias, locker rooms, commons, double classrooms, libraries, etc. shall have 2 or more horn strobe

units. Half of the horn strobes in these areas shall be on a separate horn circuit from the others and arranged so that occupants can see and hear the alarm even in the event that one entire horn circuit fails.

D. Rooms which may have high ambient noise levels will have full size horn strobes. These include Band and Music rooms as well as shop areas.

E. The office will have a strobe unit only, so that the staff can communicate with the fire department on the telephone.

F. At the FA/Security panel specify a lockdown tone different from fire alarm.

G. Exterior horns shall be water tight and sealed against moisture entering the back box through the building vapor barrier and the conduit system with silicone sealer around and inside the conduit. Exterior horns shall be on a separate circuit.

H. Exterior horns shall be located so as not to drown out the sound of the sprinkler water gong. Use single horn per building.

I. Sprinkler flow bell shall be independent of the fire alarm system. The sprinkler bell shall be 24 volts D.C. It shall be powered from a Class 2 power supply fed from the emergency panel and operated by the main flow switch contacts. It shall be located above the fire department connection.

J. All J-box covers painted red for identification.

K. Provide program feature to self-reset after power outage.

3. Reserve Capacity

A. Horn circuits shall be limited to maximum 3 ohms loop resistance.

B. Horn circuits shall not draw more than 1 1/8 amp.

C. Initiating circuits shall be limited to 1/2 manufacturers maximum capacitance and shall not exceed manufacturer's maximum resistance to the furthest point on the cable.

D. Initiating circuits shall be limited to 2/3 of maximum number of devices permitted per circuit.

E. Three spare dry contacts, Form C, shall be located in the panel, 1 alarm contact, I trouble contact and 1 supervisory contact. These shall be over and above those used for municipal tie and other functions.

F. Six pair 22 gauge, telephone cable shall be pulled to the fire alarm dialer from the main telephone demark point.

G. The wiring of the system shall be in metal conduit.

H. The bonding and grounding of the conduit shall meet the requirements of the NEC for a power circuit.

I. The door holder magnets shall be 120 volts AC.

J. No remote powered horn modules are permitted. All horn modules will be powered from a regulated power supply within the factory produced enclosure that houses the associated horn modules.

K. All fire alarm circuits shall be Class 2 and shall not be run in the same conduit with any other circuits. AC circuits shall not be run in fire alarm conduits.

L. Sprinkler supervision shall cause a supervisory condition on the panel and a trouble condition at dispatch, Valve tamper, cistern level, fire pump power available, circ pump flow, dry system low pressure shall be supervised.

M. Door holders shall be reinforced.

4. Panel Programming

A. The master disks of the panel program shall be under the control of the District at all times, No modification may be loaded into the panel without notification to and approval from the District, and providing the District with the latest version on disk and in print along with an explanation for the changes.

B. The access codes to the software shall belong to the District.

C. All functions controlled by the panel shall be able to be isolated by the function keys. The following is a list of typical function key assignments:

1) Horn bypass (disables all audible circuits for testing).

2) AHU disconnect (disables fan and louver operation).

3) Door disconnect (prevents door closure during tests).

4) Elevator bypass (disables elevator recall if any).

5) Gas shutoff disconnect.

6) Municipal tie disconnect.

All of the above functions when active shall cause a system trouble and the system trouble to be transmitted to dispatch. Upon reset all functions will return to normal.

NOTE! When gas shutdown is active during an actual alarm resetting the panel shall not restore gas to the building. This shall require a separate manual reset at the gas control panel.

D. In addition to the control functions, 2 keys shall be programmed to override groups of input devices:

1) Sprinkler flow switch override.

2) Kitchen extinguisher (ansul) alarm override.

These functions allow the alarm system to be fully operational during sprinkler maintenance. As in Item 4, trouble signals are generated and reset of the panel restores these functions to normal.

5. Quality Control

A. The system shall be installed according to the UBC, NFPA, NEC, other applicable codes as well as the manufacturer's directions and the specifications and drawings.

B. No work may proceed until submittals have been approved.

C. Wire and cable shall pass megger tests while still on the spool. Results shall be approved before beginning wiring.

D. When wiring is complete, capacitance and megger readings shall be observed and submitted before installing devices.

E. A full test of the system (per NFPA 72) will include functional tests of all devices under realistic conditions and verification of addresses and messages.

16-27 PRODUCTS

A. Alarm, annunciation and detection system shall be manufactured by ESL, Simplex, or owner approved equal. System shall have all components by a single manufacturer.

B. Fire Alarm and Detection System - Simplex or ESL addressable system, with remote calibration, or owner approved equal. Systems shall have all components UL listed with this panel. System shall have following minimum features:

1. Capable of monitoring up to 960 addressable devices or up to 96 zones of 30 non-addressable detectors, or combinations of the above.

2. Addressable initiating circuits shall allow for connection of up to 30 addressable devices.

3. Addressable and remotely settable detection devices thru the control circuitry.

4. Capable of controlling system outputs such as conventional Form C relay contacts, solid state outputs, supervised outputs to control audible devices, master box and reverse polarity outputs, extinguishing system release circuits and addressable devices.

5. Enunciator and control panel provide a 32 character alphanumeric displays to annunciate alarms, troubles, and maintenance information.

6. System is self-polling monitoring all input and output devices on a regular basis.

C. Manual Pull Station - Pyrotronics, Simplex, or owner approved equal (See Paragraph A).

D. Audible and visual alarm signal devices will be installed in every occupied space or room and directly visible to all occupants. Interior Fire Alarm Buzzer and Visual Signal - Pyrotronics or owner approved equal (See Paragraph A).

E. Exterior Fire Alarm Horn - Pyrotronics, Simplex or owner approved equal (See Paragraph A).

F. Thermal Detectors - Pyrotronics, Simplex, or owner approved equal (See Paragraph A).

G. Products of Combustion Detectors - Pyrotronics, Simplex or owner approved equal (See Paragraph A).

H. As built drawing completely field accurate fire alarm as built drawings are a critical requirement from the contractor. $5,000 will be withheld by the Owner until these drawings are provided to the Owner's satisfaction.

MSB Preferred Materials List

Controls	AUTOMATED LOGIC CORPORATION
Air eliminators	SPIROVENT
Boilers-Oil and Gas	WEIL McLAIN or BURNHAM
Unit Heaters	REZNOR or MODINE
Chillers/HVAC	TRANE
Package Day Tanks	SIMPLX
Circulation Pumps	GROUNDFOS or TACO
Fuel Transfer Pumps	OBERDORFER or FILRITE
Glycol Make-Up Systems	Polytanks (plastic)
Valves	HONEYWELL (motorized) or BELIMO
Zone Valves	HONEYWELL, TACO, ERIE
Gauges	No preference
Thermostats	HONEYWELL

Electrical Panels	SQUARE D, NQOB (bolt-in type)
Breakers	SQUARE D, NQOB (bolt-in type)
Exterior Lighting	LITHONIA LIGHTING (HPS) or approved equal
Interior Lighting	LITHONIA LIGHTING T8 (w/ electronic ballast)
Emergency Lighting	Hardwired
Exit Lights	Hardwired, not Nuclear
Generators-Transfer Switch	CUMMINS engines, ONAN generators, ONAN transfer switches
Fire Alarm Panels	SIEMENS
Security Panels	INFOGRAPICS (DSJ ONLY!) or SIEMENS
Carbon Monoxide Detection	ACME ENGINEERING PRODUCTS

Ext. Door Locks	SCHLAGE with CORBIN RUSSWIN D1 keyways
Int. Door Locks	SCHLAGE with CORBIN RUSSWIN D1 keyways
Panic Hardware	VON DUPRIN
Door Alarms	No preference, verify with MSB IT department
Door Closers	LCN (preferred) or NORTON
OHD & Operators external face	Trolley style operator, R16 (insulation level), 20 gage metal
Flush Valves	SLOAN or ZURN